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Collaboration for Sustainability and Innovation: A Role For Sustainability Driven by the Global South?

A Cross-Border, Multi-Stakeholder Perspective

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Foreword

There is a quotation attributed to Albert Einstein that frequently surfaces during debates about sustainability along the lines of "*The significant problems we face today cannot be solved through the same type of thinking that we employed when we created them*." The statement represents a paraphrasing and amalgamation of several of Einstein's comments about education and politics in relation to atomic physics, rather than a direct quotation, but the sentiment is correct, and the relevance to today's problems linked to sustainability is unquestionable.

It is in helping us to think differently about how to address some significant problems arising today, and ones that will have consequences for the future, that makes this book both valuable and timely. Technological innovations will be important solving many of the social and environmental problems that we face, but expecting the technologists alone to deliver real progress towards sustainability is neither fair nor realistic. An equally important field for innovation is in our thinking, and in how we understand and seek to manage the interrelationship between economic activity, social progress, and the natural environment. Creating a form of "sustainability revolution" in both the "hardware" and "software" of society is a daunting challenge that will require a wide range of stakeholders contributing, and often working together in new collaborative relationships.

A key component of our established and unsustainable way of thinking is our tendency to artificially divide, delineate, and separate things. This applies in politics and geography where arbitrary lines of governance are imposed over natural landscapes and ecosystems. It applies to the separation of our thinking about business, economics, and finance from the natural resources and ecosystems services on which we all ultimately depend. It applies to our division of human activity into separate spheres that we label as commercial enterprise, social enterprise, public service, and civil society. It even applies to knowledge itself which becomes increasingly specialized and compartmentalized as we subdivide academic disciplines ever more finely. What has become clear over the years is that the boundary-less nature of sustainability as a field of knowledge makes it essentially meaningless to talk about a sustainable product, a sustainable business,

a sustainable city, or a sustainable nation (even though you will find books, conferences, and policies aplenty talking about each of them). Applying the principles of sustainability within the business or policy arenas only becomes truly meaningful when we envisage these entities as part of broader and open systems of production and consumption, of living, or of governance. Such systems almost inevitably cross international borders. Therefore cross-border collaborative relationships that bring together stakeholders to develop innovative social and technical solutions to sustainability problems represent a vitally important plank with which to bridge the gap between our unsustainable present and our vision of a more sustainable future. It remains however an academically underexplored field, perhaps because it does neatly fit into any one of our preexisting disciplinary-based notions of innovation and development.

The beauty of this book lies in its challenge to us as readers to think differently about the boundaries, the relationships, and the stakeholders involved in cross-border collaborations aimed at generating sustainable innovation. A future in which financial wealth flows across the (also arbitrary) north–south divide from richer to poorer countries will be vital for the relief of poverty and the pursuit of sustainability. However, if this is achieved through the gradual liquidation of the natural wealth of poorer countries in order to maintain the global economic status quo, neither poverty reduction nor sustainability will ultimately be achieved. The result instead will be a natural capital "crunch" that will make the global credit crunch experienced in the aftermath of 2008 look inconsequential by comparison. The key to success will be to find new ways of generating social and economic value from the social and environmental capital that exists, without its erosion. This will require a tremendous amount of innovative thinking in government policies, in business models within key industries, in technological development, in how we measure progress and wealth, and in how we structure, manage, evaluate, and learn from cross-border collaborations.

To date our understanding of the way that innovative thinking and relationships can contribute to substantive progress in international development has tended to be long on interesting examples of good (and bad) practice, but short on rigorous and coherent theory building. By adopting a transdisciplinary Sustainability Science approach and applying both a multi-stakeholder and a multilevel perspective, this book offers the institutions and individuals involved in cross-border collaborations the opportunity to fully appreciate their dynamics and potential. Its chapters provide a wealth of insights from different theoretical perspectives illustrated with examples drawn from different countries and highlighting the range of types of collaborative relationships that are emerging.

This book's publication also coincides with a significant downturn in the level of aid for international development that most of the major OECD countries are willing to provide. As the conventional "donor driven" model of international development comes under both financial pressure and increasingly critical analysis in terms of its effectiveness, there is growing interest in alternatives. Old boundaries are blurring, and past certainties about sources of knowledge and leadership in

the search for pathways to sustainability are eroding. The time has come to think differently about how we can develop effective collaborative relationships across the boundaries between countries, industries, and sectors in the search for the social and technological innovations required to make sustainability something more than just an aspiration.

Ken Peattie

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Editors

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Chapter 1
Collaboration for Sustainability and Innovation in the Global South: A Cross-Border, Multi-stakeholder Perspective

Diego A. Vazquez-Brust, Joseph Sarkis, and James J. Cordeiro

Abstract Innovation, sustainability, and collaboration are all related in their efforts to manage multiple dimensions of organizational and institutional policies and practices. This chapter conceptualizes an integrative Sustainability Science perspective of innovation, sustainability and collaboration, providing and overview of the three topics and their relative importance to overall advancement of Global Sustainability, in particular through innovations from the South. It is argued that Cross-border collaboration (North–south and South-South), is necessary to achieve this goal and various collaborative arrangements and stakeholders in these arrangements are discussed. Our perspective emphasizes not only of the need but also the challenges of sustainability-oriented projects involving cross-borders partnerships. The chapter finally introduces and discusses the various remaining chapters in this book and presents summaries, insights and linkages amongst these chapters.

Keywords Cross-border collaboration • North-south • Multi-stakeholders • Sustainable innovation • Global South

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The challenge for cross-border collaboration is the transition from the traditional relationship model, with a Southern "receiver" – Northern donor and "consultant", to a new partnership of equals with balanced responsibilities, shared leadership and entrepreneurial thinking (Glasbergen and Miranda 2003). Detailed consideration of new pathways to sustainable innovation, including the cross-border collaborations we are focusing on, are especially needed after the disappointing. largely rhetorical outcomes of the Rio+20 Summit which had little, if any, substantive influence on sustainability progress. A compelling case can be made for interdisciplinary efforts that go beyond the existing, dominant perceptions of what constitutes good practice to foster innovation. We believe that this effort entails thinking creatively about alternative cross-border collaborative pathways to sustainability than those prevailing in Europe, Japan, and the USA. Collaborative arrangements from our point of view arise from cooperative regimes where groups from diverse sectors voluntarily coalesce – despite different perspectives and interests – to put policy into practice.

Over the last two decades the scale and scope of North-South partnerships has exponentially increased (Glasbergen et al. 2007; Termeer et al. 2010) Prevailing models of collaboration between North and South generally lack mutuality and equitable Southern engagement in agenda setting processes and access to funds (Schüklenk and Kleinsmidt 2006; Simon et al. 2003), regardless of whether the partnerships are between north and south NGOs (Ahmad 2001), north and south policy-makers (Johnson and Wilson 2007) or north and south research teams (Velho 2004; Boshoff 2010; Baud 2002).

Government agency donors usually require southern recipients to partner with organizations from the donor country as a prerequisite for funding, making collaboration forced rather than voluntary (Hatton and Schroeder 2007). More controversially, donor schemes introducing new technologies and funding for developmental purposes, often work to the economic detriment of the communities assisted: communities become structurally dependent on flows of funds or technology, and focus more on promises of increased assistance than on developing self-sustaining solutions for their problems (Simon et al. 2003; Peet 2008).

Overall, the extant empirical literature offers more examples of failure than of success stories in north-south (N-S) partnerships. Problems include language, distance and cultural barriers (Termeer et al. 2010); complex management structures (Ashman 2001; Bradley 2008); inequitable access to financial resources, libraries, conferences, training and publishing (Ahmad 2001; Amalric 2000); mismatched expectations (Amalric 2000); fragile social trust (Termeer et al. 2010); lack of face-to-face interaction coupled with different levels of methodological and ethical stringency (Koehn 2012) and subordination of southern needs to northern interests (Ahmad 2001; Velho 2004; Koehn 2012).

It is worth noting that southern partners appear poised to step up as partners with greater responsibility in the partnership. Bradley (2008) argues that credible southern institutions are well placed to advance more balanced agendas, even those critical to donor governments. This positioning is true despite the fact that the operational hurdles and red tape that typically accompany North-South cooperation

can lead southern organizations with the "clout" to challenge northern donors to simply avoid N-S collaboration schemes and seek more flexible, direct sources of funding.

There have been a few cases where donors relegated the research and intervention agenda to recipients in the south. One milestone was the cutting-edge "demand-driven" partnerships scheme launched by the Dutch government in 2001 seeking to fund "activities in which developing countries' citizens are able to bring about their own development agenda, with the objective of building-up research systems to unleash the potential of the south (Nair and Menon 2002, p. 2). This scheme, however, failed (Bradley 2008), being discontinued in 2005 following negative appraisals. It was found that the research questions and investment areas selected by southern researchers were not the most relevant to southern countries' actual needs, since southern researchers lived in "ivory towers" with research interests irrelevant to day-to-day realities. Southern researchers also competed against each other for funding instead of collaborating to organize a coherent research program (Bradley 2008). This phenomenon is known as the Ganuza Dilemma: Northern governments set research agendas due to lack of a unified voice from the south (Baud 2002). Finally, from the Dutch point of view, the scheme also failed to produce mutuality. Research questions chosen by southern partners did not interest Dutch partners or addressed an unpopular agenda (Bradley 2008).

It is still unclear how reciprocity – a condition for successful collaboration – could be effectively achieved without agenda setting by donors (Driessen 1998). Also, mutuality problems arise in strategic alliances with business corporations and in intergovernmental collaboration (Dicken 2011). Mutually beneficial partnerships are difficult to arrange, and it will be a "grave oversimplification to suggest that southern priorities can be achieved without a cost to Northern Actors" (Bradley 2008, p. 35). A critical stumbling block is that collaborative arrangements occur based on more than just altruism. Mutuality and equitable engagement will not exist if southern partners expect developed countries to simply transfer their technological competitive advantage (Brinkerhoff 2002). A particular concern that arises in both for-profit and academic partnerships has been the failure to reap benefits of collaboration at meso- and macro-levels. While Southern researchers, inventors and managers involved in cross-border collaboration projects have benefited individually, these benefits do not translate to improvements in their organizations and institutions, possibly reflecting a problem of agency in the relationship (Alnuaimi et al. 2012).

Some success stories exist, lamentably there are relatively few. For example, women's rights activists in India engaged with UNESCO's agenda to obtain legitimacy and funding in the 1980s, but were able to maintain a distinct position from the Western feminist ideas typically underpinning UN bodies' perspectives on women's education (Peppin Vaughan 2013). Another example is an international project funded by the EU aimed at accelerating research and development (R&D) on the three main drivers of poverty in Africa: HIV/AIDS, tuberculosis and malaria (Mgone and Salami 2009). The project was deemed a success by Europeans and their sub-Saharan counterparts, despite the fact that donors set the agenda. Success

was largely due to capacity development, agreement on best-practices, north-south technology transfer and south-south mentorship. These successes notwithstanding, translating the lessons from individual success stories into the systematic design of conditions for successful collaboration has been a daunting task, good practice checklists notwithstanding (Velho 2004).

A number of integrated multi-stakeholder initiatives promoting innovative approaches to poverty and environmental deterioration have been launched by supranational and national developmental organizations. Some notable initiatives include sustainable livelihoods, human development through the market, and ecosystem services for poverty alleviation. These initiatives share a focus on sustainable innovation through partnerships fostering grassroots entrepreneurship and market mechanisms. However, success with integrated strategies has been elusive (Kates and Dasgupta 2007). Many industry bodies and multinationals endorse the schemes but effective participation is often limited. Some cases are weakened by upper management's ignorance of resistance to implement the initiatives by lower levels of management and personnel (Brakman 2006). Moreover, the scaling-up of these approaches in terms of the number of companies and communities effectively engaged and outcomes achieved faces limitations, as does the quality and scope of many initiatives (Utting 2012). While supranational organizations have acknowledged implementation problems, debates during Rio+20 put considerable stock in the commitment and ability of business and supranational organizations to engage with vulnerable stakeholders, address real local challenges, and contribute to "southern" agendas. Schaferhoff et al. (2009) suggest that engagement of private stakeholders in international organizations' initiatives may lead to lowest common denominator solutions and limit effective policy formulation.

Rio+20 also showcased the opportunities for reverse knowledge transfer of innovation generated in developing countries. Most of these opportunities have been largely overlooked by academic literature. Some research on innovation in grassroots movements highlights how the five billion people living in developing countries are salient sources and beneficiaries of innovation. This perspective challenges the dominant top-down, North-South approach for innovation dissemination (Gupta 2010). Further understanding is still required for identifying the determinants of successful partnerships involving knowledge flows, irrespective of their direction (north-south, south-north, East-West, West-East or reciprocal). Future research needs to continue exploring these factors, and to conceptualize causes of failure and scale-up problems of multi-stakeholder collaboration (Utting 2012).

A fundamental gap in our understanding arises from the fact that conditions for success are not yet rigorously grounded in actual cases (Podestá et al. 2012), linear success stories and checklists notwithstanding. Moreover, a theoretical framework to analyze and design North-South and South-South collaboration for innovation remains elusive (Velho 2004). This book aims to contribute to these gaps, and this chapter in particular discusses the reasons for difficulty in developing and providing unified frameworks and proposes Sustainability Science as a broader (meta) theory

to guide conceptualization. This discussion is followed for a description of the contents of the book and its contribution to ongoing debates on supranational sustainability knowledge and innovation transfer.

1.1 An Integrative Sustainability Science Perspective of Innovation, Sustainability and Collaboration

The lack of a coherent and explicit theoretical base is evident in most innovation models and may well underpin the failures of many partnerships. A challenge for building integrative conceptual frameworks is the multifaceted nature of collaboration. Its many different dimensions require a reductionist perspective delegated to research silos that represent different paradigms and programs. Fruitful investigation of key innovation relationships and processes requires a multi-disciplinary and multi-stakeholder approach since cross-border collaboration can be viewed and analyzed from the perspective of various actors and at multiple levels, in turn underpinned by a variety of theoretical perspectives.

1.1.1 The Perspective of the For-Profit Corporation

This perspective has been central to most innovation and management literature. The Corporate perspective is the most mature research stream within the evolving sustainability innovation field. Its major paradigmatic foundation is market based approaches to human development and environmental protection. Cross-Border collaboration in this perspective includes inter-firm strategic alliances from different countries, global supply chains and intra-firm cross-border collaboration such as coordinated activities and strategies carried on by an multinational enterprise's (MNE) headquarters and its subsidiaries. Cross-border collaboration has developed a deep foundation in private innovation. For example in the semiconductor industry a large percentage (even a majority) of patents are the result of cooperation between inventors from at least two countries (Alnuaimi et al. 2012).

1.1.2 The Perspective of Public Policy Makers

The perspective of cross-border collaborations of Public Policy makers includes: the local scale, collaboration between local authorities in different countries (Pirie 2010); the national scale, agreements or treaties between nation states; and the supranational scale institutions providing global governance such as the World Trade Organization, World Bank and United Nations (Mundy 2007, p. 351).

Supranational institutions use research, ideas, standards and good practice guidelines as tools of power to trickle down their agenda (Peppin Vaughan 2013). North-South collaboration practice and research largely focuses on the interactions between these organizations as donors and the countries and communities where they implement their environmental or social programs in partnership with local stakeholders, as recipients. However, policy shifts will result in necessary dovetailing of diverse international, national and industry agendas. A process of global policy isomorphism is likely to hamper multiple coordination, agency and political implementation problems that supranational institutions have been largely impotent to address. Many times international organizations are unable to translate greater knowledge into useful and sustainable practices at local levels (Samoff 2003).

1.1.3   The Perspective of R&D Institutions

North-South collaboration between Public research institutions or universities is mutually beneficial and conducive to capacity building in the south (Bradley 2008). It has substantially increased in the last twenty years. This increase has occurred through formal agreements and partnerships to develop a particular technology or fill gaps in basic, exploratory research. The increase is also evident through knowledge networks, interdisciplinary research teams and synergistic stakeholder or practitioner involvement.

Today knowledge networks cover functions until recently satisfied by the temporary emigration of qualified scientific personnel from peripheral settings into central locations. However, North-South partnerships are often the only way for southern researchers to access funding; many south researchers enter partnerships far removed from their own interests as a means to obtain the funding they need to stay active in research (Bradley 2008; Podestá et al. 2012) Geography and colonial history have also led to a deep divide in development and research opportunities between the North and the South. For example, while Brazil, South Africa, China and India have world-class research institutions which are already developing south-based innovation they are understaffed and ill-equipped. Good partnership practice is rarely rewarded by the academic system in either the north or the south and managing cross-border partnerships require skills underemphasized in academic training (Ettorre 2000). This scenario may be changing. As Chap. 2 in this book emphasizes "participants connected by networks can form partnerships, learn or teach with no need to move on a prolonged basis. The emergent situation, reinforced by Internet resources, is substantially novel, urging a shift of perspective in the analysis of contemporary scientific cooperation. In this context the inclusion of a reflective component in which the ongoing experience can be analyzed collectively becomes essential."

1.1.4   The Perspective of the Non-Governmental Organization (NGO) or Civil Society Organization (CSO)

Innovation is arguably a key capability of successful NGOs, which tend to have deep insights into community needs and local factors. Such attributes are better harnessed through partnerships with universities, firms and governments creating a social compact to deliver socially and environmentally-friendly products and services (Brugmann and Prahalad 2007). Global CSO promote fairness in working conditions and international trade (e.g. Fair Trade) and act as auditors for companies and government deviant behavior (e.g. Amnesty International, GreenPeace). A new phenomenon, triggered by the Internet, social media and new communication technologies, has been the development of a-geographical networks, where human agency is played without the intermediation of organizations. Such networks can promote cross-border actions to raise funds for a particular cause, coordinate awareness campaigns or boycotts and contribute to the dissemination or rejection of innovation and technology.

Ironically, multi-stakeholder research partnerships with an inter-, cross-, or multi-disciplinary perspective do not usually engage in conceptual integration of views, since the focus is on problem solving and intervention models that cut across disciplinary boundaries. The results have "produced temporary benefits in applied problem solving but failed to develop integrated theoretical frameworks that provide orienting positions for the further development of (meta)theory" (Edwards 2009, p. 59).

1.1.5   The Multi-stakeholders Perspective of Sustainability Science

In order to be better understood and designed, cross-border collaboration in sustainable development must be analyzed with a broader conceptual and methodological integration than what is currently occurring. That is there is a need to identify core conceptual factors, their relationships, overall theoretical construct frameworks enabling meta-level research (Edwards 2009, p. 59). This procedure allows for research transcending check-lists for good collaboration practices, an all too common outcome of current studies.

Theoretical approaches useful to understand cross-border collaboration place collaboration, coordination and policy institutions at the center of the analysis. Examples include: collective action theory, institutional analysis and design from economics; contingency theory, strategic choice, strategic alliances, networks and new institutional theory from management; general systems theory from the natural sciences; socio-interactive discourse theory, political economy, advocacy coalitions and triple-helixes from the political sciences. What is common to such diverse approaches is that they enable overcoming linear conceptions that see science as

a starting point for innovation and that relegate policy implications to the end of the analysis. They also enable a multilevel approach connecting micro-, meso- and macro- lenses. Finally, they are underpinned by a multi-stakeholder perspective seeing actors interconnected by their natural, economic, discursive and institutional environment.

Sustainability Science encompasses all the above characteristics while integrating issues of collaboration and innovation. Sustainability Science can be described as a discipline that produces knowledge on the complex interaction between economic, natural and social systems and their roles in affecting the planet's sustainability (Kua and Ashford 2004). As such, drawing on system dynamics, sustainability science aims to develop practical solutions to real sustainability challenges through a new research paradigm that breaks down artificial divides between the natural and social sciences, and between knowledge generation and its practical application in decision-making (Kates and Dasgupta 2007; Kates et al. 2001; Palmer et al. 2005).

Sustainability science is underpinned by a capability-centered approach to sustainable development the intergenerational philosophy where development promotes the capabilities the current generation without compromising capabilities of future generations (Sen 2000). This definition is different than the Brundtland definition focus on "needs", where it has been argued that human beings are not only 'people with needs' but also agents of change who can, given the opportunity, think, assess, evaluate, resolve, inspire, agitate, ally, coordinate and through theses means are able to reshape their environments.

Central to sustainability science is a human systems' adaptive capacity. This adaptive capacity means the ability of a system to learn and modify itself to improve or maintain its functions against disruptions in the natural or social environment (Vazquez-Brust et al. 2009). Adaptive capability depends on collective and institutional action whose efficiency can be enhanced by developing mutual trust, social integration, community networks, rules, consensus, and the information flows used by individuals both to their own benefit and to that of the community. In north-south collaboration capacity building is a pivotal concept: capacity to create an organizational, procedural framework that allows ways to identify problems but also to manage the processes in which actions are carried out (Glasbergen and Miranda 2003).

Innovation capabilities are the foundation of adaptive capacity. Sustainable innovation can help solve specific problems resulting in improved capabilities. Sustainable innovation can be defined as any change in the way things are done in a particular context that increases the general sustainability of the wider system, whether or not this was the intended consequence. It can be either a change of paradigm, the introduction of a practice or technology from another context, the invention of a totally new device or technology, or simply a refinement in the way things are done. All types of sustainable innovation are desirable, and ideally all should be pursued. However, solutions to complex systemic challenges can only result from widespread innovation resulting in behavior change promoted through collective action (Kates et al. 2001).

Human agency, capabilities and freedom are central to sustainability science. Networks, coalitions, politics and collective action processes all leverage individual values and capabilities towards common objectives in cross-border collaboration. Cross-border partnerships succeed or fail according to the character, capabilities and commitment of the individuals involved and their supporting institutions (Bradley 2008) with critical individual attributes being flexibility, humility and willingness to learn. Strong institutional compatibility facilitates transition when individual members change. Ignoring or downplaying the role that human agency plays in corporate behavior and policy leads to oversimplification and denial of individual's responsibility. Ignoring or downplaying the role of coalitions and collective norms leads to underestimation of institutional incentives and disincentives (Ostrom 2005). Therefore, the sustainability science approach applied to the study of cross-border collaboration, sees partnerships as dynamic coalitions of actors guided by both instrumental and utilitarian motives while interacting with stakeholders' networks within the boundaries of collectively accepted rules-in-use, practices and behavior.

Sustainability science research is based on five pillars, which should frame studies of cross-border partnerships for sustainable innovation. These five pillars include: (a) aiming to advance understanding of a grand challenge or observed problem while at the same time providing practical policy tools; (b) effective solutions to observed problems should consider the economic, environmental and social factors that contribute to the problem; (c) problem identification and problem solution formulation should be place-based and span all appropriate spatial and temporal scales; (d) a systems perspective focusing attention on the whole, as well as on the complex interrelationships among its constituent parts. The parts include the biosphere or ecological system; the market or economic system; and the society or human social system; and (e) integrating the views from a wide range of scientific disciplines in an interdisciplinary and international approach (Swart et al. 2004; Vazquez-Brust et al. 2009, 2012).

The Sustainability Science focus and its many dimensions and influences from a variety of disciplines and fields of thought, sets the stage for our overview for the contents of this book. Each chapter will have some of the major elements we have described. The North-South collaborative sustainable innovation discussion will be further supported by these elements. The contents of the book are now summarized keeping these philosophical and practical elements in mind.

1.2 The Contents of This Book

The papers presented in this edited book are original works of the authors, selected as a result of a review highlighting key topics and authors in cross-borders collaboration followed by a two year long process of identification and selection of cases in the Global South. Sustainability science research five pillars' guided our selection and we aimed for a mix of scales (supranational institutions, country-to-country, city-to-city), methodologies (action research, survey, case studies),

innovation focus (environmental technologies, land-use innovation, business models, social innovation), themes (biodiversity, environmental impacts, waste, climate change, energy, poverty, education, technological divides) and types of partnership (business, academic, governmental, ngos, multi-stakeholders). We also aimed for a mix consolidated partnership schemes (e.g. Global Compact, Honeybees) and innovative collaboration start-ups (e.g. Bamboo Project, Fantasias.2).

There are several common threads across the chapters and they could have been organized in different ways. Chapters 1 and 2 focus on academic cross-border collaboration, Chaps. 3 and 4 analyze for-profit perspectives in collaboration, while Chapter 5 explores a not-for-profit cross-border initiative. In the next five chapters, drawing on a range of case studies in Africa and Southeast Asia, the focus is on multi-stakeholder collaborations and international agencies, analyzing patterns of environmental governance and policy implementation at different levels, and examining how global or northern policies are translated into local policy implementation in the south. The last five chapters focus on case studies of collaboration for social and technological innovation originating in the Global South (Latin-America Africa, and Southeast Asia) They serve as illustrations of the deep reservoir of ideas and alternative points of views in developing countries that can trigger innovative thought.

We strove to have chapters collaborating with each other to improve our understanding of a topic. Chapters 3 and 4, for instance, are a comparison of vertical integration versus arms-length transactions in East-West supply chains, analyzing coordination of vertically integrated units. A Japanese MNE with subsidiaries in Europe, versus coordination of independent business units, Taiwanese suppliers of a French MNE. Chapters 13 and 14 both focus on the problem of rural poverty in Brazil, allowing for a contrast of the effects of top-down versus bottom-up intervention. Chapters 11 and 15 analyze the grassroots Honey Bees Network innovation, with one using an internal perspective, the second an external point of view.

1.3 Chapter 2: Challenges of Cross-Border Collaboration: Knowledge Networks for Innovation and Sustainability in the Global South

Despite many efforts to describe and characterize collaborative research on complex problems, conditions for success are not yet rigorously grounded in actual cases (Podestá et al. 2012). To compensate for this lack of empirical work on specific cases, this chapter by Cecilia Hidalgo and Claudia Natenzon describes insights gained during a study of collaboration in three international (US-Argentina) climate change research projects where the authors were co-investigators. Insights illustrate the relevance of connectivity that foster or impede collaborative production of high-quality, useable knowledge. These elements are an essential component of projects involving scientists, practitioners and stakeholders. The focus is on participants with different nationalities and backgrounds who must collectively define a new set of shared principles, concepts and aims. Monitoring and reflection must also implicate

institutions. These institutions include planning and funding agencies, universities, research institutes, GOs and NGOs, which are currently rehearsing their first steps in a complex collaboration. The chapter presents observations from various stages of the projects and extracts lessons that will contribute both to design best practices and metrics of success in different collaborative settings and to expose some underlying assumptions about how collaboration processes occur, a core goal of this book.

1.4 Chapter 3: The Role of Expatriates in Intra-organizational Cross-Border Collaboration

In Chap. 3, Minori Kusumoto calls attention to how, the more organizations globalize, the more of a challenge it is for them to coordinate relations between units across nations. Direct control of subsidiaries by headquarters is hampered by problems of distance, language, culture and differences in interests. To succeed, multinationals need to develop collaborative relationships between subsidiaries and integrate them using a common objective. This chapter analyzes the determinants of successful inter-subsidiaries collaboration involving knowledge flows in a Japanese MNE. Using action research and interviews with more than 100 local managers and expatriates in nine subsidiaries, the chapter identifies five key roles of expatriates: globalizer, localizer, agent of control, agent of change, and knowledge transfer. It further investigates the factors that influence the ability of expatriates to fully perform their roles, highlighting the importance of collaborative relations with local managers for reverse knowledge transfer of innovation generated in developing countries subsidiaries. The chapter also highlights how expatriates are crucial to the success of collaborative relations between subsidiaries, to localize innovation generated in the headquarters and to cascade pro-sustainability pressures from environmentally aware customers in the MNE's home country.

1.5 Chapter 4: The Roles of First and Second Tier Suppliers in Greening International Supply Chains

Green supply chain management (GSCM) requires coordinated action across firms from different countries. This chapter by Chao-Min Liu, Diego A. Vazquez-Brust and Joseph Sarkis focuses on a case study of a Taiwanese SME supplying automotive parts to a large French car-maker to analyze the extent and purpose of final customers' GSCM practices integrated in their first tier suppliers (the case study company) and second tier suppliers (the suppliers of the case study company). No formal collaboration mechanisms between firms are found in this supply chain. It was found that SMEs mainly use reactive approaches in response to various pressures. Further, the greening drive decreases in less environmentally regulated markets where final customers are not environmentally sensitive. Shared

values serve as incentives to exchange information and help to develop mentorship relations between customers and first-tier suppliers. These relations provide the blue-print for similar mentorship relationship between first-tier and second tier suppliers. First tier suppliers teach the second tier how to satisfy customers' requirements. This collaboration and coordination depends on two factors: a) the extent of environmental awareness that second tier suppliers have and b) the supply chain complexity and the importance of first and second tier sales to European Markets.

1.6 Chapter 5: Cross-Border Innovation in South-North Fair Trade Supply Chains: The Opportunities and Problems of Integrating Fair Trade Governance Into Northern Public Procurement

Alastair Smith notes in Chap. 5 that during the past 20 years, the cross border innovation of using so-called 'fair trade' governance to structure South-North supply chains has gained significant attention. However, analysis indicates that while fair trade might be seen as an innovative methodology for improving the impact of Northern public procurement, such governance has come with its own set of issues and limitations. Of particular concern to practitioners and academics has been the multitude of different approaches claiming legitimate association with the fair trade concept, and that the most dominant approach developed and regulated by Fairtrade International (FLO) has aligned closely with conventional corporate interests. In this context, a case study of Scotland tackles the question of what interpretation of fair trade has been adopted by stakeholders committing to their purchase as an instrument of wider policy. In the majority of cases, interpretation has indeed followed the approach of FLO. However, drawing on empirical research with the National Smallholder Farmers Association of Malawi (NASFAM), it is revealed that FLO certification throws up significant barriers to entry for southern actors. In summary, the case study identifies the interconnection of discrete and cross-border communities who collaborate in the negotiation of meaning central to the practical development of fair trade supply chains.

1.7 Chapter 6: Transboundary Conservation Through Hybrid Partnerships: A Comparative Analysis of Forest Projects

In Chap. 7, Saleem H. Ali discusses how transboundary conservation has acquired greater significance in recent years as international treaties, such as the Convention on Biological Diversity, have included such projects in their program of work. Since

1990, the International Tropical Timber Organization (ITTO) has been involved in several conservation projects that span international borders, which broadly include the following ecoregions: Borneo rainforest (Indonesia, Malaysia); Central African rainforest (Gabon, Cameroon, Republic of Congo); Southeast Asian forest (Cambodia, Lao PDR, Thailand); and the Andean rainforest (Ecuador, Peru and Bolivia). This chapter provides an evaluation of these projects in terms of their potential for peace-building, which has been a stated goal alongside conservation. The study methodology involved posing a series of qualitative questions to ITTO staff, governmental officials and civil society professionals via an email survey. In the case of the Cordillera del Condor region between Ecuador and Peru, a community field visit also elicited responses from indigenous community members regarding the salient role of this case in conflict resolution between the two countries. The comparative case analysis reveals that the efficacy of these projects is often limited by leadership from the donor community and host governments but international organizations such as ITTO have the potential to catalyze lasting cooperation.

1.8 Chapter 7: Multi-stakeholder International Governance Initiatives: Addressing the Challenges of ASM Sector in Ghana

This chapter by Natalia Yakovleva and Diego A. Vazquez-Brust evaluates the outcomes of cross-border multi-stakeholders collaboration in the artisanal and small-scale mining (ASM) sector in Ghana. ASM employs as many as four million people in sub-Saharan Africa. Over 200,000 people in Ghana alone are engaged in mining diamonds and gold on a small scale. ASM is an important economic sector, providing income generating activity for rural and urban populations. However, the sector is also associated with adverse impacts on the natural environment, irresponsible mining techniques, social and health problems, dangerous working conditions, gender discrimination, conflicts between illegal ASM operators and large-scale mining companies, child labor practices, and a criminal operative presence. Various international organizations have implemented a series of initiatives with an aim to address institutional, technological and environmental problems of the ASM sector in Ghana. Based on the analysis of documents and semi-structured interviews, the chapter uses institutional analysis and collective action as conceptual frameworks to examine the success of such cross-border initiatives and it impact on the governance of the ASM sector in Ghana. The chapter also discusses how other initiatives, involving local actors, are developing in Ghana.

1.9 Chapter 8: Industry Perspectives on International Programs for Greening of Industry in Bangladesh

This chapter by Asadul Hoque, Amelia Clarke and Adriane McDonald introduces the tension between global commitments and local implementation. It focuses on environmental programs proposed by the Asian Development Bank in 1994. It frames regulatory versus voluntary adherence of the programs from less-to more-collaborative and compares the perceived existence of the two approaches using a survey of 50 managers in five polluting industrial sectors. Voluntary compliance programs and economic incentive programs are found to be present to a very limited extent. Moreover, although there are several environmental regulatory measures for preventing industrial pollution in Bangladesh, these regulations are not effectively enforced by the government. In Bangladesh, government plays a minimal role in ensuring environmental protection. Even though regulations and global commitments exist, their implementation is not comparable to Northern countries given the lack of effective monitoring and level of corruption. Interestingly, many of the executives interviewed were aware of the pollution prevention programs that exist in other countries, but were looking for government to take the leadership role. This study raises questions as to how to improve the effectiveness and innovativeness of global governance initiatives to which countries like Bangladesh make commitments.

1.10 Chapter 9: Technology Adaptation and Assimilation of Takakura for Improving Environmental Protection in Surabaya (Indonesia) Through City Level Cooperation

In Chap. 9, Tonni Agustiono Kurniawan and Jose A. Puppim de Oliveira describe a case of cross-border city-to-city collaboration between cities in Japan and Indonesia. Surabaya, the second largest city in Indonesia, has a long history of community-based solid waste management (CBSWM). In partnership with the Kitakyushu International Techno-cooperative Association (KITA) in Japan, since 1990 the Surabaya municipality initiated a composting program called "Takakura" by constructing sixteen compost houses to reduce organic wastes. In a Green Economy framework, the recovered waste is recycled to create added value and sustainable jobs, thus promoting co-benefits for local stakeholders. By turning waste into valuable resources, waste generation is decoupled from economic growth. Currently, there are over 18,000 takakuras and about 900 composters distributed to communities. Approximately 400 city environmental facilitators and 27,000 environmental cadres have been involved, and presently almost fifty percent of kitchen waste is reduced because of this community participation. The chapter

discusses the process of innovation through cooperation between two localities. In contrast to bilateral national level cooperation, local-local cooperation is more flexible and can lead to direct experiences at the ground-level. It may also avoid intricate nationalistic rivalries that may hinder cooperation at the national level, as those always involve defense and other matters of national interest.

1.11 Chapter 10: Southern Traditions Reinforced: An Analysis of Global Compact partnerships in India

Given the enormous challenges that the current transition to a more sustainable future entails, a number of firms worldwide have been encouraged to undertake significant investments in 'best practice' management approaches and voluntary commitments. In Chap. 10 Jorge A. Arevalo highlights the activities of one particular collaborative and transnational corporate social responsibility instrument – The UN Global Compact (GC). In addition to providing a conciliatory tone which emphasizes voluntary actions and the formation of partnerships with governmental and civil society actors, the Global Compact is an outspoken corporate responsibility initiative and has been linked to the achievement of the UN Millennium Development Goals (MDGs). The chapter focuses on the strengths and limitations of GC as a platform for multi-stakeholder learning in order to generate innovative ideas. The authors' particular interests are in reviewing the outreach activities of its Local Network model, specifically, the policy dialogue and partnership facilitation developments for the Asia Pacific Country Network based in India. Global Compact Local Networks (GCLNs) established themselves as formal entities ready to support and facilitate, through tool provision, learning events, and local engagement, the implementation process of UN principles. One important area of GCLN activity is the facilitation of partnerships with UN GC stakeholders, as GCLNs often provide a unique convening platform for cross-sector engagement.

1.12 Chapter 11: Green Innovation and Sustainability Through Grassroots' Collaborative Networks in the South: The Honey Bees Network

In Chap. 11, pioneering grassroot entrepreneur and Global South academic Anil K. Gupta vividly argues that the journey to sustainability needs to attend to new north (and possibly south) foci. Developing countries have developed grassroots innovations that have been characterized by low emissions in many of their rural productive systems through intermediate technologies. A pioneering example of these collaborative dynamics is the Honey Bee Network in India and its international replications in other developing and developed countries. This network

of grassroots innovation is responsible for the continuous development, valuation, and appropriation of rural knowledge and rural expertise. The chapter, written by the founder of Honey Bees, explores the determinants of success of Honey Bees collaboration networks and analyzes the linkages of grassroots innovations first at the level of collaborative innovations, in particular south-south collaboration, and second in their contribution to the Sustainable Development debate across the world. The chapter also considers how to close the gap between the appropriation of capacities and knowledge and transaction costs, whilst actively participating in a greener agenda on Sustainability the Southern way. As Anil K. Gupta postulates in the chapter "If creative people around the world get opportunities to craft their own world, one would not have to invent policies for making society compassionate, collaborative, and accommodative of various social segments. It is the failure to nurture grassroots creative potential that has fuelled so much of social anomie. May be peace through inclusive innovations and participatory institutions is the next mantra of development (Chap. 11)."

1.13   Chapter 12: "The Bamboo Project": A Partnership Promoting Sustainable Livelihoods Through Land-use Innovation in Poor Rural Communities

This chapter by Rosane Aparecida Gomes Battistelle, Marco Antonio dos Reis Pereira and Charbel Chiappeta Jabbour describes an applied research project using solid waste and bamboo as raw materials that was funded by the "Pão de Açucar Group", the biggest supermarket retailer chain in Brazil. The research has, since 2007, occurred at UNESP – The Sao Paulo State University at Bauru, Sao Paulo, Brazil with the partnership of the rural settlement "Aimorés Garden". The project aims to fight poverty by empowering vulnerable farming communities to develop alternative and sustainable uses of their land. The partners plan, based on knowledge acquired from the "Bamboo Project", to promote their deployment along the rural farming community in the region and in other farming communities in Latin-America. The settlement has about 350 poor farmers' families and the project has been seeking innovative and sustainable uses of their skills and land to generate income. Community planting was carried out with 120 bamboo seedlings, donated by the university, which in a short time provided all the raw materials needed to run the project site. Farmers are being trained in the entire production chain of bamboo and the project is steadily moving to the area's rural settlement with greater local community participation. This is a Southern innovation that can be easily applied to Northern regions.

1.14 Chapter 13: Leveraging Cross-Border Collaboration with Individual Engagement and Bottom-Up Projects in Argentina

In Chap. 13, Maria Florencia Ripani notes that the development gap between the North and the South is widening, one reason being that 'knowledge' tends to be even more concentrated than capital in the North. Such a technological divide is now perceived as the most serious constraint to international development. It is the most talked about point of concern from civil society to governments and international organizations. Thus, developing countries need develop and strengthen their capabilities to generate and exploit technology. Those absorptive capabilities can be triggered through education and involvement in activities that stimulate thinking out of the box, unleashing creativity. The chapter focuses on an initiative to break poverty in the slums of Buenos Aires, which stimulates creative thinking in children from some of the most impoverished areas of Argentina. The initiative, named "Fantasias.2" is led by a local social entrepreneur who leveraged resources from a decentralized network of donors including a French NGO, a Mexican multinational and the Ministry of Education of Buenos Aires city. The chapter, written by the project leader, critically reflects on the project's successes and failures, the challenges and barriers she faced and the opportunities for replication. It emphasizes the importance of citizenship and personal engagement as well as MNE proactivity to open institutional spaces to generate bottom up projects capturing local initiatives.

1.15 Chapter 14: "The Biofuels Program": Designing Biodiesel Supply-Chains to Fight Rural Poverty and Environmental Deterioration Through Cooperative Land-use Innovation

In Chap. 14 Clovis Zapata, Diego A. Vazquez-Brust, Jose A. Plaza-Ubeda and Jeronimo de Burgos-Jimenez discuss how collective action engagement enables individuals to overcome self-interest and work toward shared goals. To get the institutions ready for cooperation requires an understanding of how the particular set of market and non-market relationships really work for participants. In the context of the biodiesel value chain in Brazil, this chapter introduces a case study to explore how institutional arrangements need to evolve if they are to foster the productive and sustained inclusion of small farmers in collective action to promote sustainable innovation as a regional economic development strategy. The analysis suggests that collaborative arrangements between policy-makers, Petrobras and grass-root representatives acting as agents of farmers shaped the design of the program and provided political and economic incentives for its implementation. However,

institutional and socio-technical innovation failed to commence because the number of farmers engaged with the program was only half of what was forecasted and productivity was even lower. A primary source of disincentives for farmers was the lack of direct engagement of small farmers in decision-making and the dominance of institutional and cultural arrangements that excluded small farmers from linking mechanisms to engage with external agencies. This result suggests the need for policy intervention to foster inclusive collaboration based on repeated interactions and community governance mechanisms building trust and common understanding about potential course of actions.

1.16 Chapter 15. Eco-innovation and Eco-entrepreneurship at the 'Bottom of the Pyramid'

The projected exponential rise in the 80 % of humanity (largely in the developing world) living on less than $10 a day– the so-called the bottom of pyramid (BoP) – suggests that their behavior, lifestyle and consumption patterns will increasingly affect the global economy and society as a whole. There is little understanding of whether this vast pool of people across the globe 'eco-innovate', and if so how and why. This chapter by Mario Pansera and Richard Owen provides an overview of the main theoretical discussions about innovation and development, with particular attention to eco-innovation creation, transfer and diffusion at the BoP. They challenge the assumption that the "poor are too poor to eco-innovate", hypothesizing that eco-innovation in the so-called South could play an important role in contributing to global sustainability, pioneering alternative development models that could 'blowback' to the developed world. Through an analysis of empirical cases in Asia and Latin America, they demonstrate that eco-innovation *does* occur at different levels at the BoP, exploiting local potential, traditional knowledge and international connections. These cases suggest that new business models and new policies that foster grassroots eco-innovation might not only be relevant for developing countries, but also offer transfer potential from the 'south' to the 'north' (innovation blow-back), notably in the context of the extended current period of financial austerity faced by developed countries and the global sustainability crisis faced by us all.

1.17 Conclusion

For more than a decade, researchers and supranational organizations have advocated collaboration between universities, firms, authorities, and grassroots movements from both developed and developing countries as a more efficient approach to generating innovative and sustainable solutions to local challenges while simultane-

ously redressing distributive injustices (e.g. Simon et al. 2003; Termeer et al. 2010). However, the literature has also emphasized how challenging it is to implement sustainability-oriented projects involving cross-border partnerships and/or knowledge transfer. It is not always the case that collaboration leads to success (e.g. Bradley 2008; Islam and Anwar 2012; Ahmad 2001; Koehn 2012). The achievement of satisfactory results depends on a number of factors that might well be overlooked by collaborating partners. For instance, knowledge transfer from north to south is hampered when innovation does not fit with local resources and agendas (Koehn 2012). Schaferhoff et al. (2009) found that when international multi-stakeholders collaboration responds to donors' interests rather than addressing governance failures, the problem-solving quality and legitimacy of such collaboration is also influenced by their institutional design, adding that if collective action is needed and opportunistic behavior expected, highly formalized structures tend to be better than loose coordination.

The book adds to efforts to elucidate the determinants of successful partnerships involving knowledge flows, irrespective of their direction. A distinctive feature of the book is that several chapters (Chaps. 2, 3, 4, 9, 11, 12, 13, 14) are based on their authors' firsthand experience in collaboration projects. Chapters 2, 3, 10, 13 and 14 show that individuals and organizations benefit more from partnerships when collaborative arrangements have fostered long-term relations between individuals and between organizations that often span repeated collaborative projects and that provide robust support even when donor funding has dried up. Chapters 4, 10, 11, 12 and 13 also highlight the importance of individual capabilities, ingenuity, and commitment. In turn, Chaps. 2, 7, 8, 9, 10 and 14 highlight the importance of robust southern institutions: clear vision and agenda, awareness of weaknesses and strengths, solid finances, and efficient administrative systems. Chapters 6, 7, 12, 13, and 14 emphasize the importance of engaging most vulnerable stakeholders, creating arenas for inclusive dialogue and partnering with intermediate institutions when vulnerable communities are involved.

A common theme across the book is that in order to foster sustainable innovation, cross-border collaboration has to be reflexive and dynamic – a constant process of identification of and adaptation to change through renegotiation of solidarities and interdependences. Several chapters suggest possible avenues to improve consensus and commitment in partnerships. Chapter 3, for instance, argues that one of the determinants of successful collaboration and knowledge transfer between subsidiaries and headquarters is the existence of expatriates – personnel from HQ in multi-year assignments in subsidiaries – playing a range of roles, which both empower locals and reduce risk and uncertainty for HQs. The key for expatriates' success, the chapter argues, is their dual condition, since they serve both the interests of HQ and the subsidiary where they are based, thus fully benefiting when both headquarters and subsidiary are doing well.

These findings can be applied to the implementation of projects funded by northern donors and suggest the need for a global class of actors bridging north and south interests through long term assignments spanning several collaborative projects with the same groups.

The cases in the book confirm the structural and theoretical limitations of formal initiatives grounded in donor models and rooted in Northern mindsets and value systems. Chapters 7 and 8 are skeptical of supranational organizations' (such as the United Nations or World Bank) ability to improve global governance of innovation in environmental and social issues, Chapters 5 and 10 are more supportive. Chapter 5 analyzes a range of trans-boundary projects in biodiversity protection and concludes that international organizations -acting as mediators between donors and recipients – have the potential to catalyze lasting cooperation even when local institutions are weak. In terms of alternative collaboration pathways, Chapter 9 advocates local-to-local cooperation. Chapters 11 and 15 convincingly argue for the increasing relevance of grassroots collaboration and non-scientific innovation, showcasing the innovative capabilities of the poor while highlighting the potential of the south to be "the new north for sustainability".

Several chapters highlight that environmental values can be a powerful driver for collaboration, but shared advocacy of all parties in a coalition is needed to overcome negative contingent factors. Chapters 2, 11, 12 and 15 suggest that the increasingly a-geographic nature of social interaction is eroding some of the barriers between innovators in developed and developing countries and contributing to more flexible collaborative arrangements situated between networks and organizational partnerships. Hybrid arrangements primarily based on informal collaboration between like-minded individuals and potentially later scaled up by universities, firms, authorities and grass-root movements, can also contribute organically, in a positive contagion effect leveraged by social platforms. Such empowerment of individuals' innovative capabilities by new communication technologies reflects agency being taken back from the state by citizens and local organizations, while suggesting a pathway to innovative and sustainable solutions simultaneously encompassing distributive justice.

This book seeks to contribute to the knowledge and debate of how sustainable innovation and sustainability science and its elements can help in South-North innovation collaboration. The chapters are quite varied with a variety of sustainability innovations some which are purely South, others that show collaborations. Many of the Southern cases and illustrations are meant to show innovations and capabilities developed in the South. Knowledge of these innovations can aid Northern regions. That is, learning can and should occur in multiple directions. We focus on some of the areas where innovations have not been investigated in such a concentrated form as this book offers. Given this initial foundation of some of the issues related to a Sustainability Science focus, we hope readers will be able to further identify insights that go beyond those that we offer. We also hope that this book ignites additional innovative thought and practice, at all levels and for many different stakeholders.

We also hope, finally, that the reader enjoys the many stories presented.

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Chapter 2
Challenges of Cross-Border Collaboration: Knowledge Networks for Innovation and Sustainability in the Global South

Cecilia Hidalgo and Claudia E. Natenzon

Abstract Despite many efforts to describe and characterize collaborative research on complex problems, conditions for success are not yet rigorously grounded on actual cases (Podestá et al. *Environmental Science & Policy, 26*, 40–48, 2012). To compensate this lack of empirical work on specific cases, the chapter describes insights gained during a study of collaboration in three international (US-Argentina) climate variability research projects where the authors were co-investigators. Conclusions arisen which illustrate the relevance of connectivity that foster or impede collaborative production of high-quality, useable knowledge, should be an essential component of projects involving scientists, practitioners and stakeholders. Mostly as they include participants with different nationalities and backgrounds who must collectively define a new set of shared principles, concepts and aims. Monitoring and reflection must also implicate institutions (planning and funding agencies, universities, research institutes, GOs and NGOs, etc.) which are currently rehearsing their first steps in such a complex type of collaboration. The chapter present observations from various stages of the projects and extract lessons that will contribute both to design "best practices" and metrics of success in different collaborative settings and to expose some underlying assumptions about how collaboration processes occur, one of the goals of this special volume.

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2.1 Introduction

Scientists of the South have always been prone to international cooperation, now expanded to a global scale. The globalization of the scientific world has opened up new opportunities in which old relationships, structured by the prevalence of the epistemological and political perspectives of main centers of Europe and USA, are being contested. An unequal exchange of information, capacity of theory formulation and profitability of conclusions have often represented a contrast between central/north science and peripheral/south science. Linguistic barriers count as a prime obstacle to the dissemination of the knowledge produced at the periphery. English has become the dominant language, and thus the principal global means for intellectual communication. The peer review system of international publications reinforces the marginalization of local approaches that do not fit mainstream standards and expectations, rewarding elites of the periphery tightly reproductive of main centers' visions.

But at present a sense of crisis, a growing perception that science is not responding adequately to the global changes of the twenty-first century (Podestá et al. 2012) has led to an urge to create approaches and ways of interaction and exchange more varied, democratic and sustainable. Although the collective power and intellectual strength of European and American centers still allow them to lead the definition of the ways of production, dissemination and consumption of knowledge, the idea of a "peripheral south" absent in the debate on the types of problems and perspectives that deserve attention and authority is no longer accurate.

As scientific knowledge is used to enhance the capacity of different sectors and governments to respond to the challenges posed by the problems faced by contemporary society, advances in knowledge tend to be matched by a better understanding of how science can inform planning and policy (Funtowicz and Ravetz 2000; Funtowicz and Hidalgo 2008; Stainforth et al. 2007). This requires building institutional and human capacity and overcoming technological, financial, cultural, and institutional barriers to innovation and sustainability. The acceptance of diversity, the creation of renewed spaces of knowledge exchange, the spread of information and communication technologies enable a horizontal connectivity among scientists all over the world, and hence the emergence of more complex modes of interaction in which "interculturality" plays a role along with interdisciplinarity and stakeholder involvement (Carney et al. 2009).

Facing these challenges and needs of collaboration, knowledge networks, interdisciplinary (ID) research teams and synergistic stakeholder or practitioner involvement are becoming common practice for the organization of modern integrative science research in such a global context (Brewer 1999; Pohl 2011). The redesign

of regulatory processes, with the aim of "democratizing" decision making and the use of expert knowledge undertaken by the European Commission since the end of the 1990s illustrates the profound changes being introduced in the decision making mechanisms of European science and technology policy (Todt 2006).[1] Similar regulations are being implemented elsewhere. This implies fluxes of knowledges and experiences of an increasing intensity, a cross-border endeavor where mutual translation and understanding of trajectories and expectations acquires centrality.

Knowledge networks are distinguished from other modes of coordination of scientific work (i.e. laboratories hierarchically structured or decentralized discussion forums) by their high level of complexity. This complexity follows mainly from the heterogeneity and differentiation of its members, but also from a participatory and deliberative approach to decision making. Networks value and claim collaborative interaction and reciprocity, mutual monitoring of actions, confidence and deliberative rationality (Luna and Velasco 2006; Jeffrey 2003). In turn, they have as a necessary condition the creation and maintenance of fluid channels of communication, mutual understanding, translation and mediation.

Today knowledge networks cover functions until recently satisfied by the temporary emigration of qualified scientific personnel from peripheral settings towards central locations. Participants connected by networks can form partnerships, learn or teach with no need to move, at least on a prolonged basis. The emergent situation, reinforced by Internet resources, is substantially novel, urging a shift of perspective in the analysis of contemporary scientific cooperation. In this context the inclusion of a reflective component in which the ongoing experience can be analyzed collectively becomes essential.

Researchers and scholars of the Global South knowledge networks commonly perform many functions previously fulfilled by personal contacts and long lasting travels:

1. Compensate the need of training of early career team members and the lack of significant projects in their own academic units
2. Allow teams to address issues of greater scientific significance or complexity, compensate for the lack of equipment or financial resources, and mitigate weak, changing or unclear institutional research policies.
3. Help overcome the fragmentation of efforts, lack of encouragement and coordination between research institutions and higher education policies.
4. Reduce the high costs of educational and scientific activities through the formation of associative networks among universities, research centers, institutes and government agencies for research, development and innovation.

Although calls for stronger collaboration among different institutions and disciplines are currently made by science and technology agencies and universities (i.e.

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[1]Following Todt (2006) this may be analyzed both as a direct response to the social conflict affecting the development of different modern technologies, and as an intend to counter a pronounced loss of public trust of the citizens in regulatory decision making.

Committee on Facilitating Interdisciplinary Research, USA, 2004, Buenos Aires University Interdisciplinary Programmes, since 2008, Argentina), empirical and conceptual analyses of the challenges faced by ID knowledge networks and the collaborative production of knowledge with stakeholder involvement remain open issues. Many studies (Gibbons et al. 1994; Friedberg and Musselin 1996; Carullo and Vaccarezza 1997; Kogan et al. 2001; Hidalgo 2005; Schuster 2005) analyze the contemporary transformations of global and national scientific interactions. However, detailed analysis of cases is not abundant. Indeed, despite many efforts to describe and characterize collaborative research on complex problems, conditions for success (including the very definition of "success") are not yet rigorously grounded in actual cases (Lemos and Morehouse 2005; Podestá et al. 2012).

To compensate for the lack of empirical work on specific cases, this chapter describes insights gained during a study of collaboration in three research projects. We claim that to elucidate the determinants of successful partnerships involving knowledge flows, the study of real cases is mandatory. Underlying assumptions about how sustainability and innovation processes occur and about the purpose and orientation the innovation modes take, cannot be elucidated skipping the analysis of actual examples of collaborative projects.

Conclusions drawn from the study of three networks which illustrate the relevance of connectivity, two multinational and interdisciplinary, a third one national and integrated around a single shared analytical framework, are presented. A central claim of this chapter is that a self-reflective process to identify and intervene on factors that foster or impede collaborative production of high-quality, useable knowledge, should be an essential component of projects involving scientists, practitioners and stakeholders. Mostly as they include participants with different nationalities and backgrounds who must collectively define a new set of shared principles, concepts and aims. Monitoring and reflection must also implicate institutions (planning and funding agencies, universities, research institutes, GOs and NGOs, etc.) which are currently rehearsing their first steps in such a complex type of collaboration.

The chapter is organized as follows: first, we describe briefly our methodology and the projects targeted for study of the collaboration process. Then, we present observations from various stages of the projects and extract lessons that we hope will contribute both to design "best practices" and metrics of success in different collaborative settings and to expose some underlying assumptions about how collaboration processes occur, one of the goals of this special volume.

2.2   Collaboration Processes at a Close Look

The process of collaboration within the diverse networks of researchers and stakeholders was monitored and recorded throughout the lifetimes of the targeted projects. To overcome the limitations of ex post facto reconstructions we followed: (a) a diachronic design involving participant observation, longitudinal individual

interviews and follow-up protocols, and (b) the analysis of project documents, draft and published papers to map patterns of interaction as networks evolving during the processes of collaboration.

Participant observation and focused interviews were facilitated by the interest in, and commitment of the networks to self-reflection.[2] We avoid a static treatment and, instead, make a plea for a procedural consideration of the dynamics of association and linkage through the identification of "cycles" of participation, collaboration, and collective production of knowledge.

2.3 The Networks

2.3.1 Contrasts and Heterogeneities in Two "North–South" International Networks

Two international collaborative networks conducted research on the relationships between climate variability and decision making in agricultural ecosystems in the Pampas of central-eastern Argentina, one of the major food-producing regions in the world. The projects around which those networks assembled aimed to facilitate sustainable societal adaptation to a varying climate, and to inform decision-making in climate-sensitive sectors such as agricultural production. To explore those linkages between climate variability, on inter annual to decadal scales, and farmers decisions; in both projects the problem-driven collaboration of researchers from different disciplines and social stakeholders was considered crucial to success. An innovative design feature of these projects was a built-in analysis of the challenges of interdisciplinary, multi-institutional, multi-national collaboration with stakeholder involvement. Each project emphasized different scales of climate variability. The first one (2004–2007) assessed the use of seasonal climate forecasts to enhance decision-making in agriculture. The second one (2007–2011) explored linkages between decadal climate variability, technological innovations, and land use and tenure changes. The composition and structure of the networks was different in each project as each project demanded particular skills and talents. Thus they are considered two different networks, although their members partially overlapped.

The initial composition of the first project team showed a number of heterogeneities: of disciplines involved fields of study, institutional goals, and age, gender, countries of birth and professional performance of participants. Thirty researchers represented thirteen disciplines and fields of postgraduate training: agronomy, anthropology, biology, economics, philosophy, statistics, physics, geography, engineering, climatology, oceanography, psychology and sociology. They corresponded

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[2]A more detailed account on the methodological approach can be found in (Hidalgo 2008; Hidalgo et al. 2010, 2011).

to three fields of study: twelve in the natural sciences, eleven in social sciences and seven in the formal sciences. The twelve institutions participating in the project had different goals: seven academic institutions three governmental organizations (GOs) and two non-governmental organizations (NGOs). The researchers were of different ages and correspondingly, at different stages in their careers, which we have systematized into two types: approximately one third were young researchers in training and two thirds were senior researchers. In terms of gender composition, one third of the team members were female. Finally, the number of institutions from USA and Argentina was equivalent.

A remarkable peculiarity was the inclusion of a nonacademic stakeholder as a full peer of the team, which actively participated through its technical staff and members. It was a civil non-profit organization in operation since 1960 and managed by farmers devoted to promote the integral development of this business sector, to achieve profitable and sustainable enterprises and to test and transfer technology. The implications of this participation should not be minimized: in a global context in which discussions on technical and scientific issues are of economic interest, this NGO encouraged the hope that the project results would stimulate agricultural improvement, and the generation and communication of relevant climate information.

The stakeholders involved in the network did not represent sectors that needed to be "trained" in a traditional sense. Given their high social status, education, productive trajectories, social connections and long cooperation experience with research groups, their associations tended to lead innovation proposals, supporting presentations in academic forums and disseminating technological innovations with great anticipation. Their commitment to "knowledge society" made them aware of the value of scientific research, which on the basis of their financial and management resources, they promoted, and helped to fund and manage. With stakeholders like these, scholars tend to accompany rather than lead the process of decision making about research agendas and to rely heavily on stakeholders' mediation to gain access to critical information and, even more importantly, to other stakeholders already connected with them.

Equally important was the inclusion of a governmental organization with direct relevance to the purposes of the project. This GO aimed to develop meteorological services derived from the findings and conclusions emerged from the interdisciplinary interaction in the network (Hidalgo et al. 2007). While the projects were implemented the institution suffered a major change, ceasing to belong to the military province to become a civil service within the "Ministerio de Defensa" -National Ministry of Defense- (Celis and Forni 2007). This change substantially transformed the basis of its relationship with civil society and meant that information previously considered strategic and classified could enter into play in scientific reasoning and argumentation.

Alternative and cheap ways of achieving connectivity between team members were planned. Consistent with a horizontal or slightly deliberative hierarchical management, the coordinator maintained contact with the institutions of the two countries. In fact he had to travel regularly, although he tried to take the position

of a peer with special duties and responsibilities, and not the role of a director with a major asymmetrical hierarchy. The creation of a website, various wiki pages and short but frequent travels to contact participants around specific tasks were other resources designed to strengthen connectivity. Trips for young researchers to get specific training opportunities were also a regular component of the network activities.

2.3.2 Asymmetries "North–South" Within a Country

The third network studied (2001–2004) was a national one, focused on the capacity of Argentine universities to address and offer answers founded in innovative research to social and productive demands. The initial formation of the team articulated a three-node network of researchers belonging to three major federal universities. The coordination node was located in Buenos Aires, the capital city of the country, and the other two research nodes far away in the countryside, at a certain distance both physical and academic from the knowledge centers credited with the highest rates of scientific productivity. The network identified five priority areas and integrated the varied participants' expectations and knowledge into a single analytical framework designed by the principal investigator who worked at the coordination node. This single framework and instruments derived from it guided the collection of standardized information and allowed comparative interpretations. Each node had to reach and gather information from around sixty research teams connected with its respective university (Riquelme 2008).

Given the complexity of the objectives of the project and the magnitude of the number of university research teams the network tried to analyze, very soon an element of self-reflexivity was deemed necessary. Promoted by the principal investigator and general coordinator, the members of this knowledge network started to systematically reflect on what they had been experiencing. During the three years of the project they faced successive difficulties with: (a) the ability of disparate local teams to form part of a network and share the cognitive and administrative goals of a project which they had not designed, (b) different institutional logics that came into play, including those concerning research expressed mainly in multiple internal tasks (teaching and management) assigned to local researchers that prevented their full dedication to the project, and finally, (c) the mode acquired by the administrative monitoring and evaluation procedures of the funding agency of science and technology: its protocols followed patterns of assessment created for standard disciplinary research and showed no awareness of the longer times networks need to achieve a degree of connectivity and fluid inner confidence that enables them to consolidate their joint work and obtain significant results.

Throughout the project, the role of the principal investigator was crucial in counterbalancing disparate capabilities, institutional barriers and at times even the disturbing actions of functionaries from the funding agency who threatened communication and network connectivity. Relying heavily on full-time young

people in training, the coordinator fostered and maintained the cohesion of the network and encouraged reflexivity about the difficulties, which in turn fed back internal and external channels of dialogue.

2.4 Metrics of Success Along the Process of Collaboration

The assembling and articulation of disciplines, stakeholders and the various interests involved in knowledge networks is a challenging task. Equallly challenging, perhaps, is the assessment of success in collaboration. This section attempts to measure success along the process of collaboration, presenting observations of the changings dynamics of collaboration and reflexivity between stakeholdres through the succesive stages of implementation of a project.

2.4.1 The Set Up

At the beginning of collaboration project design and team composition occupy a central position, both heavily conditioned by the scope and objectives of funding opportunities. It is a crucial stage, with universities, planning agencies, science and technology institutions playing a decisive role. Indeed, their calls may guide new formats of innovative and sustainable production, dissemination and consumption of knowledge (i.e. promoting diversity in partnerships, asking for balanced participation of social and natural scientists, making the inclusion of stakeholders current, etc.). The adoption of a global perspective encouraged by an international program announcement made the first two ID project designers soughtseek international partners capable of making effective contributions. A national call for the formation and funding of knowledge networks made the third one conceive a highly demanding project. Had the announcements and call not existed, the linkages for cooperation had would not have existed either.

When a team has not worked together previously, the design of a collaborative project rests to a large extent on the work of a few individuals who will eventually assume the team coordination role. In contrast, when an existing team pursues further support, project design tends to be a more collective process (Podestá et al. 2012). Both situations have their pros and cons: a proposal developed by a smaller group may look more integrated, but be perceived by participants as alien. Collaboration sustained through successive projects increases the capacity of the whole team to define research problems and approaches. The two international ID networks demonstrated success in the gradual collective commitment with the development and submission of new research proposals. The third project illustrates the enormous efforts that must be applied to involve all participants in the rationale of a design and analytical framework developed by a single person.

At this crucial stage, great attention must be placed on team composition. The first two networks managed to gather experienced senior researchers and motivated young fellows of highly diverse backgrounds, converting heterogeneity in a potential capability. The third one included participants not yet capable of covering the full scope of planned tasks, requiring additional actions to alleviate asymmetries, be they administrative or cognitive. Universities, planning agencies and science and technology institutions should develop new procedures taking into account that to create trust and commitment among participants takes time and may require a certain degree of flexibility in work plans and budgeting to reach an equitable level of collaboration.

2.4.2   The Project Start

Channeling diversity and plurality is a major challenge at the initial stage of a collaborative project. In order to understand and use another's ideas towards a common aim, members of the teams have to deepen their skills as active listeners and translators. The team must reach a shared problem definition through a negotiated process including researchers and stakeholders (Harris et al. 2009). Ambiguities and vagueness surrounding key concepts must be clarified. A balanced allocation of minimum responsibilities must be reached. Clear consensual rules of procedure (i.e., on how to solve eventual conflicts concerning research issues) should be made explicit.

The early structure of interactions within the two international teams showed a search for equilibrium among planned collaborations, analogous to the "balance in the weaving of perspectives into a whole" identified by (Boix Mansilla and Gardner 2003) as a core epistemic indicator of quality ID collaborative work. The only remarkable axis of differentiation detected during the initial stage of the projects involved relied, on one side, on a heavy focus on outreach and publicly available products stressed by stakeholders and, on the other side, on an emphasis on model development and scientific publications underlined by academic researchers.

Initially in the national team, differences in research experience, dedication to divergent scholar functions (mainly teaching and administration) created a kind of center/periphery asymmetry within the network. The node of Buenos Aires presented the heaviest burden and the coordinator and designer of the project had to undertake the conscious and patient work of integrating the nodes around specific and transversal research tasks.

Face-to-face interaction is of upmost importance at this stage. In all the projects studied only after in-person meetings (be they of the entire team or bilateral visits) participants could benefit from communication technologies. In both ID projects researchers and stakeholders made extensive use of distant internet calls, video conferencing, instant messaging and synchronization of file repositories. However, the final interviews showed early interactions in person were indispensable to consolidating a team of people who had not worked together previously. In the

national project in-person meetings were often and helped to build a shared commitment with self reflection and deliberative rationality which in turn made them able to face administrative and cognitive difficulties through debate, training and cooperative work.

2.4.3   Halfway Stage

As projects evolve, pressures on the teams multiply. Diverging institutional incentives, tensions between academic publication and outreach or policy-relevant outputs, disciplinary biases, and many times personality issues become apparent. Assessments of preliminary results take place and the rapidly approaching end of funding introduces growing anxiety.

In the international networks studied researchers soon realized that effective interaction between researchers and groups, and concrete integration of concepts and practices were necessary to achieve tangible outputs and results. In practice, however, short project durations conspired against team-wide integration that tends to develop slowly − it takes time to generate mutual understanding and trust through deliberative horizontality. The lack of time started to become an obsession for project participants. Success in collaboration started to be measured by relevant and tangible outputs. Correspondingly, specific obstacles to integrative collaboration were openly recognized (e.g., diverging expectations about the timing of certain tasks, or contradictory notions about how much simplification or realistic complexity should be introduced in models).

The combination of pressures related to project deadlines and clear differences among the collaborative performance of individual participants or research units contributed to reducing expectations for broad, generalized integration. Instead, the overall collaborative structure gradually evolved into two clusters: active cliques that integrated their contributions quite effectively, and individuals or groups unable or unwilling to join integrative work and that pursued more comfortable, disciplinary ways of generating outputs. Members whose interaction remained low burdened the coordinator with a double load: cognitive (making him the only one in mastery of the general intellectual strategy) and managerial (compelling him to take a very proactive leadership role).

As reported in other studies, there was constant tension between the researchers' search for knowledge with a general scope and stakeholders' demand for knowledge linked to local situations (Cerf 2011). Stakeholders' priority was the development or improvement of products and services. The stakeholders' interventions, at all times relevant, prevented scientists from neglecting the search for social robustness, or from concentrating exclusively on scholarly questions. Stakeholders' demands triggered innovative initiatives and also operated as a constant, albeit positive, pressure.

A different kind of pressure plagued the national network. When its participants overcame the difficulties that emerged from the asymmetries of formation and dedication to research, audit interventions of the funding agency disrupted the pro-

cess and triggered an unexpected uneasiness. The funding agency officials showed improvisation in the assessment of these new forms of associative organization of research. In a period marked by a profound economic crisis and deep political changes in Argentina, auditors acted denoting they were rehearsing their first steps in the promotion and evaluation of knowledge networks. Their informal comments suggested disapproval of the network's performance. They questioned the financial responsibility assumed by the Buenos Aires node, charged with accounting for the correct use of resources, and urged decentralization and parity of allocation of funds. Although in the initial contest the scientific evaluation had been made by internationally renowned researchers, at this middle stage assessment seemed to rely on the criteria of officials of the national agency whose expertise did not enable a thorough understanding of the achievements of the team. Members felt officials threatened the integrity of the network, inducing fragmentation and disappointment. Perturbations introduced were both substantive (the incomprehension of the project) and procedural (the incomprehension of the deliberative and consensual nature of collaborative research).

2.4.4 The End of the Projects

At this stage, the challenge is to assess collaborative, interdisciplinary, integrative work. Despite many efforts to describe and characterize collaborative research on complex problems, conditions for success (including the very definition of "success") are yet to be rigorously grounded in actual cases. The lack of consensus on criteria for assessment of results is often ranked as a major practical difficulty of this kind of research .

Although conflicting feelings about the value of collaborative ventures might emerge as projects advance, the tensions observed in the international ID teams studied did not influence significantly the overall satisfaction or commitment of participants. Detected tensions were not tied to an incompatibility between the logics of disciplinary and interdisciplinary work, or to contradictory or competing claims between the multiple knowledge domains (Robinson 2008). Instead, difficulties were mainly linked to the researchers' varying capabilities for, and commitment to collaborative research. Representations of "success" changed along the projects' duration (Hidalgo et al. 2011) and at the end of the first project two distinct clusters of participants expressed widely different concepts of IDR "success". Researchers with frequent and intensive interactions elevated their stakes in the project and continued to aim for higher standards of integration and effectiveness. They equated success with "tangible" research, educational and outreach results. In contrast, less integrative researchers tended to stress "intangible" outcomes such as the creation of information-sharing networks, mutual learning, and a renewed understanding of their own disciplinary problems. Despite these diverging criteria, the multiplicity of types of collaborative outcomes − tangible and intangible, direct and indirect, near-term and long-term − allowed all project participants to express a positive view of their experience.

In the national network once difficulties due to the initial imbalance of capabilities of the nodes were overcome, success pointed to intangible outcomes: administrative and cognitive tasks became allocated in a way that broke the internal asymmetry "center/periphery", connectivity and fluid inner confidence enabled participants to consolidate their partnership, preliminary results started being published. A positive feeling about the collaborative experience started to vanish when external monitoring and evaluation procedures suggested the team was not being successful on the basis of assessment criteria created for standard individual and disciplinary research. Both criteria of success clashed. A renewed sense of success emerged when the team could make functionaries acknowledge the enormous value of their outcomes and participants managed to maintain the cohesion of the network through reflexivity about difficulties and strengths.

2.5 Findings and Results

Projects that support this study were deemed to solve complex problems of modern society. The teams reflected that complexity in their composition. In the first two cases teams showed multiple dimensions of heterogeneity: disciplinary, racial, international, institutional, etc. In the third one the network included three nodes with significative initial asymmetries in formation and dedication to research activities, demonstrating that that asymmetries north–south or center-periphery are not exclusive of international collaboration. The nodes were engaged in the analysis of a high number and variety (around a total of 180) research university units. In this context, effective communication was not only necessary but indispensable to carry out the collective production of knowledge.

The multilocation represented a major challenge for the three knowledge networks since the distance could not always be covered successfully only through the Internet and its resources. During the initial stages face to face interaction is crucial. In interviews we conducted all team members complained about the lack of face to face interaction and recognized its irreplaceable value. Notwithstanding, regular contact through emails, group memos, forums, and other resources partially substituted face-to-face encounters that tended to require less time and focus not in plenary sessions but in narrower working groups.

Of outmost importance was the active role of the principal investigators charged with the general coordination of the network. At key moments -project and instruments design, assembly and consolidation of databases, preparation of publications, etc.- coordinators were the drivers of network connectivity and self-reflection, enhancing not only regularity but deepness and intensity of collaboration. We have observed that coordinators carry a heavy double burden both cognitive and managerial, being the ones who usually moved from one location to another, shortening distances with their presence, sharing information and results, and generating consensus.

Intergenerational relations were another crucial component in connecting the various components of the networks studied. Indeed, in all of them young researchers working on PhD or Masters' theses linked fluidly and established fruitful exchanges in their position as fellows or research assistants. Again, at this point the mediating role of the coordinators became essential as triggers of such collaboration. Communication technologies merely complemented face to face encounters, and coordination work facilitated the deployment of areas of interest, affinities and common skills among participants.

The inclusion of stakeholders in the teams from the start and as full peers added a very important component, namely, that concerning the link and consultation with policy makers and users of knowledge from public, private and non-governmental sectors. This link is not easy to establish constituting the challenge to articulate different values, perspectives and objectives. Usually stakeholders are called to integrate scientific projects in response to the requirements of international funding institutions, but in practice they may end up being considered more of an obstacle than a contribution, creating an unclear situations both for scientists and institutions involved. Indeed, the design of collaborative projects should make clear whether stakeholders are incorporated as informants, as users or as partners, which participative methodology will be followed and how much will they be involved in research and its results. The successful performance of stakeholders in our ID projects was a consequence of their full partnership and involvement with research and outreach.

2.6 Innovation and Sustainability in the Global South

Can these cases contribute to design "best practices" and metrics of success in cross-border collaborative settings for innovation and sustainability in the Global South? The question of how international cooperation can be developed so that it is innovative, sustainable and of benefit to all partners is a key issue for science and technology decision makers, given success in collaboration relates to the more global issues of developments in systems of education, research and innovation, immigration, labor market, and competitiveness of the countries involved (Harfi 2006).

The cooperative arrangements studied carry new conceptions on north–south division of scientific labor and on the communication structures cooperative partnerships should develop. Horizontality and mutual trust, respect for another's knowledge and values make the situation substantially novel, challenging current interpretations about talent circulation and training of young generations of scientists. The obstacles to be overcome are many and diverse: to achieve consensus on a research problem relevant to all participants, to design a project sensitive to different values, political stakes, and styles of thought, research traditions, techniques, and disciplinary languages, to gather participants able to interact with geographically-disperse researchers, to balance tensions between academic and outreach evaluation, diverse national or institutional incentives.

Until recently cooperation rested on prolonged temporary migration of scientists[3] from the South to laboratories and institutions of the North, or on the local replication of experiments and standardized protocols developed in main research centers. These sites of excellence, almost always located in the first world countries, used to centralize links, define the issues considered worth of prosecution and the approaches to be followed. In an increasingly globalized world, flows of international migration of highly-skilled or qualified people have changed direction; China and India now compete with the United States, previously the most attractive destination (Schaaper and Wyckoff 2006). This kind of emigration of scholars and professionals from Southern countries has been commonly referred as a "brain drain", term first used in 1963 by the Royal Society to refer the exodus of British scientists to USA, seriously jeopardizing the British economy. Since in these migrations the investments made by poor countries on the formations of their nationals are used by the developed countries, the term underlines the unfair transfer of a technological aid to the richer countries from the poorer ones.[4]

No wonder that once high skilled people from the Global South achieved the sought training, differential opportunities opened to them in the host countries amounted to an announced "flight" of trained personnel, only moderated by the expectation that at least they did not completely lose interest and ties with their countries of origin. A related concept, "brain waste", refers to an even more undesirable situation, namely the risk that not all the migrants are able to find a job at the level of their skill (Brandi 2006).

Announcements for the formation of knowledge networks represent an alternative to the hierarchical structuring of cooperation and have become a crucial aspect of a shifting pattern of cooperation of highly-skilled people across the globe. All agents were capable of working together in the co-production of innovative, pluralistic and robust knowledge. That's why they may contribute to the development of a global collaborative pattern less defined by metropolitan hegemonies (old and new) and more open to diversity.

The knowledge networks studied took advantage from heterogeneities, transforming them into strength: reflexivity in building multi-institutional, interdisciplinary useful knowledge, very good disciplinary contributions, and social relevance because of the tight association with stakeholders. Participants felt that the format allowed them to work on complex and socially relevant issues that could not be addressed successfully by isolated researchers, scattered stakeholders or particular disciplines. Participants of the networks tried to lessen and overcome asymmetries, whether cognitive or managerial, and to articulate the work of all the members in the collective co-production of knowledge. They made efforts to base their performance

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[3]See Luchilo (2006) for an analysis of international mobility of university students, as a major expression of the mobility of qualified personnel and a relevant facet of the internationalization of higher education.

[4]Countries like Argentina have started to pull back and retain their skilled people, cf. *Programa Raíces* (Roots Programme).

on horizontality, mutual confidence, data and infrastructure sharing among members and projection to future generations (Luna and Velasco 2006).

Junior members were able to deepen their research capabilities and to gain professional experience without the risk of settling down abroad that comes when there is a mismatch between foreign and local opportunities for their career growth (Khadria 2006). They could work with partners from diverse disciplinary, training and workplace backgrounds, and although they traveled to varied locations, stays were usually short, hence discouraging permanent migration and displacement.

Collaborative research imposes what (Cummings and Kiesler 2005) referred to as "coordination costs." Leaders of the networks are charged with heavy administrative and cognitive responsibilities that must be faced through horizontal, integrative actions, and deliberative procedures. Funding institutions should pay serious attention to the excessive pressures they may impose on them along evaluation procedures and allow certain flexibility in the allocation of resources and tasks.

Participation of relevant social actors required to reach social robustness in a context of uncertainty and multiplicity of values demonstrates many tangible benefits, from project definition to validation of outcomes. They encourage scientists to produce useful knowledge and sustain outreach effort. In turn, stakeholders gain a deeper understanding of research and conceptualization processes.

The growing importance of collaboration as a mode of knowledge production demands a serious effort to understand how to conduct it effectively (Boix Mansilla 2006). We claim that an active self-reflection involving scientists, practitioners and stakeholders is an inescapable component of the process. While metrics for the assessment of success in collaboration are not explicit and change at different stages, some of the lessons we learned may help to identify factors that foster collaboration for innovation and sustainability in the Global South. Success metrics should reflect the importance of the co-production process and the perception of usability as judged by decision makers (Dilling and Lemos 2011).

It is a priority to discuss criteria for the assessment of collaborative work (Boix Mansilla et al. 2006). Standard means for evaluating disciplinary research (i.e. number of publications, citations, successful research-grant proposals, teaching evaluations by students, benchmarking with other programs, awards and patents received) may prove insufficient in these settings (Boix Mansilla and Gardner 2003; Committee on Facilitating Interdisciplinary Research 2004). Standards of validation stemming from different disciplines often can be conflicting and, sometimes, openly incompatible. Research results important to some disciplines or groups may not be viewed as equally significant by others, or may not even be well understood by all audiences (Caruso and Rhoten 2001). A community of peers able to assess a potential new synthesis of expertise may yet have to be created and trained (Heintz and Origgi 2003; Funtowicz and Hidalgo 2008). The interplay between context, process and product may not be reflected by research outputs alone (Carew and Wickson 2010).

The need to reach outcomes that clearly advance understanding and inquiry stress the need for broader assessment criteria that match the cross-cutting nature

of north–south collaboration. Indeed, the broadening of assessment criteria has been an explicit concern of science and technology policy and funding agencies. Consequently, more elaborate criteria of success have begun to be proposed. Some of these assess whether collaboration improves on disciplinary approaches in the way that (1) the complexity of an issue is grasped, (2) the diverse perspectives on that issue are taken into account, (3) abstract and case-specific knowledge are linked, and (4) descriptive, normative, and practical knowledge to address the issue is developed (Pohl 2011).

Communication and diffusion of ideas across disciplinary boundaries are not new (Jacobs and Frickel 2009). Chasms between the "social" and the "natural", the "pure" and the "applied", the "formal" and the "empirical" are becoming narrower due to a growing appreciation for the inherent complexity of nature and society and the need for science to address socially-relevant problems.

The real significance of these changes will depend on the way the governments, institutions, scientists and different social actors (especially the citizens themselves, as well as civil society) take up this opportunity to introduce their values and objectives into science and technology research and decision making. This is key to the processes of innovation and sustainability for democratic consolidation in the Global South.

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Chapter 3
The Role of Expatriates in Cross-Subsidiary Collaboration

Minori Kusumoto

Abstract The more that organizations globalize, the more of a challenge it is for them to coordinate relations between units across nations. Direct control of subsidiaries by Headquarters is hampered by problems of distance, language, culture and differences in interests. In order to succeed, multinationals need to develop collaborative relationships between subsidiaries and integrate them toward a common objective. This chapter analyzes the determinants of successful inter-subsidiaries collaboration involving knowledge flows in a Japanese Multinational. Using action research and interviews with more than 100 local managers and expatriates in nine subsidiaries, the chapter identifies five key roles of expatriates: globalizer, localizer, agent of control, agent of change, and knowledge transfer. It further investigates the factors that influence the ability of expatriates to fully perform their roles, highlighting the importance of collaborative relations with local managers for reverse knowledge transfer of innovation generated in developing countries subsidiaries, the chapter highlight how expatriates are crucial to the success of collaborative relations between subsidiaries, to "localize" innovation generated in the headquarters and to cascade-down pro-sustainability pressures form environmentally aware customers in the multinational home country.

Keywords Inter-subsidiary collaboration • Expatriates • Japan • Strategic choice • Knowledge transfer

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3.1   Introduction

This chapter analyzes cross-border collaboration in international business with particular focus on the role of expatriates in intra-firm collaboration for the development and implementation of innovation and integrated global strategies. The chapter findings are based on evidence obtained from the author's 6 years of empirical research in eight countries (UK, Japan, Germany, Italy, France, Spain, Poland and Turkey) with a case study Japanese multinational. The chapter argues than expatriates – personal from the parent company' headquarters working on foreign subsidiaries – are essential for successful intra-firm collaboration. Expatriates work as agents for their headquarters, but they are also given freeway to make their own strategic choices. This enables them to align the interests of subsidiaries and parent company, a condition to initiate cross-border collaboration between subsidiaries to achieve corporate strategic objectives. Local managers on their own are unsuccessful to trigger collaboration for intra-firm integration at a global level. The study identified five distinct critical roles to be fulfilled by expatriates, which are agent of control, agent of change, globalizer, localizer and agent of knowledge transfer. When these roles are not fulfilled, intra-firm collaboration begins to fail and global coordination for strategic objectives becomes dysfunctional hampering international value chain management, dynamic innovation and enhancement of corporate sustainability.

3.2   MNEs, Cross-Subsidiary Collaboration and Expatriates

Contingency theorists suggest that when firms go global, both firms and individuals within it must adapt to the local environment. (e.g. Ferner and Quintanilla 1998; Edwards 1998; Elger and Smith 2005; Morgan 2001). Historically, a critical capability for MNEs has been local responsiveness; the ability to adapt production, products and services to local requirements such as local customer demand and government requirements (Evans et al. 2002). However, with increasingly globalized markets and supply chains, the role of subsidiaries is no longer merely the adaptation of products and services to meet the local requirement. MNEs need subsidiaries able to contribute to the global MNE group through innovation of products and production methods, collaborating with other subsidiaries and HQs experts to develop and implement integrated strategies.

In comparison to a single – location firm, an MNE enjoys two major advantages. First, the MNE is composed of multiple geographically dispersed entities that are inter-linked through relationships centering on its HQs. Knowledge transfer between the affiliated units, subsidiaries and HQs is often easier than transmitting knowledge between independent firms. Second, because MNEs' subsidiaries are embedded in their respective host-countries, they develop, over-time, capabilities that resonate with those of other firms in their affiliates' countries. Thus, having subsidiaries

in multiple locations could be an efficient mechanism for searching for distinctive knowledge transfer across border (Almeida and Phene 2004).

Almeida and Phene (2004) argue that cross-country collaboration in research and development improves not just the resulting inventions, but also has a long-term benefit for the involved individual actors. However, the challenge is that improvements in the performance of individual employees in an MNE subsidiary does not always translate to broader improvement of subsidiary-level innovation capabilities.

Indeed, collaboration and integration between subsidiaries is difficult to implement. Within an MNE, many different groups with different resources, values and agendas emerge (Edwards and Rees 2006). As a result, MNEs are characterized by complex, contradictory internal processes in possible conflict. Organizing collaboration across institutional and national divides can bring challenges to the routines used by the MNE in the home country (Morgan 2001). Bartlett and Ghoshal (2000) argue that in order for MNEs to pursue their goals of international coordination under the three objectives of global efficiency, multinational flexibility and global learning, there is an increasing demand for employees who can attain these objectives, such as expatriates. Accordingly, Scullion and Brewster (2002) note that the rapid growth in the internationalization of firms has resulted in an increased demand for the mobility of expatriates. A number of studies (e.g. Adler 1987; Tung 1987; Delios and Björkman 2000; Black et al. 1991; Harzing 2001) acknowledge that one important role played by all expatriates is to enable HQs to control the subsidiaries. More specifically, MNEs use expatriates to hold together their complex web of relationships across subsidiaries. In addition to their specific functional tasks (e.g. manager or engineer), expatriates play the role of agents of socialization and control subsidiaries on behalf of HQ (Edstrom and Galbraith 1977). They also support collaborative innovation and transfer home-country's corporate philosophy (Scullion and Paauwe 2005).

In subsidiaries, expatriates are required to play some roles that locals would not be able to perform effectively. Uncertainty and the best ways to deal with it are the determinants of expatriate usage. For HQs, expatriates are more suitable as managers than locals, acting as sources of information/knowledge and playing an unobtrusive control role through personal control (Harzing 2001). However, locals' support is crucial to successful expatriates' adaptation to the local context (Toh and DeNisi 2003). In addition, locals are better suited to dealing with uncertainty from local competition. Nevertheless, the higher the dependency between subsidiaries and HQs, the more the HQ's preference that expatriates should manage uncertainty (Toh and DeNisi 2005), thus requiring collaborative relations with locals.

3.2.1   Japanese MNEs and Expatriates

The use of expatriates in Japanese MNE has distinctive characteristics. Japanese MNEs generally value and demand employees' loyalty and commitment to the

company. Life-time employment systems compensate for such demands. At the same time, Japanese firms expect their employees to be multi-skilled rather than specialists (Kikkawa 1995). When operating overseas, Japanese MNEs relied heavily on Japanese expatriates using them to play multiple roles, particularly knowledge transfer (technical and cultural). Dore (1973) claimed that Japanese companies do not exist merely as enterprises, with many groups of different business units and factories. A community emerges around a Japanese company's employees and stakeholders. Expatriates of Japanese MNEs, most of whom stay in one MNE for life-time, have long assignments (5 years in average) in their subsidiaries. They are treated as ambassadors of their HQ and their actions interpreted as reflection of whole corporate policies. In general, the literature praises the value added by expatriates in the area of fostering intra-firm collaboration for innovation and updating corporate policies, many of which emphasize sustainable operation.

On the other hand, using Japanese expatriates is substantially more expensive than using locals to perform similar functional tasks. Thus, pressured to reduce costs in order to remain globally competitive, many Japanese multinationals are cutting down on the number of expatriates, assuming that locals will be able to perform expatriates' roles. However, there is little literature investigating the dynamics that lead to the formation of the specific roles played by expatriate managers. Even less literature explores the long-term impacts of failure to fulfill such roles in an MNE. The research on which this chapter is based aimed to fill such gap. It was commissioned by the case study company to find out whether reducing expatriates' numbers would affect the performance and collaboration of subsidiaries with HQs.

3.3   Methodology

The case study company is a Japanese MNE: Zipper Co, the largest manufacturer of fastening products in the world. Zipper Co has the second largest geographical distribution of subsidiaries among all Japanese firms. The case study focus on the MNE's regional operations in Europe, Middle East and Africa (Zipper EMEA). The company has traditionally relied heavily on using expatriates to manage its overseas business. In Europe the number of its subsidiaries has increased from 30 to 40 and the number of expatriates, used to initiate and develop production and sales, peaked at 120 during the 1980s. Nowadays, the number of expatriates has been reduced to around 58 and the company is strategically committed to minimizing its use of expatriates, mainly for cost efficiency purposes.

The research lasted three years and started in 2004 with participant observation at the monthly Zipper EMEA HQs (Regional HQ or RHQ from now on) advisory board meetings. Participation on the advisory board provided the researcher with opportunities to interview key actors, understand the organizational perception of the environment and further discuss some of the research findings with board members.

The second component of primary data included 123 semi-structured, one-hour long, interviews with expatriates and local managers in 17 sites of 9 subsidiaries of Zipper EMEA, the RHQs in London and HQs in Japan. There were 99 interviewees, including the company's CEO, but several participants were interviewed more than once. All directors, managers and Japanese expatriates in Zipper EMEA participated in the research without exception. In consultation with advisory board members, 35 key expatriates were selected for face to face interviews while the remaining 29 were involved through emails, phone call, or participation in the workshops. This input was particularly relevant in the development of the study's conceptual framework in terms of refining the roles of expatriates and influencing factors.

The third major primary data collection method was a weekly Human Resources (HR) consultation workshop conducted at the RHQs where the objective was to clarify the roles of expatriates based on a comprehensive examination of more HR-relevant issues raised by different countries. One hundred and sixty workshops were organized. Fourteen of them specifically carried out to design and organize the research fieldwork in collaboration with the MNE. The workshops provided the opportunity to contrast and validate the finding obtained in the interviews.

All data from interviews and meeting was transcribed, translated and coded using categories developed from the literature and action research to analyze the relations between roles and influencing factors.

3.4 Conceptual Framework

The conceptual framework builds on contingency theory, strategic choice and role theories. Role theory (Linton 1936) claims that when individuals work in an organization, they are not just given functional jobs but also assigned a status. When they put the rights and duties that constitute the status into effect, they are performing a role. His claim supports the author's findings that role is not merely functional but wider than that, and in this case, expatriates' roles are not merely agent of headquarters but there are other dimensions in their roles such as symbolic meanings (i.e. embodying HQs' organizational culture) and the development and maintenance of social networks (i.e. coordination of cooperation and collaboration between subsidiaries and subsidiaries-HQs). The case study revealed that HQs and subsidiaries expected expatriates to fulfill five key distinct roles. All of them necessary to achieve successful intra-firm collaboration towards the MNE's strategic objectives:

3.4.1 Agent of Control

Japanese companies have typically assigned paramount importance to corporate values and a shared vision between HQs and subsidiaries as imbedded control

mechanisms (Bartlett et al. 2008). Following Ouchi (1993) and Berry et al. (2005), it can be argued that the ultimate aim of control should be the achievement of subsidiaries' voluntarily contributing to HQs' strategies and values. Zipper Co uses expatriates on international assignments to forge interpersonal links and supervise organizational cohesion with the corporate values of HQs. To be successful, expatriates should not only be committed to these corporate values but also have high levels of cultural knowledge of the host country (Paik and Sohn 2004). Therefore the first role of expatriates identified by the conceptual framework is that of the agent of control, which is defined as *an individual who ensures that a subsidiary cooperates with HQs by implementing strategies and policies that comply with the corporate values, policies and strategies of HQs or the global group.*

3.4.2   Agent of Change

Contingency theory suggests that a corporation cannot survive without adapting to its business environment. Thus, if the business environment essentially changes from moment to moment (Pettigrew 1985), adaption is a constant mission for corporations, whether the changes in the business environment are confined to the area where a subsidiary is located or take place in the business environment at HQs. Changes to the overall corporate strategy can be considered as changes to the corporate environment from the perspective of the subsidiary, and the subsidiary is required to adapt itself to such change. Who should initiate such changes in the subsidiary? If reforms are required by HQs, naturally it is the expatriates, the agents of control. Now, what if reform is not explicitly required by HQs' strategies but there is an implicit understanding that subsidiaries should to respond to changes in the local business environment and adapt accordingly? Should effecting change be the role of the local employees, since they are more knowledgeable about the local business environment?

To initiate reforms requires having sufficient political power (Child 1974) to coordinate action against resistance. That is, the reformer must solve any conflicts of interest that arise from reform. They must also manage any impacts the reform may have on the employees of the subsidiary. Considering the complexity of this, Zipper Co expects expatriates to initiate intra-firm collaboration for reforming corporate coordination structures and change inputs arrangements from each subsidiary. It is easier for expatriates to take the initiative here, since they essentially belong to HQs and can expect a different kind of support from HQs than local employees. Moreover, in times of crisis radical restructuring across a number of subsidiaries may be necessary to achieve rapid change (Collings and Scullion 2006). In such cases Zipper Co expects that expatriates will act as problem-solvers, organizing internal realignments and managing impacts in a manner as close to corporate values as the situation permits, while collaborating with expatriates in other subsidiaries to implement coordinated change across business units.

Therefore the second critical role of expatriates is that of agent of change, defined as *an individual who steers and manages internal realignments and processes in accordance with the preferred corporate approach to organizational change*.

3.4.3 Localizer

According to contingency theory, for a corporation to survive in the local context it must adapt itself to the business environment. The efforts made by the corporation to achieve this are known as localization. Expatriates role as localizers is to acquire an in-depth knowledge and understanding of the host country and the local environment (Parker 1998) while initiating their subsidiary's adaptation to the local environment by adjusting the home country's way of doing business. Evans et al. (2002) go further arguing that the role of expatriates as localizers is to initiate, sustain and monitor investments in local empowerment. Zipper Co has traditionally used expatriates as localizers. Expatriates are also expected to control the degree of delegation of decision-making authority. Excessive delegation to locals may bring to the MNE risk that a subsidiary begin to pursue subsidiaries' own interest instead of the MNE as a whole. However, limited delegation to locals can distract local orientation or may negatively influence motivation of local employees. The case study shows that optimizing the process and strategy of corporate' localization in global harmony, can only be achieved with expatriates. It is expatriates who can work way beyond individual subsidiaries and share know-how and information in relation to localization strategies with other subsidiaries. The role of expatriates as localizers, which involves cross-border collaboration, is inevitable for the MNE to be successfully working under the same group strategy.

The "localizer" is defined as *an individual who catalyzes and enhances the firm's actions to adapt to the local environment reassuring pursuit of the common corporate target*.

3.4.4 Globalizer

The fourth role is that of the globalizer. This role emerges as a result of universal pressures to increase connectivity and efficiency in the global supply chain, which particularly require intra-subsidiary collaboration (Bartlett and Ghoshal 1989; Lomax 2001). Expatriates can be effective integrators because they are in the position to work with subsidiaries' employees and at the same time working close to their HQs as well as intra-subsidiary, which enable cross-border collaboration (Bonache and Fernández 1997; Kühlmann 2001). They are expected to be skilled regarding the firm's identity and the need for standardization and integration through the MNEs' global coordination and operation (Tahvanainen and Suutari 2005).

Zipper Co relies on expatriates to design and coordinate their business activities across the border. The MNE selects the most appropriate international location ensuring optimal benefits to the entire corporate group. The success of Zipper Co's international business requires the coordination of interdependent subsidiaries through integration, the standardization of organizational activities and the clarification of the different roles of subsidiaries in various international locations The role of globalizer is understood as an *individual who enhances the firm's ability to adapt an international coordination strategy of global standardization and market integration through cooperation with the other subsidiaries and headquarters.*

3.4.5   Agent of Knowledge Transfer

It is necessary for a corporation's competitiveness to pass on its proprietary knowledge and capabilities to its overseas subsidiaries as it enters a new market or conducts its business (Dunning 1985). Likewise, organizational learning is important. Knowledge transfer involves much more than simply transmitting technical skills from the home country to the host country. There is increasing emphasis of knowledge transfer from subsidiaries to HQs and between subsidiaries. Moreover, collaboration for knowledge and technology creation, namely innovation, is getting more critical for MNEs due to required speed and variety of innovation from the market. Additionally, implicit knowledge is as valuable as explicit knowledge for gaining competitive advantage (Mendenhall 2001). It is considered important and useful for a corporation to take advantage of the experiences and lessons learnt in each organization in the group, which are reflected by its corporate philosophy and policy such as its sustainability policies including environmental practices (Ghoshal and Bartlett 1997; Bonache and Brewster 2001). Tacit knowledge and know-how flow occurs during expatriate assignment and subsequent repatriation (Kühlmann 2001; Oddou et al. 2001; Evans et al. 2002). In Zipper Co, most R&D was traditionally made in Japan. Expatriates transferred technical knowledge while being explicitly expected to transfer the company's strong corporate culture (the Cycle of Goodness).

Therefore, the role of knowledge transferrers is defined as the fifth key role of expatriates: an *individual who contributes to enhancement of reciprocal learning, capacity building and integration between the subsidiary and HQs, transferring knowledge, values and know-how to and from HQs but also between subsidiaries.*

When the MNE started to become international in the 1950s, the most important role that expatriates needed to play was that of localizer. Then, as a result of its interpretation of trends in the global business, the company's localization strategy changed in the early 2000s and thereby the roles that expatriate managers played changed as well. They are now increasingly required to be agents of change and globalizers, and are also expected to play the role of agents of control. The role of agent of technological knowledge transfer was no longer significant in either direction, not from Japan to the overseas subsidiary or from the overseas subsidiary

to Japan. The expatriates were only expected to introduce the company's values and philosophy to the subsidiary and to transfer market-related information from the subsidiary to the Japanese HQs.

3.5 Influencing Factors to Fulfillment of the Expatriates Roles

The research in eight different subsidiaries showed different level of fulfillment of the above identified expatriates' roles. The less roles fulfilled, the less successful intra-firm collaboration was. The extreme case was Spain, where none of the roles were fulfilled, plunging the subsidiary in chaos and straining relations with HQ and other subsidiaries. This section will describe factors that were found as influential for expatriates to form and play their roles successfully. The case study identified two types factors influencing the formation of expatriates' roles: Contingent factors and Strategic Choice factors.

3.5.1 Contingent Factors

Contingent factors refer to aspects of the context influencing how the roles of expatriates are formed (or not) in response to the environment. Contingent factors are specific to the interaction between the external environment and the organizational context in which the expatriates act. Although the literature suggested more than twenty potential contingent factors, the analysis of empirical data narrowed them down to five key factors strongly influencing expatriates' roles: HQs intervention, age of establishment, local institutional system, local HR system subsidiary core and local cooperation.

3.5.1.1 HQs' Intervention

HQs' intervention is the degree of control the HQs exerts over the subsidiary. The subsidiary's policies and strategies are naturally expected to be oriented to those developed by their HQs. Expatriates are affected by how far HQs attempts to intervene in their work. Zipper Co HQ international HR strategy determines whether they decide to depend heavily on the use of expatriate managers or move away from such dependence. As part of such strategy, Zipper Co HQs corporate board determines the standard length of an expatriate's stay in a subsidiary. Thus expatriate corporate strategy is part of the intervention by which the HQs attempt to control and influence the role of expatriates. Harzing (2001) argues that the dominant approach to control favored by HQs' influences the expatriate managers' choice,

between using direct personal control, socializing their staff into shared values or using informal communication mechanisms. Zipper Co favors direct control but also shared values, thus influencing the roles of Agent of Control and Knowledge Transfer. To respond to increasing change in the industry's structure and to pursue global efficiency, the HQs require all subsidiaries to cooperate in cross-national collaboration between subsidiaries in the group. Thus HQ intervention in this case has particularly strong influence in the formation of the role of globalizers, but also as agents of change to implement the reforms that HQ deem needed for subsidiaries to adapt to new strategies. The HQs also intervene by modifying their subsidiaries allocation of resources, thus influencing expatriates ability to empower subsidiaries (localizer role). The way in which the HQs relate to the subsidiary and manage their expatriate strategy influence all the expatriates' role and the degree of discretion they have.

3.5.1.2   Subsidiary Core

Today, many MNEs have not one but many business objectives and they have become more and more diversified and complex. MNEs design their international coordination by setting different subsidiaries with different capabilities in the most suitable sites trying to optimize the value chain. The main purpose of a subsidiary (i.e. production, R&D, sales) in the MNE value chain is the subsidiary core business. For example, the subsidiary in Germany was chosen as the MNE's center of advanced precision production in Europe, Its productive capacity became its core business. The importance of the core business for the MNE influences the resources given to the subsidiary. The subsidiary core in Germany was strategically important to the entire MNE, then Germany received sufficient investment from HQs to develop such a system. In our case study, the strategic importance given by the HQs to each subsidiary's core business is the factor that most affects the degree of discretionary power wielded by expatriate managers. The higher the importance of the subsidiary core business, the less discretionary power expatriates have[1] as agents of control and change. The importance of subsidiary core also influences what roles expatriates are expected to work on more. Subsidiaries with lower business core importance have progressed less in terms of empowering local staff, thus requiring expatriates to provide more support for the process as Localizers.

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[1]To understand this and the relationship between HQs and subsidiaries, we draw upon considerations of control and autonomy. Johnston (2005, pp.77–78) suggests that control and autonomy are clearly, albeit inversely, related and that the autonomy of a subsidiary is the antithesis of its control by HQs. The control mechanisms adapted by an MNE have important effects upon the subsidiary's autonomy. MNEs design their international coordination by setting different subsidiaries with different capabilities in the most suitable sites trying to optimize the value chain. The more important the subsidiary core business is, the more bargaining power the subsidiary has to negotiate higher levels of autonomy.

Differences amongst subsidiaries also make expatriates role as globalizer critically important to optimize the MNE's value chain by coordinating and enhancing intra-firm collaboration.

3.5.1.3   Age of Establishment

The age of a subsidiary is also closely related to the formation of relationships in an organization and has a direct influence on the attitudes of local staff to expatriates. The older the organization, the more likely it is that existing practices had been embedded, and the stronger the resistance to change (Ansoff 1965). Organizational practices become tenacious over time and their characteristics become institutionalized through previously invested know-how (Reus et al. 2009). Thus, local decision-makers may not see any need to adapt to a change in the firm's environment because they perceive it through the lens of their own historically conditioned interpretive schemes. Even when they recognize the need to change, institutionalized practices may constrain their response. On the other hand, long-established companies have built up trust between the local staff and HQs. Trust is the result of repeated positive relationships. In young companies the strategic use of local staff offers higher "moral hazard" costs due to uncertainty about the local staff's possible opportunistic behavior. As an MNE gradually acquires experience in the host country and develops trust in the local staff, it runs less risk in localizing by delegating authority and control to local managers (Bonache and Fernández 2005). The research unveiled that age of the company influences expatriates role by requiring more focus on specific types of roles from expatriates according to the age of the subsidiary. In older subsidiaries there is little need for expatriates as localizers, but expatriates need to focus more on the role of agents of change to overcome resistance against changes. In newer subsidiaries they must invest more efforts in the roles of localizer and agents of technological and cultural knowledge transfer.

3.5.1.4   Local Institutional Systems

No organization or individual can escape local business systems, which become institutionalized over time. (Hatch 1997, p. 86). For expatriates to operate in a particular society they need to comply both with explicit requirements such as regulations and the law but also with implicit social norms and business customs. Thus, institutional context has a major impact on the shaping and execution of expatriate managers' responsibilities. The research provided evidences that institutional systems strongly influences expatriates' overall role formation. In France, for instance, regulation and union practices were a main obstacle for the implementation of change and control.

3.5.1.5 Local Human Resource Management (HRM) Systems

Aspects of the local HR systems that have an influence on expatriates' roles are: (1) the degree to which core corporate practices have changed under the influence of national agreements or labor unions, (2) the extent to which the HR systems are formal or tacit, and (3) how systematically the individual aspects of the HR system have been identified in mechanisms such as job descriptions, evaluations, compensation and allocation. Local HRM systems influence heavily on the role formation of expatriates. Different local HRM systems can promote or distract them to work as agent of control, change, globalizer. If HRM systems are heavily domestic oriented, expatriates need to amend it toward more globally oriented ones with collaboration with the other subsidiaries and headquarters.

3.5.1.6 Local Cooperation

Local cooperation is concerned not only with the relationship between expatriates and local employees but also with all the relationships among members of the subsidiary where an expatriate works. The extent of cooperative relationships affects the activities, roles and responsibilities of the expatriates in the organization. Cooperative relationships help the subsidiary to develop a positive climate in which the expatriate managers can work and perform the roles required of them. On the other hand, if the relationship is damaged they will need to spend time dealing with individual conflict and may find it difficult to work in an environment that is full of negative feelings. Positive relationships at work are necessary for developing an overall positive organizational context (Ragins and Dutton 2007). It is difficult to separate the notion of identity that explains us to the world and to ourselves (Rodgers 2007) from the social relationships in which identity is embedded. As people experience themselves as being known and understood, and feel more secure, they become more likely to build trust in return. When trust exists people are likely to engage in more self-disclosure (Rodgers 2007).

For an MNE the development of mutual understanding is also a particularly important outcome of the contribution of positive relationships that enhance trust-building (Aaron 1999).

If the employees in a subsidiary show an insufficient degree of cooperation, this will not only adversely affect daily business operations and the motivation of the employees but conflicts may also arise. Then expatriates may be brought in to solve conflicts. This research found that the degree of cooperation affects the discretion of expatriate managers, thus fulfillment of their roles.

3.5.2 Strategic Choice Factors

Strategic choice theory argues that organizations develop their strategies and coordinate tasks by making various strategic choices, not only to adapt to the

environment but also for organizational reasons or individual preference. Agents in an organization have a choice in how they respond to the environment as well as the strategies they adopt and the individual capabilities they use to do so (Ansoff 1965). Individual choices form part of a political process where managers interpret multiple critical dimensions of their environment and employ their organizational capabilities to formulate strategic choices. What enables managers to make strategic choices? In the existing literature (e.g. Ansoff 1965; Child 1997), two strategic choice factors are intrinsic personal characteristics (individual capabilities) and their position in relation to other members of the multinational (Autonomy).

3.5.2.1 Autonomy

Autonomy is a form of independence (Dworkin 1989). According to O'Neill (2002, p. 28), "independence is relational". This idea is interpreted here to mean expatriates have autonomy to the extent to which they can make their own choices instead of depending on their HQs' approval and instructions. Lukes (2005) states that only people who have freedom can make their own choices according to their preferences. In reality, however, individual preference and judgments are always the result of influences from the environment surrounding an individual, and freedom is limited by lack of power. The legitimate power of managers arises from their positions in the structure of the organization (Clegg 1989). Thus, autonomy is officially delegated to individuals or sub-organizations and it is realized through the organizational structure, especially through the positions that individuals are allocated by the structure, which involve discretion and decision-making capacities (Clegg 1989, p. 189). However, Pfeffer (1992) suggests that the autonomy delegated to managers does not necessarily enable them to execute power, because power is premised on the control of resources. Clegg (1989) further comments that power is rooted in politics. Politics is a natural dynamic in organizations, whether managers choose to engage with it or not. Furthermore, a power network needs to exist before autonomy can be exerted. This implies that this study had to take into account the sources of power that managers need to execute their autonomy. It was found that the autonomy and discretion of expatriates depends on their formal capacity to organize and control human and material resources and territories. In turn, autonomy was found a most significant factor influencing roles formation. Expatriates with higher autonomy were choosing what role they worked on harder than other roles, while expatriates with lower autonomy worked more on the roles specifically demanded by HQ.

3.5.2.2 Individual Capabilities

Whatever autonomy individuals derive from their position, it is merely a condition or facilitator for making a choice, but the final outcome will depend on the individual's capabilities to evaluate the environment, select goals for the organization

and develop a strategy to respond or not to respond to the environment (Child's 1972, 1997). In addition, Child (1972) notes that a strategic choice is a political process, not merely a one-off action. Most of the time a strategic choice cannot be made by an individual on their own, it requires a dominant group or coalition whose members share the same interests or ideas. Since strategic choice is a political process, the ability to develop and maintain a coalition is very important, because it contributes significantly to the development of a network of power relationships, and because wielding power requires remarkable relationship and interdependent abilities. Without access to such a coalition, an individual's capacity for making strategic choices may be very limited. Rodgers (2007, pp. 153–154) contrasts coalitions with autonomy. While autonomy is given to an individual by an organization or some authority, he suggests that people sign up for coalitions because they want to, not because someone else has told them to do so. Participants in a coalition are driven by an emotional commitment to a particular cause or are attracted to a desired result that they judge will be best served by aligning themselves with others who want the same thing.

Rodgers (2007, pp. 134–135) notes that individual capability can be a resource used to modify and develop the knowledge, attitudes and behavior of others and build a coalition. Individual capability includes control of limited resources and access to information (resource power), personal knowledge and expertise (expert power), the network of relationships with other key people (network power) and the ability to establish empathy and rapport when interacting with others (communication power). Network power and communication power are influenced by an individual's coalition capability: the individual skill that enables expatriates to build social networks and to secure the emotional commitment of other actors to the particular cause or objective they pursue.

In practical terms for expatriates working in subsidiaries, coalition capabilities enable them to build a network of relations with key individuals and groups at HQs, the RHQs, sister companies or within their own subsidiaries. As a result, they enable individuals who have been given autonomy to execute the power that comes with it.[2] Since the researcher was allowed into the decision-making circle of the organization, she could observe the political process and coalition formation very closely. This revealed that although autonomy enabled managers to choose roles and decide how to coordinate and develop intra-firm collaboration, the quality of choices and successful fulfillment of roles chosen was ultimately dependent on the individual capability. Coalition capabilities were a determinant of success for all roles and shaped the outcomes of intra-firm collaboration in the MNE.

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[2]It is worth pointing out that the cooperative relationship, which has been identified as a contingent factor, is different from a coalition in that the former emerges from the concept of contingency, not from the skill of an individual, and does not necessarily involve expatriates. A coalition must either be built or subscribed to by the expatriates themselves, and it is developed through a political process using their own networks and personal contacts (Rodgers 2007).

The findings are captured in a model of intra-firm collaboration summarized in Box 3.1, below:

Box 3.1: An Expatriate-based Model of Intra-firm Collaboration to Achieve Multi-level Strategic Objectives

1. The MNE evaluates and interprets their global, regional and local business environment considering how it will impact on their strategic objectives.
2. Then it designs the international organizational structure and collaborative actions needed to realize the strategic objectives developed.
3. Finally, the MNE allocates and gives tasks to employees who will implement as well as facilitate cross-subsidiaries organizational learning, which will re-develop its strategic objectives and improve corporate value.
4. The success of MNEs actions depends on the extent of integration of HQ strategies and subsidiaries achieved by expatriates fulfilling five key roles in cross-subsidiary coordination: Agent of control, agent of change, globalizer, localizer, knowledge transfer.
5. In turn, the extent of fulfillment of expatriates' roles is strongly influenced by three strategic choice factors (individual aspects of expatriates) and five contingent factors (external to expatriates).

3.6 How the Roles Played out in Specific Subsidiaries?

In Zipper–France contingent factors, especially HQs' intervention to downsize the subsidiary drove the expatriates to focus on being agents of change but the remaining roles were scarcely tackled. This disproportional focus on one role led to deeply negative consequences at the subsidiary, causing economic performance to drop and considerably disrupting employees' motivation and morale.

The age of the company's establishment politically empowered the local staff to resist change. The decrease in Zipper–France's core business reduced HQs' motivation to support this subsidiary. Lack of resources impeded investment in training local staff, hiring new talent and improving production facilities, compromising the development of the expatriate managers' role of localizer. The powerful French institutional system, in particular its national employment policy, also worked strongly against the activities of expatriates and consumed much of their time and resources. In addition, the level of local cooperation was low and sometimes broke out into intense internal conflict and hostility. The expatriates were given extensive autonomy by HQs, but excessive HQs intervention disrupted their ability to exercise it. Moreover, the expatriates' limited ability to develop coalitions with local employees prevented them from taking their own initiative. The case study illustrates the differences between the roles of agent of control and agent of

change. Control requires forging interpersonal links and supervising organizational cohesion, as well as the integration of subsidiaries into the corporate strategies and culture. In France, organizational change was achieved but at the expense of a severe deterioration in organizational cohesion and integration, resulting in the fragmentation of objectives, demotivation to collaborate with HQ and chaos. As a consequence of the changes, Zipper Co lost significant control over the performance of the subsidiary.

In Zipper–Spain none of the expatriates' roles were fully formed. This led the company into disastrous intra-organizational conflict, with considerably reduced motivation, morale and commitment among the employees. Six contingent factors significantly influenced this failure. These were: (i) intervention by HQs to reduce the power of local managers and change organizational practices without considering the consequences (ii) a solid subsidiary core business, which consolidated the local managers' perceptions, sometimes in conflict with those of HQs, (iii) a long age of establishment (30 years) during which the subsidiary had developed institutionalized ways of doing things, (iv) a weak national labor regulation system which gave the expatriates too many choices, (v) the lack of a HRM system in the subsidiary, so that the expatriate managers became too closely involved in operational levels that were supposed to be the responsibility of the local managers, and (vi) negative relations with the local staff that made it harder to choose the right person for the job and to delegate tasks appropriately. In this situation, the strategic choices available to the expatriates could not compensate for the challenges of the negative contingent factors they faced. Despite being given extensive autonomy by HQs, the expatriates were unable to manage the situation, and some even made it worse by fuelling the collective hostility of local staff. Local managers sometimes came into conflict with the policy of the entire MNE as well as the expatriate managers and the changes they tried to implement. Ultimately, all of these factors acted as constraints on expatriates in making appropriate and informed choices. It was clear that the key role for the expatriates at Zipper–Spain should have been the role of localizer. There were only five expatriates in a company with 230 Spanish employees, so in order to act as agents of control or of change, or to establish a global value chain, they needed the support of the local managers. However, there was a huge gap between the local staff and HQs in the understanding of the localization process. The case of Zipper–Spain highlights that the strategic choices of expatriates and cooperation of locals are crucial in deciding the most suitable localization approach for a specific subsidiary.

Finally, in Zipper-Italy was found that expatriates played all the five roles identified in the theoretical framework. The positive results were good economic performance, successful collaboration with HQ and other subsidiaries and high employee motivation. Contingent factors, such as HQs' intervention in the subsidiary's corporate policy, strategy and core business, as well as the subsidiary's weak strategic position and limited organizational capabilities, restricted the development of expatriates' roles as globalizers and agents of knowledge transfer. However, the expatriates' extensive autonomy and individual capabilities enabled them to play these two roles as well. Expatriates were developing a local strategy

using their accumulated experience and they succeeded in managing different cultural and institutional contexts. This highlights the fact that when expatriates take a suitable localization approach, their performance in other roles is facilitated.

Another critical factor that significantly influenced the formation of the expatriates' roles at Zipper-Italy was the cooperative relationships within the organization. The quality of these local relations compensated for their initial lack of a formalized HR system and helped the company to deal with difficult negotiations with trade unions. Consequently, good progress was made in local empowerment. The local managers were perceived to have extensive autonomy. They were also involved in senior management levels of decision-making. However, they could not work on their own as agents of change, control or as localizers because fulfillment of these roles requires the political capacity to influence HQs in negotiations. They were also limited in the roles of globalizers and agents of knowledge transfer because they generally lacked international management skills and global-level business knowledge and networks. These facts indicate that at the moment expatriates cannot be easily replaced by local managers because of their different capabilities, and they emphasize the necessity for the MNE to consider developing a new group of global managers.

3.7   Conclusion

This study examined and analyzed the roles of expatriates in MNEs using empirical data from 109 interviews and 5 years of action research in a major Japanese MNE. The case studies in this study provide evidence that expatriates play a wider range of roles than is suggested by the literature. Previously, empirical research (Harzing 2001) had identified and found evidence supporting the existence of three roles that expatriates played. However, this study found that five roles are required of expatriates in terms of organizational design and for conceptual reasons (agent of control, agent of change, globalizer, localizer and transferrer of knowledge).

These five roles imply that expatriates are not merely agents of HQs in international business, as traditionally understood by the top-down (HQs–subsidiaries) stream of research on expatriates (e.g., Edstrom and Galbraith 1977; Thomas 1991; Bartlett and Ghoshal 2000; Harzing 2001; Evans et al. 2002). The existing approach has underestimated the fact that expatriates can play the role of championing the subsidiary to the HQ or regional HQ, rather than simply acting as a conduit for the messages and interests of the center.

One of the major contributions of this study is in providing evidence that expatriates cannot easily be replaced by locals, because locals cannot play the five roles that expatriates play. These roles always requires managers to have a strong connection with the HQs as well as multinational network within the MNE. It is not impossible to replace some positions filled by expatriates by locals, but MNEs need to find and develop the way for locals to build these networks and trust with the HQ. Therefore, before MNEs become successful in developing international

managers, including locals and third country nationals, by supporting them to
overcome various constrains coming from home country specific cultural value,
business customs and communication barriers due to language, there seems to be
a strong need for the function of expatriates in the MNE. In this sense, locals are not
easy alternatives to expatriates, either.

In particular, Zipper Co followed the same internationalization strategy that
most European MNEs. They built up overseas subsidiaries and gave them high
degree of autonomy. However, negative consequence of extended delegation, was
that subsidiaries started to have limited ability to lean and change toward global
integration (Scullion and Brewster 2002). Therefore, as outsiders, expatriates are
more suitable and effective than locals for the role of change because expatriates
hardly have no reason to resist to change per say. Ultimately, the research findings
underline the importance of expatriates to initiate collaborative work between
expatriates and local employees and sometimes together with different subsidiaries.

The empirical evidence also suggests that if expatriates play multiple roles
this is more beneficial to the MNE than if they play only one role. Perhaps
more controversially, two of the case studies hinted that if expatriates play only
one role, this could work as a constraint for the integration of the MNE and
negatively influence organizational performance. For example, in the case of Zipper
Co-France (where only the role of change agent was formed), the locals were
frustrated and angered by the expatriates' failure to act as localizers (i.e., to empower
the locals and communicate with them). This lead to serious resistance by the
locals to the expatriates and, ultimately, to the HQs itself. As a consequence,
the HQ lost control over the subsidiary and the latter's performance was reduced
accordingly. However, further research and case studies are needed to consolidate
these preliminary insights about the possible negative effects of incomplete role
formation in organizational performance.

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Chapter 4
The Roles of First and Second Tier Suppliers in Greening International Supply Chains

Chao-Min Liu, Diego A. Vazquez-Brust, and Joseph Sarkis

Abstract Green Supply Chain Management (GSCM) requires coordinated action across firms from different countries. The chapter uses a case study of a Taiwanese SME supplying automotive parts to a large French car-maker to analyze to what extent and why final customers' GSCM are integrated in their first tier suppliers (the case study company) and second tier suppliers (SME suppliers of the case study company). It is found that there are no formal collaboration mechanisms between firms in this supply chain. The SMEs are mainly reactive approaches in response to various pressures. Greening drive decreases in less environmentally regulated markets where final customers are not environmentally sensitive. Shared values act as incentive to exchange information and develop mentorship relations between customers and first-tier suppliers. These relations provided the blue-print for similar mentorship relationship between first-tier and second tier suppliers. First tier supplier teach second-tier supplier how to satisfy customers' requirement but such collaboration depends on two factors: (a) the extent of environmental awareness of second tier suppliers have and (b) the supply chain complexity and weight of first and second tier sales to European Markets.

Keywords Green supply chain management • Taiwan • SME • Automotive industry • Global supply chain

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4.1　Introduction

Enterprises are increasingly aware that failure to comply with environmental standards would lead to penalties, reputational damage and consumer backlash (Simpson et al. 2007). In addition, effective environmental stewardship cannot be achieved in isolation. It needs to be implemented with cooperation of the whole supply chain (Olugu et al. 2011). For this reason many firms, particularly those in developed countries, are obliged to stipulate their suppliers in other countries to abide by minimum environmental standards. Preuss (2005) terms this influence as a "green multiplier effect", and it can achieve greater environmental performance than an organization on its own.

Green Supply Chain Management (GSCM) is defined as the integration of environmental concerns into the inter-organizational activities of supply chain management (Olugu et al. 2011; Sarkis 2012; Walker and Jones 2012). GSCM can contribute to a number of business performance outcomes including cost reduction, enhanced reputation, and increased flexibility with respect to new environmental regulations (Walker et al. 2008; Simpson et al. 2007). However, many organizations still regard the implementation of green initiatives as trade-offs with economic performance (Rao and Holt 2005). GSCM may be hampered by conflicting interests and cultural, regulatory and institutional environments, especially in global supply chains (Mollenkopf et al. 2010).

The automotive industry is susceptible to the adoption of GSCM and other supply chain policies such as lean and JIT practices (Singh 2011). Several factors can lead an automotive firm to adopt the combination of green, lean and global SCM, including cost reduction, customer demands, standardized certification (such as ISO 14001), and risk management (Mollenkopf et al. 2010).

Given that automotive multinational corporations (MNCs) are mainly located in developed countries. These countries particularly those in Europe, are facing more green societal pressures and regulatory policies which serve as main drivers toward better environmental performance (Sharfman et al. 2009). The automotive industry is global with a complex, cross-border network of suppliers (Pereira et al. 2011; Olugu et al. 2011). Given that many MNCs can and do outsource in countries with less stringent environmental regulations, integrating GSCM practices can be difficult (Preuss 2005). Forty percent of automotive components are non-critical many of which are supplied by small and medium enterprises (SMEs) (Pereira et al. 2011). SMEs can be more flexible with rapid response to demands, but they are inferior to MNCs in terms of technological advancement and resources (Thakkar et al. 2008). Usually these SMEs are reactive to large customer requirements and simply follow the rules of these customers (Preuss 2005; Singh 2011). This situation is also true for GSCM practice adoption where SMEs regard local authorities and large customers as the most influential adopting these practices (Rao et al. 2006).

However, a thorough understanding of how SMEs from developing countries participate in global supply chains with respect to environmental concerns is lacking (Sachan and Datta 2005). To further this understanding the chapter uses

a case study to analyze the integration level of GSCM practices within Taiwan's automotive SMEs, including identifying drivers (such as pressures from European customers and local regulation) and barriers. (such as costs, employees resistance and complexity of supply chains) Results show that, despite customers' pressures. GSCM adoption is rather limited amongst SMEs especially when there are no specific collaborative mechanisms to support it.

4.2 Literature Review

Early efforts in GSCM have conceptually and systematically deconstructed the supply chain into several aspects and integrated environmental concerns into them (Sarkis et al. 2011). GSCM goes beyond firms' boundaries and encompasses three interrelated types of supply chain stages: upstream, internal-stream and downstream (Olugu et al. 2011). Within these stages GSCM activities may include: Green Design, Green Procurement, Green Manufacturing, Green Logistics and Reverse Logistics. Collaboration is essential to the success of these practices in greening the supply chain (Azevedo et al. 2011; Vachon and Klassen 2006).

Green Design refers to the integration of environmental concerns in the design of products and processes. It is informed by life cycle analysis (LCA) (Sarkis 2012; Jiang and Zhou 2012). LCA requires a full understanding of the sources of a product's materials, its impacts on the environment and characteristics and needs close collaboration with suppliers (Sarkis 2012).

Buying environmental friendly materials or components and a careful selection of suppliers are the principal objectives of green procurement practices (Hervani et al. 2005). Procurement personnel play a decisive role in greening other phases of the supply chain because they choose and monitor vendors, the materials and components (Zsidisin and Siferd 2001; Sarkis 2012). Green purchasing can face several obstacles, including lack of buyer and supplier awareness, lack of commitment, and lack regulatory requirement (Rao and Holt 2005). Addressing such obstacles requires close collaboration with a wide range of stakeholders. Additional understanding in green procurement is still an issue (Simpson et al. 2007; Azevedo et al. 2011).

Green manufacturing initiatives may include quality control, inventory management and technology development (Sarkis 2012). Green manufacturing can achieve the dual objectives of energy efficiency and waste minimization (Qi and Min 2009; Shi et al. 2012). Greening manufacturer can provide safe products and work environment (Jiang and Zhou 2012).

Green logistics is the integration of environmental concerns into transportation, packaging and labeling (Shi et al. 2012). Green transportation systems require considering type of transportation, operational practices, and fuel sources and efficiency (Rao and Holt 2005). Packaging can impact the solid waste stream (Sarkis 2003). The control and minimization of environmental impacts of logistic and

transportation requires close coordination between members in the supply network. Environmental impacts of automotive distribution operations have been largely overlooked by researchers and practitioners alike (Nieuwenhuis et al. 2012).

Reverse logistics represents "closing the loop" of forward supply chain activities. It includes reuse, remanufacturing and recycling materials into new products with added value with waste minimization (Hervani et al. 2005; Sarkis 2003). It includes environment-friendly waste management, eco-labeling and recovery of end-of-life products (Shi et al. 2012). Governmental legislation and regulations, such as the Directive on Waste Electrical and Electronic Equipment (WEEE), are drivers for reverse logistics (Hitchcock 2012). However, reverse logistics also requires a close collaboration between suppliers and product designers to facilitate recycling after the product life ends (Diabat and Govindan 2011).

These five GSCM practices provide a deconstructive overview of supply chain activities with collaboration efforts evident in each area. It can be argued that green design requires mainly upstream collaboration, although it also depends upon a holistic understanding of internal stream and downstream relationships. Green procurement depends on collaboration between stakeholders involved in upstream activities; while green manufacturing requires internal collaboration. Green logistics and reverse logistics success depends on collaboration in upstream and downstream activities.

4.2.1 Drivers and Barriers

GSCM adoption drivers and barriers may exist from both internal and external perspectives (Walker et al. 2008). Internal drivers are organization-related, driven by personal and ethical values of organizational owners and managers. Greening business relies on executive level commitment (Bayat et al. 2011). Other organizational factors include the desire to reduce costs and improve quality, employee involvement and shareholder pressures. External drivers include regulatory compliance, customer and social demands, and competitive factors (Walker et al. 2008). Collaboration with product designers and suppliers to integrate environmental concerns and to minimize environmental impacts is an important driver (Vachon and Klassen 2006; Diabat and Govindan 2011).

Barriers to GSCM adoption can be financially-oriented due to its potential costliness (Walker et al. 2008; Diabat and Govindan 2011). SMEs with limited financial resources are more profoundly affected by these financial barriers (Bansal 2002). Even with these barriers supply chain pressure can be an effective approach to encourage SMEs adopt GSCM (Walker and Preuss 2008). Regulatory issues, or lack of them, not only hinder innovation on products but also increase difficulty to outsource globally due to lack of environmental regulations (consumers will believe that organizations are seeking pollution havens) (Walker and Jones 2012; Mollenkopf et al. 2010). Regulations can both serve as a driver and a barrier because

it depends on how an organization manages regulatory trade-offs (Mollenkopf et al. 2010). Regulatory and consumer emphasis can have green multiplier effect is able to affect these organizations' first-tier suppliers as well as second- or third-tier ones, stimulating the overall adoption of GSCM practices (Azevedo et al. 2011; Preuss 2005).

GSCM practices, if applied strategically may overcome many barriers by having green "dividends" (Vachon and Klassen 2006; Walker et al. 2008). Not only are there short term savings, but longer term competitive advantages (e.g. new markets) associated with GSCM practices (Côté et al. 2008).

4.2.2 SMEs and GSCM Challenges

SMEs represent the largest percentage of companies, accounting for 97.63 % of all business in Taiwan and averagely 99.8 % in 27 countries in the European Union (MOEA 2012; European Commission 2012). SMEs have less than 200 regular employees and annual revenue of NT$ 80 million (US$ 2.42 million) in Taiwan (MOEA 2012). SMEs also have considerable challenges when seeking environmental sustainability. It is estimated that SMEs could be responsible for approximately 70 % of all industrial pollution and a small percentage of SMEs have introduced formal environmental practices (Walker and Preuss 2008). Several factors can contribute to this lack SME greening including lack of managerial environmental awareness, absence of environmental training for employees and a short-term orientation (Hervani et al. 2005).

Others have listed three major obstacles that SMEs often encounter in implementing environmental management: excessive initial costs, lack of financial support and shortage in skilled human resources (Hervani et al. 2005). For large companies a threshold that exceeds US$ 9 billion in revenue for a firm to undertake sustainability activities independently (Cortez and Cudia 2012; Morhardt 2009). These financial resources are clearly not available to most SMEs. Due to less financial and human resources, SMEs are believed to be more reactive than proactive on environmental issues. SMEs are generally more cash-and short-term focused than large companies and may also have lessened management support for these reasons (Thakkar et al. 2008; Vithessouthi 2009).

Alternatively, SMEs often effectively utilize their personal or business relationships to gather the information they need to keep themselves competitive in the market and explore new investment opportunities (Walker and Preuss 2008). SMEs are flexible in decision-making, quick to respond and have effective cooperation with employees due to their smaller scale (Thakkar et al. 2008). Given these situations, supply chain management can be a practical approach for SMEs to integrate environmental initiatives based on their relationships within the supply network (Côté et al. 2008).

4.2.3   Automotive Industry

The automotive industry with large and significant polluting industries in their supply chain, such as chemical, metal and other non-organic components, is primed for GSCM. The automotive industry, in addition to product quality, prices and delivery time, has sought suppliers that can meet environmental regulations (Qi and Min 2009). Several large automotive firms, BMW, Mitsubishi, Toyota, Ford, and Volvo demand ISO14001 certification for their first-tier suppliers (Vachon and Klassen 2006; Simpson et al. 2007; Mollenkopf et al. 2010).

Lean supply chains and Just-In-Time (JIT) dominant paradigms in the automotive industry may also improve environmental performance (Thun and Hoenig 2011). Through effective collaboration, lean supply chains keep inventories low, improves delivery and reduces waste (Thun and Hoenig 2011).

However, lean supply chains may not always be environmentally friendly. JIT systems employ smaller unit sizes delivered from suppliers, but this also implies more frequent transportation and a larger amount of packaging (Mollenkopf et al. 2010; Zhu and Sarkis 2004). It has been found that in internal processes, (e.g. auto painting) lean practices were found to generate greater waste generation (Rothenberg et al. 2001). Therefore, given that lean supply chains are not always compatible with green practices, changing the focus from "lean" to "green" will require a substantial paradigm shift in the automotive industry.

Recent studies in the automotive industry have sought to investigate the relationship between green and lean SC and lean and global SC, but there are obvious research gaps in green and global SC (Mollenkopf et al. 2010).

Many current automotive GSCM studies have made significant contributions in upstream activities, but very few have sought to study the retail distribution end (Nieuwenhuis et al. 2012). Much of the research focuses on product design and manufacturing processes, typically overlooking how these products are transported to customers. Thus, a significant research gap exists in integrating sustainable principles into logistics. . Research gaps can also be found in end-of-life vehicle (ELVs) studies especially with the integration of customer considerations (Olugu et al. 2011).

4.2.4   SMEs in Taiwan's Automotive Industry

Taiwan's industries have been noted for their environmental advances (Hu et al. 2009). Taiwan's SMEs have best practices such as quick response providing competitive advantages in the global supply chain. But, Taiwan's SMEs are weak in R&D and severe lack of sustainability (Luo and Chang 2011). Automotive SMEs in Taiwan are an important sector of the industry. The importance of Taiwan in the automotive industry is often overlooked because most Taiwanese firms do not focus on assembly. Taiwanese firms tend to be component specialists,

designing and manufacturing a component tailored to a platform or vehicle, as such they are first or second tier suppliers in most automotive global supply chains. According to Ministry of Economic Affairs (MOEA 2009), there are 2,343 enterprises in the auto-related industry, including auto-parts, auto-electronic and aftermarket manufacturing plants, and over 90 % of these companies are SMEs. Most SME manufacturers in Taiwan are contracted manufacturers with MNCs, Original Equipment Manufacturer (OEM) and/or Original Design Manufacturer (ODM) (Chen and Lee 2010). To not risk losing business from international buyers, SMEs must comply with the environmental regulations of the exporting countries. Although some of the SMEs decide to go beyond minimum standards and integrate GSCM initiatives, the majority of the SMEs in Taiwan choose to passively react to any regulation changes (Chen and Lee 2010).

Although the number of studies on greening SMEs is growing in Taiwan most empirical studies substantially focus on country-, state- or province-specific context. This may result in exploring different cultures influencing various approaches in managing, whereas MNCs may apply relatively more standardized ways of management.

4.2.5 Research Objectives

This chapter aims to contribute to a number of research gaps that exist in GSCM research in general and automotive GSCM research in particular. First, current GSCM and general studies in automotive industry focus predominately on large firms (Thakkar et al. 2008); however, this area of study is equally important for SMEs as large firms usually depend on them as essential suppliers. Second, there are not – to the extent of our knowledge-studies of GSCM practices of Taiwanese firms in Global Supply Chains; despite the growing importance of Taiwanese firms as component specialists in global automotive supply chains (Dicken 2011). Third, in general there is significant room for integrating additional organizational theories with GSCM practices (Sarkis et al. 2011). Studies have only recently embarked on institutional theory, examining the relationship between organizational values and ecological concerns, but it is still unclear how a firm's internal and external factors interactively lead it to adopt GSCM practices (Sarkis et al. 2011). In particular, very few studies investigate the role of environmental values in collaboration for adoption of GSCM practices. Values are particularly important to understand when participants in a supply chains form networks and coalitions to implement particular practices in the absence of structural controls. Participants in a coalition are driven by an emotional commitment to a particular cause or are attracted to a desired result that they judge will be best served by aligning themselves with others who want the same thing (Rodgers 2007) Coalition formation contributes to reduce agency and coordination problems in the supply chain (for instance when second and first tier suppliers fail to satisfy customers expectations). On the other hand, agency and coordination problems increase drastically when there are performance

measurement problems as is it notoriously the case in automotive global supply chains (Olugu et al. 2011) and also in GSCM in general (Azevedo et al. 2011; Hervani et al. 2005).[1] However, there is not enough research exploring in what circumstances values coalesce into coalition-driven collaborative practices between customers and suppliers that mitigate agency coordination problems (Vazquez-Brust and Liston-Heyes 2008, 2010).

As can be seen, overall and specific (deconstructed) research issues are prevalent for automotive industry GSCM practices. Taiwan's automotive industry with its abundance of first and second tier suppliers, is a particularly good case country to investigate, at an exploratory level, these and other GSCM practices. Thus, we propose to investigate how the SME's in Taiwan's automotive industry are practicing GSCM with specific emphasis on collaborative relationships with a developed country MNC.

4.3   Methodology

A case study approach is used applying semi-structured interviews, observation and analysis of company annual reports and other documents.

Four companies are involved in the case study: (a) a French final producer, (b) one of its first tiers suppliers: the focal company: a Taiwanese component specialist firm, and (c) two of the Taiwanese firm's suppliers (second tier suppliers of the French company). The focal company is one of the leading firms producing auto components and auto-repair tools in Taiwan. The company manufactures repairing tools for brake system, wheels, cylinder, engines and shock absorbers. The company has equipped itself with computer numerical control (CNC) and milling computer machines. It also has facilities such as torque and hardness testing machines to test the reliability of its products and ensure quality management. The SME has two plants, 52 regular employees and was founded 30 years ago. The company is ISO 9001: 2008 certified.

The company faces significant customer pressures on its environmental performance, which will result in ISO 14001 certification in the near future. Research has found that the ISO 9000 to ISO 14000 evolution is a natural one (Zhu et al. 2012).

The company's customers are concentrated predominantly in Europe, including the UK, Sweden, France, the Netherlands, Germany, Italy and Spain. It also has clients in Canada, the USA, Australia and Russia, but the sales in these regions

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[1]GSCM performance measurement remains a big challenge in the automotive industry Olugu et al (2011) as many firms in this industry have failed in GSCM due to their incapability to develop an adequate performance measurement system.

There is lack of conceptual tools to understand areas for improvement and appropriate metrics for evaluating GSCM e (Azevedo et al. 2011). Moreover, Hervani et al. (2005) affirm that green supply chain management performance measurement (GSCM/PM) is virtually nonexistent, and the existing PM largely neglects environmental aspects.

Table 4.1 Interviewees and their pseudonyms

Pseudonym	Details
Company A	An electroplating company, supplier of Company C
Company B	A surface treatment company, supplier of Company C
Company C	The focal company
Company C2	The second plant of focal company
Company F	A French company in Group S, a customer of Company C
Miss B	Marketing manager in Company C
Mr. H	Senior Project Engineer in Group S, including Company F
Mr. L	Owner of Company C
Miss N	Production manager in Company C
Mr. R	Production manager in the surface treatment Company B
Mr. W	Plant manager of Company C2
Mr. Y	Product designer of Company C
Mr. Z	Owner of the electroplating company, Company A

are much fewer than that of in Europe. The European Union (EU) has probably the world's most stringent environmental legislation and regulations on product safety, hazardous materials usage and electronic products recycling. Moreover, the company's in-plant hygiene standards, waste management and pollution controls are also under scrutiny as procurement managers from these European enterprises frequently visit the company. However, since it takes a significant amount of financial and human resources to certify ISO 14001, the company aims to conduct an in-house assessment on its environmental performance as well as that of its upstream suppliers to evaluate the possibility to achieve certification.

The focal company (Company C) was willing to contact its outsourced partners and customers based in Europe so as to construct a more robust understanding in the supply chain.

Table 4.1 shows the summary of the companies and the interviewees and their correspondent pseudonyms.

Each interview was conducted individually. The length of the interviews lasted from 20 to 40 min and the content of the interviews were recorded and then transcribed for further analysis. Secondary data regarding these companies' financial and environmental performance were meant to be collected via reports; however, there was a complete absence of environmental reports in these SMEs under study, and managers in these firms were not considering developing any either. Therefore, it was equally crucial to investigate the reasons why these companies regard environmental reports unnecessary. All the information concerning environmental performance, instead, could only be collected via oral reporting.

The unit of analysis in the study is the GSCM-related initiative, strategy or policy applied to the companies under study. An interpretative data analysis process was conducted with NVivo. The codes developed included dimensions of GSCM, performance measurement, drivers and obstacles. The metrics considered to be the most appropriate in the circumstances of SMEs in automotive industry were selected

from the literature (Rao and Holt 2005; Rao et al. 2006; Olugu et al. 2011; Azevedo et al. 2011). The focal company self-assessed its GSCM performance using such metrics (See Appendix). This assessment included collaboration indicators.

4.4 Results

Following Yakovleva and Vazquez-Brust (2011), The outcomes of the interpretative data analysis process are presented in two parts: The first part, Results, lineally describes the results obtained synthesizing the information captured from interviews in the NVivo nodes representing the coding categories: (interviewees' perceptions of) level of integration of GSCM in each firms; drivers barriers and enablers of GSCM practices; and role played by values in the integration of GSCM practices in the firms. The second part Analysis, interprets the data captured and analyses to what extent perceptions corresponds with the researchers evaluation of GSCM performance and the focal firm self evaluation.

4.4.1 Perceived Extent of Integration of GSCM: Final Producers

Company F, the main customer, has integrated internal stream GSCM in their European operations including LCA, energy saving, waste minimization and recycling. It also does supplier auditing and monitoring periodically to ensure its suppliers' compliance to regulations and sustainability. The sustainability criteria are based on Environment, Health and Safety (EHS) guidelines. The audited suppliers are assigned green, yellow and red lights scores. Green light suppliers are qualified; red light suppliers are disqualified or the business partnership will be discontinued with them. Yellow lights are acceptable suppliers under some conditions.

Company F lists "corrective actions" for yellow light suppliers and suppliers are expected implement these actions within a certain period of time. However, there is no precise guideline as to when suppliers' failure to fully implement the corrective actions will lead to discontinued relations with the supplier. The assessment does not take any environmental issue beyond the scope of Health and Safety. ISO 14001 certification, for instance, is not a requirement, nor are packaging reduction measures.

Some downstream firms proactively regulate their suppliers to decrease the amount of packaging. For example, Company X, a firm based in Copenhagen, is the first and the only one of Company C's customers to reject the usage of pallets. The elimination can also reduce the usage of forklift, thereby reducing carbon emission, but then it requires manpower to move boxes containing products onto the truck.

4.4.2 Perceived Extent of Integration of GSCM: First Tier Supplier (Company C)

In this company environmental concerns are considered for new product designs. LCA is adopted because it is essential to label the recyclability of its products or materials. However, there is an absence of green design, including an assessment of the impact that its products may bring to the environment.

Green procurement depends mainly on request of documentary proof of substances used by the suppliers, a EU requirement in most cases. EU customers usually demand the source of raw materials and proof of RoHS and REACH compliance. Based on EU company requirements, Company C requires Company A to present documentation, and further upstream, Company A, requests its raw material supplier to prove that its copper electroplating does not contain lead, mercury or chromium VI. Company C has developed a "Supplier Evaluation Form" which includes quality of new supplier's products, delivery punctuality and financial status. Supplier's environmental performance is not included, nor there is any request or encouragement to achieve ISO 14001.

Green manufacturing practices have a strong focus on preventing energy waste, such as minimizing the usage of air conditioning and applying energy saver gadgets on office computers and machines. Solar energy panels were also recently established because local government's encouragement and subsidies. But, the power generated from solar energy is only restricted to heat water. Efficiency in planning through Enterprise Resource Planning (ERP) software is used to facilitate information sharing, synchronizing information between the two plants in order to prevent unnecessary deliveries and travel.

The basic distribution chain in Company C focuses on truck shipment. Aviation is sometimes chosen as a method for distribution, but it is mostly in the when expediting delivery. When asked about Green logistics, Company C manager replied that company C has contracts with several local and international logistics companies. The current ways of packaging in Company C is mainly based on customers' demands, such as the material used for packaging or the number of products in each box. The fundamental consideration in packaging is to protect the products.

Company C consumes a significant amount of paper annually. A majority of this consumption is for producing instruction manuals and brochures for its products. Thus, Company C is planning to develop Quick Response (QR) code as instruction manuals in replacement of several pieces of papers. This is driven mostly for cost savings but will have a green logistics outcome: waste reduction. In the view of the interviewee, Green logistics and Green Reverse Logistics in Company C can be seen as a fully developed sector since waste minimization, a goal of reverse logistics, has been adopted in Company C at the early stage of its establishment three decades ago as waste recycling can serve as a source of material. Scrap product and metal swarf produced from manufacturing process are the principle waste for recycling.

The extra surplus produced from selling recycled items in Company C is exercised as "employee welfare fund" that can be applied to company social events, donation to charity.

4.4.3 Perceived Extent of Integration of GSCM: Second Tier Suppliers; Electroplating Companies

The only GSCM practices developed by all second tier suppliers are those required by local regulation. Customer pressures are a secondary concern and some second tier firms will threaten to discontinue supply if they are requested to implement environmental measures beyond regulation. For instance, Reverse logistics is fully developed in Company C and A because of stringent environmental regulations and customer pressures. The environmental Protection Administration (EPA) in Taiwan strictly regulates the wastewater generated from electroplating processes as it contains heavy metals that may seriously threaten the environment. Electroplating firms are obliged to equip in-plant wastewater treatment facilities and to possess a certification for discharging wastewater (EPA 2011). Solid wastes from the electroplating process are collected for further separation by heat treatment, and heavy metals recycled from electroplating solid wastes are subsequently sold to developing countries at bargain prices because of weaker purification.

All the products containing batteries or other electronics appliances are required to abide by WEEE standards, if the products are to be shipped to the EU. Company C is only asked to present documentation on the recycling processes conducted in Europe or elsewhere.

In terms of waste minimization, Company A provides an example:

'[A]fter we finish the process [electroplating process], we need to wash the screws with fresh water into a sink, and it not only takes only one or two sinks, but much more. After washing several times, the density of the wastewater in the first or second sink would become higher, and then we would pour it back to the electroplating sink for reuse, and for the third or fourth sink, the densities are lower, and we would send it back to wastewater treatment plant'.

4.4.4 Drivers for the Integration of GSCM

First tier and second tier companies consider large customers and Taiwan's governmental regulations as benchmarks for adopting GSCM initiatives. The failure to comply with these pressures would result in financial losses or even closure. For example, Company B has been fined for inadequate treatment of VOC emissions in 2008 and 2011, respectively. Moreover, the plant rental contract is due in September 2012. Given the stringent restrictions upon the surface treatment industry, which limits land for leasing, the owner of Company B has announced business closure.

4.4.5   Obstacles for GSCM Integration

The SMEs under study have formed a complex supplier network including 100–200 suppliers. The owner of Company C reveals that ISO 14001 is more commonly adopted in auto component companies, but not so in auto repair tools companies. Thus, to ensure the products are qualified to reach the standards of various regulations within this complex network, Company C mainly requires their suppliers to present documentation.

Interviewees reflect that most suppliers displayed willingness to co-operate when European regulations (RoH and WEE) were first introduced, but sometimes some suppliers are not willing to modify their manufacturing process because they do not target their market in Europe or the market share is rather small. The more complex the business portfolio of a supplier and the less likely they will engage in collaboration practices and they will threaten withdrawal from the supply chain if green requirements are enforced.

Enablers:

Information: At the introductory phase of RoHS initiatives, the owners of Company A and C collaborated on determining the feasibility of meeting the new regulation. Afterwards, the lathe manufacturing process was modified to eliminate the usage of lead and mercury.

Exchange of information between suppliers and customers also helps to identify gray areas in GSCM and need for intervention. For example, the owner of Company A points out an ambiguous issue in European regulation. Chromium III can be legally applied in the electroplating process, whereas chromium VI is listed as a forbidden material in RoHS initiatives. However, in the long journey of shipment from Taiwan to Europe, the chromium III remaining on the electroplating layer of the products may risk the possibility of being oxidized to chromium VI. Thus, if the transport company does not take preventive measures to avoid oxidization there is some evidence that the final product received by the customer may still fail to comply with RoHS initiatives even though the first supplier delivered a product according to standards.

4.4.5.1   Organizational Values and Individual Concerns

The majority of the interviewees agreed on the importance of environmental protection and the integration of environmental concerns into business strategies. Customers with higher environmental values pass more stringent requirements to their suppliers and the existence of environmental values in first and second tier suppliers amplifies stakeholder's pressures enhancing the adoption of GSCM. However, environmental values alone are not a driver since interviewees also emphasize the increased financial costs from the adoption of GSCM practices.

When talking about certifying ISO 14001, the owner of Company C recalled the process of certifying ISO 9000. Although ISO 9000 certification itself did not cost a significant amount, there were several invisible costs. Due to the limited knowledge regarding formal management, Company C needed to hire a consultant to assist the members of the company to work on documentation. Company C did not provide much employee training regarding new forms of management. Part of the result was employees questioning their managers when a new type of management was introduced. Skepticism with new management programs (including environmental ones) saw few incentives with potential organizational benefits left vague.

Company B indicated that governmental subsidizes forms a crucial part in encouraging SME to adopt GSCM practices proactively. They recognized that governmental anti-pollution regulations were becoming increasingly stringent but no subsidies or resources were allocated. Company B had to face problems such as insufficient initial financial resources to set up facilities, and the real potential for bankruptcy if economic benefits cannot be recouped in a short run.

Higher degrees of upstream supplier commitment and coordinated actions can lead to better internal stream performance. Customer pressures and their interest in greener products can influence greener performance in the focal company. Overall responsiveness and competitiveness are correlated with better SC performance.

4.5   Analysis: Completeness and Proactivity of GSCM

The product designer in Company C claims that environmental concerns are integrated at the design phase, however they only include the restrictions specified in the regulations:

> We have already integrated these environmental concerns into the design phase after we are certified with ISO (9001), so we will also need to prepare documentation of a product if it is required to comply with environmental regulations.

Company C mainly emphasizes the features of its products on quality, prices and durability.

ISO 14001 is probably the most common requirement in the automotive industry's green procurement efforts. However, to be certified with ISO 14001 may pose a financial burden on SMEs, MNCs may just demand its suppliers to present documentation proving their lack of use of forbidden substances as a bottom line to comply with environmental regulations.[2] For example, the senior project engineer in Company F (Group S) asserts that

> We will absolutely demand our products manufactured from our suppliers should meet the standards of RoHS, REACH, WEEE and PAHs [Polycyclic Aromatic Hydrocarbon]. Absolutely, absolutely, absolutely that these products must have the documentation.

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[2]The finding is similar to Rao et al. (2006) results from a survey conducted amongst, Western Australian SMEs, where 80 % state that their clients have never mentioned to assess their environmental performance would be a factor in deciding their future partnerships.

For Company C, as the information asymmetry with its customers is low (i.e. Company F conducts stakeholder audits annually) it is unnecessary for Company C have ISO 14001 certification for this customer. On the other hand, there is no evidence of a multiplying effect on second-tier suppliers since the "New Supplier Evaluation Form" developed in Company C does not assess environmental performance. This result is supported by environmental management system (EMS) diffusion in the automotive industry in Spain which showed that companies who had EMS were more likely to require their suppliers to also have EMS (Gonzalez et al. 2008).

The production manager reports that as long as a new supplier's environmental performance is not extremely bad, it is in an acceptable range. However, the definition of extremely bad performance is based on evaluation. She provides an example:

> Once we had a supplier, because their location was very far, we didn't go to their factory to do the evaluation. But once I went to their factory ... I found that their environment was really, really disgusting. It was all messy inside. I didn't really take a look at their effluent flows, but what I knew was that the ambiance of the factory gave me a very uncomfortable feeling, so then we discontinued working with them.

Green manufacturing is probably the most deep-rooted practice that many firms would engage in, as it is closely associated with waste minimization and energy conservation. However, the solar energy panels and other technology applied are introduced to reduce costs rather than reducing environment impact. Information and Communication Technology development also has positive spillovers on production efficiency and energy reduction. Company C has adopted ERP software to facilitate information flows within the company. Not only does this adoption increase the transparency of the production line for each manager, but also the increased efficiency prevents wasting energy.

Logistics design and planning can facilitate the greening of the supply chain, but the case of company C supports the view that its importance is often ignored.

The fundamental reasons for company C selecting its logistics and distribution suppliers was economic and business performance related. Sustainability commitment is not a criterion even though the logistics companies had ingrained CSR activities for many years. The production manager in Company C further admits that cost is always the primary consideration, whereas the social or environmental performance of its partnered logistics companies is a (unused) marketing tool:

> Well, I would say this can be a marketing strategy because we didn't consider these things when we are selecting. The most important thing to consider is the cost, but I found out that these companies are doing well after our initial corporation, so I think if I were a marketing manager, I would promote that our logistics are green.

Although environmental-friendly packaging aims to reduce unnecessary material, similar to other activities for GSCM, the main concern in terms of packaging is business oriented focusing on product protection from damage in transportation. When customers' interests differ, company C refrains from the implementation of pro-active measures. For instance, Company C aims to develop a QR code in order to

minimize the amount of paper consumed. However product users can only read the instructions with a smartphone, and this may be particularly infeasible in developing countries. Therefore, rather than using QR codes for developed countries customers only, the Company may refrain altogether from the use of QR codes and use recycled papers as a compromise.

Due to the large number of suppliers, an SME may face more risks and uncertainties in the supply chain, especially with its inability to audit their suppliers. The companies under study mainly use documentation as proof. Company A revealed the way he presented documentations to customers without a formal approach was risky:

> Mostly we only tell them verbally, but if the customers ask whether the electroplating has some specific heavy metals, I will then ask my raw material supplier to give me the documentation of what chemical elements have been added.

This informal hazardous material assessment may risk affecting the overall environmental performance in the supply chain.

Since as information asymmetry between Company F and Company C is low, it is not necessary for Company C to certify itself with ISO 14001. It can be argued that the products that Company C produces are not as complex as those companies producing auto components; thus, Company F may be able to reduce the environmental impact opacity without certification requirement. However, on the whole, EU companies are missing the opportunity to embed more environmentally proactive practices in their first-tier suppliers and – more importantly- they communicate the message that certification is indeed not a priority, thus setting a pattern for the interaction between first and second tier suppliers.

State uncertainty is a major obstacle for GSCM. State uncertainty describes the ambiguity arising from environmental information processing. For instance, UK firms failure to comply with RoHS initiatives was attributed to unclear definitions of the regulation. However, strong supply chain integration and collaboration can be an effective way to minimize such uncertainty (Sharfman et al. 2009). Collaborative activities form an important part of knowledge sharing that may lead to greener product design, process modification or waste minimization (Vachon and Klassen 2006).

A possible explanation for the meetings between the owners of Company A and C to discuss RoHS regulation could be that both did not want to risk the chance of losing business opportunities or avoiding penalty and financial losses. Large enterprises can play a role as mentors or consultants to assist SMEs in improving their environmental performance. A customer mentoring culture can have a long-term positive impact on not only the suppliers' environmental performance but also a substantial change of corporate leaders' attitudes toward environmental protection (Hines and Johns 2001).

Company F's corrective actions imposed on its suppliers can be viewed as a way of information sharing and mentoring. These learning processes for environmental performance improvement between suppliers and buyers can have a strong positive impact on supplier performance and eventually enhance the supply chain integration (Carter 2005).

The findings of the case study support the view that regulations and market pressures are the most influential forces to drive an organization to adopt GSCM practices (Hervani et al. 2005; Rao and Holt 2005). Yet, the power that an organization holds in the supply chain can play a decisive role in influencing other parties to be greener (Zhu et al. 2010). The production manager in Company C identified a situation in which some suppliers are not cooperative when asked to follow regulations because Company C is relatively powerless:

> Not every one of our suppliers is focusing on the European market, many are targeting the American, Southeast Asian, or Chinese market, so these regulations can be quite annoying to them. Besides, our company's outsourcing only accounts for 2% of their sales, they wouldn't want too many changes just because of us. So we are quite powerless in terms of demanding them to comply with these regulations.

In the case of second-tier SMEs, environmental management responds mainly to threats of penalty or coercive closure imposed by governmental regulations (Rao et al. 2006). Company B's plant closure due to its incapacity to cope with the additional costs imposed by more stringent environmental regulation is an example. The companies' manager acknowledges that it is for the better, since he no longer wants to work for a polluting company, but if regulation had not been enacted it would have been (a polluting) business as usual.

In view of the issues discussed above, it is possible to suggest that Company C, as well as many other SMEs, implement GSCM practices reactively to attain regulatory compliance and customer expectations, instead of proactively developing GSCM strategies. It seems that local authorities and large customers are supposed to encourage and work collaboratively with small firms to map out more proactive GSCM initiatives. The motivation to implement GSCM practices is largely cost and profit driven (Hervani et al. 2005). Many SME managers believe that because environmental protection is not a priority for business, the presence of tangible economic benefits functions as a threshold to proactively adopt green supply chain initiatives (Côté et al. 2008). This is a very instrumentalist perspective.

ISO 14000 is probably the most common approach for MNCs to select their suppliers in a global context as it provides an internationally standardized metric for corporate environmental management (Mollenkopf et al. 2010). Moreover, as ISO 9000 and ISO 14000 share similar processes for firms SMEs already certified with ISO 9000 are expected to have advantage in the implementation of ISO 14001 (Zhu et al. 2012). However, none of the first and second tier suppliers–even those with ISO 9000- are ISO 14001 certified, mainly because it is not a requirement of their existing customers and its perception of certification as such a financial burden (Zsidisin and Siferd 2001).[3]

Personal attitudes and awareness of environmental management can be regarded as the most essential elements for a firm to adopt in-house environmental man-

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[3]Company C owner acknowledges that cost of certification itself are low, including consulting. However maintaining the certification will imply substantial and expensive changes in facilities and the production line.

agement and GSCM practices (Leszczynska 2010). Positive managerial attitudes, which shape organizational values, are fundamental for a firm to act proactively and identify the business case, but it is also indispensable that these attitudes should be shared amongst employees. A challenge that a firm may face when introducing new management fashion would be employees' unwillingness to cooperate. The owner of Company C believes that any change in a company requires every member's cooperation, and this process needs an establishment of a culture, although the integration of a new culture takes time.

The marketing manager in Company C observed that although financial costs and the business case are certainly affecting a firm's willingness to adopt GSCM practices, it is the personal attitudes that determine the initial steps. She further explains that SMEs in Taiwan have been using OEM sale as an approach to yield profits in the past decades, but two concerns may emerge from this pattern. First, since OEM sale companies do not require design or innovation, managers would gradually acquire the habits of passively abide by the rules stipulated by their purchasing companies. Second, as OEM means to manufacture products under the purchasing company's brand name, suppliers are substantially invisible to end-users. Thus, they may perceive proactive environmental management a thankless or unnecessary task.

4.6   Conclusion

The aim of the paper is to seek insight into the degree to which GSCM practices are integrated into Taiwan's automotive industry SMEs. The case suggests that proactive environmental management is generally absent in these Taiwanese SMEs because production patterns as well as attitudes are still in a transitional phase. Therefore, it is suggested that the focal company adopts GSCM practices reactively because the concerns for environmental protection and the belief in business case are not yet fully developed. The analysis of the multilevel supply chain shows that once there is a barrier in any stage of the supply chain, diffusion of GSCM practices are quickly lost. Although motivation is internal in many cases, external pressures can prove to be significant motivators. Yet, a lack of supply chain pressures can be a damper on GSCM diffusion.

The present results are significant in at least two major respects. First, it seems clear that although GSCM practices are to some extent implemented by Company C and its suppliers as well as customers, the implementation is mainly in response to governmental regulations and customer pressures. These two pressures are essential for SMEs because the failure to comply with governmental regulations may result in monetary penalty, damaged reputation or even forced closure, while failure to meet customer standards may lead to a discontinued partnership. However, it is found that customers hesitate to actually discontinue relationships, thus undermining the strength of the threat.

Most managers interviewed demonstrated optimism regarding the future development of GSCM practices for SMEs in Taiwan. Apart from stakeholder pressures, it is also found that smooth information flows and repeated collaboration patterns amongst the supply chain members can facilitate GSCM implementation, but the complexity of the supply chain network may increase uncertainties and risks, thus reducing incentives to cooperate. Second, some facilitating factors may exist in deciding a firm to proactively or reactively adopt GSCM practices. The business case resulted from greening the supply chain is closely associated with top-managers' decision to invest in GSCM initiatives and their personal attitudes towards and awareness of environmental protection are equally decisive. Shared values also act as incentive to share information and develop mentorship relations between customers and first-tier suppliers. These relations provided the blue-print for similar mentorship relationship between first-tier and second tier suppliers. First tier supplier teach second-tier how to satisfy customers' requirement but such collaboration depends on two factor: (a) the extent of environmental awareness of second tier suppliers have and (b) the supply chain complexity and weight of first and second tier sales to European Markets.

Appendix

Performance Measurement: Company C

Please mark 1, 2, 3, 4, and 5, where 1 as the weakest performance and 5 as the strongest.

Table 4.2 Performance measurement: Company C

Measures	Metrics
Upstream	
Collaboration	Level of supplier commitment 5
	Level of encouraging suppliers 3
Competence	Level of supplier performance on sustainability 2
	Level of supplier environmental certification 1
Operations	Level of supplier preprocessing of raw materials 3
	Level of information flow and communication 5
	Environmental monitoring on suppliers 2
Internal stream	
Green cost	Environmental compliance and investment 4
	Energy consumption and cost 3
	Greenhouse gas emission 3
	Renewable energy usage 2
	Disposal costs 4

Table 4.2 (continued)

Measures	Metrics
	Recycling costs 4
	Costs on environmental certificate 5
	Training employees on environmental issues 5
Process management	Waste reduction 5
	Level of spillage, leakage, and pollution control 4
	Number of violations of environmental regulations 5
	In-plant defect product = remanufacturing 3
	Development of risk-prevention systems to cover potential environmental accidents 4
Product features	Level of recycled materials in products 2
	Level of product to be disposed 4
	Level of hazardous or toxic material 1
Traditional SC costs	Delivery 4
	Inventory 5
	Information sharing 5
Downstream	
Customers	Customers' perspectives 5
	Collaboration with customers to design environmental-friendly products and packaging 3
	Customers' pressure 5
	Customers' interest in a greener product 4
	Formal policy of distribution and transportation 1
	Reverse logistics 4
	Eco-labeling 4
Overall performance	
Overall performance	Percentage increase in responsiveness 5
	Percentage increase in flexibility 4
	Percentage increase in competitiveness 5
	Percentage increase in financial performance 3

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Chapter 5
Cross-Border Innovation in South–North Fair Trade Supply Chains: The Opportunities and Problems of Integrating Fair Trade Governance into Northern Public Procurement

Alastair M. Smith

Abstract Fair trade is a means of governing South–North supply chains to increase the benefits of international trade integration for poor southern producers of agricultural and handicraft goods. Although the approach itself is arguably innovative in comparison with commercially orientated supply chains, many consider that its formalization within third-party, Fairtrade International certification, has facilitated a process of conventionalization. Furthermore, Fairtrade certification is considered to dominate producer and consumer attention; and therefore marginalize other more innovative and radical fair trade approaches, making differentiation increasingly difficult. The chapter investigates one aspect of this narrative by elucidating the effects of the Fairtrade Towns scheme: a promotional program viewed to be precipitating "Fairtrade absolutism" within the wider movement. Focusing on the devolved region of Scotland, evidence for this process is uncovered and the implications for Southern producers highlighted through a parallel case study of the National Smallholder Farmers Association in Malawi. Here it is found that the costs of certification and their geographic restriction are actively isolating some producers; which combined with "Fairtrade absolutism" in consumer countries undermines the principle of fairer access to northern export markets. The final section however, connects the producer and consumer cases, by reporting on an innovative fairly traded supply chain constructed between Malawian rice farmers and Scottish schools. Overall, the chapter highlights the continued potential for innovation within the fair trade movement, and suggests that such opportunities will emerge where supply chain actors are more proactively embedded in wider understandings of development and trade justice.

Keywords Fair-trade • North–South supply chains • Malawi • Farmers • Fairtrade Towns

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5.1   Introduction

In general, fair trade is firstly concerned with building markets in more wealthy northern countries for poor southern producers of mostly artisan and commodity goods. Secondly, the broad approach requires that "fair trade is a trading partnership, based on dialogue, transparency and respect, that seeks greater equity in international trade" (FINE 2001, p. 1). The current chapter however, examines the fair trade movement as a site of continual reflexive and dynamic innovation in the way that cross-border, South–North, supply chains are constructed and governed: particularly in the way that "fair trade" itself is understood by those proclaiming to participate in this activity.

Fair trade practices emerged after World War Two when mission driven organizations sought to build South–North supply chains not for their own profit motivation, but to serve the welfare and development interests of marginalized southern producers. In this way, innovation emerged from the construction of supply chains that circumvented contemporary barriers to involvement in international trade networks and did so through genuine partnerships between private Southern and Northern stakeholders. In concrete terms this was achieved through the application of non-market forms of "relational" governance (See: Gereffi et al. 2005): for example, in place of seeking to drive down prices paid to suppliers, Northern buyers would aim to pay as much as possible after operational costs had been met (Brown 1993, pp. 164–165; Littrell and Dickson 1999).

During this period, claims to fairness were based on trust relations and the social reputations of often religiously grounded actors such as Oxfam in the United Kingdom (UK) or the Mennonite International Development Agency in the United States of America (USA). However, this model was inherently limited for a number of reasons: not least by the fact that the "alternative" nature of retailers, situating themselves within religious discourses, only appealed to a relatively small percentage of North consumers (LeClair 2002; Low and Davenport 2006, p. 319). In order to bypass this developmental blockage, Southern and Northern stakeholders again collaborated to innovate in the development of third-party certification for fair trade: initially under the name of Max Havelaar in Holland, but the principles and practices of which later informed the creation of an international network of labelling bodies operating under the central coordination of Fairtrade International (abbreviated to FLO, and represented by the specific legally trademarked term "Fairtrade")[1,2].

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[1]Although the chapter uses the name Fairtrade International throughout the text, some documentary sources retain the name Fairtrade Labelling Organisations (FLO) as they originate from before the name change.

[2]This situation is more complex in reality given the break of Fair Trade USA from the wider international system, although this chapter does not consider this latest event in the history of fair trade.

Although this institutionalization of fair trade governance has facilitated tremendous growth of the movement, it is widely understood that this has been a double edged sword for two reasons: and it is argued here that the model of fair trade promoted by Fairtrade certification has been less innovative and more conventional than was initially envisioned. Firstly, the integration of fair trade goods into conventional supply chains has required the involvement of corporate actors in decision making processes concerned with the development of certification standards. As a consequence, it is suggested that the strength of initial principles and standards has been undermined: for example, in the opening up of Fairtrade certification to plantation style production, despite the initial mission of fair trade operation to support small farmers and artisans (see below). Secondly, although dedicated, mission driven and not-for-profit fair trade organizations have remained a strong part of the movement (either as part of Fairtrade certification networks or not), they have found it increasingly difficult to highlight the additional value they are perceived to provide. Therefore, it is argued, the success of the Fairtrade system is leading to the active marginalization of other fair trade approaches and rendering it increasingly difficult for more innovative models to differentiate their activities from profit driven arrangements.

More specifically, this chapter critically investigates the effects of the Fairtrade Town scheme: an accreditation for place-based consumer communities first developed by Fairtrade International's UK member, the Fairtrade Foundation (Samuel 2012, p. 1). Here existing analysis argues that the scheme has promoted the rise of "Fairtrade absolutism" (Mohan 2010, p. 94) as Fairtrade certification has been prioritized over and above both other certification and alternative fair trade approaches. Having said this, the argument currently rests on the assumption that those communities seeking accreditation comply fully with the Fairtrade Foundation's specific requirements, despite the fact that non-compliance is common place within many private accreditation systems.

For this reason, research was designed to empirically investigate if the Fairtrade Town scheme is in fact conventionalizing innovation within the fair trade movement. To present this work, firstly the case study of Scotland is discussed – chosen due to the devolved government's express support for fair trade – where it is identified that in many cases, the Fairtrade Towns scheme is indeed promoting the prioritization of Fairtrade certified goods. The next section of the chapter provides an account of the consequences of this narrowing of fair trade innovation for producer communities, by presenting the perspective of the National Smallholder Farmers Association of Malawi (NASFAM): chosen as the largest association of smallholder farmers working within one of Scotland's major development partner countries. Here the problems of a "hegemonic" (Herman 2010, p. 406) fair trade system are manifest as while NASFAM have had some success in exporting Fairtrade certified groundnuts, further efforts have been frustrated: to some extent by the cost of certification, but also by the geographic limitations imposed on other Fairtrade produce categories. Finally however, the third section of the chapter reports on what is argued to be the theme of continuing innovation preserved by the unique nature of more radical fair trade networks. Specifically, it is found that where organizations, including state

institutions, are able to build relationships on the basis of critical understanding and trust, the problems and barriers of certification can be circumvented, and innovative pro-development supply chains still established.

5.2 Fair Trade: A Background of Innovation and Conventionalization

Fair trade activity as it is interpreted in this chapter emerged in the context of the International Trade Organization and governance reform that followed the Second World War: two developments which taken together represented a significant effort at innovation in trade reform aimed at improving international inequalities. As Fridell (2007) identifies, the manipulation of market forces had long been used by the rich and powerful for the development of their own interests. However, "what makes the [overall] fair trade movement unique is that it has aspired to use market regulation to protect the week, not the strong, and ideally to create a more equal international trade system" (Fridell 2007, p. 25).

Although the use of non-market institutions by states and international organizations was ultimately frustrated by an emerging neoliberal agenda, a collection of more practical actions did survive. What emerged were grass roots, civil society based innovations that sprung up simultaneously, and collectively offered parallel and alternative supply networks therefore circumventing contemporary barriers of entry for poor southern producers. This movement of movements was highly heterogeneous in its motivations and operations (Gendron et al. 2009, pp. 64–65; Low and Davenport 2006). However, what precipitated out was a collection of governance principles under which international supply chains might return greater material benefit to Southern participants. Broadly speaking, such fair trade operations involved mission-driven, Northern "alternative trade organizations" – responsible for the purchase and import of goods – and Southern producer organizations – which provided a variety of services to their members, including marketing, product development and commercialization (LeClair 2002, p. 950). In this light, alternative trade developed supply networks isolated from conventional trade activity (Rosenthal 2011, p. 159): where the suspension of market conditions identified within a firm[3] were extended down the supply chain in models of "relational governance" usually identified within economic transactions by member of the same family or with a close identity bond (Smith 2009, p. 458 fn. 451). At this stage, organizations did not carry any form of accreditation for their activities, but instead relied on the social orientation of their reputation to justify claims to promote greater social justice in international trade (Tran-Nguyen and Zampetti 2004, p. 391).

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[3]This refers to Coase's (1937) seminal definition of the "firm" as economic space in which market coordination is suspended.

This situation changed in 1988 when a Dutch NGO and a Mexican coffee farmers' cooperative developed a "third-party" governance and certification approach to provide external legitimacy to fair trade operations. The Max Havelaar mark, guaranteed that coffee had been: bought direct from cooperatives for a bottom line price of up to 10 % higher than the world market price; prefinanced by up to 60 %; and traded within long term relationships (Brown 1993, p. 162). This development was again a considerable cross-border innovation as it facilitated the migration of fair trade goods out of alternative supply chains operated by social economy actors and into those provided by conventional profit orientated companies (Davies 2007, p. 463). By 1993 the Max Havelaar mark had a 3 % share of the Dutch market (Brown 1993, p. 182) and this approach to fair trade encouraged the development of similar initiatives all around Europe and now across the world.

Initially, expansion of the certification approach was under a system of separate National Labelling Initiatives (NLIs), for example under the Max Havelaar name in Belgium, Switzerland and France (Nicholls and Opal 2005, p. 10), and that of the Fairtrade Foundation in the UK (Brown 1993, pp. 180–184). In 1993 however, centralization began and in 1997 different NLIs merged to form the Fairtrade Labelling Organizations (FLO): subsequently renamed to Fairtrade International in 2011 (although still widely known by its acronym). This process involved greater centralization and harmonization of the different standards that existed among national certification systems, and by 2009 there were 21 FLO affiliated NLIs in Northern consumer countries promoting a unitary suite of Fairtrade International certification (FLO 2009b, p. 27). In order to be eligible for such certification, an individual product must be produced by a Southern group meeting certain economic, social and environmental standards. Due to the focus on "trade", governance also stipulates that in order for products to carry the Fairtrade Mark, the first buyer must usually: pay at least a minimum price set by FLO, or the world price where this is higher; pay an additional percentage as a Social Premium to fund development projects by the producer community; and have provided up front credit of up to 60 % where requested. Buyers are also encourage to commit to long term relationships and provide indications of future demand, although these standards are not as well elaborated or enforced as core requirements.

The development of Fairtrade certification has certainly facilitated the great expansion of fair trade activity (Nicholls and Opal 2005; Tallontire 2009, p. 1005). Since the introduction of certification retail sales of fair trade goods have grown steadily year on year. Figures from members of European Fair Trade Association indicate that from 2001 sales have increased 40 % to reach €286 million in 2009 (Boonman et al. 2010, p. 23). As this data involves a variety of certified and non-certified goods, it is not possible to identify the effect of FLO endorsed products; however, at the global scale these also have grown yearly, expanding 12 % from 2010 to reach €4.9 billion in 2011 (Fairtrade International 2011). Although there is no official translation of this figurers into financial benefit for the developing world (which would be significantly less given the nature of value distribution in international supply chains), it is estimated that Social Premium payments in 2011 totalled some €65 million.

While the majority of this growth has come from the private sector due particularly to the involvement of supermarkets, increasing support from European governments and even the European Union itself have certainly contributed to market expansion. In 2006 the European Parliament issued a Resolution which explicitly recognized the definition and principles of Fair Trade, agreed by major institutions within the movement (Boonman et al. 2010, p. 17). At the national level, in the UK for example, while the national labelling initiative of Fairtrade International, the Fairtrade Foundation has received grant support from the government, the state has also identified that fair trade goods can be purchased as a means to promote sustainable development through public procurement (DFID 2009).

Despite this increasing popularity and support for fair trade however, analysts identify that corporate involvement has turned FLO into a site of "negotiating, establishing, enforcing and reformulating the standards and certification" (Jaffee 2010, p. 268) in which an increasing amount of concessions have been granted to commercial players (Jaffee 2010; Renard 2005, pp. 421 & 424). This is viewed to have "weakened" (Jaffee and Howard 2009; Renard 2010, p. 290) or even "corrupted" (Doppler and González 2007, p. 190) the principles and practices promoted, in a way that is detrimental to the interests of southern producers (Reed 2009; Tallontire 2009). For example, corporate actors have pushed for lower minimum prices (Barrientos and Dolan 2007, p. 18; Tallontire 2009, p. 1011) and, in perhaps the most extreme case of conventionalization, even advocated for the total removal of this component from certification (Renard 2010, p. 290). It might be argued that another area of weakening has been that while FLO mandates the payment of a Social Premium, there is no requirement for Northern buyers to invest in Southern production capacity; and where such investment has taken place, it has been aimed at the commercial needs of buyers, rather than the development interests of producers (Macdonald 2007; Tallontire 2009, p. 1009). Overall, these new interactions have led some to suggest that Fairtrade certification has facilitated a transformation of fair trade operations away from "relational" supply chain governance models and more towards conventional structures (Reed 2009).

Also of pertinence to the current chapter, FLO has been criticized for the way it has managed access to its certification. For example, while the system was initially developed for the express purpose to support small farmers, pressure from supermarkets for large quantities of certified goods has seen extension to plantation style production; and this is argued to have been to the detriment of initial stakeholders (Renard and Perez-Grovas 2007, p. 150). On the other hand, although coverage has expanded well beyond the initial category of coffee – and now covers 18 separate product categories, facilitating the certification of over 300 individual raw products (Fairtrade Internatinal 2012, p. 8) – not all standards are available in all countries. For example in the case of certification for rice, only producer groups located in Thailand, Laos, India and Egypt can readily apply for certification (FLO 2009a) – and as will be discussed below, this has been to the immediate disadvantage of producers in other countries such as Malawi. Finally, while third-party certification was initially free of charge to producers, it is now

necessary to pay an up-front fee of €250 and also to bear the costs of inspection and verification, levied at €350 per day (Neilson and Pritchard 2010, pp. 1847–1848).

In parallel to the institutionalization of fair trade within the Fairtrade certification system, many of the original mission driven founders of the fair trade movement have continued to innovate and professionalize (Fichtl 2007, pp. 15–17); and these have been joined by others seeking to create alternative international trade circuits (Barrientos and Dolan 2007, p. 10). Although such organizations might also carry FLO certification, many of their goods remain outside of the system and instead rely on direct contact and trust to uphold their claims of fairness (Bezençon 2011, p. 61; Raynolds 2009, p. 1086). More importantly, many organizations go well beyond FLO requirements to promote the interests of Southern supply partners. For example, Cafédirect and Divine Chocolate have made it an explicit aim to extend ownership to producers themselves and to invest heavily in producer capacity as a means to redress long standing power inequalities between the North and the South (Doherty and Tranchell 2005; Tallontire 2000). It is because of these practices that some refer to such organizations as having adopted the "gold standard" of fair trade (Brown 2007, p. 272). In some cases there organizations have sought to market their products by incorporating FLO certification into their business model, although this is not always the case. What has emerged as an important issue however is that fair trade practices that go beyond FLO requirements have been at pains to communicate these additional efforts to the consumer. While some are viewed to have achieved this through diligent and innovative management of marketing strategies, there is a general concern that not all such operations have achieved this so effectively.

Having said this Fairtrade certification is not the only system of third-party legitimacy available in the market. The World Fair Trade Organization (WFTO) also offers accreditation for fair trade activity that: is not able to access FLO certification due to geographical or product characteristics (Gendron et al. 2009, p. 68); or wishes to differentiate themselves from less producer focused operations (Davies 2007; Murray 2011). In either case, the key point is that the WFTO is a membership organization which represents "100 per cent authentic fair trade" or dedicated socially orientated organizations (Davenport and Low 2012, p. 5). Indeed, some analysts go as far as to associated this accreditation with radical interpretations of the fair trade model (Rosenthal 2011, p. 168). This is because Fairtrade certification applies to individual products, and therefore, allows large corporate actors, often with dubious ethical records, to adopt minimal Fairtrade ranges without making fundamental changes to their wider operations. The WFTO on the other hand only accredits whole organizations whose entire operations comply with certain standards in the areas of the Ten Fair Trade Principles:

1. Creating Opportunities for Economically Disadvantaged Producers
2. Transparency and Accountability
3. Trading Practices
4. Payment of a Fair Price
5. Child Labour and Forced Labour
6. Non Discrimination, Gender Equity and Freedom of Association

 7. Working Conditions
 8. Capacity Building
 9. Promotion of Fair Trade
10. Environment

In summary then, it has been argued that fair trade initially emerged as an innovation by civil society actors to circumvent the state based neoliberalization of the global economy. Genuine partnerships between North–South trading partners extended the suspension of market forces within firm operations, and applied this down the supply chain in models of relational governance. However, in a further effort to escape the limited opportunities of alternative trading networks, the introduction of third-party certification is argued to have resulted in a conventionalization of the fair trade system. In the next two sections, the chapter examines one way in which this has occurred and furthermore, how this narrowing of what fair trade activity is taken to be affects producer stakeholders in the developing world.

5.3 The Fairtrade Towns Scheme: Promoting the Conventionalization of Fair Trade?

Following the success of Fairtrade International's product certification system, and indeed as one of the recent drivers of its widespread adoption (Fisher 2009, p. 995), the Fairtrade Foundation in London has built on grassroots activity to develop an important promotional tool for the movement: the Fairtrade Town (Crowther and Human 2011). This initiative can be described as a place based certification system for consumer communities. Formally launched in September 2001 the Fairtrade Town scheme offers towns, villages, cities and other geographically defined areas, the opportunity to receive Fairtrade accreditation if they are able to show evidence that:

1. The local council has passed a resolution supporting Fairtrade, and agrees to serve Fairtrade products (for example, in meetings, offices and canteens).
2. Arrange of Fairtrade products are readily available in the areas retail outlets (shops, supermarkets, newsagents and petrol stations) and served in local catering outlets (cafés, restaurants, pubs).
3. Local workplaces and community organizations (places of worship, schools, universities, colleges and other community organizations) support Fairtrade and use Fairtrade products whenever possible. A flagship employer is required for populations over 100,000.
4. Media coverage and events raise awareness and understanding of Fairtrade across the community.
5. A local Fairtrade Steering Group is convened to ensure the Fairtrade Town campaign continues to develop and gain new support.

(Fairtrade Foundation 2009b)

In order to achieve Fairtrade Town accreditation, a steering group has to submit evidence that the community has met the targets and then continues to improve upon these achievements every year for the award to be renewed. In recognition that the criteria have been met, communities are presented with a certificate and permitted to erect signs to acknowledge their achievement. Such accreditation has proved very popular. By 2010, 400 Fairtrade Towns and Cities appeared in the UK (Fairtrade Foundation 2009b) and the systems has spread to other European countries (Alexander and Nicholls 2006, p. 1245), as well as the USA, Canada, Australia and New Zealand (Crowther and Human 2011, p. 94). The concept of accreditation for placed based consumption communities has also spread to other institutions, and it is possible to become recognized as a Fairtrade church, university or school (Crowther and Human 2011, pp. 93–94; Fairtrade Foundation 2009a).

As can be seen above, from an examination of the Fairtrade Foundations documents, it can be assumed that the accreditation scheme specifically calls for the political support, and public and private consumption not of fair trade goods as a general category, but specifically of those carrying the Fairtrade Mark: and therefore, certified by Fairtrade International. Indeed, the "Sample Motion" provided by the Fairtrade Foundation (No date) uses the Trademarked term "Fairtrade" and makes further explicit references to the "Fairtrade MARK" (original capitalization). It is for this reason that some have concluded that these schemes "compel" community actors, including the Local Authorities "to serve *Fairtrade* [certified] produce during their meetings and promote Fairtrade produce in their area" (Preuss 2009, p. 217).

For this reason, Mohan (2010, p. 94) argues that despite a multitude of private ethical and pro-development certifications available in the market place, including multiple approaches to fair trade, the Fairtrade Town scheme promotes "Fairtrade absolutism" by seeking to obtain "a monopoly" for FLO certification; both to the exclusion of non-certified fair trade goods and differently certified goods such as that offered for example by the Rainforest Alliance (Mohan 2010, p. 98). The specific reason for this concern is that there is insufficient evidence to make a universal claim that FLO certification is necessarily the most appropriate form of private governance with which to promote the interests of southern producers (Mohan 2010, p. 98). Indeed, the process can also be argued to narrow fair trade to the consumption of Fairtrade certified goods and therefore, by implication, inadvertently promote a more reformist or conventionalized version of the fair trade concept – rather than the more radically innovative set of tools that remain within other approaches and accreditations.

Naturally however, analysis of the requirements set down by governance and certification frameworks is not sufficient evidence to infer that accredited practices are compliant – as research in a wide variety of such systems clearly demonstrates that this is perhaps very rarely the case. For this reason, empirical research was conducted in Scotland to ascertain to what extent Fairtrade Towns were generalizing fair trade to focus on Fairtrade certification. The reason that Scotland was chosen was that it has taken the step of embedding a commitment to fair trade

in its International Development Policy primarily by achieving certain levels of community accreditation from the Fairtrade Foundation (Smith 2011, pp. 101–102).

Examining the empirical reality, it can be reported that none of the Scottish councils currently registered as Fairtrade Zones have adopted the Sample Motion suggested by the Fairtrade Foundation and none of them make reference to the "FAIRTRADE MARK" (For more detail see: Smith 2011). However, half of motions (four out of eight) which include general commitments use the trademarked term "Fairtrade". Out of the nine motions that make specific commitments about the practices of Local Authority procurement, four specify "Fairtrade certification" and four commit to the purchase of "fair trade (such as the Fairtrade Mark)". These specific commitments to purchase or specifically prioritize Fairtrade certified goods also manifest themselves in actual purchasing behavior. For example, a representative from one Local Authority recalled an incident where someone had telephoned to say that the company tendering to supply tea and coffee to the café/restaurant in the council headquarters was offering Rainforest Alliance certified products, and asked if this was acceptable. After consulting with the Fairtrade Steering Group it was concluded that "because we are a Fairtrade City under the Fairtrade Foundation scheme, we should only be using tea or coffee with the FLO Mark".[4] This suggests that in some areas there *has* been a rise of what might be termed as "Fairtrade absolutism" and an important issue is therefore how this situation might affect southern agricultural producers.

5.4   Malawi and the Limitations of Fairtrade Certification

Alongside commitments to fair trade in its International Development Policy, Scotland has also fostered specific development partnerships with various African countries: the most prominent of which has been with Malawi due to the strong historical precedence of such interactions.[5] Indeed, in 2005, the then First Minister of Scotland, Jack McConnell, and President wa Mutharika of Malawi, signed the Scotland-Malawi Co-operation Agreement. Here it was identified that the two countries would cooperate in various areas including civic governance and society, health, education, as well as "sustainable economic development" (Scottish Government 2005, p. 1).

Despite this support, the development challenges in Malawi are significant. Situated in south-eastern Africa, the country is among the poorest and least economically developed in the world (World Bank 2009). Despite the absence of current or recent violent conflict (OECD 2007, p. 331), Malawi is ranked 171out of

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[4]Interview with Council Representative 05/01/2010.

[5]This signalling out of Malawi is grounded in the historical precedent of Scottish involvement with the area as early as 1859 (Scottish Government 2007), when the celebrated explorer, Dr Livingstone, is believed to have contributed beneficially to the area.

187 in the United Nations Human Development Index; 74 % of the population earn below the poverty line; and life expectancy is a meager 54 years (United Nations 2011). Furthermore, history, geography and politics combine to make altering this situation strikingly difficult (Ellis et al. 2003). The small country is landlocked, densely populated with poor infrastructure, and is heavily dependent on agriculture for 35 % of GDP and over 53 % of export earnings (Booth et al. 2007, p. 6; Harrigan 2003, p. 847; Tsutomu 2009, p. 358). Specifically, the sale of tobacco provides the biggest single contribution, generating 70 % of foreign exchange and 30 % of GDP (Malawian Government 2009; Orr 2000, p. 348). As such, Malawi is highly vulnerable to external price shocks and declining terms of trade. As the country imports all its fuel products, inflation is strongly linked to both international petroleum and diesel prices (OECD 2008, p. 405). The national currency of Malawi, the Kwacha has a long history of value adjustments (Kherallah et al. 2001, p. 26) and in 2005, the government pegged the exchange rate to the US Dollar. While depressing the cost of imports, reliance on an overvalued exchange rate raised the cost of selling goods on international markets; reportedly reducing their volume; contributed to a ongoing lack of foreign exchange; and facilitated a significant balance of payments crisis (Chiyembekeza 2010; Govenor of the Reserve Bank of Malawi quoted in Malawi News 2009, p. 8).[6]

It was in this context that the National Smallholder Farmers Association (NAS-FAM) first became involved in fair trade as they saw the innovative approach to export trade as a way to both promote alternative livelihoods and generate much needed foreign exchange. In 2003 the organization began to obtain certification from Fairtrade International for the Mchinji Area Smallholder Farmers Association (MASFA) as a groundnut producing cooperative, and itself as a registered Fairtrade exporter. With certifications being ratified in 2004, MASFA sent its first shipment of 64 metric tons of groundnuts to the UK in 2005; and subsequently 36 metric tons in 2006, 450 metric tons in 2007 and was expected to have sent around 1,170 metric tons in 2008.

As is established in the existing literature on fair trade, this is of significant importance as the volume of goods sold under certified conditions can dramatically affect the level of benefit derived from investment in fair trade operations. Although volumes were initially low, from 2007 to 2011 groundnut exports to the UK generated an income of $527,000 and Fairtrade premiums to the value of $58,000 (Analysis of NASFAM records). More specifically, MASFA have used the Social Premium to construct a Guardian shelter[7] at Mchinji hospital and invested in processing and export capacity: such as a warehouse for safer storage of their groundnut crops.

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[6]The rate of this depression has now become evident after the liberalization of the MK in May 2012 when markets have settled around a rate of MK250/USD, although reportedly still below the black-market level of closer to MW275/USD (Reuters 2012).

[7]The Guardian shelter provides shelter for relatives and patients visiting and caring for friends and family staying at the hospital.

On the basis of this experience, NASFAM has also sought FLO certification for other Associations – particular one at Mzimba, which also produces groundnuts. However, at the time of fieldwork it was noted that while the group was in theory eligible for certification, the funds required to meet necessary fees were simply not available. NASFAM's Commercial Manager explained that "we have an association, a very productive association – we just don't have on any of the budgets around €3,000 to certify them. We have already paid a bit for the audit, if we don't certify this year we have to start from scratch". This view is supported by other interviews in Malawi[8] and also wider analysis that since the shift to charging producer organizations for their certification, some have not been able to afford the investment. The General Manager of NASFAM Commercial makes the analogy that the Fairtrade certification system.

> ...acts as if you are telling somebody without shoes, ok, I can get you shoes later on, but can you give me your slip-ons. So the guy has to look around for the money to buy the slip-ons, so when they now donate the slip-ons, they are now promised a pair of shoes.[9]

Another group that NASFAM would like to embed in fair trade supply networks is the Kaporo Small Farmers' Association (KSFA) located in the north of the country in the town of Karonga. This community of farmers is of particular interest to NASFAM as it produces Kilombero rice. Exporting this crop is especially attractive as it has high value potential and also offers a non-traditional export for the organization and country as a whole. Unfortunately, while Fairtrade International offers certification for the production and export of rice, it is understood by stakeholders to be difficult and currently impossible to obtain in Malawi.[10] This is because only producer groups located in Thailand, Laos, India and Egypt can readily apply for certification (FLO 2009a) and only where they are growing certain varieties under certain production methods. As a result, before KSFA or any organization in Malawi could have their rice certified by FLO, it would be necessary to arrange for the Product Standard to be extended to the country: the primary obstacle of which is setting the minimum price level that would be applied.

This issue of exclusion and extension is something that has been addressed in Fairtrade International's most recent Strategic Review. Indeed, the current view is that there "shouldn't be a barrier now" as even where national price structures exist for certain commodities, there is "now a mechanism for setting that much more quickly" (Interview with senior FLO representative). Unfortunately, when FLO representatives were approached by stakeholders in the Kilombero rice supply chain, no mention of this possibility was made. Indeed, the request was met with the response that nothing could be done until the next price review meeting of FLO's central board, and no preparatory measures were suggested.[11] Although NASFAM

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[8]Interview with Anonymous Stakeholder 16/11/2009.

[9]Interview with Joshua Varela 5/11/2009.

[10]Interview with Andrew Parker 23/11/2009.

[11]Personal communication with an anonymous informant.

have subsequently been offered the option to develop the standard themselves by agreeing a price with a buyer in the market (one of the recognized procedures for expanding the geographical coverage of FLO certification), they are resisting this option given the expected cost and uncertain returns in the initial trading period.[12]

In summary, the problems associated with any tendencies towards "Fairtrade absolutism" are clearly manifest in this example of a producer group frustrated by the difficulties in accessing Fairtrade certification. In the case where only Fairtrade International certification is recognized as a valid fair trade methodology, southern producers unable to obtain this will inevitably find themselves isolated from fair trade markets: therefore reducing the innovative capacity of fair trade activity. However, where interpretations of what constitutes fair trade are wider, this approach to international trade might resist these challenges. In this light, the final section links together the two case studies above, with an example of how continued cross-border innovation in what constitutes fair trade might well offer a method through which to circumvent these problematic issues.

5.5   Cross Border Innovation: The Fair Trade of Kilombero Rice Between Malawi and Scotland

Returning back to Scotland, although some Fairtrade Towns phrase their commitments to specifically support the consumption of Fairtrade certified goods, there are also others which word these in a more general way. For example, five of the motions avoid specific references to "Fairtrade", and instead phrase their commitments in terms of the more general category of "fair trade" or "fairly traded". While in some cases the choice between policy wordings can be more down to stylistic choice or automatic spell-checkers,[13] in Edinburgh choices were made very deliberately. When asked about the reasons for wording policy in terms of "fair trade", a representative of Edinburgh City Council replied that:

> It's a very fundamental question . . . we went down the sort of exemplar policy statement that the Fairtrade Foundation had advised us along the lines of . . . [However] we were advised by our fair trade, well, activists here in Edinburgh, people who had been working in the fair trade area for a long, long time, [who] were saying that two words when you are talking about fair trade in general, or as in I'm going to buy fair trade chocolate, but if you are talking about anything that the Foundation talk of, like Fairtrade Fortnight, Fairtrade Cities, Fairtrade Zones, Fairtrade schools, its two words – one word, I mean one word'.

This innovation of opening up the agenda of Fairtrade Towns beyond the implied restriction to FLO certified goods is also found in East Dunbartonshire. Here the council has passed a resolution to procure "fairly traded" goods and has also purchased a wide range of variously certified products for use in a range of public

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[12]Personal communications with anonymous informants.

[13]Interview with Sylvia Grey 16/06/2009.

institutions. Of particular interest in the context of studies concern with cross-border innovation however, has been their purchase of "fairly traded" Kilombero rice: the same rice produced by KSFA in Malawi and which is imported into Scotland by a dedicated fair trade organization, Just Trading Scotland (JTS), despite its lack of FLO accreditation.

In brief summary, the Local Authority took on the rice for use in school during Fairtrade Fortnight: an annual promotion drive, run by the Fairtrade Foundation as a means to boost interest in FLO certified products. In the previous year, the Local Authority had used FLO certified pasta in schools, although the Sustainable Development Officer decided that simply serving pasta left little opportunity to highlight the difference between fair trade and "non-fair trade" ingredients to the children.[14] For this reason, a partnership between JTS and the council produced an education pack to accompany the serving of rice which explained the wider context and the issue of global trade justice that were involved. In explaining how this innovation occurred a representative of the council explained that "this is where the [Fairtrade Town steering] group pays dividends ... It took the group to deliver this ... [as] it was the educational spokesman that would push the educational side, the citizenship, but as a catering supplier it fitted my needs as well".[15] Furthermore, while the rice was initially procured for use at a specific time of year during Fairtrade Fortnight, it has subsequently been used in Local Authority catering across a variety of institutions and further orders have been placed with the supplier.

While those responsible for the purchase of the rice were aware that the produce was not Fairtrade certified, knowing the origins and background of the rice, they were satisfied that the product fitted the broader principles of the fair trade agenda as they understood them. This is because the rice comes from one of the poorest countries in the world, where the economic situation strongly suggests that the promotion of non-traditional exports is highly important for development. In addition, the fair trade nature of the supply chain stems from the fact that as a democratically organized membership organization, NASFAM pays prices to farmers based on a calculation of the sustainable cost of production – as opposed to exploiting market failures to drive down the price of agricultural produce as is the practices of other domestic buyers in the country. In order to extend the social embedding of transactions to the international context, JTS have worked with NASAFM to provide a price that also incorporates domestic transaction costs (processing and transport) based on transparent discussions. Further to this, in the spirit of more radical and innovative fair trade operation, JTS have facilitated the funding of infrastructural improvements to process the rice in the community where it is produced. The farmers' Association can now clean, process and bag its own produce and thus the investment facilitates a well recognized and fundamental process in economic development: the maximum capture or addition of value, both in the community and country of origin. Overall, the supply chain can be considered

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[14] Interview with John Riches 19/03/2009. Interview with Grace Irvine 16/06/2009.

[15] Interview with Grace Irvine 16/06/2009.

to be coordinated by the type of "relational" governance that initially dominated the fair trade movement and is characteristic of more radical, contemporary, fair trade operations (see Reed 2009).

Given the nature of their interactions and operations, JTS and Imani Development (the importer's development partner in Malawi), have played an important role in highlighting the opportunity to accredit the Kaporo producer Association through the WFTO.[16] While there remains some concern that such accreditation will not be as well recognized as certification provided by Fairtrade International, the costs involved are minimal and the system is much more accessible to the organization (see above). In summary, the example of Kilombero rice is a testimony to the potential of continuing cross-border innovation to generate market access for poor small farmers in the developing world. While third-party certification has a great role to play in breaking the need for fair trade to be embedded in trust and knowledge flows, where this proves inappropriate or impossible, it is concluded that more radical uses of social capital can bring great opportunities.

5.6 Conclusion

During the last 20 years, the cross-border innovation of fair trade governance, designed to structure South–North supply chains in ways more beneficial for southern stakeholders, has gained significant attention. However, it has been argued above that what started as international cooperation between isolated mission driven actors has been largely co-opted by corporate and profit making interests. As a result innovation has been reduced as the use of interventionist tools has been weakened: for example, where the structural integration of producer support has been reduced to an additional Social Premium payment and profit orientated actors have even advocated for the withdrawal of the minimum price system.

More specifically, it has been noted that despite the benefits of widening fair trade participation, the rise of Fairtrade International has had the adverse effect of pushing other fair trade approaches to the margins of the movement. This has been of particular concern as it is these alternative practices which are considered to contain the most promising potential for innovation within international supply chain governance. Investigating the effects of the Fairtrade Towns scheme administered by the UK's Fairtrade Foundation, it was found that in Scotland there *is* evidence for the rise of "Fairtrade absolutism". The reason for this is that the requirements to become a Fairtrade Town are often interpreted literally, with communities and local authorities exclusively building their actions around the consumption of Fairtrade certified goods. Furthermore, empirical detail was added to the problems of such a development through discussion of NASAFM as a producer case study. While this organization has had some success in exporting

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[16]The fieldwork on which this chapter is based also identified very similar processes of negotiation and contestation concerned with the interpretation of what it means "to do fair trade" in Malawi.

Fairtrade groundnuts, the cost of further certification has proved a great limitation; and which producer representatives themselves see as a great irony of the system. Although the organization has other products produced under fair trade conditions, they have not been able to obtain certification as despite being available in other countries, this is not currently the case for Malawi. Although mechanisms do exist for the geographical extension of this opportunity, FLO's administration has proved slow in facilitating the realization of this opportunity; although, testimony suggests this was more of an issue with particular personnel than the system as a whole. This being said, NASFAM remain hesitant to pursue Fairtrade certification due to the costs involved.

In this context the final section of the chapter has linked together research on Fairtrade Towns and the producer experience in Malawi. Specifically, analysis has taken a supply chain approach to report on an alternative "community of interpretation" around the concept of fair trade. Here it is illustrated that where consumers, individual and/or institutional, have a more open minded and wider understanding of what legitimately counts as fair trade operation, continued innovation can prevent the exclusion of legitimate stakeholders from fair trade relationships. Indeed, contrary to other communities, East Dunbartonshire has conspicuously avoided specific references to Fairtrade certification in its policy aims, instead considering the more general terms of "fair trade" and "fairly traded" activities: an interpretation which has also filtered through to practical action as the community has promoted the consumption of a variety of certified goods. Beyond this, the local authority have been keen to replace simple consumption with a more holistic education package for delivery in schools, and this has led to the ongoing procurement of fairly traded rice. While the scale of this project might be viewed as insignificant, there is great importance in this example as it highlights the opportunities for civil society and state actors working within the fair trade movement to resist and negotiate the meaning of the FLO centric Fairtrade Towns scheme. Furthermore, the hugely important role of mission driven fair trade organizations is highlighted, as it is these actors that are arguably the epicenter of innovation in fair trade praxis: influencing as they do the interpretations and actions of both producer and consumer communities.

What is important moving forward is that research extends collective understanding of how fair trade is being operationalized in a variety of contexts and moreover, critically investigates the options for further increasing levels of innovation in economic governance. Indeed, understanding of these dynamics is of critical importance. The growing popularity of promoting "relational" supply chain governance in a variety of sectors and contexts is increasingly evident: particularly in cases where state authority is drawing on these principles as matter of government policy and action (for example, see the legal definition of "fair trade" in France and the developments of the solidarity economy in Brazil). While understanding the empirical benefits of these initiatives will be of huge importance, the role of conceptual development and interpretation in contributing to praxis will be key in understanding differentiated outcomes. Only through an adequate consideration of such linguistically embedded innovations will it be possible to evaluate the contribution of alternative economies to global sustainability and development.

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Chapter 6
Transboundary Conservation Through Hybrid Partnerships: A Comparative Analysis of Forest Projects

Saleem H. Ali

Abstract Transboundary conservation has acquired greater significance in recent years as international treaties, such as the Convention on Biological Diversity, have included such projects in their program of work. Since 1990, the International Tropical Timber Organization (ITTO) has been involved in several conservation projects that span international borders, which broadly include the following ecoregions: Borneo rainforest (Indonesia, Malaysia); Central African rainforest (Gabon, Cameroon, Republic of Congo); Southeast Asian forest (Cambodia, Lao PDR, Thailand); and the Andean rainforest (Ecuador, Peru and Bolivia). This chapter provides an evaluation of these projects in terms of their potential for peace-building, which has been a stated goal alongside conservation. The methodology for the study involved a series of qualitative questions that were posed to ITTO staff, governmental officials and civil society professionals via an email survey. In the case of the Cordillera del Condor region between Ecuador and Peru, a community field visit also elicited responses from indigenous community members regarding the salient role of this case in conflict resolution between the two countries. The comparative case analysis reveals that efficacy of these projects is often limited by leadership from the donor community and host governments but international organizations such as ITTO have the potential to catalyze lasting cooperation.

Keywords Transboundary conservation • Biological diversity • Rainforest • Central Africa • SouthEast Asia • Andean Region

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6.1   Introduction

A clear recognition that ecological systems defy political boundaries has led several international organizations to implement an "eco-regional" approach to conservation (Busch 2008; Lopez-Hoffman et al. 2010). Political borders that may divide such contiguous ecosystems necessitate the involvement of environmental diplomacy, giving rise to the emerging practice area of "transboundary conservation" (Fall 2005; Ali 2007). International organizations can play an important role in this context to ensure that political rivalries and sensitivities over security concerns do not hinder the environmental and social protection of such areas (Conca and Dabelko 2002; Acharya 2009). Border communities are particularly vulnerable to political conflicts and natural resources can become acutely contested on economic and social concerns in this context (Chester 2006; Mittermeier et al. 2005).

The International Tropical Timber Organization's interests in transboundary conservation can be traced back to 1990, when the ITTO Mission to Sarawak recommended that more land should be conserved in protected areas.[1]

ITTO also recognized the potential for border areas in supporting cooperation between bordering states (Goodale et al. 2003). This approach was in congruence with a broad mandate for environmental peace-building that gained currency within the Convention on Biological Diversity (CBD), particularly as part of the program of work on protected areas and the focal area on "an ecosystem approach" (Brookfield et al. 1995).

In 2004, the CBD's decision statement at the seventh Conference of the Parties (COP 7) in Kuala Lampur stated that "the establishment and management of protected area systems in the context of the ecosystem approach should not simply be considered in national terms, but where the relevant ecosystem extends beyond national boundaries, in ecosystem or bioregional terms as well. This presents a strong argument for and adds complexity to the establishment of transboundary protected areas and protected areas in marine areas beyond the limits of national jurisdiction."[2] It also had a target to strengthen collaboration between neighboring protected areas across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the ecosystem approach, and improving international cooperation. 6 ITTO transboundary conservation projects have been implemented since 2002.

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[1] A detailed history of ITTO as an organization can be found in Poore (2003).

[2] UNCBD COP 7 Decision, Kuala Lampur, 2004, pertaining to Protected Areas (Overall section II, point 8).

6.2 Aims and Methodology

The aim of this study was to do an independent evaluation of the 6 ITTO transboundary conservation projects since 2002 and to draw policy lessons across cases which have thus far not been collectively compared. The criteria for analyzing success and failure of projects were defined by the stated goals of conservation and increased cooperation between the jurisdictions involved in the projects. As with many international donor-driven organizations ITTO uses logical framework methodologies to monitor and evaluate the implementation of its projects and regular reports are prepared in this regard. Such reports were initially evaluated for this study and the descriptive information about the parameters of projects is derived from these reports. However, the goal was to do a more critical investigative analysis of project implementation, based on field survey responses and interviews with key officials in the process. Narrative responses were collected and analyzed for specific findings.

The interviews were carried out in languages that the respondents were most proficient in, followed by in-house translation by ITTO staff. Cross-verification of responses was performed by the author by contacting other external experts familiar with each case to prevent documentation biases due to "conflicts of interest."

6.3 Case Analyses

Following the case analyses, cross-cutting policy recommendations are provided, with particular relevance to international treaty obligations of countries and development donors.

6.3.1 The Borneo Cases

Area of influence: 2.16 million ha.

 Malaysia

(a) **Development of Lanjak-Entimau Wildlife Sanctuary as a totally protected area;**
(b) **Transboundary Biodiversity Conservation in the Pulong Tau National Park;**

 Indonesia

(a) **Development of Bentuang Karimun Nature Reserve as a national park,**
(b) **implementation of a community-based transboundary management plan for the Betung-Kerihun National Park; Indonesia-Malaysia: Management**

**of Kayan Mentarang National Park (KMNP) to Promote Trans-boundary
Conservation along the Border between Indonesia and Malaysian States of
Sabah and Sarawak.**

Soon after the cases commenced, socio-economic surveys were carried out in
the immediate settlement areas surrounding the protected areas to determine
land-ownership and acquisition, traditional land uses and social practices (partic-
ipatory mapping), settlement patterns, economy, health, education, attitude and
development potentials. This was followed by inventory of biological resources,
community-oriented activities and training to improve the knowledge and skills of
both officers of the Forest Department and the local communities. As a result of
these inventories, a number of sensitive areas have been identified as special protec-
tion zones. Re-zoning of the Lanjak Entimau Wildlife Sanctuary has subsequently
been carried out. This is a significant feature of this project which responds to a
frequent critique that the boundaries of TBPAs are determined politically rather
than due to conservation criteria.

As a stated objective, subsequent phases of the project aim to develop a
strategy for cooperation in trans-boundary conservation between Indonesia and the
Malaysian States of Sabah and Sarawak, in order to conserve the integrity of the
Park's bio-diversity values.

An important feature of this project has also been the attempt to negotiate
between provincial entities that share borders. Dialogues and discussions with local
authorities at the provincial and district levels, with local communities living inside
the park, and with relevant park authorities in the Malaysian States of Sarawak
and Sabah had been conducted to gain inputs and support for project design and
implementation.

International organizations of which both Malaysia and Indonesia are members
have helped. In particular the ASEAN Agreement on Trans-boundary Haze Pollu-
tion, which came into force in 2002 and the Cebu Declaration on East Asian Energy
Security have been important in raising the profile of this project. To ASEAN-
Wildlife Enforcement Network which was established in 2005 has also strengthened
the mandate of ITTO's efforts at transboundary conservation.

This project has also tied conservation activities, directly to development
impacts. Penan communities have been provided clean water from gravity feed,
planting of popular local fruits trees , amenities, better infrastructure and facilities
(24 fishponds for the longhouse communities and schools, a suspension bridge).
The efforts at developing infrastructure have also been aimed beyond the borders
of the park itself such as the construction of homes for 18 Penan families living
outside the national park.[3]

One of the key field managers of this project, Paul Chai notes, however, that: "it
has not been easy to strengthen transboundary cooperation beyond joint task force
meetings, workshops, cross visits and exchange of information. Priorities, funding

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[3]Respondent, Paul Chai, Forest Department, Sarawak.

and management capacity vary between the partner nations. It is not realistic to expect both sides to be equally committed to TBP cooperation. Most of the time, it was Sarawak that had to initiate meetings of the joint task force, cross visits, and workshops. We should not be too ambitious in transboundary cooperation – in view of rapid development pressures, ability to protect TBPAs from encroachment will already be an achievement in itself."

There can be several micro-conflicts within protected areas irrespective of the border location. ITTO staff note that when the LEWS project was initiated in 1993, the residents blocked the river with their boats to block staff from entering the sanctuary. However, through years of trust-building efforts through positive development impacts and conservation are now on well-respected. According to Paul Chai, "some of the people have also taken the initiative to stop outsiders from entering protected areas to fish and hunt – this has never happened before."

Indonesia and Malaysia already have existing bilateral and multilateral cooperation,. According to a representative from the Worldwide Fund for Nature in Indonesia what we need is "community-based ecotourism, species conservation, joint action on transboundary national park management with regular joint inspection, staff and local people exchange, sharing knowledge and sharing the capacity, joint program on environmental education).[4]

The Borneo TBPA projects suggest that persistence at managing local conflicts through development efforts focused on local priorities can pave the way for greater border cooperation. Following such trust-building it may be possible to also prioritize conservation lands based on importance in terms of biological diversity as exemplified by the success of the rezoning efforts in LEWS. The role of regional security organizations such as ASEAN can play an important role in further strengthening the binational cooperation efforts in TBPAs.

6.3.2 The Emerald Triangle Complex

Area of influence: 174,000 ha.

Management of the Phatam Protected Forests Complex to promote cooperation for transboundary biodiversity conservation between Thailand, Cambodia and Lao PDR.

Indochina is a critical area in terms of environmental conservation but is also a region that has endured decades of violent conflict that has scarred the landscape. Hence border areas in this region are particularly sensitive and regional rivalries between the countries in this region remain high. ITTO's decision to initiate conservation in this region was particularly bold since one of the three countries involved, Lao PDR, is not an official member of ITTO. However, the project

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[4]Respondent, Hermayani Putera, WWF, Indonesia.

was approved, nevertheless with the expectation that such an initiative could pave the way for Lao PDR joining ITTO or at least at strengthening environmental cooperation between Lao PDR, Cambodia and Thailand.

The cooperation between the countries was built mainly through the Tri-partite Commission comprising government officials and protected area superintendents and the Joint Task Force composing protected area field staff which served as the forum for exchanging views and information and for decision making on the implementation of the various cooperative activities of the project.

However, the level of economic and political disparities between the three countries was a major hindrance to this project. As one respondent stated: "If participating countries with different social, economic and historical characteristics maintain different environmental and national security policies, problems and constraints retard the progress of transboundary Conservation Areas."[5] The evaluative study carried out by ITTO in 2010 stated that: "The achievement of the respective outputs is less than what was planned. This is due to the non-participation of Lao PDR and to the border conflict between Thailand and Cambodia since 2008 which created a context that is not conducive to any strategic dialogue between the three parties as far as pursuing TBP goals in the Emerald Triangle is concerned."[6] Part of the critique of this project revolved around the inconsistency in applying a logical framework matrix across the three country participants. The Framework analysis seeks to get development donors to focus on three key parts of project evaluation: (a) developing measureable indicators; (b) verification mechanisms (c) analyzing assumptions to ensure project applicability elsewhere. The indicators of success chosen set the bar very high but expectations in this regard required a high level of coordinated actions between the three governments and did not take into account political exigencies involved. The project accordingly seemingly failed to achieve most success indicators.

Furthermore, the ITTO completion report noted that the budget allocated for supporting livelihoods activities was considerably low for a project that defined itself in community development terms.

An evaluation by the Thai government also echoed some of these concerns: "A Trans-boundary coordination activity among the three countries was not achieved. Strengthening of Human resources capacity in biodiversity conservation was partially achieved, but there was no systematic training. Strengthening of Law enforcement and protection measures were not achieved."[7]

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[5]Respondent Lim Sopheap, Cambodia Forestry Administration.

[6]International Tropical Timber Organization, "Management of the Emerald Triangle Forest Complex" Report Prepared by James Gasana, 2010.

[7]Royal Forest Department, Government of Thailand and Ministry of Forestry and Fisheries, Government of Cambodia, "Management of the Emerald Triangle Protected Forests Complex to Promote Cooperation for Trans-boundary Biodiversity Conservation between Thailand, Cambodia and Laos (Phase II), Completion Report," ITTO, August 2010.

The trans-boundary project area was east of a major long-running dispute over whether Thailand or Cambodia controlled the Preah Vihear Temple and immediately adjacent setting. This is an active military zone with occasional firing across the border which has also escalated to the level of garnering international news coverage. There are conservation organizations such as the Maddox Jolie Pitt (MJP) Foundation that have actively worked on transfrontier conservation efforts in this context which could also have been included in the larger ITTO program effort as well. The MJP Foundation has also partnered with the U.S. National Park Service to train park rangers on both sides of the border in Thailand and Cambodia.[8]

Respondent Hunter Weiler, who advised the project for 4 years suggested that "for several years Cambodia and Thai forestry staffs communicated by email and phone weekly to monthly to share data and report on activities in the trans-boundary project conservation area, met together alternately in Thailand and Cambodia for joint presentations to the stakeholders and ITTO, and even made a joint field trip to the Tri-border area."[9] However, Weiler and his staff noted in subsequent correspondence that there was a reluctance to engage with the political needs of the three countries directly and this led to inaction on the part of Lao PDR. One internal document suggested that the way to include Lao PDR in the effort was to:

> If ITTO really intends to offer any project support to Lao PDR, ITTO should officially inform the Lao Government via the CPC only. The CPC will forward the project proposal to the Ministry of Agriculture and Forestry to consider passing the project to the Department of Forestry. The Department of Forestry will examine the project proposal and provide recommendations. The Ministry of Agriculture and Forestry will then coordinate with the Ministry of Foreign Affairs to submit the project proposal and the recommendations to the higher authorities for consideration and approval. Finally, the matter will be returned to the CPC. After the project has been approved, the government officers concerned will be able to participate in the project. If the project is not channeled through the above route, it would not be possible to receive approval.[10]

An internal evaluation of the management plan also considered the funding of the project as a reason for the withdrawal of Lao PDR from active engagement. In the original proposed Project Document for Phase II, funding for participation by Lao PDR was included. However, as Lao PDR was not a member of ITTO, it became increasingly difficult to procure funding for the Laotian component secured from donors.[11]

Another important critique of the project centers on the actual demarcation of the protected areas. Unlike the Borneo projects where there was clear rezoning undertaken following community advice, the Emerald Triangle case borders were not as well-considered. Because of security concerns there are no protected areas in Lao

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[8]For details regarding this effort refer to: http://home.nps.gov/applications/digest/headline.cfm?type=Announcements&id=5092

[9]Respondent Hunter Weiler, Cambodia, Cambodia Forestry Administration, Department of Wildlife & Biodiversity.

[10]*The Management Plan of The Pha Taem Protected Forest Complex January 2004, Annex 3.*

[11]Respondent Hugo Rainey, Wildlife Conservation Society, Cambodia.

PDR that border Cambodia and only one that borders Thailand (Phouxeingthong NBCA the Laotian government has not moved forward in formalizing this area.

Despite these deficiencies in the project, there is still potential for learning from these processes. As one Cambodian respondent stated: "It is too early to provide information in details in terms of environmental conservation which directly created a more suitable political situation for resolving any existing disputes or conflicts between the bordering states as the trans- boundary for biodiversity conservation along the border between Thailand and Cambodia is very young (2 years). However, the fact that border deputes have been seen as obstacle to transboundary conservation of biodiversity. So far environmental conservation has not been seen to solve political conflicts. No formal and direct dialogues have been conducted in regard to the matter."[12]

With the linkage of this TBPA to other border projects in the region, there could be a transformation of the conflict. Enabling regional cooperation platforms through technical support, legal instruments, and financial assistances, such as ASEAN; ASEAN Senior Officials on Forestry (ASOF); ASEAN Senior Officials on Environment (ASOEN); the ITTO, ASEAN-Wildlife Enforcement Network; and Greater Mekong Sub-region Cooperation (GMS).[13]

6.3.3   Congo, Kabo-Ndoki Region

Area of influence 1.3 million ha.

Biodiversity management and conservation in a forest concession adjacent to a totally protected area (Nouabale-Ndoki National Park), northern Congo.

Central Africa's forests are considered among the largest contiguous conserved areas in the world for primate habitat. Given their significance in ecological terms as well as the desperate need for economic development in this region, ITTO has embarked on two key projects in this region which are border zones.

The Kabo-Pokola-Loundoungou forest concessions adjacent to the Nouabale-Ndoki National Park are largely managed within the Republic of Congo, though the area borders, Cameroon and the Central African Republic. The Agreement regulating the implementation of the project was signed on 2 April 2001 and the first disbursement of funds was made on 19 June 2001. This project used an ecosystem approach for the management of the contiguous Kabo-Pokola-Loundoungou forest concessions adjacent to the Nouabale-Ndoki National Park northern Congo. The Ministry of Forest Economy (Government of Congo), the Congolaise Industrielle des Bois – CIB – (private company) and the Wildlife Conservation Society – WCS – (international environmental NGO) agreed to work together with local communities

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[12]Respondent Hort Sothea, Cambodia Forestry Administration.

[13]Survey Respondent: Cheang Danny, Forestry Department, Cambodia.

to implement an integrated project with the goal of sustainable wildlife and forest management as part of the ecosystem management strategy. Thus, the project developed practical tools to assist the Republic of Congo in meeting the ITTO sustainable forest management objective while promoting biodiversity conservation within the context of a multiple-use forest production adjacent to a protected area.

A key feature of this project is the development of a zoning system, following the wildlife management guidelines. This system will be included in the Management Plan of CIB company's forest management units (FMUs) totaling 1.3 million hectares, surrounding 0.4 million hectares of the Nouabale-Ndoki National Park. A formal management system has been established to facilitate communications among the Government of Congo, WCS and CIB, in order to ensure that management strategies are officially incorporated into the CIB internal regulations and management plans that could serve to set national standards for forest management and wildlife conservation in forest concessions in the Republic of Congo.

The CIB logging company benefited in the implementation of this project and revised its regulations and management plans, in order to reduce forest encroachment and control human immigration and deforestation. The serious threat related to the illegal hunting and commercialization of protected species has been minimized in the Nouabale-Ndoki National Park. Thus, CIB has improved chances for certification of its products as a result of improved forestry and biodiversity management in its forest concessions. The local communities and the indigenous peoples were involved in the establishment and implementation of a wildlife management strategy through the demarcation of hunting zones based on the traditional community land tenure systems, and all eco-guards incorporated into the enforcement efforts were recruited from local communities and indigenous peoples. Alternative activities for the production of proteins to replace bushmeat have also benefited local communities and indigenous peoples.

The surveillance of 1.3 million hectares of the project area and the anti-poaching system have been implemented by a team of 38 eco-guards, acting under the supervision of sworn officials from the ministry of forestry economy of the Republic of Congo. During their surveillance patrols, the eco-guards have seized 23 guns of different types and related ammunitions, more than 6,000 metallic traps, bushmeat of 25 animal species including endangered ones (leopard, gorilla, chimpanzee, etc.). These patrols have led to put under arrest 99 people for poaching activities in the project areas.[14]

The project evaluation report further noted some key aspects of the project design that have contributed to the project's success include the following:

- Strong integration of the government officials in the project validated the importance of the project, offered support at local and national levels and assured that the project goals matched government goals;

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[14]ITTO, *Biodiversity Management and Conservation in a Forest Concession Adjacent to a Totally Protected Area* (Nouabale-Ndoki National Park), Northern Congo (Congo) [extract from CRF(XXXVII)/3, 2005, Completion Report].

- Early definition and clarification of the division of responsibility among all stakeholders prevented confusion and overlap between project partners, through shared responsibility among stakeholders, thus contributing to address the most complicated and socially contentious issues (such as controlling the commercial bushmeat trade);
- Integration of the private sector offered expertise and resources essential to the project success;
- The involvement of local communities into the establishment of hunting zones and the recruitment of eco-guards and project employees from local communities have contributed to the success of the law enforcement and wildlife conservation component of this project. The project has contributed to encourage local populations being organized in associations/committees that contributed to reinforce project actions in the field;
- The multi-faceted approach adopted for this project, which simultaneously developed education, wildlife conservation, research and monitoring, reduced impact logging techniques and alternative activities was essential to gaining and maintaining local support during project implementation; and
- The traditional land tenure systems have been reinforced through the wildlife management zoning based on traditional territories in consultation with local communities and indigenous peoples.
- Close management of the protection teams to prevent/reduce employee corruption, through regular evaluations, punctual and clear disciplinary measures, and increased intensity of the training program;
- The careful planning of eco-guards' field program as pivotal factor in the successful management of these units with a maximum efficiency;
- Strong disciplinary measures taken by CIB logging company to limit the complicity of CIB truck drivers with hunters for the transport of commercial bushmeat on their vehicles. However, it is important to note that the importation of protein sources is more expensive than bushmeat and could require either an increase in employee salaries or the creation of a company-subsidized program;
- A strong field team and the willingness to try multiple activities for the development of alternative activities program taking into account the diversity of regions and cultures in the project landscape with different dietary preferences; and
- A strong education program aimed at mitigating potential conflicts with local populations, especially for the enforcement of wildlife laws.

Aspects of the project design that challenged or slowed project implementation include the following:

- The lack of a formal structure for conflict resolution gave way to situations in which the stakeholders could not reach an agreement;
- The lack of a formal organ for communication between community leaders and other parties at the beginning of the project implementation;
- The lack of a regional development plan (national road placement, town development, etc.);

- The lack of a defined buffer zone in areas immediately surrounding the Nouabale-Ndoki National Park.

Additional arrangements that could improve cooperation between the relevant parties interested in the project implementation include the following:

- Strengthening of community hunting and conservation committees could decrease village anxiety regarding changing wildlife policies and improve cooperation among local communities;
- Establishing a multi-agency task force (involving the project partners as well as other governmental departments concerned), which could contribute to deal with conflict management regarding development of infrastructure and reconciliation of biodiversity conservation with forest production objectives.[15]

This project has also been studied by conservation biologists in terms of the efficacy of management practices on the distribution of fauna. One recent study concludes that: "logged forest can extend the conservation estate for many of Central Africa's most threatened species if managed appropriately. In addition to limiting hunting logging concessions must be large, contain patches of unlogged forest, and include forest with different logging histories."[16]

Another study focusing on the elephant and ape populations concluded that "given adequate protection from poaching, elephants and gorillas can profit from herbaceous vegetation in recently logged forests and maintain access to ecologically important resources located outside of protected areas". However, despite antipoaching controls – logging roads were still exploited by elephant poachers while human disturbance had some negative influence on chimpanzee abundance.[17]

Despite these successes, there are concerns about the overall poverty in the region. As one respondent, based in the Republic of Congo stated: "Until the fundamental needs are met for Rep of Congo people, environmental conservation will be a challenge, and not the 'cure' for saving Congo' wild lands and animals or any other disputes or conflicts. Since the economic recession the logging company CIB had to lay off over 600 personnel which in turns leave many people needing food and other resources, thus increasing pressure on wildlife, thus poaching increases."[18]

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[15]PD 310/04 Rev.2 (F) *Biodiversity Management and Conservation in Forest Concessions Adjacent to Totally Protected Area (Nouabale-Ndoki National Park), Northern Republic of Congo (Phase II).*

[16]Clark et al. (2009).

[17]Stokes et al. (2010).

[18]Respondent Suzanne Mondoux, Wildlife Conservation Society, Republic of Congo.

6.3.4   Cameroon-Gabon

Area of influence 137,000 ha.

Establishment of the Mengamé-Minkébé Transboundary Gorilla Sanctuary (MMGS) at the Cameroon-Gabon Border.

Gabon has been an oil-dependent economy and this has generally translated into less timber exploitation in the rainforest.[19] Cameroon's forests came under international scrutiny during the construction of the Chad-Cameroon oil pipeline which received partial funding from the World Bank's International Finance Corporation. Since its establishment in 2001, the project aims to contribute to the protection of the Gorillas and of their habitats in the MMGS. Transboundary cooperation between Cameroon and Gabon for the joint management of the sanctuary was a stated objective from the start of the project.

This effort has also received support from the Jane Goodall which signed a convention with the Cameroon *Ministry of Environment and Forests* (MINEF) to establish a community centered conservation and wildlife research program in the newly proclaimed Mengamé Reserve (115,000 ha). As noted by the Jane Goodall Foundation, this reserve is "a priority biodiversity corridor on the border of Cameroon and Gabon, the Mengamé Reserve plays an important role in emerging transboundary protected area initiatives and partnerships such as the Central African World Heritage Forest Initiative and the Congo Basin Forest Partnership."[20]

The project has faced considerable challenges because of the difficulty in border crossings and the persistent problem of cross-border poaching. As noted by project manager Etienne Nkomo: "there is intense cross-border poaching in both directions and the need for the establishment of a joint strategy to fight against poaching is needed. It is also very difficult to arrange meetings for participants from both countries due to security restrictions."[21] However, the cross-border initiative has given an opportunity for both countries to develop some cross-border initiative, particular pertaining to illegal mining of gold in protected areas. This project still has considerable development needed but the commitment if both countries to conservation appear to be strengthening.

As noted by one of the key advisors on the project from the Worldwide Fund for Nature in Cameroon: "International organizations can strengthen transboundary conservation by facilitating necessary administrative structures to ensure the implementation of transboundary agreements. The provision of technical assistance greatly facilitated the development of the TRIDOM (Congo, Gabon and Cameroon) initiative which has changed the conservation approaches between these countries. To facilitate development of local economy, international organizations can facilitate information exchange and sub-regional markets for local communities.

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[19]Wunder (2003).

[20]*Gorilla Journal* 27, December 2003: www.janegoodall.org

[21]Respondent Etienne Nokomo, ITTO Manager, Cameroon.

It is important that transboundary initiatives be backed up by enabling legal and institutional framework that can be developed in collaboration with international organizations.[22]

6.3.5   The Cordillera del Condor Case

Area of Influence 2.42 million ha.
   Bi-national conservation and peace in the Condor Range region, Ecuador-Peru Area of influence.

The territorial conflict between Ecuador and Peru goes back to the Spanish colonial period in the nineteenth century when Peru and Ecuador gained independence. In 1998, following several failed attempts at conflict resolution and an armed conflict lasting 3 weeks (1995), a Peace treaty and border demarcation agreement with innovative features was signed. Both countries would establish ecological parks on either side of the border, where unimpeded transit would be guaranteed and no military forces would be allowed.

   Initially both countries declared national parks on their respective sides of the border. In 2000, Conservation International and ITTO partnered with local conservation groups in Ecuador and Peru and with the Chimu indigenous communities (particularly the Schuar of Ecuador) to establish a bioregional management regime.

   However, the lack of consultation with the indigenous communities during the negotiations leading to the peace agreement are still manifest in resentment towards conservation efforts. In the words of one community leader from the Shuar: "This was territory occupied by the Shuar Wampís and they were not consulted about the agreement. Therefore, it is illegal what has been done, declaring it property of the State of Peru, even if a reserve was built. And we are not against the conservation of the Natural Resources, but the name Park of the Peace is not considered appropriate. The conflicts that take place are by-products of the presence of transnational mining, oil, *cuíferas* and timber companies, that are yet to come. For who are we going to extract? To build more vehicles, computers, so they can sell it back to us at a more expensive price. Why the concentration of wealth happens? Why not allow the communities to participate? As for the timbering, mining, and oil extraction, they have to obey the policy of the native communities. In the process of decisions, they should participate with a policy describing how they want to do the extraction. About the compensation: if there is a proper participation of the native communities, then, compensation is not needed. However, if there is no participation, then the use of wood or other outside product shall not be accepted. The State is interested in

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[22]Respondent Njiforti Hanson Langmia, WWF, Cameroon.

generating energy through rivers inside the Shuar territories. The solution for this is that the international agencies will have to meet with the native communities and come up with a common decision." [23]

Despite the peace agreement, there is considerable difficulty in movement and border crossings. Even for the ITTO research team, the procedures for travel remain complicated.

The community organizations have many ideas to improve cooperation through development efforts if some of these issues of access can be addressed. Another indigenous representative stated: "Since the peace agreement was signed there should be freedom to come and go, but there has been a strict control and they want to suspend such freedom. La Federación de Comunidades Huambisa del Río Santiago (FECOHRSA) dreams about the creation of an environmental services fund, but there is no capacity for economic and technical exploration. It should be added that the projects proposed should be of Wampís authority and prepared by the communities themselves."[24]

While the overall armed conflict has stopped, the implementation of various features of the peace agreement remain unfulfilled. The structural aspects of the peace treaty have also prevented the formation of a functional "peace park" where access to both sides of the order would be guaranteed. Instead of creating a shared zone, the peace treaty demarcated borders and established conservation areas as buffer zones. The operations of the Cordillera del Condor TBPA could be vastly improved if these commitments were met. The following Table 6.1 provides a list of outcomes that were stipulated in the peace agreement and the paucity of progress in that vein, compiled by Santiago Kingman for ITTO.

Considerable conflicts between large and illegal medium scale mining industry are also happening, especially in Ecuador, including the presence of armed groups. Conflicts of small and informal miners from Ecuador can also pass to the zone of Peruvian concessions. Conflicts in the El Quimi reserve of Ecuador are also gaining strength because the Shuar want to contest the activities of the Ministry of the Environment. Having clear mineral extraction zones as well as exploration guidance for artisanal miners could reduce the random impacts of mining.[25]

Ten years of support Fundacion-Natura-Ecuador and Conservation International (CI) under grant support from the Moore Foundation, aimed at the Shuar is an example of positive engagement with the population. A staff member for CI-Peru, stated, however, that "the resources and situation is different and it is not expected that the experience will be replicated, but that it will at least serve as a lesson learned for the Wampis and Awajún and for the institutions that wish to develop projects in

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[23]Respondent Ángel Nantip: Coordinador de Gestión Externa Comunicador del Pueblo Resident of Pueblo Shuar Arutan Fecha: 15 de julio de 2010.

[24]Kefren Graña, Presidente de FECOHRSA, Ruyer Chimpokat, Vice Presidente de FECOHRSA; Eliseo Chimshami, Tesorero de FECOHRSA, Comunidad de Kukuasa, Distrito del RSA FECOHRSA – Federación de las Comunidades Wampisas del Río Santiago.

[25]Respondent: Santiago Kingman, Coordinador del Proyecto ITTO PD 238/03 Respondiendo al cuestionario desde el punto de vista de las comunidades Macas, Ecuador. August 3, 2010.

Table 6.1 Implementation challenges of the Ecuador-Peru peace agreement

Commitment of peace agreement	Status
The agreement on the freedom of coming and going, vehicles, See Going and Fluvial Vessels and Aircrafts	The freedom of coming and going is not guaranteed through the simple use of an identity card. People must spend several hours in the military posts of the two countries and leave their documents. There is no migration, except by the armed forces in the basin of Santiago
The Convention on Traffic in Persons, Vehicles, Maritime and Fluvial and Aircraft	The movement of people is not free, with the simple use of card. People can spend several hours by the military posts of the two countries and leave their documents. There is no migration but only armed forces in the basin of Rio Santiago
The Organizational Structure of the Bi National Plan for border areas and development	The Bi-National Plan was created, but it didn't manage projects, nor did it foment them with local organizations of the Cordillera del Cóndor
Agreement of Acceleration and Deepening of Free Trade between Ecuador and Peru	The free trade in the region has few prospects. The only thing that could develop is the sale of timber and non- timber forest resources
The Memorandum for Understanding on Electrical Interconnection	No observable implementation
The Ground Agreement for commissioning an improvement study for the Binational Project for the transport of Hydrocarbons	An increase of the oil activity in the region is expected. For now there is only invitation for bids and in the south of Ecuador does not yet exist hydrocarbon activity
Memorandum of Understanding for Strengthening the Mutual Cooperation in Tourism	No observable implementation
Memorandum of Understanding in Educative Cooperation	No observable implementation

their territories."[26] Furthermore, "understanding that the native peoples have ties that surpass the borders and that maintain the same plans and traditions apply for the natural resources implies a modernization, a secular process involving social and political terms and the construction of a unity where there are only families."[27]

While the conservation dimensions of the peace agreement are often downplayed in many policy analyses,[28] there is a general feeling among practitioners that ITTO's involvement in this effort has greatly helped to continue the momentum towards transboundary conservation.[29]

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[26]Respondent: Bráulio Andrade Conservación Internacional Perú.

[27]Santiago Kingman, Coordinador del Proyecto ITTO PD 238/03 Macas, Ecuador, August 3, 2010.

[28]For example, a study of the peace agreement conducted by the U.S. Institute of peace bare mentions the central role of establishing the national parks as means of conflict resolution. Instead the focus is on the process of mediation. See Simmons 1999.

[29]Respondent: Luis Espinel, Director Ejecutivo, Conservación Internacional Perú.

Fundacio Natura officials in Ecuador believe that "there is no doubt that biodiversity conservation has helped to create a climate of greater confidence between states and peoples, and to resolve some conflicts among peoples. However, other disputes regarding the extraction of non-renewable resources, such as mining, are still alive and resources are still insufficient to resolve mining conflicts.[30]

As a pioneering effort to directly link conservation to conflict resolution in a violent border dispute, the Condor Case has become an important example for international diplomacy. However, the full potential for this agreement and the ITTO efforts at transboundary cooperation have yet to be realized. Addressing the concerns of indigenous communities, improving access across borders and regulating extractive industries will be key factors to ensure the efficacy of this project in reaching its goals of environmental peace-building.

6.3.6   Tambopata–Madidi Protected Area

Area of influence 2.42 million ha.

Conservation and development in the natural protected areas system of Tambopata (Peru)–Madidi (Bolivia).

Madidi, Pilon Lajas, and Apolobamba in the northwestern Bolivian Andes and the adjoining areas of Tambopata and Bahuaja Sonene in Peru constitute a protected area of more than 15,000 mile^2 of tropical Andian forests, considered by many standards to be the most diverse region on Earth. The Project's main objective was to generate and collect environmental and socio-economic information that will form the basis for the establishment of coordinated participatory processes between the two countries to ensure the planning and management of conservation areas and the development of sustainable economic alternatives within the System of State-Protected Natural Areas (SPNAs).

The key achievements of this project, thus far, as compiled by the evaluation report to ITTO are as follows:

Compilation of information related to the master plans on conservation areas, including transboundary thematic and cartographic cover of the project's area of influence and of the specific protected areas master plans, was developed and approved.

A B-inational Technical Committee was created and met on several occasions to coordinate transboundary cooperation issues, develop the Binational Action Plan for the conservation of the transboundary protected areas.

A monitoring and control plan was developed. For the development of this plan, critical environmental and socio-economic variables were identified and plotted

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[30]Respondent: Ruth Elena Ruiz, Fundacio Natura.

on a map overlaying present and potential conflicts with the strategic protection areas; and

A socio-economic diagnostic was completed for the Apolobamba National Natural Area of Integrated Management (ANMIN), and a further 37 participatory communal workshops have been held in two of the three municipalities that share the ANMIN.

The master plan for the Tambopata National Reserve was expanded to include the micro-zoning of areas for direct communal use and the research program developed for the "La Nube" Biological Station. A methodology was defined for the communal management of natural resources, in particular those related to the sustainable harvesting of Brazil Nuts

The value-adding processing of products was sought to ensure the highest income levels possible for the local communities. An Economic and Economic Zoning was carried out to facilitate preliminary analyses combining variables such as manpower availability, access to energy sources, production costs, and road infrastructure, among others; and

Based on the zoning exercise, collaborative management and business plans were developed for several communities for palm farming and ecotourism.

The local communities in the Tambopata – Madidi area, with a population of approximately 20,000, collaboratively developed management plans jointly within a Peruvian-Bolivian system of natural protected areas aimed at ensuring the conservation of biodiversity in the region. Given historical rivalries between Bolivia and Peru, the project has served as a vital tool in harmonizing sustainable use and conservation activities across the Bolivian-Peruvian border and in strengthening the collaborative management of the protected areas. The design phase of the project should be able to anticipate in as much as possible the potential changes in the environmental and socioeconomic context at both the national and regional levels, so as to not require substantial changes. Border patrol activities may need further coordination to allow for access to communities.[31] When there is a sudden political crisis, such as the recalling of the Peruvian ambassador from Bolivia in June 2009 over disagreements about the country's policy on indigenous people, the strength of a TBPA is tested. In this case, the arrangements for border cooperation were able to endure such a crisis and bode well for the future of the protected area complex.

6.4 Conclusion and Policy Recommendations

This study has attempted to provide a broad comparative evaluation of the seven key transboundary projects being conducted by ITTO. The report followed an ethnographic methodology of conveying views of practitioners and community members on the efficacy of these projects. Transboundary conservation is an emergent area

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[31]Respondent Luis G. Espinel Cuba, Conservation International Peru, July 22, 2010.

for international activity and in this regard, ITTO's efforts are to be commended in showing leadership to support projects in three different continents over the period of decade. Conservation professionals have recognized this contribution widely, as exemplified by the wide array of partners in the conservation community that ITTO projects have shown.

In the words of Trevor Sandwith, the director of protected areas for the International Union for the Conservation of Nature and one of the earliest proponents of transboundary conservation:

> By focusing on transboundary forest conservation (already a subset of the broader suite of TBPA initiatives), ITTO allows a consideration of whether some of these forests would be better managed as protected areas, or which could be linked to protected areas in the regional landscape. Where a protected area exists only on one side of the border, ITTO's activities could foster more formal conservation status for areas that are not protected in the adjacent country, and by focusing on the forest ecosystem per se, may make the case for more effective connectivity of protection throughout the forest ecosystem including a range of governance types.[32]

International organizations are still struggling to convince governments to think "ecoregionally" about their resource base. The performance of such areas should be gauged within the constraints of international norms on intergovernmental relations. The key lessons that can be gleaned from the seven cases surveyed in this report are as follows:

(a) *Demarcating the region for conservation value*: The first part of the planning phase of any TBPA should consider the conservation importance of a region based on ecological factors. Diplomatic means should be used where possible to convince neighboring states and communities to rezone areas that might be most ecologically and socially appropriate for the area. The Borneo case examples showed that such rezoning is possible while the Emerald Triangle case revealed the drawbacks of not considering such a prospect for the Dong Khanthung region in Lao PDR. This case also shows the importance of considering not only federal but provincial and local jurisdictions for action across international borders.

(b) *Resolve micro-conflicts before instituting conservation plan*: Conservation has a checkered history among many communities who consider it a land-grab and this view can be even more acute in border areas where territorial security is further threatened. Resolving these disputes early on can build trust as exemplified from the Borneo case where a blockade against initial project work was transformed through early and continuous engagement and trust-building. Having a dispute resolution system incorporated in the conservation plans can be helpful as suggested by the experience in the African case studies.

(c) *Make livelihood prospects as they relate to migration part of the negotiations*: TBPAs will be particularly vulnerable to the "jobs versus environment" narrative because of the threat of migration flows across borders. Hence, providing

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[32]Respondent Trevor Sandwith, Director of Protected Areas Program IUCN, via email September 18, 2010.

opportunities for improving aggregate livelihoods through considering cross-border synergies for jobs is vitally important. ITTO has the potential to further this goal through its partnerships with private companies in regions of operation in border communities. The Congolese projects showed how managed logging can border protected areas but the potential for livelihood generation in this and other cases has yet to be fully realized.

(d) *Negotiate access and communication during earliest phase of agreement*: Peace treaties can resolve disputes but don't necessarily address issues of access without clear and consistent bureaucratic procedures. This in turn can hinder the cause of conservation as exemplified by the Cordillera del Condor case. Access across borders is a particularly sensitive issue for indigenous communities and deserves primary attention in the negotiation phase of conservation agreements. The Gabon-Cameroon case also showed that access to hold personnel meetings remains a challenge. Reliable communication is the most essential ingredient of trust-building and every effort needs to be made to ensure "open channels" for collaborative interactions.

(e) *Seek mediation and diplomatic leverage from "guarantor" countries and NGOs*: TBPAs have historically been facilitated by international mediation, either through donor funds for technical support or more formally through mediation of peace treaty. The Condor case suggests the importance of "guarantors" in such processes. However, the guarantors need to remain engaged even beyond the signing of the agreement to ensure that progress is made on the ground in implementing the terms of the accord. Large international organizations and NGOS can also play such a role, though often with less overall leverage.

Transboundary conservation is an essential part of meeting the goals of ecological regionalism. Since natural systems transcend political borders, our management approaches must also aspire to transcend physical and cognitive barriers (Shine and Sandwith 2001). However, a pragmatic approach to transboundary conservation requires us to proceed with care to address local grievances and have an adaptive framework for operations. International agreements such as the Convention on Biological Diversity have within their programs of work a commitment to transboundary conservation. ITTO's initiatives have tried to follow such mandates with alacrity and continue to seek further opportunities for improvement. Considering the inertia within international systems, particularly in sensitive border regions (Hampson 1996), these projects reveal the rewards and the ongoing struggles in gaining legitimacy for global transboundary conservation.

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Chapter 7
Multi-stakeholder International Governance Initiatives: Addressing the Challenges of ASM Sector in Ghana

Natalia Yakovleva and Diego A. Vazquez-Brust

Abstract Artisanal and small-scale mining (ASM) sector employs as many as four million people in sub-Saharan Africa. Over 200,000 people in Ghana alone are engaged in mining diamonds and gold at small-scale level. ASM is an important economic sector and income generating activity for rural and urban populations. However, the sector is also associated with adverse impacts on the natural environment, irresponsible mining techniques, social and health problems, dangerous working conditions, gender discrimination, conflicts between illegal ASM operators and large-scale mining companies, child labor and criminal element. Various international organizations have implemented a series of initiatives with an aim to address institutional, technological and environmental problems of the ASM sector in Ghana. Based on the analysis of documents and semi-structured interviews, the paper uses institutional analysis and collective action as conceptual frameworks to examine the success of such cross-border initiatives and it impact on the governance of the ASM sector in Ghana. The paper also discusses how other initiatives, involving local actors, are developing in Ghana.

Keywords Multi-stakeholders • Governance • International developmental institutions • Small artisanal mining • Ghana

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7.1   Introduction

Artisanal small-scale mining (ASM)- in this chapter defined as artisanal mining of mineral resources conducted on a small-scale by individuals or groups of miners using rudimentary techniques- is a global industry that supports the livelihood of 13 million people worldwide, through a significant share of ASM operations are conducted informally. In sub-Saharan Africa ASM employs as many as four million people and 200,000 of them work in Ghana, where often unregistered miners operate gold and diamond mines. In Ghana, ASM is a growing sector and important income generating opportunity that attracts workers from around the country and neighboring states. However, the sector has been also associated with many adverse impacts on the natural environment, irresponsible mining techniques, social and health problems, dangerous working conditions, gender discrimination, child labor and criminal element, and conflicts between illegal ASM operators and large-scale mining companies. With the assistance from international organizations, from 1989 to 2009, the Government of Ghana and the mining industry implemented various initiatives to address some of these institutional, technological and environmental problems, with the overarching aim of improving governance in the ASM sector. However, the outcomes of these initiatives were disappointing both in terms of the specific challenges targeted and in terms of improved governance in the sector. By 2009, all these major programs have been completed or downsized but the ASM sector still remained largely unregulated and highly conflictive, with frequent, sometimes violent, confrontations over the exploitation of mineral resources between mining multinationals and informal small scale miners or "galamsey".[1]

This chapter aims to understand why improving governance in the ASM has been so challenging and why major multi-stakeholders initiatives promoted in the sector by international organizations (World Bank, United Nations, GTZ) did not succeed. Methodologically, the chapter uses analysis of legislation and policy reports from international organizations to complement field observation and interpretive analysis of 26 in-depth semi-structured interviews conducted with a range of key actors in ASM governance in Ghana from 2005 to 2008. The chapter first describes the context of ASM in Ghana, presenting in more detail its history, the governance challenges faced by the sector and finally outlining the above mentioned multi-stakeholders governance initiatives. This is followed by the introduction of the theoretical framework: "new institutionalism" (Paavola 2007; Ostrom 2005; Polski and Ostrom 1999), and its relevance to study the problems faced by collaborative initiatives targeting ASM governance challenges. The analysis section evaluates the governance system in Ghana and the reasons for the failure of multi-stakeholders initiatives using the lens of new institutionalism. Finally, the discussion section

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[1]Galamsey is the local term for informal small scale mining, it derives from the expression "get all and sell it".

relates the initiatives' shortcomings with a major structural issue taking place in Ghana: the transition from community led to state-led governance and the processes of resistance surrounding the transition.

7.2   Background

Ghana is one of the largest gold producers in Africa; gold production contributes 5 % to country's gross domestic product and 37 % to exports. Since 1990s, the investment in the Ghana's mining sector has been dominated by foreign companies; and by 2008, over 200 mining companies were awarded mining leases and exploration rights by the Government (Boon and Ababio 2009). However, the tradition of artisanal gold mining in Ghana dates hundreds of years back, before the establishment of a legal regime for mining operations in the country (Hilson 2002). The legal regime for mining operations in Ghana is divided into two parts: the first was established for large-scale mining operations and the second was drawn for small-scale mining. The large-scale mining regime was established in 1986 by the *Minerals and Mining Law* (PNDCL 153) soon after the Government of Ghana launched the National Recovery Plan in 1983, following the guidance of the International Monetary Fund (IMF) (Hilson 2002). In the wave of IMF assisted liberalization of investment regimes, Ghana too liberalized its investment regime aiming to attract foreign direct investment into exploitation of country's mineral resources. The IMF promoted governance solutions aimed to increase economic efficiency through market friendly policies. The new legislation introduced variable royalties (3–12 %), reduced corporate tax (35 %), removed restrictions for dividend transfer and reduced import duties to encourage start-ups of large-scale mining enterprises (Hilson 2002; Akpalu and Parks 2007).

The regulatory regime for small-scale mining was formed in 1989 with the *Small-Scale Mining Law* (PNDCL 218), which began to formalize artisanal mining activities previously on the informal economy (Appiah 1998; Hilson and Potter 2003; Yakovleva 2007; Hilson 2010a). The 3 years delay between the *Mineral and Mining Law* and the *Small-Scale Mining Law* created a regulatory void during which informal small-scale mining, following the global rise in gold prices had expanded significantly. In the course of the 1990s and 2000s, the ASM sector in Ghana continued its rapid growth in investment and operations. However, only a portion of small-scale miners are legalized, i.e., formally registering as small-scale miners with licenses and permits acquiring plots for mining activities according to the small-scale regulation (Banchirigah 2008). A substantial share of the ASM sector remained informal (Aubynn 2009) conducted by "galamsey": unregistered small-scale miners on land plots without official permission. The galamsey group has been a great concern for the country's regulatory system and its enforcement authorities, as they tend to conduct their mining activities on plots that have been

designated to other users, often large-scale mining companies, which acquired their concessions for exploration and mining activities under the legal regime for the large-scale mining operations.

Apart from the complexities of the legal regime for large-scale and small-scale mining, Ghana has two major coexisting land regimes – state land regime (regulated by land legislation and enforced by state authorities) and customary land regime (regulated by ancient tradition and enforced by local chiefs). Whilst large-scale mining enterprises (often multinationals) and registered small-scale miners are operating under the state land regime to access mineral resources, whereby mineral rights and land rights are allocated by the state; "galamsey" are operating under the customary land regime, whereby they access mineral resources with a permission of local chiefs to operate on land plots traditionally belonging to certain chiefdoms. Obviously, the latter group of mineral resource users are violating the state imposed land and mineral rights regime, and contributing to conflict around access to resources between the state, large-scale mining enterprises and informal small-scale miners.

Besides the conflict between mining parties, the ASM sector in Ghana has been associated with adverse impacts on the natural environment and human health due to improper use of mercury and other chemicals in mineral recovery, irresponsible mining techniques (i.e., mines are often left abandoned without proper re-cultivation, officially small-scale miners are not allowed to use blasting, a prohibition often overlooked by galamsey which leads to greater damage to natural landscapes), social and health problems, dangerous working conditions, gender discrimination, child labor and security issues (Hilson 2006, 2010b; Hilson and Yakovleva 2007; Yakovleva 2007). The governance of the minerals sector has been further affected by institutional weaknesses in the area of environmental management and regulation, as the Environmental Protection Agency Act was passed by Ghanaian Parliament only in 1994, 8 years after the enactment of the *Mineral and Mining Law* (Akpalu and Parks 2007).

On the hand, several major initiatives supported by international organizations were designed and implemented during the course of 1989–2008 with the overarching aim to improve the governance of the ASM sector in Ghana, specifically targeting regularization, pollution, institutional development and policy support in the small-scale gold mining sector. The initiatives analyzed in this chapter are five: (1) Small-Scale Mining Project; (2) Mining Sector Development and Environment Project; (3) Prestea Action Plan; (4) Alternative Livelihood Project; and (5) Abatement of Mercury Pollution Program.[2]

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[2]Beside, other multi-stakeholders initiatives have had an impact on small-scale operations in Ghana, such as: Diamond Sector Reform Programme supported by the United Stated Agency for International Development (USAID); Compendium of Best Practice in the Small-Scale Mining developed by the UN Economic Commission for Africa; Extractive Industries Transparency Initiative (EITI); Global Dialogue; Kimberley Process Certification Scheme; and Diamond Development Initiative International. These initiatives are excluded from the analysis as they address broader geographical areas, minerals commodities, issues and topics.

As Table 7.1, below, shows, the assessment of these programs outcomes by their funding organizations ranged from "moderately satisfactory" in one case to less than satisfactory, partial, or total failure in the rest (World Bank 2003). Academic literature was less generous with all the programs (see Hilson and Yakovleva 2007; Styles et al. 2010; Telmer and Veiga 2008). Hilson (2010a) highlighted the many governance failures remaining after the programs came to an end. It proved extremely difficult to bring the sector under regulation, register all small-scale miners, distribute land plots, effectively oversee environmental and health impacts, prevent human rights violations against local communities and provide alternative lifestyles to farmers expelled from there. Besides, a government official interviewed for this research suggested there are much more illegal miners than those formally registered, which constituted a significant challenge for the government, workers, legal operators and local communities and escalated into incidents of expulsion of galamsey with force leading to violence.

7.3   Framework

The new institutional approach to governance[3] (Paavola 2007; Gibson et al 2005) suggests that governance is best understood as the establishment, affirmation, or change of institutions to resolve conflicts over the use of resources. To date, new institutional research has focused in governance of common pool resources – i.e., forests, pastures, fisheries – with which the governance of mineral resources in Ghana share two defining attributes: rivalry over consumption and difficulty of exclusion. Institutions resolve conflict by striking a balance between conflicting interests. A Governance solution is the particular configuration of exclusions, entitlements and institutional rules underlying the decided best balance of conflicting interests (Ostrom 2005).[4]

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[3]This approach calls to extend analysis from common pools resources to other kinds of resources. It also extends the use of institutional analysis from local (i.e, local common property arrangements) and international domains of application (i.e., environmental conventions) to all governance solutions, including national environmental and natural resource use policies and multi-level governance solutions (Paavola 2007).

[4]Institutional Analysis focuses on the interactions between individuals (individual actors) or organizations (collective actors) which make decisions on governance solutions over a course of action Actors interact with each other in "action situations" leading to certain outcomes which are bounded by context exogenous variable such as biophysical and material conditions, attributes of the community, institutions and rules-in-use. Attributes of the community are "the values of behavior generally accepted in a community; the level of common understanding that potential participants share (or do not share) about the particular types of action arenas; the extent of homogeneity in the preferences of those living. in a community; the size and composition of the relevant community; and the extent of inequality of basic assets among those affected" (Ostrom 2005, pp. 26–27). In trun, rules are conceptualized as "the set of instructions for creating an action situation in a particular environment" (Ostrom 2005, p. 17).

Table 7.1 Multi-stakeholders initiatives in ASM in Ghana

Initiative	What and why?	The target	Instruments	Donor assessment
Mining Sector Development and Environment Project Partners World Bank (Donor) Minerals Commission Ghana Implementation 1995–2009	Capacity building of the mining sector institutions and support for the SSM. The reason was the relative neglect of socio-economic and environmental issues in the World Bank's earlier interventions in the mining sector	Mining sector institutions, the mines (the construction of a dam), the miners (health)	Introduction of the new equipment, new retorts, capacity building instruments, new developments (dam, reclamation of land)	Moderately satisfactory
Small-Scale Mining Project Partners German GTZ (Donor) Ghanaian Government, PMMC, the Geology Survey Department 1989–2005	The provision of support to the SSM just after its legalization; because the mining sector required support after the legalization	The mining sector (emphasis on SSM)	Improvement of technological aspect of existing mines; provision of new equipment; search for new areas for SSM	Many objectives not met
Prestea Action Plan Partners Ghanaian Government, Mineral Development Fund, CASM (UK World Bank, Donor) ; Golden Star Resources 2005–2008	Relocation of galamsey to suitable area; improved organization of the SSM; in order to legalize their activities; in order to foster greater engagement with galamsey	The industry, but mainly the galamsey themselves	Newspaper announcement; setting new demarcated areas for settlement which lacked sufficient services	Failed

Alternative Likelihoods Projects (2005, ongoing), also including Local Economic Development Projects; umbrella title "Re-Skilling Programs" *Partners* *Ghanaian government and universities, OICI (an international NGO)* *Multinational companies (e.g. Anglo Gold Ashanti, Newmont)* *Example: collaboration between AngloGold Ashanti and university centers* *2005-ongoing*	To provide alternative likelihoods to galamsey; in order to dissuade them from illegal mining and attract to other activities such as farming; belief that other activities can be more profitable and beneficial for communities	galamsey	Training in other activities; business-awareness training	Disputed, less than satisfactory in several cases
UNIDO Abatement of Mercury Pollution Program *UNIDO, Ghanaian and Tanzanian governments*	Assessing the impact of mercury on environment and human health, raising awareness, fostering better technologies	Galamsey, the industry	Formal and informal training; various material disseminated; technical and non-technical issues covered	The organization of the project appeared to be much better

Table 7.2 Current governance functions of the ASM sector

Governance functions	Application to ASM sector in Ghana
Exclusion of unauthorized actors	Registration of small scale miners
Regulation of authorized uses and distribution of their benefits	Allocation of suitable land for small scale miners to operate. Prospection costs
	Identification of health and safety and environmental risks, alternative technologies, land compensation, resettlement
Provisioning and recovery of costs	Financial and technical support
Monitoring	Mineral Commision Inspectors. Limited institutional capacity
Enforcement	Expulsion of of unregistered small scale miners from concessions
Conflict resolution	Alternative uses, mining excludes other issues, large scale mining excludes small scale
Collective choice	Spaces for dialogue betwen galamsey, government, industry, and customary authorities. Inclusive decision-making (not enabled)

Rules can be formal (laws, regulations etc) and informal (how things are done, cutural and religous codes of conduct), Paavola (2007) identifies four types of rules shaping the interactions between actors:

– *Rules of exclusion* define how unauthorized users of a resource can be excluded.
– *Rules of entitlement* assign actors the rights to use a resource and create hierarchies of rights and accepted uses, these can have implications for government outcomes and distribution of benefits of resource use.
– *Monitoring rules* determine what is monitored and by whom.
– *Decision-making rules* configure which actors entitled to make decisions, the procedures they should follow and whose interests should be balanced/prioritized when making a decision.

Rules define what actions are "required, prohibited, or permitted and the sanctions authorized if the rules are not followed" (Ostrom 2005, p. 38). A well designed system of rules provides the support for seven "governance functions" that should be fulfilled by a governance solution to warrant successful outcomes. (1) Exclusion of unauthorized actors, (2) Regulation of uses and distribution of benefits, (3) Provisioning and recovery of costs, (4) Monitoring, (5) Enforcement, (6) Conflict resolution, and (7) Collective choice. Table 7.2, expands on this functions with examples of its application in the ASM sector's governance. Three main types of governance solutions, i.e. state-based, community-based and co-management respond to particular configurations of aforementioned governance functions and rules (Paavola 2007).

Finally, there are three successive and interrelated levels or functional tiers of governance where the fulfillment of functions should be consistently aligned by governance solutions: operational, collective choice and constitutional choice

(Ostrom 2005; Paavola 2007). The functional tiers are governed by corresponding rules (Di Gregorio et al. 2008; Nicholson 1993). Outcomes of the constitutional level are decisions about the authority and agency of decision-makers, what areas are regulated and which patterns of interaction define relationships among decision-makers (e.g. laws, voting rules and representation). At the collective choice level authorized authors make choices interpreting the outcomes of the constitutional level (i.e., who is entitled to use a resource and how) the rules they follow in making such decisions are institutional rules. The operational level of governance includes the results of decision-making on day-to-day activities that affect the physical world directly within the constraints of operational rules which define choice sets. Paavola (2007) also suggests that the choice of governance solutions is a matter of social justice rather than economic efficiency, emphasizing the importance of governance solutions that can accommodate private ownership and collective ownership.

7.4 Methodology

The research used both secondary and primary data. Secondary data from international organizations and policy reports and regulation was used to make a preliminary asesment of multi-stakeholders programs and governance in the sector. To investigate more in-depth the reasons for failure, 26 semi-structured interviews were conducted with key actors in the ASM sector in Ghana in 2005 and 2008 (see Table 7.3). The interviews lasted between one and two hours. Interviews topics included sustainable livelihoods, challenges of the ASM sector, conflict between small- and large-scale mining actors and success of multi-stakeholder governance initiatives. Interviews were recorded with a permission of respondents and later transcribed. The transcripts were coded focusing on three core aspects in Paavola (2007) framework: (1) functional and structural tiers of governance institutions; (2) governance functions and their organization; (3) formulation of key institutional rules.

Table 7.3 Interviews by type of actor

Range of actors	Interviews
Government departments	11
Small-scale miners and buyers	4
NGOs[a]	5
Large-scale mining companies and industry associations	6
Total	26

[a]Includes NGO and university

7.5   Analysis

7.5.1   Governance of ASM

According to Paavola (2007) governance solutions require a promotion of procedural justice which is concerned with the following questions:

1. Which parties and whose interests are recognized and how?
2. Which parties can participate and how?
3. What is the effective distribution of power?

Our analysis reveals that major parties or actors involved in the governance of the ASM sector are: registered small-scale miners; informal small-scale miners (workers and groups who are not legally registered as small-scale miners and/or who conduct operations on plots which are not legally allocated to them to lead mining activities); members of the small-scale mining value chain (financiers, buyers and equipment suppliers); customary land owners (chiefs and individuals); other land users (farmers, etc); large-scale mining companies; local communities around both the mines; members of a network formed around the small-scale mining (suppliers and vendors, etc); national government and its departments at national, regional and local level; local municipal authorities; nongovernmental and civil society organizations; large-scale mining companies and their associations; and international organizations.

We find that the current governance of the ASM sector has set the rules of exclusion that define who are formal and informal small-scale miners. Entitlement rules have also been put in place, these are procedures for registration of small-scale mining operations, licensing and permitting. Although a system has been put in place to monitor the operations of small-scale mining sector, it only extends to registered miners and cannot effectively monitor informal mining operators. Finally, informal small-scale miners are excluded from influencing the decision concerning use of minerals, land and other natural resources. The distribution of power attempted by governance functions aimed to transfer power from the customary land use regime to the state-based regime. To this end, governance rules disempowered communities, customary authorities, small-scale miners and galamsey, while empowering the central government, large companies, and supranational institutions such as the World Bank and a select number of international NGOs.

The analysis of levels of governance reveals weaknesses in procedural justice and a substantial lack of alignment between actors and governance rules in each level. As a result, the distribution of power is ineffective as evidenced by the steady spread of galamsey activity and large firms' impotence to protect their concessions from occupation. Indeed, incidents of expulsion of galamsey[5] with

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[5]Galamsey is the local term for small scale miners, derives from the expression "get them and sell".

force leading to violence are just the surface of an increasingly antagonistic pattern of relationship between major actors in the mining sector (government, registered small-scale miners, large-scale miners, unregistered small-scale miners, customary authorities) that leads to social injustice (exclusion of small-scale miners from legal access to mineral resources and over-exposure to environmental and health risks and violence). are just the surface of a growing antagonistic relationship between major actors in the mining sector (government, registered small-scale miners, large-scale miners, unregistered small-scale miners, customary authorities), This antagonisms is the expression of a social divide brewing social injustice in the form of the exclusion of small-scale miners from access to mineral resources, in the expulsion of farmers by new concessionaries of their lands, in the denial of traditional knowledge and norms and in the exposure of communities to violence and environmental risks.

Constitutional level rules – legislation – attempted to reduce the agency of customary authorities as described by the interviewee: *"Chiefs, their problem is that they do not have control of the concession, you see once the concession has given to the mine, the chief does not have any authority whatsoever."* (Manager of mining company 3 2005)

In addition constitutional rules denied traditional knowledge and excluded small-scale miners' interest from the design of formal rules for land allocation. This created both incentives for illegal mining and a regulation enforcement void that makes "formal actors" unable to prevent and control illegal activities.

> Now, if somebody goes into your concession and you report it to the chief, he has no authority to stop them coming. Indeed, the chiefs are often behind the illegal miners. Some chiefs took into their hand the authority to license small grounds to some groups. (Manager of mining company 1 2008)
>
> In the Awaso area, the police had been bought by the illegal miners, so in the end they had to bring in the military but this something us we would never do because the Ngo's already want some excuse to tarnish the image of registered mining companies. (Manager of mining company 2 2008)

In the Institutional level, formal processes reinforced injustices and created further incentives for illegal mining through cumbersome bureaucratic procedures, high registration fees and limited availability of suitable areas for small-scale mining.

> If you ask galamsey to pay 60000 cedis before they begin their activities they cannot do it. (Government official 4, 2005)
>
> The areas given for small-scale mining have not been explored, we do not know if there is any gold there; and there is no funding to hire universities. Small-scale miners are not allowed doing prospection and there is thius perception that all good goldfields are in concessions. So, why people would pay a license to work where there is no gold? They will go and find it in a concession, but if you are mining in somebody's land we cannot give you a license. (Officer from Minerals Commission 2008)

An additional incentive for informal mining was the lack of mechanisms to channel financial support for ASM miners. Neither public nor other institutional

funds are available in the country to support ASM activities *"...financial support for small-scale miners.. is on case to case basis ... they want to work systematically over a long period then they can actually make their case and present a request"* (Government official 5, Ghana 2005).

However, governance was achieved through informal institutions leading to incipient co-management solutions. Despite regulatory attempts to marginalize customary authorities, both galamsey and firms acknowledged some degree of agency of local chiefs to deliver governance functions as indicated in the interviews:

> Some chiefs took into their hand the authority to license small grounds to some groups. You have to make an agreement to give him some formal authority to act in your behalf. It depends on how influential the chief is. If the chief is influential he will use his authority to discourage or to persuade people from going into their lands. (Manager of mining company 2 2008)

Local communities also provide private investors to fund small-scale-mining, although at very high rates. At the operational level, formal rules and state representatives reject all interaction with galamsey- even for humanitarian purposes: *"The galamsey mandate is one of an illegal operator, operating on somebody's concession. So if you go there and advise the person then it means that you are glorifying illegality and that is dangerous"* (Government official 3, 2005). However, some companies successfully managed cooperative interactions with galamseys. The analysis reveal the development of bottom-up approaches to governance from the operational level, where a conjunction of day-to-day realities *"The reality is that you live with that problem, you need to interact with them and relate to them in the best possible way"* (Manager mining company 1 2005) and external constraints (image, international pressures) forces companies to interact and negotiate use of lands with informal miners and local chiefs.

> You need to know how to talk and engage the galamsey. They must trust you, you must be seen doing something for the community. We actually helped them in the day-to-day of doing galamsey, we help them increase recovery and move away from the use of mercury, we develop alternative programmes with them, even let them know that we can get some of them working on the main mine "Because we have good relationships with them, everytime they have tried to go into a particular concession we have been able to persuade them. We have also the fear of becoming a suction point for other miners, but it was the opposite, our miners fed-off new entrants to protect their relationship with us. (Manager mining company 1 2005)

However, changes need to reach the constitutional level to provide stable governance. In a well functioning governance system, actors can move among the different levels, looking for the best outcomes within a given set of rules or bargaining to shape collective or constitutional choice rules to their benefit. The review of the governance system of the ASM sector in Ghana ultimately reveals that the party that both affects the sector and is affected by the governance – informal small-scale mining operators – is largely excluded from decision-making and power distribution.

7.6   Multi-stakeholders Initiatives

The interviews revealed a consistent perception of failure of these initiatives at the operational level. Our analysis suggests that failures at the operational level were indeed the result of a combination of weaknesses of governance solutions at the constitutional, institutional and operational levels. In all the programs, legislation at the constitutional level was taken as a given. Therefore, the exclusion of galamsey from uses of land resulting from existing regulation, cascaded down to institutional and operational level solutions that explicitly denied galamseys the rights to access information or consultation. In many cases there was also misalignment between institutional and operational solutions, associated in many cases with the intention of supra-national institutions and some companies to enforce a variety of rules of exclusion of local actors, from attempts to impose one-size-fits all policies, to red-tape and explicit denial to acknowledge agency or entity to customary authorities. We will briefly analyze each initiative, highlighting insights into specific areas of governance solutions that need to be addressed.

7.6.1   Constitutional and Institutional Level Weaknesses

The Small-Scale Mining Project (SSMP) reveal asymmetries at the constitutional level in the design of programs in terms of the effective distribution of power between the funding institutions (WB and GTZ) and the Ghanaian government. The government had limited saying in terms of decision-making rules, from the design of the initiative, to selection of areas of intervention and appointment of experts. As a consequence Government representatives criticized the broad focus without due consideration of the local context. As a solution, Government representatives expressed a desire for narrow focused initiatives for specific geographical areas, which would take into account local conditions of mining and operations of the ASM sector in Ghana, as suggested by one of the Government officials: "*it's not emeralds in Zambia – it's gold mining in Ghana*" (Government official 2, 2008).

The Mining Sector Development and Environment Project targeted the constitutional and institutional functional levels but its reach at the operational level was limited. Although the initiative was discontinued by 2009, it played an important role as a founding initiative that assisted the development of the governing system of the ASM sector in Ghana. However Criticisms from interviewees highlighted failure to address a critical governance function: provisioning and recovery of cost, both at the constitutional, institutional and operational level. At the operational level in terms of provision of funding for small-scale miners keen to register, at the institutional level and constitutional levels in terms of resourcing of institutions, dealing with small-scale mining within the Government of Ghana, as one of the interviewers asserted:

To be honest with you, I think that the EU and World Bank projects in relation to the small-scale miners have been more of a lip service because if you go down the small-scale mining department of the Minerals Commission it is the weakest link of the Minerals Commission . . . They do not have the resources. It is the weakest link because, you see, they are reluctant to deliver and also assert authority in the case of finances and they are the least resourced. (Academic, University of Ghana 2008)

7.6.1.1 Institutional and Operational Level Weaknesses

Prestea Action Plan is a powerful example of how ill-designed exclusion and decision-making rules can hinder governance functions, in this particular case conflict resolution, distribution of benefits and exclusion of unauthorized users. The plan aimed to impose a strictly state-based governance solution for the conflict arising out of the occupation of Prestea mine by hundreds of galamsey. However, the government lacked information to provide a fair system of regulation of uses and distribution of benefits (providing alternative suitable areas for small scale exploitation). Neither had the government resources, nor willingness to continuously monitor uses and enforce exclusions rules. Critically, the government did not have technical information nor resources to fund a survey to identify areas feasible for small scale mining. However, small scale miners were not entitled to carry on their own explorations while galam*sey* communities were not consulted concerning attractiveness of proposed areas for mining. As a consequence, although the workers were initially removed from the concession of the large-scale company (with intervention of armed units), the small-scale miners did not take up areas that were identified by the Government for them to operate on. Instead, they scattered to other areas continuing the informal operations, spreading conflict with other mining multinationals and ultimately returning to the concession. The Government officials and others now voice an idea that corresponds to Paavolas' co-management governance solution. Large-scale mining can go alongside small-scale mining through voluntary agreements at the operational level negotiated with galamsey by the companies operating the concession, as commented in the following interview:

If you allow the small-scale miners to come to that place they will go beyond their bounds and then affect the large concession that you have, because of that you are denying them. But I believe that if they sit the small-scale miners down in and said that yes we have actually cordoned off this area for your operations. We have provided you with the technical systems so that you can actually operate very efficiently. Stay there and leave the bigger concession for us to work on I believe that system will work because it has been tried and tested at Awaso and it has worked so I know can also work elsewhere. (Government Official 6, 2008)

In 2005, most of our state and private sector interviewees praised the potential of alternative Livelihood Projects to improve governance and solve conflict by creating new sources of income in the ASM sector. However by 2008, the enthusiasm had petered out and livelihood projects were hardly mentioned by government representatives and companies. Despite good intentions, this outcome was almost inevitable. From the onset, the effectiveness of livelihood initiatives launched in the mining communities had been heavily criticized by local NGOs and local

communities. One of the aims of providing skills for local communities in mining areas was to deter from joining informal mining activities by providing them with skills to pursue productive employment and earning opportunities. However, the interviews revealed widespread failure both at the institutional level (lack of assessment of community attributes and needs, neglect of dominant informal rules, habits and capabilities) and operational level (implementation, engagement and take up). The governance solutions underlying livelihoods projects were particularly wanting in terms of justice in the distribution of benefits and enabling collective choice to decide how to compensate those excluded from the use of land. Farmers displaced from their traditional grazing lands by large-scale mining operations or aspiring artisanal miners denied access to concession areas were not generally benefiting from the skills programs, as reported by the local NGO:

> You see our people . . . are farmers and then you take away agriculture from them and then you tell them that I want you to be a fish farmer . . . picking snails . . . collecting leaves for wrapping food . . . this is work for women . . . tell them that shift from agriculture now go into grass cutter rearing, or go into snail farming . . . which lives wild in Ghana. Should the farmer go into soap making and compete in the open market with Lever Brothers, with multinational companies . . . We can get involved in any form of sustainable livelihood but the grass cutters will need grass and it's not available to them. (NGO officer, 2005)

The Abatement of Mercury Pollution Program was developed by United Nations Industrial Development Organization (UNIDO) in cooperation with the Ghanaian and Tanzanian Governments which participated in its design and operationalization. It aimed to eradicate poisoning owing to use of mercury by ASM miners. Its failure can be traced to two main problems. As in all other programs end users were excluded from design of solutions and decision-making (formal and informal ASM miners). In addition the program was oriented only at the operational level of the governance system of the ASM but failed to address how operational level aspects were connected to the institutional level through the supply chain of mercury in gold mining. As reported by the local NGO in 2005:

> Community people do not import chemicals, they do not import mercury. So if there's still mercury in the system the Government [should] make sure that when it finds the use of mercury, mining companies dispose of them properly. And what are they doing with them if they do not dispose of them? So, I think it's something that someone should investigate. The link between the use of mercury by galamsey people and the mining companies. (NGO officer, Ghana 2005)

7.6.2   Discussion: The Reason for Failure of Multi-stakeholder Initiatives and ASM Governance

The implementation of governance initiatives examined in this chapter followed a logical pattern. The early initiatives were mostly focusing on establishing constitutional arrangements, moving onto institutional arrangements and the most recent ones introducing initiatives that target operational level of governance. Although

the growth of informal sector persisted throughout the 2000s, and most of the initiatives to some extent failed to deliver the outcomes expected, we cannot dismiss these initiatives as total failures as these were introduced and implemented in the circumstances of almost total non-existence of formal governance rules. It is a gradual process. By building the system from top to bottom, each initiative is built on the previous one, accumulating more experience, building on evidence and resources constructed during the preceding initiatives. It is evident that these initiatives are linked and it could be seen as a positive sign that, at least these initiatives do not ignore the previous experiences and start anew. In isolation, none of them can be seen as a total success, but together can be seen as steps to building a formal system. However, the close examination of these governance initiatives reveals several design and implementation failures, and if addressed can lead to efficient delivery of such programs.

The joint analysis of governance conditions and multi-stakeholders programs aimed to solve the problems of ASM mining reveal an underlying structural problem: constitutional rules exclude customary authorities and create a vicious circle of exclusion of galamsey. Initiatives that were designed to address the challenges of the ASM sector (spanning to both formal and informal sides of it) have mainly failed to incorporate the informal users in its development and implementation.

As a consequence the voice of small miners and its day-to-day problems and realities have been excluded from the design of multi-stakeholders programs providing basic training on environmental and health and safety issues or aiming to develop alternative livelihoods to mining. Unsurprisingly, these programs failed. Indeed, it was not only galamseys who were excluded from important governance functions in these programs. The programs also missed to take into account the role and influence of key players in the political economy of informal mining such as chiefs, vendors, suppliers and financiers of small-scale-mining were ignored. Constitutional decisions followed the donor's agenda and donor's priorities (e.g. decisions such as who is considered an expert, where the programs were focused, what problems were targeted and what solutions implemented). Local stakeholders were only involved in the collective action and operational level, within the rules of interaction and procedures defined by the donor. As a result, local stakeholders seem to think that these programs often had a hidden agenda to benefit donors (e.g. paying foreign experts and buying foreign technology) and are not satisfied with the outcomes of collaboration to solve local problems.

As a case in point the extracts from an interview with Minerals Commission officer that collaborated with GTZ exemplifies problems highlighted in most programs. Problems affecting collaboration included perceived lack of transparency: *"I don't think we derived much from GTZ. I mean the funding the German government provided. They never made us aware of how much money was going to the project and they would bring their so-called expert and said, oh this man is here for 24 months. How much are you paying that person? Nobody knows"* (Officer from Minerals Commission of Ghana 2008).

The second most important drawback of the program design was the failure to draw on local expertise and distrust of legitimacy of offered expertise as indicated by the same interviewee's testimony:

> They brought some German pumps, whether those pumps can really do the work satisfactorily for the miners on the ground is for me and you to judge. Most of them I would say never performed. In fact just a waste of resources. (Officer from Minerals Commission of Ghana 2008)
>
> They don't do small-scale mining in Germany. They don't mine gold there. They mine coal and they bring a coal expert and tell you that person is an expert in gold small-scale mining. That's unheard of! (Officer from Minerals Commission of Ghana 2008)

From the institutional perspective, the current challenges of the ASM cannot be resolved by multi-stakeholders' agreements where the agenda is decided by the northern donor and is underpinned by state-centric governance rules (Gibson et al. 2005). ASM challenges resulted from the forced transition from community-based management of resources, such as customary regulation of land and mineral resource use, to state-based governance system which are defined by Mining Code and small-scale mining regulation.

In order to be effective in the solution of ASM challenges, multi-stakeholders agreement should be designed to foster co-management solutions and develop collaborative relationships between stakeholders representing both regimes (Sarkis et al. 2010). Instead they have been used as tools to accelerate the transition and empower state-based institutions. According to the customary governance of natural resources, following a principle of unified rights for surface and mineral, the owner of land surface has mineral rights. Therefore, tribal chiefs that have customary rights for land surface allow artisanal miners to lead their operations on their lands, considering that mineral rights go together with land rights.

Customary resource use regime usually allows multiple use of land; such as for farming, fishing and mining (Di Gregorio et al. 2008). The interviews indicated that traditionally, small-scale mining has been conducted at the same time or complimentary to farming activities and communities were managing both mining and agricultural activities in the same area, until the new regime of state-based governance challenged this multiple use of land. State-based governance of the extractive sector excludes other uses in mineral rich areas and only allows mining activities in certain plots. This can be seen both in registered concessions for small- and large-scale mining.

By expelling farmers from mining plots while deterring rural population from joining the informal small-scale mining sector, the regulators do not provide alternative legal avenues of employment or unemployment protection. The sustainable livelihoods program aimed to protect the welfare of displaced farmers, but its success was once again frustrated by the design of alternatives without the adequate mechanisms to engage communities and customary authorities. Another facet of this discussion that should be integrated in multi-stakeholders agreements agenda is how to engage the surplus of small-scale mining industry-skilled labor (Hall and Soskice 2001). Hilson and Yakovleva (2007) observed that government policies were not effectively addressing the issues of protection and employment of industry-skilled

labor and thus many of them remained in informal sector. Alternative livelihood strategies in rural Ghana were initially perceived as an avenue to accommodate such labor surplus. However, most of them were unviable whereas the few cases that worked had limited scale-up potential (Banchirigah 2008; Okoh and Hilson 2011; Hilson and Banchirigah 2009).

It is evident that although state strategies aimed at containing informal mining and defer informal miners from accessing mineral resources, the system was not complete. Agents that bought gold from small-scale mining for the state Precious Metals and Minerals Commission did not discriminate against non-registered miners and continued to buy gold from unregistered miners. If the system was even further prohibitive of informal mining, it would lead to displacement of many thousands of workers from employment opportunities and income streams thus leading to negative social and economic effects in the mining areas of Ghana. Moreover, although there was concern for negative environmental effects of small-scale mining with respect of use of mercury, the control of mercury trade in the country was not explored.

The benefits for rural communities for engaging in informal mining are shown in studies highlighting increased rural incomes or second-income streams in the country which is concerned with poverty and economic growth (Okoh and Hilson 2011). As the number of informal miners grew, as well as the understanding of the sector, we saw that the attitudes towards informal mining changed. Galamsey are no longer seen as criminals, but a sector that is problematic and should be brought within the legal framework and monitored. Comparing the first interviews conducted in 2005 with those conducted by the end of the research in 2008, there are some changes in the perception of various actors about informal ASM from seeing them as illegal to treating them as informal.

> If you use the terminology of galamsey in this country, then it means people who are actually working on small-scale mining basis illegally. (Government official 1, 2005)
>
> Galamsey, they are informal miners because they are contributing to the informal economy, they buy food and equipment from local communities. You need to understand [that] in their culture, the land belongs to the community, even the chiefs do not own land. (Government official 4, 2008)

There were instances where key actors in the sector considered collaboration between informal (and formal) small-scale miners and large-scale mining operations. In some later interviews there were even institutional-level proposals to manage a double system for minerals concessions whereby small-scale miners will be working on a surface for a short period of time, followed by mechanized large-scale mining operations that can take place in the same areas.

> We have different galamsey operators. We have some who operate on the hard rock and others who mine on deep seated alluvial. But there is another type, who work only on the surface, the overburden, they call it 'dig and wash'. These type of people are not interested in licence. The reason why they are not interested in licence, they go there for a very short time. (Government official 2, 2005)

If ASM miners work for a short time on the surface companies can allow them work for a certain periods of time, stipulating the conditions of operations (use of chemicals and machinery) Although implementation of such proposals might be way ahead, the discussion of solutions different from total denial and exclusion could be the way forward for improved governance in the sector; pluralist and inclusive of many informal miners, who are using incomes for eradicating poverty and supplying much needed resources for the development of rural communities.

7.7 Conclusion

Table 7.4, below, summarizes the main factors influencing the success or failure of current governance solutions in the ASM sector in Ghana.

In the circumstances when major actors in the ASM sector are confrontational, there are difficulties in building spaces for deliberation. The current governance framework in Ghana lacks procedural justice mechanisms and therefore does not allow for promotion of open discussion and debate, inclusive of various parties in formal and informal sectors who are operating for the same market in the same

Table 7.4 Factors for success/failures of governance solutions in ASM sector in Ghana

Stage	Level	Factors
Design of Solutions	Constitutional	*State-based versus co-management governance system*
		State-based governance is not an appropriate solution for Ghana. Co-management, multilevel governance is required when local knowledge and cooperation is a condition for success
	Institutional	*Skills for deliberation*
		No initiatives to promote institutions/skills that enable deliberation
		Exclusion vs. inclusion
		Assumes that "unregistered" can be excluded from governance solutions and these would still be viable
	Operational	*Assessment of needs and capabilities*
		Lack of assessment what works on the ground
Implementation of solutions		*Consultation in decision-making:* Top-down approach fails to interpret acceptance factors at operational levels (limited consultation with end users)
		Evidence and expertise in decision-making: Suspicion of "quality of expertise" by parties involved in implementation
		Transparency of decision-making: Necessity to avoid limited transparency of decision-making
		Progression of solutions: Focus on general advice is contested by participants and greater desire to seek specific solutions

areas and intersect in many ways (Hall and Soskice 2001). As a consequence multi-stakeholder agreements underpinned by a northern state-and-market-centric perspective are largely ineffectual to address the sector's challenges and only respond to their donor's agenda. In an attempt to address the challenges of the informal sector, one solution could be found in building a discussion by deliberating and listening to different actors, such as customary owners and users, informal supply chain operators, traditional chiefs and informal small-scale operators themselves. By opening spaces for deliberation, future programs should focus on working to creating co-management solutions to address the following governance problems:

- Exclusion of small-scale miners from access to mineral resources.
- Entitlement and availability of land for ASM.
- Distribution of benefits, prospection rights for ASM on par with large-scale mining sector.
- Provision of financial and technical support to ASM.
- System for monitoring unauthorized users.
- Enforcement, such as implementation of viable alternatives to avoid violence and use of force.
- Limited acknowledgement of pluralism in decision-making

In addition to promoting public discussion, policy-makers could be considering alternative land regimes in mining areas. Could there be avenues for forming and constructing a system of alternate users on the same mineral concessions, whereby small-scale miners and large-scale miners may operate on same concession? Issues to consider are plenty: depth, periods and length of exploitation. How to control and regulate this system of alternate use? Can these be combined with agricultural activities or any other use of land? For instance alternating small-scale mining with farming? Can they exist side by side? How to regulate this system?

There are grassroots informal arrangements between large-scale mining companies and small-scale miners, where they co-exist either as neighbors or latter tolerated as intruders as long as they do not cause significant obstruction to the mining companies. This indicates that there is a space for such co-existence. If this practice exists, can it be formalized and negotiated? Can we see a future where small- and large-scale mining operators co-exist in the same area on the basis of negotiated agreements as an alternative to legislative reform?

Our analysis highlights the problems faced by the initiatives that have attempted to regulate and address negative impacts within the informal mining sector. The design of these initiatives with the focus on formal regulation and technical assessment, exclusion of end-users, informal rules and customary authorities from decision-making processes and the lack of suitable arenas for interaction, collective consultation and deliberation, have hindered their reach and significance. Future initiatives could be improved by reconsidering these top-down approaches to governance solutions. The framework of the analysis can be also applied to improvement of governance solutions for informal economies in the sectors other than mining.

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Chapter 8
Implementing a Developing Country's Global Environmental Commitments: Industry Perspectives on Potential Pollution Prevention Programs in Bangladesh

Asadul Hoque, Amelia Clarke, and Adriane MacDonald

Abstract This chapter is positioned in the literature that discusses the tension between global environmental commitments and local implementation from the perspective of a developing country. It focuses on the implementation of international conventions, treaties and protocols signed and ratified by Bangladesh, as evidenced by the existence of related programs. The programs examined in this study were proposed by the Asian Development Bank in 1994, based on international best practices for industrial pollution prevention. The chapter also frames the regulatory, market-based and voluntary initiatives on a policy continuum from compliance, cooperative and collaborative approaches and compares the perceived existence of these approaches. The business perspectives of these programs are analyzed in the tannery, pulp and paper, fertilizer, textile and cement industries. Results show that although there are environmental regulations for preventing industrial pollution in Bangladesh, they are not as effective or comprehensive as they could be. The study also found that voluntary programs and economic incentive programs are present to a very limited extent. This study raises questions as to how to improve the implementation of global governance initiatives to which countries like Bangladesh make commitments.

Keywords International commitments • National government regulations and programs • Pollution prevention • Industry perspective • Bangladesh

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8.1 Introduction

Heavy industrialization continues to compromise the environment; consequently, human health is also being compromised in many developing nations. This is the case in countries where the prominence of heavily polluting industries remain active, such as Bangladesh's leather tanning, pulp and paper, fertilizer, textile and cement industries (Hoque and Clarke 2013); Mexico's leather tanning industry (Blackman 2008); and, India's cement, pulp and paper, and chlor-alkali industries (Blackman 2008). Globalization and the reality that state borders do not bind pollution produced from heavy industrialization, make the environmental issues of one country an international concern. It is often the case that intergovernmental organizations, such as the United Nations (UN) and the Asian Development Bank (ADB), will put pressure on these countries to sign international environmental agreements (Asian Development Bank 1994). These intergovernmental organizations exert pressure on countries in two ways: (1) offering carrots in the form of financing; and/or (2) using sticks in the form of trade sanctions (Barrett 1999). The tension arises when global commitments are made by developing nations as local implementation can be challenging. Issues such as inadequate financing, limited technical capabilities, weak institutions, and lack of befitting laws are barriers to meeting international commitments (Alam et al. 2008).

Although a few studies focus on the developing country context, the literature review shows that most research in this area has been conducted in developed countries. To our knowledge, no academic study has as of yet been undertaken in the context of Bangladesh that highlights potential pollution prevention programs from an industry perspective. For this reason, the researchers feel that this study, "Implementing a Developing Country's Global Environmental Commitments: Industry Perspectives on Potential Pollution Prevention Programs in Bangladesh" is an important contribution to the extant literature. This in-depth study on potential pollution prevention programs carries importance for Bangladesh because it can enhance the country's formulation of government policies and programs.

Theoretically, this chapter is situated in the literature that discusses the gap between global commitments and local implementation. It first discusses the global landscape, highlighting global environmental challenges, and the role of large-scale intergovernmental organizations in managing these challenges. Then, it considers the varying policy options available to governments for implementing environmental management and pollution prevention commitments by placing them on a continuum from mandatory to voluntary. This paper empirically explores these policy options from a business practitioner's perspective and determines which programs exist in five intensive polluting industries in Chittagong, Bangladesh. The research questions guiding this study are:

1. To what extent are internationally recommended programs, such as those suggested by the Asian Development Bank, implemented in a developing country?;
2. How are these programs perceived by business?; and

3. On a policy continuum from mandatory to voluntary industry participation, which programs are perceived by the business community to have the most uptake?

This chapter provides a summary of the findings from each research question, discusses the study's practical and theoretical implications, and concludes with a section on limitations and next steps.

8.2 Global Challenges and Pressures

Environmental pollution problems accrue from such trans-boundary sources as acidic deposition, ozone depletion, global warming, and surface water pollution (Callan and Thomas 1996). Today's business world is confronted with severe pressure from global environmental concerns to take essential measures for environmental protection, along with its business activities (Gomez and Rodriguez 2011; Pun and Hui 2001). Panwar (2002) reports that globalization has created a new movement for policy dialogue to encourage sustainable industrial development programs in all countries.

A number of international environmental agencies and conferences have been playing a significant role to preserve and protect the natural environment around the world. Some of these conferences include the United Nations Conference on Environment and Development (UNCED) and meetings related to the United Nations Framework Convention on Climate Change (UNFCC). Further, the contributions of international agencies like the United Nations Environment Program (UNEP), United Nations Development Fund (UNDF), World Bank (WB), and International Monetary Fund (IMF) are also worth mentioning (Uberoi 2004). Caplan (2003) reported that the Global Environmental Facility (GEF) was established (in 1990) by the World Bank, United Nations Development Program (UNDP) and the United Nations Environmental Program (UNEP) to finance developing countries in implementing their sustainable development plans. Over its 17 years, the UN's Global Environment Facility (GEF) has allocated US $7.5 billion intended to help tackle key global environmental problems (Mee et al. 2008).

There are significant opportunities for strengthening the capacity of environmental governance at national and local levels within Asia and the Pacific region (Asian Development Bank 2001). According to the Eco-Trade Manual (Komma Consultants BV 1996), United Nations Industrial Development Organization (UNIDO) works with a number of countries in the preparation of Environmentally Sustainable Industrial Development (ESID) strategies aiming at formulating government policies and programs, which would promote Cleaner Production (CP) as an essential element of sustainable development plans. In this regard, UNIDO contributed to an environment pollution control program for leather industries in Southeast Asian countries, financed by the governments of Austria, Denmark, Germany, Switzerland and Nederland (Alam 2002).

Table 8.1 International conventions, treaties and protocols (ICTPs) signed and ratified by the government of Bangladesh

Convention, treaty, protocol	Year	Signed/ratified
Cartagena Protocol on Bio-safety to the Convention on Biological Diversity	2000	Signed
Kyoto Protocol to the United Nations Framework Convention on Climate Change	1997	Signed
International Convention to Combat Desertification	1994	Ratified
Agenda 21, UNCED	1992	Signed
United Nations Framework Convention on Climate Change	1992	Ratified
Convention Concerning Safety in the Use of Chemicals at Work	1990	Signed
Convention on Civil Liability for Damage Caused during Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels	1989	Signed
Montréal Protocol on Substances that Deplete the Ozone Layer	1987	Ratified
Vienna Convention for the Protection of the Ozone Layer	1985	Ratified
Convention Concerning Occupational Safety and Health and the Working Environment	1981	Signed
Convention on the Conservation of Migratory Species of Wild Animals	1979	Signed
Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration	1977	Signed
Convention Concerning the Prevention and Control of Occupational Hazards caused by Carcinogenic Substances and Agents	1974	Signed
International Convention on the Establishment of an International Fund for Compensation for Pollution Damage (as amended)	1971	Signed

Sources: Alam et al. (2008), Gain (1998)

Numerous international environmental conventions, treaties and protocols have been created in the last 50 years (Ebbesson 2010). The Government of Bangladesh has signed and ratified a number of international conventions, treaties and protocols relating to the conservation and protection of the natural environment, as shown above in Table 8.1.

8.3   Local Implementation

There are programs that governments can choose from to promote pollution prevention in industry operations (Asian Development Bank 1994). Figure 8.1 shows policy options presented by the Asian Development Bank that governments might employ for local pollution prevention to meet commitments made in international treaties, conventions and protocols (ITCPs).

While these policy options exist, there are a number of barriers that come up when developing countries attempt to meet goals set in international treaties, conventions and protocols. Some barriers include insufficient funds, skilled labor, and information, as well as poor coordination and institutional integration (Alam et al. 2008). Despite these barriers, international conventions continue to have a
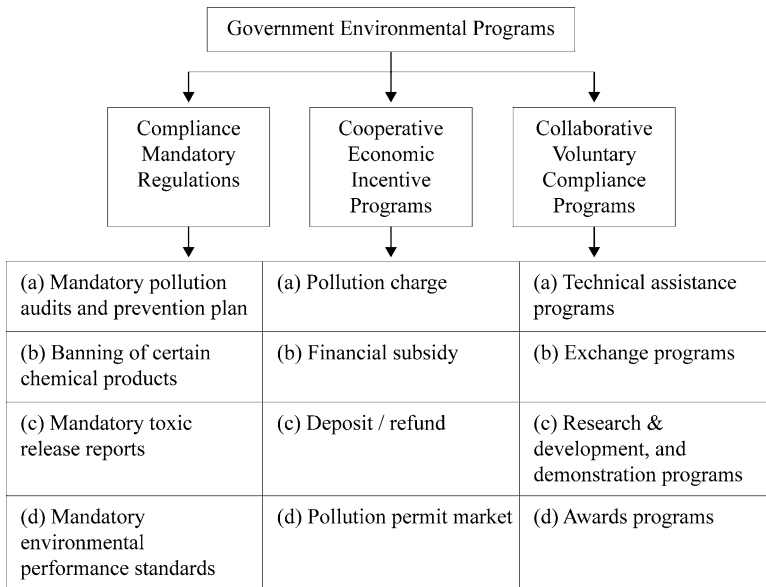
Fig. 8.1 Combination of programs for pollution prevention (Sources: Asian Development Bank 1994; Callan and Thomas 1996)

strong influence on planning processes in many Asian countries (Alam et al. 2008). While regulations often exist in developing countries, they can be challenging for government to force pollution-generating industrial business units to abide by them. For example, clusters of small and medium-sized enterprises (SMEs) create severe pollution problems given conventional regulatory approaches are typically ineffective (Blackman and Kildegaard 2010). Additional challenges for the local implementation of voluntary programs in developing countries are ineffectively enforced regulations and non-regulatory pressures placed on industry (Blackman 2008). Therefore, if governments improve the legitimacy of their current regulations, they can incentivize polluter participation and integrate voluntary programs into their policy programs.

8.4 Policy Continuum

The following section discusses these policy options on a continuum from compliance to collaborative. Strong government actions (regulatory intensive) are related to firm cooperation, as many firms adopt sustainability strategies only when coerced to do so by government (Clemens and Papadakis 2008; Urpelainen 2011). Complementary partnerships and collaboration can also be used for addressing meta-problems associated with achieving sustainability (Clarke and Fuller 2011;
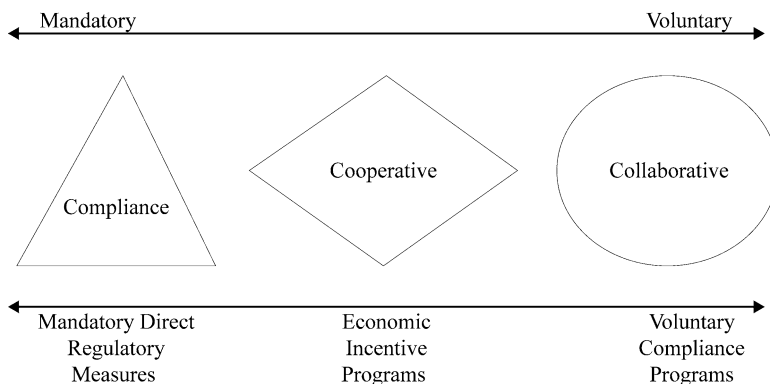
Fig. 8.2 Policy continuum

Huxham et al. 2000; Trist 1983). Contemporary environmental governance will not necessarily result in a complete shift from mandatory regulation to voluntary compliance or market mechanisms; rather, it will combine mandatory and voluntary approaches in an innovative and complimentary way (Falkner 2003; Ruggie 2004; Vogel 2008). The relationships formed between private and public stakeholders are complex (Falkner 2003; Vogel 2008), which result in nested systems of governance that integrate the broader global frameworks that were not historically present (Ruggie 2004). This section delves deeper into each classification of policy option by discussing them on a continuum from mandatory to voluntary. Figure 8.2 integrates themes from bodies of work in political science, public administration, environmental management, and collaboration theory.

8.4.1 Compliance

The compliance policy classification commonly referred to in the literature as "command and control" represents the traditional approach that governments take to manage environmental impacts of industrialization (Lynch-Wood and Williamson 2011). For instance Khanna and Anton (2002, p. 539) say that, "the United States has traditionally relied on mandatory command and control environmental regulations to protect environmental quality". Environmental regulations are also an important driver in developing countries, especially for pollutant intensive industries (Salomaa and Watkins 2011; Watson and Emery 2004). This type of approach is defined by rigid mandatory regulations that are enforced by the state (Asian Development Bank 1994). The primary advantage of this approach is that it is considered legitimate and forces action. At this level, environmental regulations provide a means for government to ensure that all companies reach a minimum environmental standard (Frederick et al. 1992; Ravichandran and Balasuadaram 1999).

The criticism of this approach is that it is costly to government because it requires regular monitoring and enforcement (Whitten et al. 2007). In this approach, the level of communication between government and industry is one direction, and the level of collaboration at this stage is quite low.

8.4.2 Cooperative

The next set of policy options available to governments for pollution prevention and environmental management are classified in this analysis as cooperative. This category includes a range of market-based instruments (MBIs). MBIs have become increasingly popular in environmental policy (Clarke and MacDonald 2012; Roseland 2000). The World Bank's perception of "new environmentalism" emphasizes the need to apply market-based initiatives instead of command-and-control regulations to make industries pollution-free (Ravichandran and Bala-suadaram 1999). Governments can choose from an array of MBIs to incentivize industry behavioral change through market signals for improved environmental practices (Bocher 2011; Collins and Scoccimarro 2008; Roseland 2000). Some MBIs include taxes and charges to disincentivize poor environmental practices, and rebate programs and tradable permits to incentivize positive practices (Roseland 2000; Whitten et al. 2004). Advantages of using MBIs is that they are comparably less expensive than regulatory approaches (Stavins 2003) and, in theory, they have the potential to be effective, efficient and flexible (Whitten et al. 2004). The disadvantages are that they do not ensure compliance from industry since the success of these instruments are highly context dependent and require the presence of certain institutions which developing countries often lack (Kathuria 2009). Therefore, a thorough analysis of the environmental, social, political and economic context is essential to the design of MBIs (Stavins 2003). In this policy approach, the level of communication between industry and government is moderate, and cooperation between both parties is required.

8.4.3 Collaborative

There is a broad array of voluntary instruments that range from state-driven voluntary programs, such as the awards and technical assistance programs (Asian Development Bank 1994), to privately enforced international regulations and standards, such as ISO 14000 (Chittock and Hughey 2011). A voluntary compliance program is a pollution prevention program which is voluntarily taken by the owners of industries (Fisher and Thorburn 2011). The government can exert control over the polluting industries to reduce the amount of pollutants through promoting such voluntary compliance programs (Arimuraa et al. 2008; Urpelainen 2011). Further, these non-regulatory voluntary programs can be used side by side with different regulatory approaches. That being said, without stringent mechanisms

for enforcement and punishment to ensure compliance, voluntary instruments rely "... on the voluntarily supplied participation, resources, and consensual actions of governments and/or firms" (Vogel 2008, p. 264). This type of instrument will often rely on a collaborative process to gain legitimacy. Collaboration between government, industry, and other actors is a useful way to gain credibility and trust between key actors and a means to engage new industry partners in sustainability during the implementation phase (Chittock and Hughey 2011). Here, collaboration as defined by Gray (1989, p. 5) as "a process through which parties who see different aspects of a problem can constructively explore their difference and search for solutions that go beyond their own limited vision of what is possible". It is often the case that voluntary environmental approaches will use collaborative arrangements between business, regulatory agencies, or central governments to gain industry commitment (Chittock and Hughey 2011; Clarke 2011). The strength and weakness of voluntary programs is that they are innovative and novel, meaning that both their potential and limitations are yet to be fully explored. In this policy option, the level of communication between government and industry is quite high; key actors are actively collaborating with each other.

8.5 Policy Continuum in Bangladesh

In Bangladesh, a number of industrial enterprise units were established in different areas of the country after independence was achieved in 1971, but environmental issues were not seriously considered at that time. More recently, industrial pollution has become an area of growing environmental concern in Bangladesh (Nishat et al. 2001). The study by Rahaman (1992) reveals that many people are being affected by industrial pollution in Bangladesh. Bangladesh is home to 30,000 industrial units, consisting of 24,000 small and cottage, and 6,000 medium and large enterprises; this creates colossal environmental problems (Reazuddin 1994). That said, environmental regulations do exist in Bangladesh and the Government of Bangladesh is committed to the protection of the environment (Belal and Owen 2007). Unfortunately, regulations "are routinely flouted due to lack of enforcement by relevant agencies which appear to be corrupt, weak and ineffective" (Belal and Roberts 2010, p. 313). There are also examples of corporate social responsibility in Bangladesh (Islam and Deegan 2008; Sobhani et al. 2009), though voluntary measures that have no government involvement are outside the boundaries of this study. Below are details about the existing programs in each of the three policy types (compliance, cooperative and collaborative).

8.5.1 Compliance: Environmental Regulations

The environmental regulations of Bangladesh have connections with the British-laid legal system as the British rulers formulated most of the laws (Gain 1998).

Table 8.2 Summary of mandatory type regulations

Regulations	Requirements	Goal(s)	Bangladesh enforcement agency
(a) Mandatory Pollution Audits and Prevention Plans	1. Pollution audits 2. Prevention plans	To assess the progress of pollution prevention progress	Ministry of Environment and Forest (MoEF)
(b) Banning of Certain Chemical Products	1. Ban on the sale and use of polythene	To reduce the use of toxic and hazardous chemicals	Ministry of Environment and Forest (MoEF)
(c) Mandatory Toxic Release Reports	1. Report toxic chemical use	Does not exist in Bangladesh	Does not exist in Bangladesh
(d) Mandatory Environmental Performance Standards	1. Maintenance of certain standards	To achieve pollution prevention targets	Bangladesh Standards and Testing Institution (http://www.bsti.gov.bd/about.html)

Islam (2002) reports that the Government of Bangladesh set up a full-fledged Ministry of Environment and Forest (MoEF) through replacing the small Department of Environment and Pollution Control (DEPC) in the 1980s. Now there is a Department of Environment (DoE) under the MoEF. About 200 environment-related regulations deal with the protection of the natural environment in Bangladesh (Khan 2000). The main objectives of environmental regulations in Bangladesh[1] are: protection of environmental health; control of environmental pollution; conservation of natural and cultural resources (Chowdhury 1999). In particular, the objective of the Environmental Conservation Act (ECA)-1995 is to conserve and improve the quality of the natural environment and to control pollution. It serves as the prime legislative framework for environmental protection and management in Bangladesh, while the Environmental Conservation Rules of 1997 exist to enforce it (Kabir 2005). In Bangladesh, according to the Environmental Conservation Rules, 1997, if any industry violates the emission standard of gaseous, liquids or solids, the DoE can issue warning and direction to reduce it within a stipulated time. That being said, at least one recent study states that these laws are not properly implemented (Mohammad 2011). Table 8.2 above summarizes some of the compliance type regulations that exist, four of which exist in Bangladesh.

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[1]The important environmental regulations that currently exist are: National Environmental Policy (1992), National Environmental Action Plan (1992), Forest Policy (1994), Environmental Conservation Act (1995), Environmental Conservation Rules (1997), National Conservation Strategy (1997), Bangladesh Environment Conversation (Amendment) Act (2000), and Environmental Court (Amendment) Act (2002) (Reazuddin and Hoque 2002).

8.5.2   Cooperative: Economic Incentive Programs

The Government of Bangladesh can adopt programs based on economic incentives. The operators of leather tanning operations in Dhaka have suggested that an incentive based approach would be more effective and fair (Barber and Pfefferle 1994). In the case of industry, there is a desire to use economic incentives to complement regulatory approaches in order to improve environmental management in regards to waste-minimization and eco-labeling initiatives (World Bank 2006). A report from the MoEF which was done in collaboration with the International Union for Conservation of Nature (IUCN) and funded by the GEF and UNDP details Bangladesh's desire to explore potential partnerships on Non-Kyoto Market Mechanisms such as Methane to Market, Carbon Sequestration Partnership Program and Asia-Pacific Partnership Program (MoEF 2007). Below Table 8.3 highlights and explains popular economic incentive programs.[2]

8.5.3   Collaborative: Voluntary Compliance Program

Another option available the Government of Bangladesh for the management of environmental issues and pollution control are voluntary compliance programs. These programs often require collaboration from industry, government, and other stakeholders for their success. Collaboration has been identified as a tactic to gain the required participant buy-in as theses programs operate on a voluntary basis. Below is Table 8.4 summaries the voluntary compliance programs examined in this study.

The remainder of this chapter focuses on the methodology and results of the Bangladesh study. This is followed by a discussion that integrates the results of the featured case study and the literature presented.

8.6   Methods

The Industrial Pollution Projection System (IPPS)[3] approach was used by the experts of World Bank, in 2001, to select the top ten most environment-polluting industries of Bangladesh (Nishat et al. 2001). The top most environment-polluting

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[2]Note this table does not include the activity of economic incentive programs in Bangladesh. Economic incentive program were not found by this study to have a presence in Bangladesh.

[3]IPPS stands for "Industrial Pollution Projection System" and was developed by the World Bank. IPPS depends on sector estimates of pollution intensities, also called the emission factors, expressed in pollution per unit of output or employment. IPPS is capable of making reasonable projections for all the major industrial pollutants (Nishat et al. 2001).

Table 8.3 Summary of economic incentive programs

Incentive	Examples	Function	Goal(s)
(a) Pollution charge	1. Product charge 2. Effluent or emission charge 3. User charge	Fee imposed on firms that pollute	1. Removes economic incentive to pollute 2. Form of revenue for government to offset costs of environmental damage
(b) Financial or fiscal subsidy	1. Consumer rebates for purchases of environmentally-friendly products 2. Soft loans for business planning to do environmentally friendly products 3. Monetary incentives to maintain environmental standards	Financial assistance for firms who choose or plan to reduce pollution	1. Encourage pollution prevention practices
(c) Deposit refund system	N/A	Polluting industries are required to deposit an up-front charge for their role in pollutions, which is rebated upon investigation to reveal significant improvements in pollution-reduction	1. Removes economic incentive to pollute 2. Encourages pollution-reduction activities
(d) Tradable emission permit systems		Polluters can emit polluting emissions, but are given tradable pollutions credits, which they can buy or sell	1. Financially reward non-polluters using market mechanisms 2. Allows authorities to limit overall pollution. Often focused on air or watershed pollution

Table 8.4 Summary of voluntary compliance programs

Program	Function	Goal(s)	Activity in Bangladesh
(a) Technical assistance program	Government provides environmental management technical support to industries	1. Reduce hazardous waste generation 2. Improve to management of hazardous waste products	United Nations Industrial Development Organization contributed to a pollution prevention program for leather industries in Southeast Asian countries (Alam 2002)
(b) Exchange program	1. Education transfer programs 2. Technology transfer programs	1. To share knowledge about environmental management and pollution prevention 2. To Transfer environmentally-friendly technology from developed to developing countries	No known approved policy for foreign technology transfer programs in Bangladesh
(c) Research, development and demonstration programs	1. Funding for R & D programs targeted at environmental issues 2. Funding for personnel education and training programs	1. To promote the development of ecologically sustainable products (Ananda et al. 2009) 2. To promote the development of technologies that minimize and control pollution	No known program exist
(d) Awards programs	1. Reward and recognize significant environmental achievements	1. Encourage waste reduction and pollution prevention efforts (Asian Development Bank 1994)	The Bangladesh Government annually grants the National Environmental Award (Zaman 2011)

Table 8.5 Category-wise respondents from sample industrial enterprises

Name of sample industry	Number of sample industrial enterprises	Number of sample respondents
Tannery industry	02	(5 + 5) = 10
Pulp and paper industry	02	(5 + 5) = 10
Fertilizer industry	02	(5 + 5) = 10
Textile industry	02	(5 + 5) = 10
Cement industry	02	(5 + 5) = 10
Total	10	50

industries are: tannery, pulp and paper, pharmaceutical, fertilizer, industrial chemicals, textile, food, metal, cement, petroleum and others (Nishat et al. 2001). From these top ten most environment-polluting industries, five sample industries were selected for this study due to their availability in Chittagong. The lead researcher had better access to the Chittagong industrial zone than other zones in the country. The selected industries are: tannery industry, pulp and paper industry, fertilizer industry, textile industry, and cement industry. All five of these industries are "red category" industries, which mean that the Government of Bangladesh has classified them as highly polluting.[4] The six heavily polluted districts (hot spots) in Bangladesh are: Dhaka, Gazipur, Chittagong, Khulna, Narayanganj, and Bogra (Islam and Miah 2003). Two industrial enterprises have been selected (through convenience sampling) from each sample industry as sample enterprises from Chittagong. The Chittagong industrial zone is the second largest industrial zone[5] in Bangladesh, and is typical of other industrial zones in Bangladesh.

The study is exploratory in nature (Patton 2002); sample enterprises have been selected based on the needs of the study and willingness of enterprises to furnish the pertinent data. Five senior executives of each sample industrial enterprise were selected as respondents. The interviewees were all located in operations departments and were suggested by the operations manager as being a key informant. Numbers of respondents are shown above in Table 8.5. In order to collect the needed primary data, a combination of methods was used in this study. The methods were in-person, semi-structured interviews, written questionnaires, and the maintenance of a notebook. All 50 respondents filled out both the written questionnaire and participated in an interview.

The lead researcher determined the awareness and attitude of respondents relating to each program in Fig. 8.1. To do this, during the interview, the lead

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[4]In Bangladesh, as per Environmental Regulation 1997, all industries have been divided into four categories:

Green, Orange A, Orange B, and Red. Red is the most polluting. The list of industries of these four categories is in schedule 1of the Environmental Conservation Rules '97 (ECR 1997).

[5]There are more than 140 industries in Chittagong: 19 tanneries, 26 textiles mills, 1 refinery, 1 TSP fertilizer, 2 chemical, 5 fish processing, 2 cement factories, 1 paper rayon mill, 1 steel, 2 soap factories, 4 dyeing factories, and about 75 other small industries (Islam and Miah 2003).

researcher explained each program to the respondent to determine the industry awareness and a positive or negative attitude. The lead researcher then reduced all the relevant information regarding industrial pollution prevention into a tabular form (Yin 2003), following the deductive framework shown in Fig. 8.1. This was further analyzed and the "industrial enterprises' practices" were determined. In categorizing the industry awareness of this type of program, 50 % of respondents or above was coded "yes"; otherwise it was coded as "no". The same 50 % rule was used for the "positive" and "negative" coding of industry perspective. Evaluation of existing government environmental programs was carried out in 2012 through the Ministry of Environment and Forest's website.

8.7   Results

The specific results of this study are summarized in Table 8.6. This is followed by a summary of the results in regards to how each regulatory or program exists in Bangladesh and the related industrial enterprises' practices.

8.7.1   Compliance: Industrial Enterprise Practices in Bangladesh – Mandatory Regulations

This section displays the study's results in terms of industrial enterprise perceptions, opinions, and practices in regards to mandatory regulations imposed by government agencies. As noted earlier in Fig. 8.1, this study specifically considered four types of regulations (a) mandatory pollution audits and prevention plans, (b) banning of certain chemical products, (c) mandatory toxic release reports, and (d) mandatory environmental performance standards.

(a) *Mandatory Pollution Audits and Prevention Plans*
    Some executives of technical services of the sample industrial enterprises claimed that they learned about pollution prevention plans from their industrial unit, though they do not actually have a plan. Respondents commented that the programs should be made obligatory by the government for every industrial plant to prevent pollution. Respondents also commented that government would need to have a fair idea of the waste-generating scenario of a polluting industrial plant by examining the pollution audit report; such a report could be prepared by professional auditors.

(b) *Banning of Certain Chemical Products*
    Although there are some regulations in this regard, the existing regulations are not working effectively in the banning of certain chemicals, products and management practices in the industrial enterprises of the study area. The field visit of the researcher uncovered that the tannery industry, pulp and

Table 8.6 Existence of industry perspective of environmental programs

Continuum	Environmental programs	Programs active in Bangladeshi plants	Industry awareness of this type of program	Industry perspective (once explained)
Compliance (mandatory regulations)	(a) Mandatory pollution audits and prevention plans	(a) (No)	(a) (Yes)	(a) Positive
	(b) Banning of certain chemical products	(b) (Yes)	(b) (Yes)	(b) Positive
	(c) Mandatory toxic release report	(c) (Yes; not accurate disclosure)	(c) (Yes)	(c) Positive
	(d) Mandatory environmental performance standards	(d) (Yes)	(d) (Yes)	(d) Positive
Cooperative (economic incentive programs)	(a) Pollution charge	(a) (No)	(a) (Product) (yes) (User) (no) (Emission) (yes)	(a) Positive
	(b) Financial or fiscal subsidies	(b) (No)	(b) (Yes)	(b) Positive
	(c) Deposit-refund system	(c) (No)	(c) (No)	(c) Positive
	(d) Tradable emission permits systems	(d) (No)	(d) (No)	(d) Negative
Collaborative (voluntary compliance programs)	(a) Technical assistance program	(a) (No)	(a) (No)	(a) Positive
	(b) Exchange program	(b) (No)	(b) (No)	(b) Positive
	(c) Research, development, and demonstration programs	(c) (No)	(c) (Yes)	(c) Positive
	(d) Environmental award program	(d) (Yes)	(d) (Yes)	(d) Positive

paper industry, fertilizer industry, and textile industry have been using toxic and harmful chemicals (chromium, chlorine, ammonia, and various dyeing chemicals) in their manufacturing processes. Respondents of sample industrial enterprises report that the use of toxic and harmful chemicals in industrial plants is not monitored by the enforcement agency. They comment that if the Government of Bangladesh would have banned the import of certain toxic chemicals through regulatory measures, industrial pollution could have been significantly prevented.

(c) *Mandatory Toxic Release Reports*

Respondents of sample enterprises commented that the industrial units, and those particularly belonging to "red category" industries, are required to submit a report regarding the harmful effluent. In this report, the industry is liable to disclose information related to harmful pollutants to the DoE. Industrial enterprises do not supply accurate information regarding generated pollution from their plants. In most cases, manipulated data are submitted to the Department of Environment (DoE). Officials of the DoE are also not active enough to verify the genuineness of the submitted report.

(d) *Mandatory Environmental Performance Standards*

Respondents of sample enterprises comment that they do not follow any mandatory performance standard in order to prevent industrial pollution. Yet, the respondents do state that mandatory performance standards can prevent industrial pollution significantly. In their opinion, the Government of Bangladesh can impose regulation to follow environment-friendly manufacturing processes for "red category" industries. This may help in bringing desired improvement in industrial pollution prevention.

8.7.2 Cooperative: Industrial Enterprise Practices for Economic Incentive Programs

This section discusses the study respondents' perceptions of and industrial practices with economic incentive programs. Specifically this study focused on industrial engagement with (a) pollution charges, (b) financial and fiscal subsidies, (c) deposit-refund systems, and (d) tradable emission permit systems.

(a) *Pollution Charges*

No information has been found regarding the implementation of product charges in sample industrial enterprises. Some respondents are found in sample enterprises to understand product charges, that is, that the imposition of a product charge on polluting industries can reduce the use of polluting inputs such as raw materials and chemicals. Further, that the uses of non-polluting raw materials and chemicals can be increased in industrial plants in order to avoid product charges. They commented that the central Government of Bangladesh

could impose a product charge on polluting industries under the supervision of the Department of Environment (DoE).

Respondents of the sample industrial enterprises expressed an unawareness regarding the idea of a user charge. Respondents commented that pulp and paper industries have been using forest resources as raw material, which can be prevented through a user charge.

Collected primary information does not support the existence of emission charges in the industrial enterprises in Chittagong, Bangladesh. Interviewees reported that although some emission standards have been fixed by the Department of Environment (DoE), no tax is being imposed for excess emission discharge. Respondents are convinced that an emission charge is an important economic instrument, but it is still very challenging to introduce to Bangladesh industrial plants. According to the view of respondents, it is very hard to accurately measure discharged emissions from industrial enterprises. Government would need to allocate funds to develop institutional set-up, so that government can later collect tax by implementing emission charges.

(b) *Financial or Fiscal Subsidies*

The subsidy system is not available as a part of pollution preventive efforts for industrial enterprises in Bangladesh. The majority of executives of sample industries are familiar with the idea of providing financial subsidies. Respondents commented that under a financial subsidy system, government financial institutions can provide various types of low-interest bearing loans to non-polluting industries. Respondents reported that the owners of industries are interested in procuring low-interest bearing loans for facilitating their pollution-preventive efforts. However, it is necessary to monitor so that the recipients of such a loan do not use it for other purposes. If the Government of Bangladesh is able to provide the financial subsidies to the polluters, polluting industries will be definitely motivated to accept this assistance.

(c) *Deposit-Refund System*

The deposit-refund program is not found to be in existence in the industrial enterprises in Chittagong, Bangladesh. Respondents commented that government can demand mandatory deposit during the time of establishment of a new industrial enterprise and that later government can curtail money from the deposited amount in case of any kind of environmental damage caused by that industry. Here, environmental damages could be assessed through physical inspection by the inspectors of the DoE. Respondents commented that the deposit-refund program could be imposed not only for massive environmental damages, but also for the violation of any kind of environmental standard fixed by the DoE for industrial enterprises.

(d) *Tradable Emission Permits System*

The emission permit trading system is not employed in the sample industrial enterprises. Interviewees from the sample enterprises are fully unaware of the pollution permit trading system. Respondents commented that the pollution permit trading system is not feasible for Bangladesh industries.

8.7.3   Collaborative: Industrial Enterprise Practices for Voluntary Compliance Programs

The following section presents the results of this study in regards to enterprise perceptions, opinions, and practices of industrial voluntary compliance programs (which have government involvement). The programs highlighted in this section are: (a) technical assistance programs, (b) exchange programs, (c) research, development and demonstration programs, and (d) environmental award programs. Because most corporate social responsibility (CSR) programs have no government involvement, they are outside the boundaries of this study.

(a) *Technical Assistance Programs*

Based on the interview findings, existing technical assistance programs for the control of environmental pollution do not work effectively in simple industrial enterprises. Respondents reported that the owners of industries do not come forward to voluntarily take part in technical assistance programs because government initiatives are found to be insufficient. According to the opinion of the respondents, owners of industries need to come forward to start this type of voluntary program at the initial stage.

(b) *Exchange Programs*

Adequate educational programs have not been introduced in the sample enterprises to explain the importance of the prevention and control of industrial pollution. Respondents commented that the government can provide assistance to employees of industrial enterprises to enhance their knowledge regarding environmental aspects through environmental educational programs. Respondents reported that more technical information exchange programs, such as environmental education and technology transfer programs, need to be introduced through coordinated efforts between industry and the Government of Bangladesh.

(c) *Research, Development and Demonstration Programs*

Research and development (R&D) units have been observed in large-scale industrial firms (e.g., pulp and paper and fertilizer industries). Respondents commented that industrial plants' R & D units do not provide a significant contribution to pollution prevention and control activities. Respondents commented that the Government of Bangladesh could encourage these industrial plants to set up R & D by providing financial and logistical support.

(d) *Environmental Award Programs*

Respondents of the sample enterprises reported that award programs for environmental aspects are not working effectively in motivating industries to mitigate their pollution-generating activities. They commented that an initiative for more awards programs at the district level would encourage industrial plants in taking active measures for reducing their generation of pollution. They reported that the achievement and recognition of being awarded such an environmental award, would ultimately create a good image in the competitive market for that company.

8.8 Discussion and Conclusion

To reiterate, the research questions guiding this study were: (1) To what extent are internationally recommended programs, such as those suggested by the Asian Development Bank, implemented in a developing country?; (2) How are these programs perceived by business?; and, (3) On a policy continuum, from mandatory to voluntary industry participation, which programs are perceived by the business community to have the most uptake? While these questions are all answered in detail in the results section of this paper, this discussion provides a summary of the findings. The theoretical contributions of this paper concern local implementation in a developing country of global environmental commitments, and the use of coercive, cooperative and collaborative approaches.

8.8.1 Synopsis of Findings for Research Question 1

Mandatory regulations in Bangladesh were found to as the most common and recognized ways that governments manage environmental issues and prevent pollution. Executives of sample industrial enterprises reported that all industrial enterprises have been divided into four categories based on their location and environmental impacts.[6] Industries in the Orange A and B categories are required to have Initial Environmental Examinations (IEE), while industries in the Red category are obligated to perform comprehensive Environmental Impact Assessments (EIAs) (Rasheed 2002). That being said, respondents of sample industrial enterprises made the assertion that EIAs are often biased due to corruption of technical experts of the DoE.

According to the Environmental Conservation Act '95 (ECA), the Director General, or any person empowered by him, has the power to collect samples of air, water, soil or other materials from the industry premises. It is evident that the DoE officials are sufficiently empowered to inspect any place or any document to find out any pollution related activities. Still respondents indicated that monitoring of the DoE does not work effectively, because of the rampant corruption of DoE officials. This invisible corruption practice makes the inspection work ineffective. Respondents of sample enterprises suggested that honest magistrates should be deployed in the inspection team to perform the job properly of containing industrial pollution. The environmental regulatory measures cannot work effectively without proper monitoring.

In case of failure to comply with such directions, legal action can be taken against the violators. But respondents indicated that sample industrial enterprises have been violating environmental regulations, yet adequate disciplinary actions have not been

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[6]The categories are: (1) Green category; (2) Orange A category; (3) Orange B category; and (4) Red category.

taken. They suggested that rigorous imprisonment and penalties need to be imposed in the cases of gross violation of environmental rules, and this requires a strong monitoring system under the supervision of the inspectors of the DoE. Respondents also commented that a good amount of revenue can be collected by enforcing the penalties for non-compliance of regulations, and perhaps considered as a revenue-raising task.

It is the responsibility of industrial plants to inform the DoE of any discharged pollutants, which are in excess of the prescribed limit, and which are due to an accident (Sarif 1999). Yet, it has been found that most of the owners of industrial plants do not perform this responsibility properly; rather, they conceal the fact regarding the occurrence of an accident to avoid the officials of the DoE. Respondents also reported that Environmental Clearance Certificate (ECC) from the DoE is obligatory for every industrial unit. Thus, it appears that although there are various environmental regulatory measures for controlling industrial pollution, these are not enforced effectively.

8.8.2   Synopsis of Findings for Research Question 2

As can be seen through this study, there are numerous regulations and programs that governments around the world are pursuing in order to mitigate environmental impacts of businesses and, in particular, to help with the greening of industries, more generally (Asian Development Bank 1994; Callan and Thomas 1996; Daugbjerg and Svendsen 2011). The deductive framework (i.e., Fig. 8.1) used in this study provides a comprehensive way to consider the implementation of global environmental commitments through different government regulations and programs in Bangladesh. From the perspective of the executives in the tannery, pulp and paper, fertilizer, textile and cement industries, many of these programs do not exist in Bangladesh, and if they do, they are poorly implemented.

The mandatory measures, such as pollution prevention plans, existed in some enterprises. Currently, there is no accurate reporting to government about toxic releases; there is reporting, but it is not accurate. Also, there are some regulations banning some chemicals, but no effective monitoring to ensure that they are not used in practice. Performance standards do exist, but respondents indicated that they conceal accidents. Regulations have even less effect, as corruption ensures that Environmental Clearance Certificates are easily obtained. There was openness to economic incentive programs, and some understanding about pollution charges, financial subsidies, and emission permits. The deposit-refund system was a new concept to the interviewees. There was a desire by the executives for government-led voluntary compliance programs, but only if they involve industry representatives in their design.

With little pollution-prevention activity occurring as voluntary initiatives within these five very polluting industrial sectors, respondents expressed an interest in government playing a much larger role. They expressed their desire for both

command-and-control approaches, and economic incentive programs. With each comment came the caveat that the regulations and programs require monitoring, and that these reports should be written by external auditors, thereby ensuring their accuracy. The corruption documented in other studies (Belal and Roberts 2010; Dammania et al. 2003) was also observed here. This corruption was not unique to government employees, but also the industries themselves indicated that their self-reporting is inaccurate.

8.8.3   Synopsis of Findings for Research Question 3

The results of this study show that in Bangladesh the government relies on the use of compliance policy options for pollution-prevention and environmental management. The Government of Bangladesh uses three of the five policy options available from the compliance categories, while it only uses one of eight policy options available on the cooperative and collaborative end of the continuum. Although the Government of Bangladesh technically has regulations in place, the threat of the enforcement is weak. These findings are consistent with Blackman's (2008) work, which highlights similar challenges of weak regulation enforcement found in other developing countries such as Mexico and India. The threat of regulation gives more power to policy options such as market-based instruments and voluntary compliance programs (Harrison and Antweiler 2003; Blackman 2008). Without strong enforcement of regulations, business has less incentive to participate in voluntary options, as their advantage is that they cost less and allow for more autonomy than regulations. A potential consequence of weak regulatory enforcement might be the inability to effectively implement cooperative and collaborative policy options.

8.8.4   Implications

The contributions of this study are relevant for different audiences. The policy decision-making by governments in developed countries, regarding the conservation and protection of the natural environment of developing countries, is often hindered because of the lack of reliable information on the implementation. The findings of this study provide authentic information to the policy makers of developed and developing countries about the existing situation so that they can formulate strategies and programs for better implementation aimed at sustainable industrial development for developing countries in general and Bangladesh in particular. In addition, the findings of this study can provide information needed to help the policy decision-makers verify whether the Government of Bangladesh is working in the most effective manner to fulfill its commitment to global environmental conventions, treaties and protocols.

For the Government of Bangladesh, this study highlights the potential to increase the mix of policy approaches. It is known that command and control has challenges with enforcement, so also having market based instruments and collaborative initiatives might incentivize the desired behavior.

For international agencies, such as the Asian Development Bank, these findings are particularly relevant. They highlight the need for the international agencies to not only provide support to develop regulations, but also to enforce them. Greater capacity (both financial and knowledge) is needed. In addition, ongoing monitoring mechanisms that consult users may be needed to ensure programs are being understood, valued and properly implemented in the desired way. Finally, as there are a number of policy options, for some issues it might be more effective to work directly with business. For example, the Asian Development Bank already works with banks in Bangladesh to support micro-finance efforts.

Many researchers in developed countries are not fully aware of the existing situation of command and control measures and market-based instruments in developing countries. The findings of this study can provide them further insights into the possibility of generalizing theory so that it is also relevant for developing countries. The findings can also help academics by highlighting the developing country reality and indicating potential future research directions. Furthermore, in categorizing ADB's policy options from compliance to collaborative, this study has made a novel contribution by providing an innovative way to think about pollution prevention policy options as a continuum.

8.8.5   Limitations and Future Research Suggestions

This study reveals how important it is to conduct research in developing countries on the greening of industry. In Bangladesh, in practice, government plays an insufficient role in ensuring environmental protection. The regulations and global commitments exist, but their implementation is not comparable to developed countries given the lack of effective monitoring and level of corruption. Voluntary initiatives are also very rare in domestic industrial companies. Interestingly, many of the executives interviewed were aware of the pollution-prevention programs that exist in other countries, but were looking for government to take more initiative. Interviewees retain the perception that voluntary initiatives are costly, so prefer it to be mandatory or there to be sufficient incentive. With little stakeholder pressure (Hoque and Clarke 2011), and managers who do not value pro-environmental behavior (Bansal 2003), punishment, recognition and/or reward from government are needed instead. Because reward is desired, market-based instruments might work very well in Bangladesh. That being said, although cooperative and collaborative approaches are less common than compliance policies, they do exist, and there appears to be interest in these types of policies. The Government of Bangladesh has an opportunity to move towards a more diverse policy mix that incorporates innovative approaches to pollution prevention.

All of the industrial enterprises studied in this research project were domestic companies. There are multi-national companies in Bangladesh which have voluntary pollution-prevention programs, such as Bata shoes and their tanneries (Bata 2011). There are also examples of corporate social responsibility in Bangladesh in other sectors (Islam and Deegan 2008). Industries such as tannery, pulp and paper, and fertilizers are known to be some of the most environmentally-polluting industries in the country (Nishat et al. 2001), so one might assume these companies should experience comprehensive standards and monitoring or intense public pressure to pursue voluntary initiatives, which is clearly not the case.

These findings highlight the need for further research into the greening of industry in developing countries. Some of the questions that have emerged from this exploratory study include: What strategies for greening of industry are effective in a developing country context?; What voluntary programs are relevant for developing countries?; Why are some sectors more interested in pollution prevention than other sectors?; and, What drives, or might drive, pollution prevention in developing countries? This study also raises questions as to the effectiveness of global governance initiatives to which countries like Bangladesh make commitments.

In conclusion, this exploratory study: considers business perspectives on what government rules, programs and practices exist for these industries, and determines that compliance approaches are more utilized than cooperative or collaborative approaches. As Bangladesh moves forward, it will be essential for this country to ensure the stable enforcement of compliance policy programs. If they do so, they will have potential to be quite innovative in their approach by integrating cooperative and collaborative options into their policy mix. In other words, if Bangladesh first strengthens their regulations, they are more likely to gain increased traction for policies such as market-based instruments and voluntary programs. The results from this study show that Bangladesh is currently moving towards a more diverse policy mix, but requires further progress to ensure implementation of their global environmental commitments.

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Chapter 9
Technology Adaptation and Assimilation of Takakura for Promoting Environmental Protection in Surabaya (Indonesia) Through City Level Cooperation

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Abstract Surabaya, the second largest cities in Indonesia, has a long history in community-based solid waste management (CBSWM). Since 1990, the city has won a number of Adipura Awards at national level and international recognitions including the Honor City by UNCED in 1992 and the UNEP Award in 1990. In partnership with the Japan's Kitakyushu International Techno-cooperative Association (KITA), since 1990s the Surabaya municipality has started composting program called "Takakura" by constructing about 16 compost houses to reduce organic waste. By 2011, about 30 % of reduction of waste was achieved at the Benowo landfill. To date, there are over 40,000 takakuras and about 900 composters freely distributed to local communities. Approximately 400 city environmental facilitators and 28,000 environmental cadres have been involved. Presently almost 30 % of kitchen waste is reduced due to community participation. This chapter discusses the evolvement of innovation facilitated by cooperation between two localities. Different from bilateral national level cooperation, local-local cooperation can lead to direct experiences at the ground-level, as people from both cities work together to attain the same target of waste reduction.

Keywords Compost • Community-based solid waste management • City-to-city international cooperation • Co-benefits

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9.1 Introduction: City to City Cooperation in the Waste Sector

The 1992 United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro (Brazil) attracted the world's attention on the implications of an over-generation of municipal solid waste (MSW). Unlike homogeneous waste streams, which originate from industrial or agricultural activities, the properties of MSW are complex. The waste includes not only refuse from households, but also non-hazardous waste from industrial/institutional establishments. The impacts can be unpredictable especially when proper landfills and monitoring of leachate are not carried out. Moreover, waste is also a social and economic issue as it generates a series of economic activities with social positive and negative impacts (Do Carmo and Puppim de Oliveira 2010). There are a large number of families around the world, especially in developing countries, who make a living off the waste from the streets and from landfills.

The management of MSW is also costly when being carried out by public or private companies. This is attributed to the fact that the costs associated with waste management represent its direct costs such as capital costs of infrastructure, equipment required and labor costs. For cities, waste management is an area with very high direct costs that requires a huge investment. For this reason, many cities around the world cannot afford to collect and/or dispose of solid waste properly. Some governments leave the whole issue of waste in certain parts of the city up to informal sector or to local community. As a result, waste could end up in rivers, empty property or on the streets, or even being dug or burned without proper care. Ultimately, this would generate all kinds of toxic pollutants such as dioxins, which lead to serious environmental pollution problems worldwide (Kurniawan et al. 2012).

Reducing waste through simple technologies can alleviate part of the problem, and this can be a step towards equating the solid waste problem in the city and at the same time generating benefits. There are many methods to compost household waste that cost very little. However, obstacles to disseminate those simple technologies are not only technical issues which are easy to learn, but also the creation of the social networks at the local level to disseminate technology and provide the organization capacity to manage waste locally, thus filling the existing gaps of the service providers, which are not always existent in some cases. The initial investment, which can be relative low (∼USD 10 or less per household in certain cases such as in this chapter), can also represent an obstacle to poor households and cities in the developing world (Manaf et al. 2009).

To address this issue, international cooperation can bridge both technical and financial gaps that certain developing countries have to start up MSW management programs with simple technologies (Daskalopoulos et al. 1998). One kind of international cooperation that has grown in recent years is cooperation between cities. There have been a number of cities networks around the world with different forms, which have broad objectives of sharing experiences and working closely to improve MSW management at local levels (Keiner and Kim 2007). The city networking

movements have grown quickly since 1980, as the world became more urbanized and globalization allowed more flow of information and people (Friedmann 2001). Since 2000, the idea of city to city cooperation at the international level has been disseminated not only by international organizations, but also by the initiatives of cities themselves (UNDP 2000; UNV and IULA 2003), thus creating concrete and long term relationships among the cities involved. Concrete examples between Sao Paulo (Brazil) and Toronto (Canada) for housing upgrade as well as Zurich (Switzerland) and Kunming (China) in the sector of urban transportation represent a number of examples that led to concrete outcomes (Hertogs 1999; Joos 2000). Presently there are several active networks of cities exchanging information in the area of sustainable development, such as ICLEI – Local Governments for Sustainability and Clinton Foundation's C40, as well as other regional- focused networks such as Citynet for Asia (Tjandradewi and Marcotullio 2009).

Most of those networks specifically promote North–south cooperation. On the one hand, cities in the North with developed urban management technologies willingly transfer their experiences to developing countries to bridge the existing technology gap. Moreover, those city-to-city cooperation schemes are financially supported through respective international cooperation agencies such as Japan International cooperation agency (JICA), which assess the feasibility of projects or programs. On the other hand, North–south technology transfers often encounter problems related to the appropriateness of selected technology. Many Northern technologies may not always transferable and fit local conditions in the South such as climate or social, institutional or physical infrastructure that exists locally such as maintenance or operational costs. However, a number of cities in the South with good practices were able to make South-South or even South–north transfers such as the case of Curitiba (Brazil). The bus rapid transit (BRT) developed in Curitiba operates in hundreds of cities around the world presently, both in the Southern and in the Northern region. Even though there was no deliberate policy or national support for those transfers, it took place through multilateral organizations such as the World Bank.

There are several advantages of the city to city international cooperation as compared to national to national, particularly concerning urban issues. Firstly, urban challenges are more alike between cities. In general, the kind of infrastructure cities use can easily be adapted across cities. In addition, cities share similar organizational structures. Generally they are sub-national governments that fit under other levels of government and tend to have departmental divisions such as department of transportation or waste. Moreover, cities are flexible and agile in the cooperation as they exchange experiences or resources directly between users. Last, but not least, cities in different countries have less political disagreement that their respective national governments, thus facilitating trust between the parties involved (Kironde and Yhdego 1997). For example, Japan has several initiatives of cooperation with Asian cities, such as the case of Yokohama and Penang (Malaysia) (Tjandradewi et al. 2006).

Reflecting from those particular cooperation models, this chapter specifically analyzes the cooperation between the cities of Surabaya (Indonesia) and Kitakyushu (Japan) in the area of waste management. Since 2005, the two cities have cooperated

through the Kitakyushu International Techno-cooperative Association (KITA). It was a gradual process of incremental innovation in the waste sector through cooperation between two major cities with different backgrounds. Unlike radical innovations that require a technological discontinuity based on a break-up with existing competencies and technologies, incremental innovation represents minor modifications of existing processes or products (Rogers 1995). Waste composting is not a new idea towards environmental sustainability. However, the use of locally available bacteria (native micro-organism) for fermentation purposes significantly shortens the time required for waste decomposition to 1 day, reflecting incremental innovations. This chapter also examines the waste management system in Surabaya before and after the introduction of Takakura home composting (THC) method. In addition, the impacts of Japanese innovation on the waste sector in the city by the assimilation of Takakura method into local policy settings are also analyzed.

9.2   Methodology

The methodology used in this research was one single case study (Ragin and Becker 1992). This empirical study concerns with how city level cooperation could promote technology adaptation and assimilation of Takakura composters for improving environmental protection in Surabaya (Indonesia). To undertake a thorough longitudinal case study, data were collected from primary and secondary sources. In the beginning, our literature survey focused on the analysis of written policy documents on Surabaya's policies concerning MSW management. The documents were obtained from the local government. The secondary data are complementary in this study. Following the collection of the secondary sources, semi-structured interviews with 40 local stakeholders were also undertaken for this case study in 2011, including government officials, technicians from the landfill, waste pickers, community leaders and local experts in waste. This method is a valuable means to find out what happens not only by asking critical questions, but also assessing on going phenomena with them. The respondents' answers were screened to identify the most commonly discussed points. Their replies were also coded to detect key differences based on the proponents' literature surveys.

9.3   Changes in the Waste Management in Surabaya

As the second largest city in Indonesia situated in the northern shore of the eastern Java, Surabaya is the center of commercial and trade activities in the province. The capital of the East Java also represents the hub of development that serves the eastern part of the country. In spite of its strategic roles in the Indonesian development plan, the city has been confronted with the increasing generation of MSW day after day (Meidiana and Gamze 2011).

With a 2.1 % annual growth of its urban population of more than three millions in 2010, Surabaya generates over 2,100 t MSW daily (Santosa 2000). In spite of its varying composition, the MSW consists of organic matter such as garbage from fruits with moisture content ranging from 40 % to 60 %, with huge potential for composting. Among the MSW, food waste is the most predominant component.

Depending on the economic status of its districts, the daily amount of MSW generated in Surabaya varied from 1.95 to 2.05 kg per person in the beginning of 1990s (Cervero 1995). Out of the waste generated, only less than 50 % were collected, transported, and disposed of in open dumps, while the rest is recovered and recycled by scavengers. In spite of the local government's efforts to encourage people to recycle and reuse the MSW through various approaches, its generation rate still increases annually by 4 %. Rapid urbanization, increasing economic activities, and uncontrolled population growth might have contributed to the rising generation of solid waste in Surabaya city (Dhokhikah and Trihadiningrum 2012).

Most of the waste collected is disposed at the Benowo dumping site. Based on past trends and future projection, it is anticipated by the Surabaya environmental agency that the municipal garbage stockpiles would attain 10 million tons, its maximum limit, by 2020 (Premakumara and Abe 2011). This indicates that an additional site is required for new landfills to meet the need for MSW disposal in the city from 2020 to 2040. The required amount of land is almost two-thirds the area of the city's Juanda International airport, or almost enough to house local population growth for the next decade. Unless properly tackled, Surabaya would face serious urban environmental degradation as the city would go beyond its capacity to absorb the volume of MSW generated. It is anticipated that the local MSWM could not meet the demand for its proper disposal, thus causing a backlog of MSW left in the urban environment (Chaerul et al. 2007).

So far, it is estimated that about 4,000 scavengers work daily at the dump sites for resource recovery (Premakumara and Abe 2011). Since they work under hazardous conditions to earn their daily income, scavengers are exposed to environmental and hygienic risks. There is also public concern over the deterioration of living environment surrounding the local landfill, as the waste contributes not only to water-borne diseases and flooding, as well as for the increase in greenhouse gases (GHG) emissions (Kurniawan 2011).

As MSW dispersion could lower the quality of air and water resources, the MSW over-generation is one of the most important issues that needs to be tackled immediately. In 2007, the Intergovernmental Panel on Climate Change (IPCC) reported that waste from human activities represents one of the main CO_2 emission sources that accounted for 3 % to the total CO_2 emission, while CH_4 emissions from landfills contributed to a quarter of the total CH_4 emissions worldwide (Kurniawan 2011). Compared to the CO_2, the latter is around 21 times more potent in GHG effects. For this reason, reducing CH_4 emissions from MSW would significantly lower global GHG emissions. Unless properly tackled, MSW problem not only will derail the country's progress towards the UN Millennium Development Goals (MDG), but also hold back its development towards environmental sustainability. This decade determines how Indonesia would cope with this environmental challenge caused by an over-generation of its MSW nationwide.

To improve environmental protection in Indonesia, seminal approaches in MSWM that includes collection, treatment, recycling, resource recovery and disposal are required. A high quality of MSW management not only improves economic efficiency and facilitates sustainable development, but also addresses environmental deterioration caused by resource shortages. The main obstacle for attaining this novel goal is the capacity of reversing the MSW growth by tackling waste problems from upstream to downstream. This would facilitate its resource recovery on sustainable paths.

While there are debates in the literature on the way out for MSW problems such as composting and 3R (recycle, reuse, and recovery), solutions to MSW in Surabaya are still confined to two conventional approaches: (i) reducing MSW at its collection points and (ii) disposing of the collected waste using technological approaches (Kurniawan 2011). The first has been undertaken through public education and recycling initiatives using "blue box" to collect and separate paper and plastic for recycling. For the second, organic waste is processed to be fertilizer through anaerobic processes, while methane, one of its by-products, can be used to produce renewable energy. Although composting could recover valuable resources and release CO_2, it may not solve waste problems in the city.

To attain sustainable and effective MSWM, it goes without saying that development strategies need to go beyond engineering aspects (Kurniawan 2008). The waste has to be recycled to create added value and sustainable jobs. By turning waste into strategic resources, benefits may be attained in decoupling MSW generation from economic growth. For this purpose, the municipality has a long history in applying innovative environmental management, particularly on community-based solid waste management (CBSWM). With assistance from the KITA, Surabaya started a home composting program using "Takakura Home Composting" (THC) devices locally made.

This simple technology, which originated from the local area, gained an Indonesian Intellectual Property Right (P00200600206) in 2010 for organic waste composting process at household scales. The partnership has brought a considerable improvement in terms of waste management to Surabaya, thus bringing many benefits to the population and local government. As a result, since 1990 Surabaya has won a number of Adipura Awards at national level and international recognitions including the Honor City by UNCED in 1992 and the UNEP Award in 1990. The awards recognized the city's success story in reducing the generation of waste from its sources, as reflected by the improving number of participants for the city's Green and Clean (SGC) competition, the increasing number of garbage banks in local municipality, the increasing number of households who have composting unit using Takakura bins, and the increasing amount of compost from households' organic waste used for greening activities.

So far city-to-city cooperation between Surabaya and the Kitakyushu city (Japan) under the KITA scheme has facilitated the former to find the most appropriate technology for processing organic waste at neighborhood level. As a philanthropic organization, the KITA has been actively involved in promoting international

cooperation between major urban cities in Asia and the Kitakyushu. So far the cities have been benefited from networking promoted by the KITA to improve the capacity of local governments in developing regions. Needless to say, networking cities for knowledge sharing and expansion of good practices and policies is one of simple and effective ways to improve such capacities and enhance local actions for knowledge sharing and mutual learning (Maeda 2009).

For example, by using THC method, the Surabaya municipality could reduce about 30 % of organic waste at household levels, while the composts may be used not only for urban farming, but also helping to beautify the local environment through gardening. The method could also be applied for composting not only kitchen waste on household level, but also for market waste in a larger area. More importantly, the THC possesses a number of key characteristics such as simple methodology, low energy consumption, indoor use, portable, rapid waste decomposition, no odors, and low cost production (Premakumara and Abe 2011).

Due to its prominent features, Mr. Takakura disseminated his composting technology in other Southeast Asia regions such as Cebu (the Philippines), Thailand and Malaysia. Those local municipalities have purchased the bins and distributed them freely to low income groups, who work in the agricultural sector. In partnership with the Japan International Cooperation Agency (JICA), the composting bins are widely promoted in the other parts of the world such as Nepal, Burkina Faso, Dominican Republic, Sri Lanka, Djibouti, Tanzania, Benin, Ethiopia, Jordan, Mozambique, South Africa, Rwanda, Uganda, Bhutan, Namibia, and Fiji.

In spite of its widespread use for composting purpose, there are also drawbacks that limit its application. For example, it is suggested to use rice husk or rice barn as a raw material to complete fermentation process. However, such materials are often not locally available. As a result, THC sometimes failed in its implementation. For this reason, KITA often engaged with local government not only to facilitate technological transfer and international cooperation between Kitakyushu and the city, but also to effectively support a wide range of sustainable development projects, sponsored by the JICA for countries located around the world.

9.4 Solid Waste Management in Surabaya Prior to THC Implementation

Before the introduction of the THC method in Surabaya in 2005, the solid waste management was solely operated by the city's Public Works Agency without involving private sectors. As a result, its collection capacity was less than a half of the waste generated in the municipality. Previously the city's waste management system included source handling, collection and transfer, as well as waste disposal. The community was responsible for waste handling from household levels to transfer stations, while the Agency in charge collected, transferred and disposed the waste from the station into local landfills. The households often transferred the

waste into stations without proper separation. In addition, street vendors did not use recyclable packaging materials in their business operation. Since the waste was not professionally treated from its source at household levels, the process of waste disposal into local landfills became time consuming and inefficient (Santosa 2000).

Like other cities in Indonesia, landfill is widely employed for the disposal of solid waste in Surabaya. Up to 95 % of the total solid waste collected around the city (2.92 million t) was disposed of annually in the Benowo landfill, which represents an open dump (Kawai et al. 2012). As the typical characteristics of open dumps are indiscriminate dumping and burning, unplanned heaps of uncovered waste, and pools of standing polluted water (Kurniawan 2011), this particular type of landfill often poses environmental, health and safety hazards. For this reason, there is growing need among the residents to improve the existing system of solid waste management in the city in order to minimize or eliminate the impacts associated with these concerns.

Unlike engineered landfills, the open dump does not have bottom liners to prevent the seepage of leachate or top cover to retain moisture within the fill. Nor does this traditional landfill has a top cover or other preventive measures to reduce methane emission into the atmosphere (Kurniawan 2011).

The lack of finance, limited public participation, and poor waste management in the city (from collection to final disposal) are the main reasons for the city to resort to the open dumping method in the Benowo landfill (Elizabeth 1992). To address this environmental problem in the long-term, the Surabaya municipality developed community-based solid waste management (CBSWM). The goal of this multi-stakeholder scheme is to reduce the generation of waste from its source through a variety of community programs and to mobilize people to be involved in waste separation (organic and non-organic type) at household levels (Santosa 2000).

Local municipality and community in Surabaya have played predominant roles in this scheme. It is expected that the organic waste could be converted into compost, while the recyclable waste could be sold to other trash collectors. In order to improve the technological innovation systems, social dynamics are the key for matching the technology and the users (Bergek et al 2008; Pol and Ville 2009). This not only gets the right technology, but also generates the right dynamic in society to have the best result in applying that technology. Although people's participation in this waste management program improved, the waste reduction set by the Surabaya municipality was not optimum prior to the THC implementation. This could be due to the fact that the implementation of 3R (recycle, reuse, and recovery) could not maximize the conversion of organic waste into compost at household levels. Normally, micro-organisms take 2 weeks using conventional composters to decompose organic waste into composts (Ying et al. 2012). To improve its performance in terms of time efficiency, state-of-the-art of the existing composter needs to be modified accordingly.

9.5 Takakura Composters: Eco-Innovations that Bring Co-benefits in Surabaya

The question of how the generation of the waste could best be minimized has been a subject of controversies, but not always well-informed debates. Often such debates are linked to the question of improving environmental protection through best practices of MSW management. It was often claimed that environmental sustainability could only be attained if we strike a right balance between environmental protection, social inclusion and economic growth. For this reason, developing synergies between broad outside long-term interests and objectives (such as fighting global warming) and short-term local benefits (like economic development, local health and environmental quality) is very fundamental to undertake technology transfer and to enable best practices to be smoothly adopted by the recipient city.

To enable win-win or co-benefit approaches to bring large impacts on local urban development, it is necessary to identify innovations that not only facilitate the required changes technically, but also facilitate the diffusion of co-benefits initiatives. In this regard, the innovative capabilities need to represent both technological and institutional forms so that they could be tailored into policy making setting (Rogers 1995). In the long-term, this would contribute to the city's ability to generate co-benefits at local level.

In line with this point of view, in 2005, Dr. Koji Takakura, a composting expert affiliated with the Wakamatsu Environment Research Institute (Japan), disseminated an innovative composting method using "Takakura bins" (dimension: $40 \times 25 \times 70$ cm) to address solid waste problem in Surabaya Composting with Takakura bins is ideal for households that consist of 5–10 people per family. Due to their ability to convert garbage into compost within 1 day without releasing unpleasant odors, Takakura bins are widely applied in the city.

To date, there are over 40,000 takakura bins and 900 composters freely distributed to local communities since 2006. In the local market, one set of takakura bin costs USD 10. About 400 city environmental facilitators and 28,000 environmental cadres have been involved in the distribution and training. The ULI Peduli played major roles in providing financial support for both activities.

The Takakura bins, which typically represent an incremental innovation, posses minor modifications of the existing composter in the city. The Takakura method uses fermentative bacteria as seed compost that was initially cultured from fermented food like yoghurt, fruits, and rice husks. Considering safety aspects, the bacteria used in this fermentation are the same as those usually found in local food like tempe (fermented bean foodstuff) and tape (fermented rice). As they were inactivated for over two hours at over 60°, the bacteria became inert during composting process.

Through the KITA scheme, Japanese social innovation could be applied in developing world, as long as the innovative product considers factors of climate local features, and customs, while respecting local identity and culture by using

locally available resources (Akenji 2011). As reflected by the THC method, it is not required to promote cutting edge technology in developing countries, rather efficient energy, inexpensive, and convenient device is more suitable for this purpose (Maniatis et al. 1987). What is common in Japan is really novel and seminal in Indonesia. Needless to say, the device might not work if the Takakura technologies were adopted into another region with different climate. The annual temperature in Indonesia vary from 27°C to 35°C. With an annual average temperature of 31°C, it is an ideal condition for composting purpose. For this reason, it is important to adapt Takakura technology based on local climate conditions. It is also necessary to transfer know-how of the technology to local people to enable them to use Takakura bins themselves, thus assisting its diffusion into local society through NGO involvement as one of main institutional key players (Hekkert and Negro 2009).

For this purpose, local community was trained by KITA's expert staffs on how to convert garbage into compost using THC method. A number of top rank officers, who were responsible for the city's MSW management, have visited Kitakyushu for attending capacity building training program that last for 2 weeks, while in return, over five experts from KITA have visited Surabaya for site visits and inspections. The officers, who previously participated in those trainings, are now promoted to occupy key positions with managerial responsibilities for transferring best environmental practices in Surabaya.

Resulting from the KITA's training, the local municipality established banks of garage by separating and recycling non-organic waste, thus promoting waste segregation at its source and connecting unofficial recycling industries into the city's new waste management system. Due to intensive training for 10 months and public campaigns by local NGOs financially supported by a private sector (Unilever) on the benefits of applying the THC, people's mindset gradually changed and this led to a higher degree of their participation and environmental awareness, thus promoting a cleaner neighborhood throughout the city.

Based on the results of the demonstration projects in Surabaya in recent years, it is conclusively evident that Takakura method represents an eco-innovation that benefited the local people in terms of time efficiency and reduction of final waste quantitatively. This kind of innovation offers new solutions to local problems by improving the outcomes of composting activities. In this case, the seminal device could efficiently transform garbage into good quality compost within 12 h, thus improving local environmental protection and the quality of people's life. By turning it into valuable resources like composts, waste could be decoupled from economic growth (Sjöström and Östblom 2010). With the increasing use of THC in Surabaya city, this indicates that city to city cooperation scale can lead to direct experiences at ground-level, as people from both cities closely work to achieve the same goal of waste reduction.

9.6 Assimilation of Takakura Composting Method into Local Policy Settings

After realizing the benefits of the THC method, the Surabaya municipality extended the innovative waste management system in partnership with NGO staff from Pusdakota. Since 2006, the local NGO was actively involved not only in encouraging local residents in segregating waste at its source, but also in promoting THC as a means of converting organic waste at household level into compost. It helped residents in their neighborhoods to understand a new waste management approach and to practice waste segregation and household composting using Takakura bins. Although its involvement did not represent a feature of city to city cooperation, the Pusdakota paved the way for other NGOs such as the Unilever's ULI Peduli Foundation to be closely involved in promoting THC citywide through workshops and practical training (Table 9.1).

To further promote environmental awareness among local residents about the new waste management system, in partnership with private sectors such as Unilever, since 2005 the Surabaya municipality has organized Green and Clean (G&C) Competitions annually for the city's neighborhood units. Through workshops and seminars, environmental facilitators and cadres assist the participating community with technical assistance in composting or in recycling as well as non-technical support including project management, presentation and accounting skills and access to the city's recycler networks (Santosa 2000).

After 9 years (2005–2013), the implementation of the various seminal policies introduced by the Surabaya municipality has brought positive impacts on the improvement of local environment. Due to extensive public campaign by environmental facilitators and cadres, the environmental awareness of households has significantly improved, as indicated by the increasing waste segregation and reduction at its source. Currently about 400 environmental facilitators and over 28,000 environmental cadres are actively involved in promoting green and clean environment. As a result, the number of neighborhood unit that have participated in the annual G&C competition has substantially improved almost by 567 %,

Table 9.1 List of actors involved in promoting THC for composting (Adapted from Tahir et al. 2011)

Actor	Role
Household	Separating organic waste in Takakura bin
Environmental cadres	Supplying household with technical and/or nontechnical support for operating the community-based waste management
Facilitators	Educating local community in environmental awareness and training environmental cadres
Local NGOs	Providing the community with technical trainings and financial support for waste separation activities
Media	Disseminating information and public campaign
Municipality	Establishing community-based composting centers in every district

from 300 in 2005 to 2000 in 2011. In addition, over 40,000 households in the municipality have widely used takakura bins for home composting activities. This encouraging result not only reflects an improved environmental awareness among local community, but also promotes composting activities at household levels, thus providing job opportunities for poor family. They may either commercially sell their compost at US$ 0.07/kg or use it for their agricultural farming (Akenji 2011).

Furthermore, the municipality established over 15 composting centers citywide with their production capacity of 600 t compost monthly (Santosa 2000). The compost is used not only for beautifying local urban environment, but also for urban farming. This leads to an increase in green space citywide in recent years. As a part of the G&C public campaign promoted by the municipality, a variety of trees are planted surrounding the city's green spaces.

Apart from being involved in compost production, the government and private sector have been credited for having set up over 15 informal recycling industries in Surabaya. They make handicrafts and hand-made products like plastic bags and purses from recyclable waste, thus creating additional income for unemployed housewives (Wilson et al. 2006).

9.7   Concluding Remarks

After 9 years (2005–2013), the international cooperation between the Kitakyushu and the Surabaya cities has borne fruit in terms of improved solid waste management system through the THC method. Organic waste going to the MSW system has being reduced and large amounts of greenhouse gases have been avoided through a relatively small innovation and limited resources needed by both cities.

There are several lessons we can bring from the relative success in the adoption of the Takakura method in Surabaya through the cooperation with the city of Kitakyushu. Firstly, the case showed that large improvements can come up with a very simple technology. The high-tech solutions may fit in some cases, but there is a lot of room for improvements in developing countries with existing best available technologies (BAT). Cities in developing region can play major roles in this process as they have the required expertise, and in many cases, the budget to start the kind of cooperation.

Secondly, local institutional environment is important to the success of adoption of BAT in the waste sector like composting. Similar to other BATs such as cleaner production, composting technology using the THC has minimum impacts on the environment and acceptable cost without compromising local public health (Dijkman 2000). The international cooperation did not end with the simple provision of the technology. The local government and communities had to create the organizational capacity to make a viable CBSWM system. The technology was simple and relatively inexpensive, but substantial improvement was only possible when people followed up and the local government firmly spreads and applies the

new system widely. Cities have knowledge to engage local communities that are also important to share, or at least be aware of their need to improve the local capacity to provide such services.

Thirdly, there was a huge demand for the services that the technology could provide and interest from the local communities and governments. The local government wanted to reduce MSW because of the reducing capacity of local dumping sites. Local communities were also eager to improve waste management in their areas to reduce the problems caused by uncollected waste. The THC nicely filled the existing gap. Even though it did not require much financial resource, the THC could mitigate the local waste problems. This indicates that city to city cooperation could catalyze processes that are highly demanded locally.

Finally, city–to-city cooperation on social innovations can facilitate larger processes in other cities or at the national level towards environmental sustainability. The success of the THC in Surabaya has inspired community-based solid waste management to be replicated in other cities in Indonesia. As a result, Takakura-based composting model was included as one of the most important features in the Indonesian Solid Waste Management Legislation since 2008 (Meidiana and Gamze 2011).

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Chapter 10
Collaboration and Partnership in the Context of Indian CSR: The Global Compact Local Network and the I4D Project

Jorge A. Arevalo

Abstract The recent emergence of sustainability partnerships and the activities and commitments of some prominent global actors has not received enough empirical attention in the academic literature. In this chapter, we examine the collaborative dynamic of a relatively new initiative – the Investors for Development Project (I4D). Specifically, we investigate how its partners i.e. Northern Governments, United Nations Economic and Social Commission Asia Pacific, the UN Global Compact, and the wider community in the CSR field, have fueled the promotion and awareness of sustainable and responsible business in Asian economies. We find that financial and leadership commitments play an important role in shaping the sustainability efforts among Global Compact participants in Asian nations. In particular, we observe how the aims of this project have, to some extent, addressed some of the reported challenges of implementing CSR among the Indian business sector. We further find that the I4D model, conceptualized in this study as an inclusive partnership of global actors, does offer a platform for collaboration and networking opportunities among various stakeholders genuinely concerned for sustainable development in the South. We offer a discussion on the potential of this initiative, and make calls for more strategic insights that can move the scientific research in this field.

Keywords Partnerships for sustainable development • Sustainability in emerging economies • CSR in India • I4D Project • Global Compact local networks

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10.1 Introduction

Given the enormous challenges that the current transition to a more sustainable future entails, a number of firms worldwide have been encouraged to undertake significant investments in "best practice" management approaches and voluntary commitments (Aragón-Correa 1998; Kolk and Pinske 2005; Darnall 2003). However, a significant number of differences have emerged between sectors in terms of an awareness of sustainability challenges, investment into improved processes and products, and the overall sustainability impact of their actions (Banerjee 2001; Bansal 2005). These differences in corporate approaches to sustainability have become visible in the international arena with value chains of developed country corporations reaching deeper and deeper into those of developing ones (Gereffi 1999). Likewise, corporate approaches of firms from developing countries have also witnessed a higher visibility in terms of their development of global value chains and how these generate sustainability impacts of an increasingly global nature (Hoskisson et al. 2000; Cuervo-Cazurra 2008).

Adding to these corporate challenges and their voluntary approach, is the current debate on sustainable development and the institutional arrangements that are most promising to bring the process of progressive change forward. While some see the state-centric approach as generally recognizing the basis for sustainability policy and politics; it is the pluralistic approach that is increasingly gaining popularity. Instead of relying on a strong state to induce sustainable progress on business, the focus has shifted to develop more promising opportunities within a strong society (Glasbergen et al. 2007). This societal approach is at least partly based on private initiatives from the market and civil society. In certain ways, governance for sustainable development has become an effort to cooperatively structure the relationships of stakeholders around a sustainability issue (Lafferty and Meadowcroft 1996; Meadowcroft 1998; Driessen and Glasbergen 2002).

In capturing these developments, the current chapter highlights the activities of a sustainability-oriented partnership involving the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the Investors for Development Project (I4D), and local networks of the UN Global Compact. Briefly, the Secretariat of the ESCAP is the regional and social development center for the United Nations in Asia and the Pacific; the I4D is a project launched in 2007 by the Trade and Investment Division of ESCAP; and the Global Compact (GC) is a CSR initiative which serves as the main United Nations instrument for the development, implementation, and disclosure of responsible and sustainable corporate policies and practices (a more formal description and introduction of these entities is presented in Sect. 10.4).

In general, partnerships for sustainable development are self-organizing and coordinating alliances. In a more strict definition; they are collaborative arrangements in which actors from two or more spheres of society- whether state, market, and civil society, are involved in a non-hierarchical process through which these actors strive for a sustainability goal (Glasbergen et al. 2007). In recent times, partnerships are set up to solve societal problems and they do so on the basis of a

commitment that is formalized to some extent. In most cases their problem-solving task is accomplished, either partially or exclusively, by private parties. Recently, partnerships are perceived as arrangements that can further the drive for sustainable development. In that role, they provide a managerial response to the general ethical ideal of societal progress.

In this chapter, we are particularly interested in examining how these agencies (ESCAP, I4D, and the GC), and the roles they play in this partnership, promote sustainable and responsible business in Asia. Specifically, we examine how the outreach activities of this partnership have enabled developments in policy dialogue and partnership facilitation for one particular economy – India. An important aspect of the GC is the commitment of its local networks as Global Compact Local Networks (GCLNs) support the implementation of the GC principles at the national and regional levels. GCLNs play an important role in helping to identify pertinent partnering themes and engaging relevant actors in concrete projects where their comparative advantages are utilized (Whelan 2010). Given half of its corporate members (those surveyed in 2008, see UNGC Annual Network Report 2008) are engaging in cross-sector projects that address development gaps, a closer look at the reported accomplishments of south-driven sustainability efforts is timely and relevant. While the I4D Project is relatively a new initiative, this chapter seeks to understand the dynamic of cross-border partnerships and the effect of the GC networks in advancing implementation of CSR for the business sector. This chapter attempts to explore these factors by focusing on the processes required to build innovative relationships among multi-stakeholders while reporting on the successes of cross-border partnerships and collaboration in this region.

To this end, the chapter is organized in five sections. The first section offers definitions of CSR in the context of development. The second section describes the distinctions between East and West approaches on corporate social responsibility by first presenting an overview of the historical aspects of CSR in India. It then provides a more recent account of the perceptions, orientations and CSR trends in the country, and concludes with a review of the reported drivers and barriers to CSR as described in the recent literature. The third section describes our methodology. The fourth section presents a model for South-driven sustainability by describing the dynamics of the I4D Project. The last section offers some concluding thoughts on cross-border partnerships and collaboration.

10.2 CSR in the Context of Developing Countries

Corporate social responsibility (CSR) is not a new concept in most parts of the world (Barkemeyer 2009). While different terms have been used to describe this concept, there have been similar approaches towards business responsibility in society in many different countries (see e.g. Blowfield and Frynas 2005; Prieto-Carron et al. 2006). The current dissemination of CSR instruments, however, is somewhat different in that it stems from the Anglo-American tradition of business

responsibility – that which highlights a voluntary approach particularly putting emphasis on the activities of northern multinational companies. Some authors have argued the non-authoritative, self-regulatory approach of CSR has been extremely successful in recent years as it has become increasingly relevant in areas that had previously been dominated by official development assistance (see e.g. Blowfield and Frynas 2005). This shift in relative importance can be illustrated by the increasing magnitude of foreign direct investment (FDI) into developing countries in the last decades. It is argued that the rise of FDI into developing countries has been rather modest compared with the respective financial flows among the so-called triad of North America, The European Union and Japan (Barkemeyer 2009; Chambers et al. 2003). However, its relative importance has increased dramatically, especially in the reported share of FDI flows into developing countries. For example, the World Investment Report (UNCTAD 2011), reports that for the first time developing and transition economies together attracted more than half of global FDI flows, rising moderately in 2010 to USD1.24 trillion, or 15 % below their pre-crisis average. Outward FDI from those economies reached record highs, with most of their investments directed towards countries in the South; where in contrast, FDI inflows to developed countries reported a continued decline (UNCTAD 2011).

In the academic literature, CSR in developing economies has been recently characterized as more extensive than commonly believed (Visser 2008). It is less embedded in corporate strategies, and less politically rooted than in most high-income countries. Recent research similarly characterizes the CSR of small and medium enterprises (SMEs) in developing countries as anchored in a blend of personal and religious motivations (Jamali et al. 2009). The activities of SMEs in developing nations reflect in a spontaneous altruistic philanthropic CSR orientation. In the African context for example, Frynas (2005) identifies a grassroots understanding of CSR whereby local firms are expected to actively assist their surrounding communities. Likewise, Amaeshi et al. (2006) explain that the CSR of African firms is not only culturally embedded but also provides a social buffer where public institutions are weak. In the case of South American businesses, Newwell and Muro (2006) note that the degree of embeddedness within global markets emerges as perhaps the single most important driver of CSR behavior. Countries in this region possessing highest levels of FDI and greatest exposure to global markets, also demonstrate an increased involvement in CSR initiatives (Newell and Muro 2006, p. 57). CSR activity in developing countries is therefore portrayed in the academic literature as ongoing and extensive. However, this activity tends to be less formalized, more sunken, and more philanthropic in nature (Amaeshi et al. 2006; Visser 2008), in comparison to northern CSR activity. It has also been observed that CSR in developing countries draws on deeply engrained cultural and religious values and is primarily oriented towards local communities (Jamali et al. 2009; Visser 2008; Arora and Puranik 2004; Raman 2006; Balasubramanian et al. 2005). The literature, therefore, points to distinctive CSR orientations among firms across the developing world, with a salient set of cultural and religious values at play. Moreover, research on CSR in developing countries suggests that the role of government is limited in the social domain and that CSR is often conceived as a way to fill in as governments

have fallen short in these aspects (Amaeshi et al. 2006; Frynas 2005). It is suggested that the power of corporations in the developing world seems to have evolved and flowed, as governmental bodies have waxed and waned, implying a tremendous scope for maneuver in the CSR domain (Jamali and Neville 2011).

In this chapter, we apply a development-oriented framework to contextualize CSR to the structural adjustments relating the macro socioeconomic issues relevant to the developing countries, with a particular focus on CSR in India. We begin with a discussion on the historical aspects of CSR in India, where we also provide a literature review on its recent trends as they have emerged from the academic studies. To complement this discussion, we then continue with a review of the reported drivers and barriers to CSR implementation as they have also emerged from the literature.

10.3 Historical Aspects of CSR in India

Unlike its western counterparts, businesses in Asia take part of a social welfare philosophy that is embedded in corporate philanthropy (Mohan 2001). In the case of India, scholars have traced the overarching role of tradition, spirituality, and respect in the evolution of CSR (Mohan 2001; Jose et al. 2003; Sagar and Singla 2004; Balasubramanian et al. 2005). In the late nineteenth century many family owned businesses, traditionally operating in merchant communities, pioneered the indigenous industrialization in India (Arora and Puranik 2004). In addition to participating in the freedom struggles of the nation, these families also contributed to the nation-building processes taking place thereafter. During the 1950s and 1960s, the Gandhian philosophy of trusteeship became quite influential for India's development. The idea that businessmen in India see their business empires as a "trust" held in the interest of their communities at large, was revived and reinterpreted by Mahatama Gandhi. Following this tradition, businesses made significant contributions to support schools, hospitals, technical training, public health and rural development (Mohan 2001). Also, shortly after its independence in 1944, India began experiencing the elements of state-sponsored CSR activities through large public sector companies – while the country continued to face a mixed economy framework.

In its historical form, CSR in India has been dominated by a philanthropic approach consistent with the long-standing tradition of close business involvement in social development needs (Chaudhri and Wang 2007). More recently, CSR in India has received an impetus from the emergence of nonfamily businesses, or corporate will, as well as government and public expectations (Mohan 2001). Scholars also note that Indian CSR is now an important part of the movement away from rapid growth, export-oriented, cost advantaged-focused strategies to longer-term, business development initiatives (Balasubramanian et al 2005). In the next section, we describe these CSR trends in the context of social responsibility in development and discuss how they are understood in India.

10.4   Recent CSR Perceptions, Orientations and Trends

The concept of CSR is not new in India. It has been defined in a number of ways and, to a large extent, the discussions about "what it is" have been confused by the variety of perspectives being adopted (Balasubramanian et al. 2005). In the turn of the century, much research began to be conducted by different organizations attempting to gage the perceptions of CSR among companies and their different stakeholders. These perceptions are outlined next, followed by a review of the more current literature which has attempted to describe the reported drivers and barriers of CSR by the business sector.

The first prominent set of surveys was conducted by Partners in Change (PIC), which investigated the perception of companies on their role in CSR activities. Their 1999–2000 survey reported an increase in CSR activities by managers in comparison to their mid 1990s findings (PIC 2004). This increase suggests that the corporate environment is more conscious of the implications of involvement in CSR activities with specific reference to the Indian context. A second prominent survey traced the CSR history and operationalization of CSR in India. It was suggested that at least four models of social responsibility can be identified as operating in the country (Kumar et al. 2001). First, there is the voluntary commitment to public welfare which is based on ethical awareness of broad social needs, or *Gandhian* model. This approach emphasizes corporate responsiveness to charity, and support for those in need. The second model comprises state-driven policies including state ownership and extensive corporate regulation and administration, or *Nehru* model. This framework emphasizes state-driven notions of responsibility defined by legal requirements. The third model is corporate responsibility which is primarily focused on owner objectives, or the *Milton Friedman* model. This framework emphasizes the need to sustain business based on fulfilling risk takers' expectations. The fourth model addresses stakeholder responsiveness which recognizes direct and indirect stakeholder interests, or the *Freeman* model. This framework addresses the need to take account of all those affected by corporate decisions, society, and the environment as well the economically interested stakeholders.

The above report, which explored the perceptions and expectations of some stakeholders vis-à-vis workers, company executives, and the general public, showed that Indians in general feel businesses must play a wider and expansive role in society (Kumar et al. 2001). Researchers examining the ethical orientations of managers in India suggest that changing business patterns since the country's liberalization in 1991 have promoted more pragmatic and western-style ethical stances (Chakraborty 1997; Fisher et al. 2001). These examinations suggest that while the Ghandian, Nehruvian and stakeholder models of CSR are being understood and idealized simultaneously in India, the Friedman model has been noticed as more influential by businesses in India (UNDP 2002). A survey conducted in 2002 by the British Council revealed that many companies are still steeped in an amalgamation of transition from trusteeship/ethical model to the statist model, and highlighted growing recognition among companies that passive philanthropy is no longer sufficient in the realm of CSR (British Council et al. 2002).

A comprehensive review of CSR in India, from the late 1990s up to 2003, concluded that while many companies in India have taken on board the universal language of CSR, CSR itself seemed to be in a confused state in India (Arora and Puranik 2004, p. 98). The authors find that companies define CSR in their own limited ways and contexts with an end result being that many of the CSR activities are merely philanthropy, or extensions of "giving."

10.4.1 CSR Drivers and Barriers

The drive for responsible business has been associated with the "business case" for CSR (Fox 2004; Barkemeyer 2009). Businesses face a series of internal and external drivers, which together may generate returns for particular actions. These can include the pursuit of new business opportunities through social and environmental innovation, cost savings, staff recruitment and retention, reputational risk management, pressures from NGOs or trade unions, media exposure, regulation, and litigation (Fox 2004). In the business case of Indian companies, a number of comprehensive studies have investigated the extent of corporate responsibility uptake in leading emerging markets and the corresponding drivers. Baskin (2006) conducted a comparative analysis of companies in both emerging markets and developed economies by analyzing a number of generic indicators including the Dow Jones Sustainability Index (DJSI), the Global Reporting Initiative (GRI) and ISO14001; on companies self reporting of their CSR activities. His study concluded that the reported CSR in emerging markets, especially South Africa, Brazil, and India, is more developed than commonly thought, often exceeding standards in some high-income countries and regions. The study also summarized the current state of CSR in Asia as: a) Indian and Malaysian companies beginning to incorporate CSR in their social, environmental and ethical policies, systems and practices; b) companies sharing CSR interests elsewhere, and c) China reporting a lower uptake of CSR activities (Baskin 2006, p. 31). The key drivers to CSR in Asian companies reported in the same study were: global pressures, strategy for competitive advantage, and strong external investor interest in corporate governance and social responsibility investment in Asia.

Other surveys which are NGO oriented have identified the concerns that drive managers as they practice their CSR. These include: concern for social improvement, concern for ethics and values, and concern for the need to care for society (IndianNGOs.com 2002). Surveys conducted by business-related agencies have focused on the pragmatic CSR themes that motivate companies to practice CSR-these include: corporate reputation, employee and customer relations, stakeholder impact, responsiveness to local communities, legal compliance, strategic and corporate planning at the board level (UNDP 2002). Other reported drivers for corporate managers on CSR include: the drive to become good corporate citizens, maintaining social commitment, and improving employee relations (Reddy 2006).

Obstacles and problems managers face while implementing CSR are addressed in more recent surveys – and directly from CSR managers during the turn of the century. Brown (2001), for example, notes that competitive business practices, poor ethical decision-making, corruption, and mismanaged government practices – lax regulation, confused policies, complicated and excess bureaucracy – were some of the more visible concerns by managers. Likewise, another prominent survey explored perceptions of and attitudes towards corporate social and environmental responsibility of modern Indian companies covering a wide range of businesses (CSM 2001). The findings from this report suggest that the government with unclear policies, ineffective bureaucracy, poor monitoring record, complicated tax systems, and poor infrastructure was the key barrier to CSR in India (Prakash-Mani 2002). Some managerial inadequacies have also been noted in the proper implementation of CSR i.e. the need to move from an "ad hoc approach to strategic intervention" (NSE/NIFTY 2003) and the lack of executive commitment and unprofessional management (Brown 2001). Added to this list was the inadequate subsequent evaluation of CSR initiatives by managers (IndianNGOs.com 2002), the lack of financial support to become CSR oriented, alongside foundation creation, public relations activity and philanthropic work involved in the commitment (NSE/NIFTY 2003).

In a recent empirical study, Arevalo and Aravind (2011) surveyed top level managers on their motivations and reported barriers to implementing CSR practices. The study found that the CSR approach that is most favored by Indian firms is the stakeholder approach and that the caring or the moral motive, followed by the strategic or profit motive, are important drivers for Indian firms to pursue CSR. Because the study focuses on the activities of leading Indian firms participating in the UN GLobal Compact (GC), and the survey items were based on prior empirical research and recent literature on CSR motivations and reported challenges, we share the results of this analysis in Table 10.1.

Further, their results indicated that the most significant obstacles to CSR implementation are those related to lack of resources, followed by those related to the complexity and difficulty of implementing CSR (See Table 10.2).

As can be seen from the above discussion, CSR is considered a key strategic concern for corporations in India. However, some speculate that it has not been extensively integrated into the daily practices of many of the large Indian corporations (Balasubramanian et al. 2005). Aside from a few specific sectors, some corporations which have been identified as CSR proponents, are still reporting gradual implementation processes and practices but little impact analysis or subsequent evaluation is reported as to what it is that is being undertaken. When considering the reported barriers to CSR implementation, it is critical to understand that from an emerging market perspective, these needs are real. In the context of CSR in development, there exists a gap and opportunity to fulfill the reported shortcomings – mainly in the area of financial resources and knowledge transfer mechanisms that will enable the business sector to align their CSR motivations with some measurable implementation outcomes.

In the next section, we describe our methodology and sources used to analyze the literature on CSR and sustainability for emerging markets. Following this section,

Table 10.1 Motivations for Pursuing CSR

How important were each of the following reasons for implementing CSR in your company?	Rating Average
Implementing CSR aligns with our company's ethical values	6.65
It is the right thing to do	6.40
Top management believes in CSR	6.30
Demonstrating leadership in CSR	5.65
Meeting government regulations	5.55
Gaining market access	5.50
Brand protection	5.45
Satisfying employees	5.40
Increasing Sales	5.33
Satisfying major customers	5.25
New export opportunities	5.16
Improving image	5.15
Satisfying shareholders	5.11
Satisfying Non-Governmental Organizations	5.10
Satisfying major suppliers	4.65
Catching up with our competitors	3.90
Possibility to charge higher prices	3.74

Source: Adapted from Arevalo and Aravind (2011), Corporate Governance: The International Journal of Business in Society

Table 10.2 Barriers Facing CSR Implementation

In your opinion how important are the following barriers or obstacles to the implementation of CSR in your company?	Rating
Lack of training opportunities or seminars to learn about CSR	3.60
We do not have sufficient financial resources for CSR implementation	3.25
Difficulty obtaining information about CSR implementation	3.20
We do not have enough knowledge about CSR practices	3.05
Our workers do not have the necessary skills/education for successful implementation	3.00
Our management does not have adequate training to implement CSR practices	2.95
We do not have enough knowledge about CSR implementation	2.90
CSR implementation is too time consuming	2.80
Currently there are more important priorities for the company	2.65
CSR implementation is too complex	2.65
CSR implementation is too expensive	2.40
There will be no significant benefits for our company from CSR implementation	2.30
Middle management does not support CSR implementation	2.15
Top management does not support CSR implementation	1.85

Source: Adapted from Arevalo and Aravind (2011), Corporate Governance: The International Journal of Business in Society

we then highlight how one particular project, the I4D, has made an attempt at addressing some of the South-driven needs in terms of moving the sustainability agenda forward for Asian countries.

10.5   Methods

Methodologically, our literature review is based on selected articles from the wider analytical literature on CSR and Sustainability in Asia, including both peer-reviewed articles and general UN publications including Annual Reviews and GC Local Network publications. The literature was accessed and reviewed between May and June 2012 using three sources: (1) ABI/Inform, (2) Business Source Premier, and (3) Google Scholar. These search engines provided numerous hits (over 170); however, only peer-reviewed articles and special issues on sustainability topics in emerging markets were selected. Articles specifically including India as a country of analysis (whether comparatively, or as the central focus), were used for our review. Other sources of information include a) the UN Global Compact web site (see: www.unglobalcompact.org), which provides rich data on its business/nonbusiness participants including updated specific country listings, dates of joining for participants, type of participant (i.e. business, NGO, academic, etc.) industry sector, company size, and reporting trends as they implement the UN principles, as well as other sources of information for business and scholars; b) correspondence and specific feedback on the I4D Project from representatives at UNESCAP Trade and Investment Division, Thailand; and c) the official Global Compact Network Office in India including its Annual Reports and relevant publications (see: www.gcnindia.org).

10.6   The Partnership and Collaboration Model of the I4D Project

10.6.1   Leadership and Influence of UN Agencies

The I4D project was launched in 2007 by the Trade and Investment Division of ESCAP with funding originating from the governments of Sweden and the Netherlands. The Secretariat of at ESCAP is the regional and social development center for the United Nations in Asia and the Pacific. Its main objective is to foster cooperation between its 53 members and 9 associate members by (a) supporting governments of countries in the region in consolidating regional positions, and (b) advocating regional approaches to meeting the region's unique socioeconomic challenges in a globalizing world (visit website at www.unescap.org for more information).

The I4D project has two main functions. First, it aims at promoting more effective implementation of the GC's principles and CSR through the establishment and promotion of a regional community of practice in Asia and the Pacific. This community includes a diverse group of business people, NGO representatives, governments, consultants, researchers, and other stakeholders who work in the CSR field. Second, I4D also performs as the GC's regional support center Asia Pacific by enhancing the capacity of, and cooperation between, Global Compact Local

Networks (GCLNs) in the region (see www.unescap.org/tid/i4d/ index.asp for more information). Since the end of 2007, ESCAP has been implementing I4D which aims to improving the contribution of business to sustainable development through increased implementation of corporate sustainability principles. The project was designed to use GCLNs as key change agents, and focused on building the capacity of these networks to support company implementation of GC principles. Over the course of the past 5 years the project has achieved substantial results in terms of increasing network growth and participants' engagement.

As the only intergovernmental UN organization covering the whole Asian and Pacific region, ESCAP is ideally placed to carry out this task. ESCAP implements the project in close cooperation with stakeholders both at the national and regional level, and in close coordination with the GC main office and all relevant UN agencies (UNESCAP 2012). To leverage ESCAP's regional convening role and build capacity in a sustainable manner, the project has focused on three key components: (1) helping networks increase their financial and organizational sustainability and ability to provide value to companies, and address network governance issues; (2) increasing the capacity of network focal points through organizing specialized trainings and creating platforms (both online and through in person meetings/exchanges) to facilitate the sharing of experiences and learning from each other, and (3) developing training curricula and materials, conducting training of trainers, and organizing country-level hands-on trainings for companies on implementation and reporting of GC principles, thus building the capacity of networks to perform their core function of promoting the GC and assist companies in implementing its principles. It is worth noting that I4D has always been mandated to help individual GCLNs – which can be considered the intermediary organizations between the GC office in New York and companies across the world. However, I4D is not designed to provide support or interaction on a company-by-company basis (UNESCAP 2012).

10.7   The Instrumental Commitment of the UN Global Compact and Its

10.7.1   Local Network Structure

The UN Global Compact (GC) was initiated by former UN Secretary General Kofi Annan and has rapidly evolved into one of the most visible global CSR initiatives (Barkemeyer 2009; Waddock 2008). Launched on July 26, 2000 with 44 signatories, the GC today comprises nearly 10,378 members worldwide (business and nonbusiness), including 6,971 companies listed as active business participants (UNGC as of 3 July, 2012). The GC is an international voluntary network-based initiative which houses companies of all sizes from a variety of sectors and offers cooperation with local/global NGOs, academic institutions, foundations, governments, CSR

Table 10.3 The ten principles of the Global Compact

Human rights	
Principle 1	Support and respect the protection of internationally proclaimed human rights
Principle 2	Make sure that they are not complicit in human rights abuses
Labor	
Principle 3	Uphold the freedom of association and the effective recognition of the right to collective bargaining
Principle 4	Elimination of all forms of forced and compulsory labor
Principle 5	Effective abolition of child labor
Principle 6	Elimination of discrimination in respect of employment and occupation
Environment	
Principle 7	Support a precautionary approach to environmental challenges
Principle 8	Undertake initiatives to promote greater environmental responsibility
Principle 9	Encourage the development and diffusion of environmentally friendly technologies
Anti-corruption	
Principle 10	Work against corruption in all its forms, including extortion and bribery

Source: Adapted from UNGC Annual Review (2008)

organizations, and other stakeholder groups (UNGC 2010). As a voluntary initiative, the GC relies on public accountability, transparency, and enlightened self-interest of companies. The GC takes two basic approaches. First, it prescribes a set of 10 norms for CSR related to human rights, labor, the environment, and anti-corruption, as guidelines for CSR (See Table 10.3). These norms are drawn from the Universal Declaration of Human Rights (principles 1 and 2), the Fundamental Principles on Rights at Work from the International Labor Organization (principles 3, 4, 5, and 6), the Rio Declaration on Environment and Development (principles 7, 8, and 9), and the United Nations convention Against Corruption (principle 10). Second, the GC offers learning and discussion platforms for companies and NGOs, where exchanges are made regarding issues related to CSR development and cooperation. The GC's main objectives are also twofold. The first involves efforts to internalize the GC and its principles by making them part of business strategy and operations. Second, the GC facilitates cooperation and collective action for problem solving among different stakeholders (Kell 2003, p. 36).

The GC provides a rich and publicly available database and informational website including: overview of the initiative, participation guidelines, disclosure and communication on progress (COP) guidelines for current members, a complete list of all business/nonbusiness participants worldwide, local network information, etc. (visit unglobalcompact.org for further details). Table 10.3 lists the ten principles of the GC.

In terms of engagement, the GC does not follow a formal candidacy selection of its corporate members, nor does there exist a huge barrier to entry (Arevalo and Fallon 2008). The GC, along with other easy access networks, such as the GRI, has been classified as a "process-oriented" initiative (Gjølberg 2009), which to some extent does offer its members high global visibility (Bremer 2008). Due to its voluntary nature, the GC actually does not aim at forcing companies to participate in

the initiative, nor does it mandate binding contracts. Because of its magnitude; the GC is not designed as a certification process, nor as an initiative that aims to sanction its participants. Its framework relies heavily on the voluntary commitment of its signatories. Understanding that the GC began operating and continues to operate on a rapid growth to scale strategy which seeks to build a large base of participants; it was important for many of its participants to disseminate knowledge and best practice on their own and through a local networks engagement.

It has been documented that almost as soon as the GC was launched in 2000, a number of its participants recognized the need and value in engaging locally in an effort to better understand the practical meaning of the initiative (Whelan 2010). Without any clear direction from the GC office in New York, the idea of local networks began to emerge in a diverse and uncoordinated manner (see Whelan 2010 for an overview of the evolution of the GC's network governance and trends in network management). Thus, the creation of the GC Local Network (GCLN) was the direct result of a committed individual or organization seeking to promote the agenda among their peers. Some participants saw themselves as promoters of the initiative by gathering committed stakeholders while others took the lead and established themselves as formal entities ready to support and facilitate the implementation process (Whelan 2010).

Thirteen years in operation, the GC has reached approximately 101 local networks, with 20 networks in development (UNGC as of July 2012). It is worth noting that the Swiss Government provided invaluable financial support for the development of GCLNs from the very start of the process. In addition to supporting the first Network Meeting, they provided financial support by way of seed funding to a number of developing country Networks (Whelan 2010, p. 330). Today, local networks are clusters of participants who come together to advance the GC and its principles within a particular geographic context.

10.8   The Activities: GC Local Networks in Action

Local Networks undertake a variety of activities to support GC participants – including identifying local priorities, organizing learning and dialogue events, producing learning materials in local languages and motivating participating companies to develop partnership projects to contribute to the UN Millennium Development Goals (MDGs). They have also taken two main roles for the GC. First, GCLNs support companies, both local firms and subsidiaries of foreign corporations, in their efforts to implement UN principles; while also creating opportunities for multi-stakeholder engagement and collective action. Their second role is to protect the overall integrity of the GC. As the capacity and accountability of GCLNs has developed over the years, they have increasingly assumed responsibilities which protect the overall brand of the GC. These integrity measures include screening of new signatories, facilitation and workshops for COP reporting, and promotion of dialogue facilitation in cases where concerns are raised about a company's participation or lack thereof (Whelan 2010).

Overall, network activities fall into the following categories: outreach events and awareness raising, tool provision, learning events, policy dialogue, and COP facilitation and partnership facilitation. We discuss these next in the context of their general activities in the Asian region and offer brief commentaries on some of the reported outcomes for the Indian sector (see www.ungobalcompact.org – *Local Networks* for general information, and www.unescap.org for specifics on the I4D Project).

10.8.1   Outreach Activities to Promote CSR and the Global Compact

The initial purpose of reaching out to companies was to ensure awareness raising and recruitment of new companies to the GC network (Whelan 2010). In the early days of the initiative, GC staff travelled extensively around the globe promoting the concept of the GC and its principles, while reaching out to clusters of GC participants in order to exchange on their experiences and learn best practices. Through these events, the idea was born to form committed clusters to continue these exchanges and enforce coordinated efforts. Another purpose of these outreach activities was to spread the word about CSR among companies and the nonbusiness sector in a country. In the early phase of local networks development, the GC organized conferences, media campaigns and workshops to initiate discussion on how global responsibility trends can be applied to specific countries. More importantly, these events ignited interest among companies receiving these public messages as to how the GC and its local network offered potential value to both businesses and their societies. It is noted that once enough interest in the initiative had been generated, and a critical mass of stakeholders had recognized the value in engaging locally, a launch of the GCLN could take place (Whelan 2010).

Recent outreach activity impact: In March 2010, the GC Network office in India held the Asia Pacific Regional Conclave drawing more than 500 delegates from 21 countries to Delhi to explore the Global Compact's role in drawing regional businesses into responsible business initiatives (UNGC 2011). This pact is expected to spark the development of a road map for expanding corporate sustainability throughout India and Asia Pacific.

10.8.2   Learning Activities and Provision of Tools

While the GC has developed a valuable set of globally designed and generic tools i.e. tools and resources for principle implementation, material and guidance for business development, guidance on business and peace, workshops on financial markets, and abundant resources on integrity measures; additional materials and

training are sometimes more successful if they are a source for practical action and inspiration in a local context. These workshops and training sessions provide valuable learning platforms where GC stakeholders can gain a better understanding of the UN principles, as well as understand the general concept of the GC and its CSR objectives. GCLNs add value to the coordinated efforts of its participants by adjusting and further developing some of these tools to fit to the local context and language of the local network.

Recent learning activity impact: The Regional Center Asia Pacific has created a web based meeting and information portal for all Local Network contacts. The portal has helped build closer professional as well as personal relationships where contacts have access to meetings, a variety of tools, case studies, forum materials and discussions, to boost their knowledge of corporate responsibility (UNGC 2011). The Indian GC local office actively offers a number of monthly meetings and consultation workshops, as well as international conferences for cooperation and development goals (see Upcoming Events www.gcnindia.org).

10.8.3 Policy Dialogue Platform and Facilitation of Partnerships

As the GC has moved into a solid cluster of networks, some GCLNs have taken the initiative to promote public-private dialogues relating the general business and society agenda. In recent years, political and/or public issues are beginning to proliferate in business communities as these issues are relevant to their economic future. For example, there are businesses operating in areas affected by a low business climate, corruption, and lack of development – public issues normally associated with emerging markets. It is anticipated that more companies will be interested in participating in such public discourses in the future as these activities can, to some extent, positively affect the improvement of policy and agenda overall. Another important aspect of GCLN activity is the facilitation of partnerships with GC stakeholders. Local networks often provide a unique convening platform for cross-sector engagement while playing a key role in helping to identify potential partnering themes. Through exchange and learning platforms, GCLNs can engage relevant actors in concrete projects where their comparative advantages and resources can be utilized (Whelan 2010). In fact, many companies surveyed by the GC are engaging in cross-sector projects to address development gaps (UNGC 2008, p. 42), with the majority of these business participants engaged in projects through their local networks.

Recent policy dialogue impact: The 6th National Convention of the Global Compact Network India was held in February 2011 in Hyderabad. This event brought together over 200 business and nonbusiness delegates from India to deliberate on issues of supply chain management, collaboration opportunities among government – enforcement agencies and corporations on the issues of public-private

partnerships and challenges of diffusion and adaptation of environmentally friendly technologies and green business (see Other GCN Publications www.gcnindia.org for this particular convention's takeaways and details).

10.8.4 Facilitation on UN Principles Implementation and Reporting Progress

It was only until 2008 that the GC began to "delist" companies from their website, as many of these were not reporting progress, or providing an annual communication on progress report (COP) (UNGC 2008). Clearly, as the role of COPs evolved and gained importance for its participants, so has the role and responsibility of GCLNs in this process. COP facilitation remains the most frequent activity of local networks for almost 80 perfect of all networks involved (Whelan 2010). It is reported that three out of four networks conduct COP training and awareness-raising events with half of these providing some kind of mentoring process; also one quarter of GCLNs are involved in peer review processes, and one third of networks engage other networks in some kind of social vetting process (UNGC 2011). The majority of GCLNs see the COP process as an important tool for discovering what it is companies are doing (UNGC 2008). Most important, however, is the role that networks have taken with their local COP efforts in that their measures protect the overall GC brand and integrity of the initiative itself.

Recent reporting progress impact: Overall, and from the six different activities mentioned above, a total of 538 activities were reported by the entire GCLNs network in 2010 with the Asia/Oceania region reporting 28 % (the second highest after Europe) from this total. Local network websites remain the most favored vehicle for circulating information, and newsletters represent the second favorite way to disseminate local activity information (UNGC 2011, pp. 25–28).

In sum, we describe and conceptualize the partnership and collaborating model of the I4D project as a south-driven initiative that is fueled by the financial commitment of northern actors, or those governments located in developed nations who are motivated to invest in emerging markets and are concerned with the current sustainability efforts in place in those nations. We find that UN agencies such as ESCAP and the GC play a critical role as far as influencing leadership and commitment among various stakeholders in the CSR field, especially when supranational bodies such as the United Nations assumes the responsibility to carry out south-driven sustainability projects of this magnitude. Likewise, GCLNs play an instrumental role in facilitating the outreach, learning, policy and partnership dialogues, as well as reporting progress mechanisms needed to ensure advancement in CSR implementation by the business sector in a variety of regions. Such activities are true attempts in addressing the reported CSR implementation gaps that have been reported in the literature, as is the case for the Indian business sector (See Fig. 10.1).

In regards to outcomes and impacts related to the I4D project, it is worth noting that general assessments of effective GC principle implementation have not been
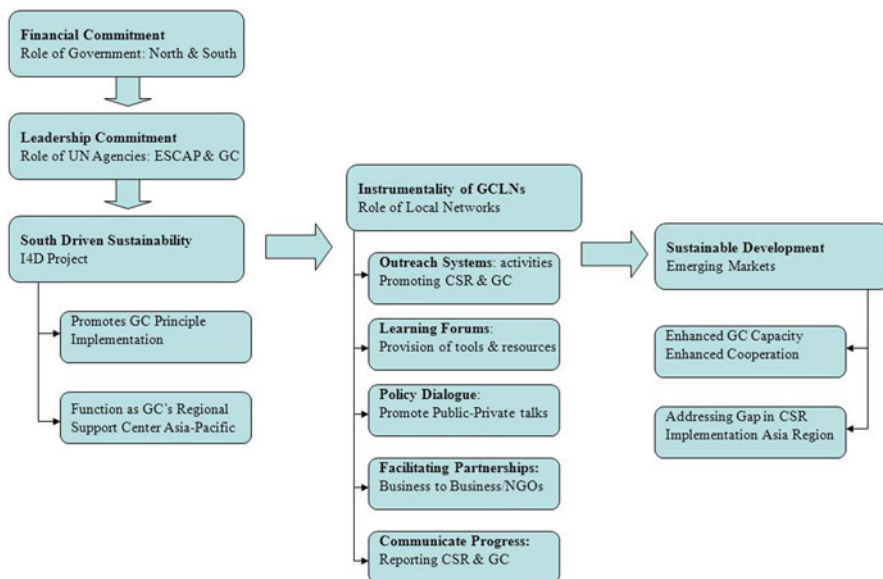
Fig. 10.1 Partnership and collaboration for South-Driven sustainability: The 14D Model (Source: Author's description and interpretation of the I4D project's partners and partnership dynamics)

conducted nor reported in the literature to this date, nor would it be feasible to conduct them on the I4D Project given its infancy. However, a review of the GC's tenth year statistics does reveal an increase in GC membership and capacity in Asia (UNGC 2010). We do not suggest that the reported growth of GC membership has been a direct effect of the I4D Project, nor do we suggest that the project bears no impact on GC membership and its participants' CSR implementation. We trust that GC activities, as well as other CSR activities in the region could have triggered the interest in CSR among these nations. The increase in CSR driven initiatives that have spun in the region could have prompted additional awareness (i.e. CSR ASEAN, APEC 2008 Leaders' Declaration, APEC CSR Activities) as well as the increase of CSR engagement by Asian corporations in international initiatives such as the I4D Project, ILO Programmes and Projects, Climate Neutral Network, The Copenhagen Communique, and the GRI (Anakout 2009).

In review of GC reports, we notice a substantial and almost twofold growth for the Asian region from 2007 with nearly 900 GC participants, to approximately 2000 by 2010 (UNGC 2010). Likewise, the number of GCLNs in the Asia region grew from 7 in 2007, to 13 in 2010 (UNGC 2010).

More specifically for India, we note a slow membership activity since the GC's inception in 2000, to a robust momentum in growth picking up in the year 2008 with 27 new members (12 nonbusiness/15 business) to 41 by midyear in 2012 (25 nonbusiness/16 business) (See Table 10.4). Also, it is worth noting that more academic institutions have joined, and that a good portion of Local NGOs are also joining efforts in the initiative.

Table 10.4 GC membership growth statistics 2000–2012: India

Participant type	Year of GC adoption													12 Year Total
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Nonbusiness														
Academic				1			1	2	4	2	13	4	3	30
Business –association				3			1		1	3	1	1		10
City organization						1								1
Foundation										2	5	1	3	11
Labor local											1			1
NGO global									3	3	4	1	3	14
NGO local				3	3		1	3	4	9	17	9	16	65
Public sector											1			1
Total nonbusiness														133
Business														
Company	3	18	8	2	1	4	8	5	9	1	11	14	3	87
SME			2	2	1		1	9	6	3	10	17	13	64
Total business														151
Overall total	3	18	10	11	5	5	12	19	27	23	63	47	41	284

Source: Author's 12 year analysis of GC activity in India – data retrieved from UN Global Compact website (see www.unglobalcompact.org – participants search)

As we mentioned earlier, we can only assume that the I4D Project, together with its dedicated partners, has had an effect on the establishment and promotion of a regional community of CSR practice in Asia and the Pacific. The above numbers represent the outcomes of a dedicated community in the CSR field attempting to improve the effective implementation of UN principles and CSR for GC participants. We believe that this particular partnership has enabled what some have termed a "cluster of local development" (Porter and Kramer 2011, p. 72); which aims to include businesses, academic institutions, NGOs, trade associations, and standards organizations in the their collaborative quest to drive productivity, innovation, and competitiveness. In fact, Porter and Kramer (2011) have suggested that productivity and innovation are strongly influenced by clusters, or geographic concentrations of firms, their related business associations, suppliers, and service providers. For GC participants, shared value is created by building clusters that can improve company productivity while addressing gaps or failures in the framework conditions surrounding the cluster, or network. We next discuss these observations and offer ideas on fruitful avenues to continue this line of academic research.

10.9 Discussion and Implications

This chapter begins to understand collaborations and partnerships for South-Driven sustainability by exploring the roles and commitment activities of those partners supporting one recent initiative – the I4D Project. It extends previous research on CSR in development by evaluating the reported drivers and barriers to implementing CSR for one particular Asian nation – India. This research emphasizes that while CSR is considered a key strategic concern for corporations in India, a number of pressing issues have been identified in the literature as managers from these developing nations face quite different economic and social challenges than those managers in developed nations. As we discussed, CSR orientations in developing nations draw on deeply engrained cultural and religious values, and is primarily oriented towards local communities and their pressing needs. For India, a transition economy which continues to report growth and economic performance (Kumar et al. 2007), sustainable development can not be undermined. Against this backdrop, companies have been encouraged to undertake significant investments in management approaches and voluntary commitments, and corporations in India are not lagging behind. As companies from giant economies like China and India continue to witness a higher visibility in terms of their development of global value chains – much like their Western counterparts, it is critical to observe how these value chains generate sustainable impacts of a global nature. This chapter has made an attempt to explore these issues from the perspective of collaboration and partnership in the South. We examine these collaborative interactions, elaborate on their potential, and make calls for further contribution to this literature.

First, we find that financial commitments and the role of government play an important role in getting projects such as the I4D off the ground. Understanding the economic nature and complexity related obstacles to the implementation of CSR practices by managers as evidenced by the literature (IndianNGOs.com 2002; Reddy 2006; Brown 2001; Prakash-Mani 2002; Arevalo and Aravind 2011), a number of reasons exist as to why governments should seek to promote CSR both at the country, and regional levels. In a recent report by the Investors for Development Project I4D, Freeman (2011), points to the social opportunities available if there was more government involvement with responsible business practices. From a social perspective, governments from all regions are expected to play a key role in promoting the economic, social and environmental conditions that favor more inclusive and sustainable development. A promising line of research in this area would be to investigate what motivates Northern governments, such as the Netherlands and Sweden, to invest in the sustainable efforts of south-driven initiatives – as is the case of the I4D Project. To this end, what can Southern governments learn from this project and how can they harness the CSR agenda of their own business sector's goals? In this regard, Porter and Kramer (2011) suggest that while the focus has been primarily directed at companies, much more needs to be known as to how the principles of shared values equally apply to governments and nonprofit organizations.

Our second contribution to literature concerns the important insights which can be drawn from the commitment of UN Agencies and their network structure. With a variety of activities and core objectives, Local Networks serve as the forum and on-the-ground platform for GC membership dialogue and mobilization of joint efforts. Gilbert (2010), suggests that when looking at these developments, much can be learned from network theory, especially as we continue to learn that the GC has become a "network of networks" for both business and nonbusiness actors (p. 345). Following this line of thinking, a single network can thereby represent the connections of different stakeholders by a certain type of relationship where economic action and outcomes are affected by the actors' relations and by the structure of the overall network of relations (Granovetter 1992). To this end, applying network analysis on the dynamic of the I4D project can further our understanding of the interdependence found among these actors and how their respective positions in the network influence their behavior, opportunities, and strategies to achieve their objectives (Rowley 1997). Some argue that creating shared value should supersede CSR in guiding the investments of companies in their communities (Porter and Kramer 2011). Will the GC, a successful enabler of local cluster development, be the promising tool that is going to teach world actors how to create shared value as they learn to implement CSR?

Our third and most critical contribution to literature is the conversation we are having on sustainable development and the emergence of sustainability partnerships that have derived from the activities and commitments of global actors. From the 1990s to the twenty-first century Johannesburg summit on Environment and

Sustainable Development 2002 (the Rio + 10 summit), and our recent Earth Summit 2012 (Rio + 20), partnerships for sustainability are no longer a new phenomenon. As we have seen, these partnerships aim to address the challenges of environmental governance in an increasingly complex, globalized world. This emerging paradigm in governance for sustainable development has stirred a number of debates on the role and inclusion of private actors in policy making for sustainable development (Glasbergen et al. 2007). While in this study we define and conceptualize the I4D project as an inclusive partnership comprising government, UN agencies, and the business sector, scientific research on partnerships within the context of governance theory is relatively new. There is an urgent demand from governments and international organizations, but also from non-governmental actors, for strategic insights to build upon their activities in this field. To this end, the recent Earth Summit 2012 in Rio de Janeiro has drafted a number of innovation and collaboration public policy recommendations including cross-sectoral negotiation for urban sustainability (Earth Summit 2012, p. 34). As cities across the globe face crises of sustainability (from i.e. metropolitan areas becoming sprawling, resource-use intensive, difficult areas to live due to climate change and/or sustainable water supply, to increasing economic inequality, and break up of communities etc.), a number of collaborative efforts including: global trans-city collaborations, regional collaboration and coordination, cross-sectoral collaborations, and partnerships with local people have been suggested (see Earth Summit 2012 report summary via www. unglobalcompact.org/docs/news_events).

Over the last 13 years, the Global Compact has become by far the most prominent corporate sustainability initiative. The new design of the GC as an established on the ground "network of local networks"; has helped the initiative with the adaptation and adoption of UN principles at the local and regional level while strengthening its legitimacy and the legitimacy of its actors. Some have suggested that the decentralization of the GC via its local networks and the establishment of regional offices has been an important tool in making the initiative more effective (Rieth et al. 2007; Gilbert 2010). In this study we emphasize the importance of collaborating and aligning sustainability efforts with the efforts of UN agencies – such as the GC. Going forward with initiatives such as the I4D Project and the collaborative efforts of UN agencies, the UN Global Compact can serve as the connection to a world of network opportunities in our quest for sustainable development.

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Chapter 11
Innovation, Investment, Enterprise: Generating Sustainable Livelihood at Grassroots Through Honey Bee Philosophy

Anil K. Gupta

Abstract This chapter argues that the journey to sustainability needs to look at new north poles, may be in the south. Developing countries have developed grassroots innovations that have been characterized by low emissions in many of their rural productive systems through intermediate technologies. A pioneering example of these collaborative dynamics is the Honey Bee Network in India and its international replications around other developing and developed countries. This network of grassroots innovation is responsible for the continuous development, valuation and appropriation of rural knowledge and rural expertise. The chapter, written by the founder of Honey Bees, explores the determinants of success of Honey Bees collaboration networks and analyzes the linkages of grassroots innovations first at the level of collaborative innovations, in particular south-south collaboration, and second in their contribution to the Sustainable Development debate across the world. The chapter also takes stock on how to close the gap between the appropriation of capacities and knowledge and transaction costs, while actively participating in a more greener agenda on Sustainability the Southern way. At the chapter argues "If creative people around the world get opportunities to craft their own world, one would not have to invent policies for making society compassionate, collaborative and accommodative of various social segments. It is the failure to nurture grassroots creative potential that has fuelled so much of social anomie. May be peace through inclusive innovations and participatory institutions is the next mantra of development.

Keywords Honey bees • India • Grassroots innovation • Global South • Knowledge rights

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When an individual, institution, network or a society learns to live with a problem unsolved indefinitely, it ceases to be a progressive and inclusive forward looking community. Indian society is going through a transformation when the traditional inertia is giving way and innovations are being recognized slowly and slowly as instruments of empowerment and change.

After more than two decades, Honey Bee Network could succeed in persuading the government to institutionalize a regular support to NIF (National Innovation Foundation) as a part of Department of Science and Technology, Government of India. The power of the network is apparent from the fact that almost 90 % or more of the ideas, innovations and traditional knowledge practices at grassroots are scouted through volunteers. The remaining entries are received at NIF. I will briefly summarize the journey and then describe a few lessons that follow from the journey for inclusive development. I firmly believe that the current decade declared as "decade of innovation" by the Prime Minister and the President signifies a transformative phase of India's destiny. Many of us being very close to this situation may not realize how important this period would be in the history of the country after a few decades or a century. One of the major reasons is an aspirational revolution that is being experienced in different parts of the country.

There was creativity even in the past. There are numerous examples of outstanding excellence having been achieved in metallurgy, architecture, water management, health, food, etc., which have stood the test of the time. But, the fact remains that over a period of time, we internalized the constraints and generated a culture, which reinforced compromise, compliance and conformity rather than dissent, diversity, and innovation. This habit could survive because of an accompanying culture of "chaltahai," i.e., everything is all right. However, the current young generation is refusing to put up with such an attitude. Even in the earlier generation, those who had fortitudinous ability as evident from their innovations and off-beat approach to life and its challenges are beginning to be recognized. Honey Bee Network has played a small role in bringing about change in the mindset.

Honey Bee Network implies basically four principles: cross pollination of ideas in local languages, acknowledgement of individual and community creativity without making them anonymous, protecting their knowledge rights, and sharing the benefits in a fair and just manner accrued from value addition in the innovations or traditional knowledge. Accordingly, about 1,40,000 ideas, innovations and traditional knowledge practices [not all unique] have been mobilized from 545 districts of India. More than 90 % have been collected by the volunteers of Honey Bee Network while the remaining have come in response to the advertisements.

It all began with Honey Bee Network started in 1988–1989 which led to establishment of SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) in 1993. As a follow up of an international conference on Creativity and Innovations at Grassroots held at IIMA during January 1997, Grassroots Innovation Augmentation Network [GIAN] was set up in collaboration with Gujarat Government. The purpose of GIAN was to reduce transaction costs of innovators, investors and entrepreneurs by linking them with each other. It was also the first attempt to provide micro venture capital support to grassroots innovations.

NIF came about in 2000 with the help of Department of Science and Technology and has become grant-in-aid institution this year.

In 2003, based on an idea mooted by SRISTI in 1997 IIMA conference, a Micro Venture Innovation Fund [MVIF] was set up with the help of SIDBI. It has invested more than 2.5 crores in ideas and innovations by common people without collateral or guarantor. More than 60 % people have paid back and barring one or two cases, there is none who made profits and did not pay. More than 60 technological licenses have been given mainly to small companies and individual entrepreneurs with benefits going back to the innovators. In about two dozen cases, small entrepreneurs chose to license technologies after paying money even when patents had not been granted. This revealed to us an extraordinary ethical value on their part. If they had copied and commercialized, nothing could have been done legally. But, they chose to do otherwise. Probably the values of the network have created wider social capital.

Every summer and winter SRISTI has organized shodhyatras [learning walks] for the last 13 years. We celebrate the creativity at its doorstep. The idea is to honor knowledge experts on the way to convey that outstanding traditional knowledge as well as contemporary innovations matter. Sometimes, when outsiders coming from far off places honor local institutions, individuals and other initiatives, the local respect for the same may also go up. It is part of the institution building effort in the country. It is easier to suggest that India should be a knowledge society but without recalibrating the worth of local knowledge such a transformation may not ever take place. We also organize biodiversity, recipe and idea competitions in the villages to demonstrate the spirit of excellence and collegiality. We try that those recipes which have some uncultivated plants as ingredients get special attention. In the wake of climate change, we might need new sources of food if the present one succumb to new diseases or pests. We have started preparations for any such catastrophe in the foreseeable future.

Many of the so-called weeds are actually rich source of nutrition. The inquisitiveness and the survival instincts of the poor people might actually hold the key to survival of humanity in future. Thus, attention to their knowledge need not be justified only on its own account and for potential help to the poor but also because it will provide ways of survival for the more privileged ones who have lost such an instinct.

We also take the blessings of centenarians on the way and try to learn from their life. Many times innovators are discovered serendipitously on the way. The biodiversity competitions provide a way of speeding up the knowledge transfer from grandparents to the grandchildren. It is an open book quiz where children can learn from anybody in the village about plants and their uses and bring their collection to the meeting. Sometimes the children who excel in this domain may not be very good in studies. Our society has not yet figured out a way of respecting multiple intelligences and thus enabling such children to grow as conservators of nature. This is a task still incomplete. The cultural creativity on the way is also celebrated. The purpose is to create markets for the creativity of unsung heroes and heroines of our society through e-commerce and other mechanisms.

Implications for sustainable livelihoods:

There are primarily four strategies, which I will advocate to policy makers, NGOs, NGIs and R&D institutions that believe in inclusive innovations. The private sector willing to engage with knowledge rich, economically poor people can also contribute to these strategies in a viable manner.

1. Strengthening the technological and institutional basis of existing enterprises
2. Triggering innovation and knowledge based new enterprises
3. Benchmarking the unsolved problems of society and linking them with R&D and management institutions
4. Building value chain and horizontal supply chain to reinforce in-situ value addition and people to people exchange and marketing

11.1 Strengthening the Technological and Institutional Basis of Existing Enterprises

Large number of existing enterprises instead of becoming more remunerative over time, start losing money. That is how we explain widespread poverty in agriculture and rural sector. When a vast majority generates a very small share of GDP and that too growing at a very small rate if at all, the marginalization of their socioeconomic system becomes evident. One of the ways in which these enterprises can be made viable is by looking at the viability of household portfolios Gupta (1981) rather than each enterprise separately. Second way would be infusion of science and technology to improve productivity. Third approach can be improvement in the scope and scale of activities to make negotiating power of the producers felt in the market place. Fourth dimension of this process can be recalibrating the institutional framework so that the role of common property institutions, so critical for sustainability, can be appreciated. The role of other collective institutions has been neglected a great deal in the literature and by the practitioners. In our anxiety to treat each individual as an independent decision maker, we have unnecessarily given away the advantages of social, cultural and ethical capital in our everyday life. Let me illustrate some of these dimensions. We all know that in dry regions the role of craft, livestock, trees and grasses is far more important than just the crops. Even within the crops, the role of fodder and fiber is more important than the grain. And yet, the focus of public policy and many NGO interventions remains focused on improving crop productivity. Given the market and climatic fluctuations, a great deal of effort generates a very minor pay off. If the portfolio of activities is taken into account and flexibility and malleability of choices is enhanced, the household and the communities will be able to make better choices. If there is too much rain, as it was this year in some parts of the country, the monsoon crop may not mature early and the pay off may be limited. Farmers developed a practice in Haryana of harvesting the millet crop as fodder and focus on timely sowing out winter pulse crops on residual moisture to get much higher economic returns. The fodder of the pulse

crops such as chickpea acts as a spice for livestock like camel and cattle. If you try to look for literature on the fodder quality of chickpea plant and leaves, you may not be able to find much knowledge base. This is true despite large number of national and international research institutions working on the subject. The breeding objectives of crops and trees would also get modified. Once the SEVA team in Madurai took me to neem farms and showed how the local people figured out the productivity of trees by looking at the orientation of the cracks on the bark. If it was upward, it was perhaps better compared to horizontal orientation [Vivekanandan, personal communication, 1995]. Such insights are seldom collected and rarely disseminated. Thus, a farmer growing tree crop nourishes or looks after even less productive trees. The value of the wood, seed, creepers growing on trees [as medicinal plant], bark, leaves, etc., imply a very different approach to viability. Not many farmers realize that the system of storing neem seed itself could affect the proportion of active ingredients and the oil. How many farmers and NGOs monitor the patent database to find out what are the new technologies being developed on each of the base resources. Large number of patents expire or are abandoned by the innovators every year. This valuable knowledge base is open access and can be used and modified as one wishes. Even if this one lesson can be taken home by every reader of this book, I would feel happy and something would change in the lives of millions of people.

In most of the rainfed regions, the agro biodiversity is very rich. In the current context of consumer preference and market conventions, the demand for local varieties is very limited. If we characterize the nutritional and medicinal properties of some of these varieties, a new market can be generated without any other change in the system. If organic labeling is done where possible, additional value may be added. The food processing is one of the fastest growing industries in the country. It is well known that when incomes increase, the share of processed food also increases in the consumption basket. But, very little of this share is harnessed by the poor communities. It was alright for Prahalad (2010) to see the fortune at the base of economic pyramid by targeting them as consumers. But, how much can they consume, if their purchasing power is not expanded. It is in this context that livelihood program should measure its effectiveness by identifying this parameter as an indicator.

The opportunities for generating livelihoods though knowledge and culture based enterprises remains to be properly exploited. It is only in India that we can classify 250 million people as "unskilled" under the National Rural Employment Guarantee Program [NREGP]. There is nothing more dehumanizing than devaluing the skills, knowledge and value in which poor people are rich. If someone can sing very well or perform or make sculptures, drawing on the wall or excel in any other field of art, culture or crafts, should such a person be asked to break stones and dig earth. One way in which we can create market for such people is to put small videos, audios of their skill on the web and create market opportunities for them. A young child of Tamilian parents from Madurai in USA or anywhere else in the world may like to hear stories in the local dialect used by his/her grandmother. Putting such stories on the net will enrich the cultural world of the children and their parents might not mind paying a few cents every download, which can go to the storytellers. A very

simple proof of the concept has been created at www.sristi.org/cultural but much more remains to be done. There is no reason why livelihood programs at different levels in the country should focus on only labor aspect of people's life rather than skill and knowledge aspects. The paradigm has to change and India has to take its own people and their strengths more seriously.

11.2   Triggering Innovation and Knowledge Based New Enterprises

Honey Bee Network has mobilized tens of thousands of ideas, traditional knowledge and innovations from all sectors, segments and social spaces of our society.

Transaction costs involved in linking innovations, investment and enterprise
The ex-ante transaction costs have four components: (i) searching information (ii) finding supplier, (iii) negotiating contract and (iv) drawing up the contract. The ex-post transaction costs include (i) monitoring and compliance; (ii) side payments, i.e., concessions which can make the contract enforceable through modified inducements/discounts; (iii) resolution of conflicts if any; and (iv) redrawing the contract if none of the above help in going ahead with the contract. While designing the eco system, the institutions and actors have to reduce their transaction costs if any mediating platform has to have legitimacy.

i. Searching information: How do traditional knowledge holders or grassroots innovators find out the potential applications of their knowledge for which a third party may have some use and thus the need to enter into negotiation for possible negotiation of contract and share benefits. Likewise, the entrepreneurs who want to set up businesses around innovative products and services have to find out about the potential leads. They may or may not be internet savvy. In some cases, they may not even be educated. The method of searching information has to be compatible with the existing knowledge, capacity and willingness to pursue on the part of seeker of information. At the same time, the format of information and the language can also make a difference in influencing the reduction of transaction costs. The potential investor may not know both the entrepreneur or the innovator. The available information may not confer sufficient faith in his mind to motivate him to invest. How would then such investors develop partnership with the innovators and/or entrepreneurs. This cost cannot be met only by providing information on the web and that too in English language. The access to multimedia, multi language databases may make it possible for people to learn from each other and also with other stakeholders. In the case of herbal knowledge, the transaction costs of the potential investors, entrepreneurs, and R&D players in seeking knowledge about the local communities with scientific names of the plants is enormously high. In the absence of scientific names (which can only be ascribed after taxonomic authentication), the modern scientific institutions,

drug, dye and nutraceutical companies may not be able to make offers of possible cooperation.

Tracking usurpation of one's knowledge rights:

Local communities and individual innovators also need to track the usurpation of their knowledge by unauthorized IP seekers. They will have to have access and the ability to scan the patent applications around the world, interpret and then inform themselves and the patent offices about any suspected violation.[1] Otherwise they will remain dependent on the benevolence of the state or other civil society organization. The bringing of their knowledge into public domain without their authorization by national and international scholars and institutions has been the single most important instrument of exploitation and unfair treatment of their knowledge rights (no research council in developing world or developed countries has yet characterized such a behavior on the part of the scholars as inadmissible and unethical conduct). In the absence of such a reform as mentioned later in the paper, "lawful" and "rightful" disclosure is the only option. The publication of people's knowledge and thus bringing it in public domain reduces the transaction costs of potential users in western and educated segments of eastern society. Their search costs goes down without conferring any advantage to the local communities and grassroots innovators. However, providing synoptic information is extremely useful and can generate tremendous queries for the knowledge holder. NIF received queries for various grassroots innovations from more than 55 countries entirely because it shared the synoptic information on the web. Therefore, we should balance the advantage of open source, multi language databases with the disadvantage of disclosing unique knowledge. In the case of multi language database, put up by SRISTI on its website, about 5000 innovations/traditional knowledge practices were put up in public domain so as to generate wider interest in this knowledge system. It is also expected that various intermediary users will share this resource with local communities. The search cost of the communities will not go down otherwise. This is one of the reasons why

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[1]USPTO (United States Patents and Trade Office) has started recently a discussion forum around the patent applications and under certain condition, any prior art revealed by any one on the web can be taken into account while examining that application. But there is no doubt, it will improve the quality of the applications. This innovation is particularly important for those developing countries which do not have enough examiners like India. But the substantive issue is, how to enable communities and local innovators to read these patents put up for discussion in USA and published in other countries, How much public is public domain after all, and for whom? Will information in English be accessible to the local communities not knowing English language? How should translation wiki, as was suggested by a student in Margaret Chong's class at Seattle Law School, be created for worldwide access to different language communities. May be the students worldwide can translate patents apparently based on traditional knowledge or biodiversity in different languages one page a week and soon, we will have enough resources for tracking the unauthorized IP. There is another way to tackle this problem. I have suggested that every patent applicant should declare that all the knowledge disclosed or used while making claims made in their application have been obtained "lawfully and rightfully."

SRISTI organizes along with the NIF shodhyatras [learning walks] twice a year so that existing knowledge base can be shared with local communities at their doorstep. This is a very costly way of diffusing knowledge though it has its own advantages in terms of cultural and ethical impact it has on the learners' values. An initiative of Honey Bee on mobile is under discussion with some telecom service providers so that almost 500 million mobile phone users can be reached depending upon their need and preferences by the Honey Bee Network. It is a paradox that such an initiative could not be taken off for want of resources for more than 5–6 years.

ii. Finding suppliers: Having found the sources of information, one has to find providers of information, services and other support systems. For a local healer or conservator of genetic resources to take a sample of their material to a public or private sector R&D lab to get it analyzed for potential negotiations is almost well neigh impossible. It is important to create capacity so that they can deal with the knowledge providing, processing and managing institutions at their own terms. For an innovator, to find supplier of facilities for fabrication of machineries, testing, design, packaging and marketing and distribution is not easy. That is why a lot of grassroots innovations remain undeveloped and localized. The cost of finding innovators have been reduced drastically for all stakeholders because of Honey Bee Network's contribution over last two decades. NIF maintains a database and is able to connect people just for a call. The mobile revolution has meant that farmers from different parts of country and the world can call and get information. In due course, once we are able to generate resource for Honey Bee on mobile, we will be able to make lot of the information retrievable through voice protocol without human mediation. The supplier of authentic information, commodities or services may not become apparent or obvious while searching information. Somebody has to authenticate information before a lay person can rely on it. Transaction costs involved in finding supplier should not be confused with just making a website or a database. There is a whole lot of vouchsafing to be done before a bit of information becomes worth engaging with. Similarly, for an investor or entrepreneur or a corporation, finding the right kind of innovation, meeting their specifications may require prior marketing research and benchmarking.

iii. Having found a supplier or potential user of their knowledge, they have to negotiate a contract and use a combination of IP and/or contractual instruments as a basis for negotiation. The tension between individual and collective knowledge, organizing proper representation and nomination for negotiation and having internal as well as external negotiations are other dimensions that come into play. Negotiations between a rural innovator and an urban entrepreneur or investor can involve a whole range of ethical issues of informed consent, capacity to negotiate, honest brokering, etc. SRISTI, GIAN and now NIF help innovators in this regard when opportunities for licensing their technologies arise. There have been cases where entrepreneurs have licensed technologies for which patents were not even granted. The entrepreneurs paid money because they appreciated the spirit of the negotiating platform, i.e.,

Honey Bee Network. Therefore, negotiation is not just a matter of finalizing the terms of exchange but also involves influencing the ethical framework in which stronger party does not necessarily take advantage of the weaker party.

iv. Drawing up the contract: To be able to exercise prior informed consent, and then arrive at reasonable terms of agreement which are acceptable within the community and as well as to the negotiating partner involves tremendous complexity, cost and resources. Without meeting these costs and enabling the communities, the contracts may remain asymmetrical and sometimes difficult to enforce. The language of the contract may not always be comprehensible to school dropout innovators. Under such conditions, the responsibility of Honey Bee Network becomes very critical. Some of the interesting dimensions of the contract negotiated so far in the last 15–20 years are:

(a) The first contract SRISTI entered into with a company involved pooling of public domain traditional knowledge and licensed with a small upfront payment.

(b) Licensing of the rights to manufacture and market on district basis. This was perhaps the first time in the country when a technology was licensed to three small entrepreneurs for right to sell in earmarked districts. The fee was hardly USD 500–1,000 depending upon number of districts. This can help in democratizing the technological innovation and at the same time bring small actor into the market who may otherwise be deterred by the complexity of negotiations and terms. There was no patent granted on tilting bullock cart in this case. However, media attention and awards to the innovator influenced the market for technology.

(c) The licensing to entrepreneurs on exclusive basis with the condition that if they did not sell pre-specified number of products in a year [on which royalty depends], then the license would become non-exclusive.

(d) Incorporating the privilege of marketing the value added product developed by the entrepreneur in his own district. In addition to the royalty and upfront payment, the innovator also gets dealership for a district.

(e) The licensee is enabled to access funds for adding value to the product.

There are many other conditions, which have been negotiated to safeguard the interest of the innovator including the right to revert the license if the licensee did not commercialize a technology within a given period.

v. Having entered into a contract, keeping track of the licensing and sublicensing of technologies by the primary contractor becomes an obligation of the communities. It is possible that the contracting party, in this case, a company or a state agency, may not work the licensed IP from the communities directly. They may sublicense it to a third party who may generate revenues, which may or may not be shared. It is important to keep track of such a process. The enforcement of the conditions therefore requires tremendously important skills and capacities have to be built for acquiring and using those skills. There have been cases where the licensee did not follow all the terms diligently. So far, the Network has avoided legal recourse for settling such problems. However,

it is very clear that in the absence of any power to enforce, a small grassroots innovator may feel handicapped.

vi. Side payments: It is not always possible for communities or individual grassroots innovators to wait for benefits to accrue and share. Upfront benefit sharing may be necessary. Such concessions may have to be negotiated. Sometimes offering concessions beyond the terms of contract generates confidence. Recently, a firm, Matrix Bioscience, to which SRISTI licensed twelve herbal products developed in its lab gave the name and photographs/sketches of the innovators on the package of these products. This was a side inducement so to say. Likewise, innovators can offer some additional leads if the deal on the earlier one goes well to induce the contracting parties go beyond the terms of the contract. The opportunity exists on both the sides for making terms of contract mutually favorable by offering concessions, discounts, or other considerations if the agreed terms of contract are not generating desirable outcomes.

vii. Conflict management: During the benefit sharing process, conflicts may arise. Such situations require capacity building of the community of the innovators to settle the disputes in an efficient manner, without damaging their interests and welfare. Hence, the capacity of the community/innovators to negotiate, identify the right platforms and engage public interest lawyers and supporters becomes crucial to achieving the ends of justice. Here the role of Network and NIF becomes very critical. There have been cases where innovators entered into contract with a company on their own and later when the terms were not upheld, they sought the help of NIF. Sometimes, local collaborators in their anxiety to help the innovators fast, may take recourse to short-circuiting the negotiation and contractual process with best of the intentions. But, given their lack of experience, the innovators may suffer and consider the Network responsible. It is a matter where careful attention has to be paid by all the stakeholders to avoid conflicts to go out of hand. So far, the policy of the Network has been to avoid acrimonious exchanges and thus try to use the power of persuasion. The results have been satisfactory by and large.

viii. Renegotiating the contract: If despite all the persuasion, the existing terms don't work and conflicts cannot be resolved satisfactorily, the renegotiation with the attendant costs is the only alternative. In some cases, this may even be desirable Gupta et al. (2010).

11.3 Benchmarking the Unsolved Problems of Society and Linking Them with R&D and Management Institutions

Our generation betrayed the trust of the society by learning to live with a large number of problems unsolved, indefinitely. Thus, if women experienced tremendous drudgery in picking leaves from tea bush, pulling water from the well using pulley

without stopping mechanism, transplanted paddy by keeping their feet in water for fortnight or a month, collected fuel wood and grass on hill slopes and in forests over long distance, etc., we did not bother. The top institutions of science and technology also did not bother. The NGOs and various other social organizations also learnt to live with them. The way out is to benchmark all such problems during production process, post harvest, food processing, forest product collection and processing, transporting and treating drinking water, crafts, livestock management and other nonfarm activities. While doing so, we might come across some innovations. But in many cases, our experience shows that women's problems have often been neglected even by the male grassroots innovators.

This neglect of innovations for and by women is not peculiar to India. Autumn Stanley in her book on "Mothers and Daughters of Invention" (1995), a product of 13 years long study of US patents over 200 years found similar neglect. Following steps can help us address this problem once for all and then create a platform for ongoing solutions to second or third generation emerging problems. While doing so, we may recall what Gandhiji had done in 1929 when he announced a global competition to redesign charkha to reduce drudgery of the people.[2]

AkhilaBharatiyaCharkhaaSangh Workers' Samiti has decided to organize this Contest for inventors and engineers all over the world that if they could come up with a Charkha or a SamyuktaYantra which – for making the thread and cloth, that satisfies the following criterion – shall be awarded a Prize money of 1 Lakh Rupees or 7700 pounds.

The Criterion:

1. Charkha must be light weighted, easy to move, and it should be in such a way so as to be operated using either hand or one's leg – in a natural way in the rural cottages of India.
2. Charkha must be in such a way that a lady shall be able to work with it for 8 h at a stretch without great effort put in.
3. Either Charkhas must have a build to accommodate the use of a puni (used to make handspun cloth)or along with the charkha there must be a way to handspun cloth.
4. On working with the charkha for 8 h at a continuous stretch – it should result in 12–20 numbers of 16,000 ft (1 gaj?) yarn.
5. The machine should be so designed such that it costs no more than Rs. 150 in producing it in India only.
6. The machine should be strong and well-made and with time-to-time servicing it should be capable of running for at least 20 years without any stopping. Servicing of the machine should not cost much and every year not more than 5 % of the cost of the machine that year shall be needed for servicing.

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[2]Empathetic innovations: Connections across boundaries, to be published in a book entitled, "Timeless Legend of India, Gandhi" [Ed.] Dr. R. A. Mashelkar in commemoration of 30 years of Gandhi National Memorial Society, Pune, 2010, IIMA WP No.2010-09-02, September 2010, 43–57.

7. All those taking part in this contest, may – with their own input costs and expenses send their machines to Sabarmati Ashram before or not later than 30th October, 1930. In case the machines satisfy the criterion mentioned – then the inventor/designer can patent it on his name to protect their rights on them. But, if they wish to become eligible to win the prize money of the contest, then the designer shall have to transfer the rights of the patent to Indian Charkha Sangh Council.

8. The Judges for the Contest shall be KhadiPratishtan's Sri Satish Chandra Das Gupta, BardoliSwarajya Ashram's Technical Director Sri LakshmidasPurushottam and Tiruchengonduu Gandhi Ashram's Director Sri Chakravarthy Rajagopalachari. In case there is no consensus amongst the judges on the winner – Gandhiji's decision shall be the final one. In case of Gandhiji's absence Akhil Bharat Charkha SanghMantri Sri Shankar Laal Banker shall be the final decision-maker.

   All questions and queries may be addressed to Mantri, Akhil Bharat Charkha Sangh, Mirzapur, Ahmedabad.

   Dated: 24th July 1929. Shankarlal Banker.

After more than eight decades, Indian government or philanthropists have yet to announce a similar award for solving problems of disadvantaged people of our country. So much for inclusion. The present value of this award is more than Rs.10 crores. We don't have even a one crore prize for solving problems which have held back the progress of our society for thousands of years. SRISTI has supported a platform designed with the help of students led by Hiranmay Mahantalast year, viz., www.techpedia.in. It already has more than 100,000 engineering projects pursued by around 350,000 final year students from over 500 colleges. There are options at this site of problems in search of solutions and innovations in search of augmentation. Dozens of student teams from IIT Mumbai have already volunteered to take up augmentation challenge this year. Slowly and slowly, we can mobilize a large part of 10 lacs students who graduate every year from engineering colleges. Ministry of Human Resource Development or AICTE or UGC might continue to neglect this important task of connecting real life problems of our society with the technology youth of our country. There are many other advantages of such a portal for promoting originality, innovation, connection with MSME, etc., which I have discussed at my blog, www.sristi.org/anilg. I will restrict here to what we can do for improving livelihoods in the near term by engaging with the youth.

Step one: Post problems, bottlenecks, inefficiencies and pain points in the existing technological practices pursued by the poor. If possible, one can attach videos, sketches, diagrams, material properties, etc., as well. Through the linkage Honey Bee Network has with international groups like Engineers for Change, or Engineers beyond Borders and American Society of Mechanical Engineering, we can mobilize intellectual resources from around the world.

Step two: Students submit the synopses, i.e., the planned strategy for solving each problem. Even if 500 students show interest in one problem, we should not bother. Let there be lot of redundancy and a small support of say Rs. 25,000–

50,000/= may be given in two installments to the students whose synopses are found worthwhile with an expenditure of Rs.50 lacs we can support 100 or more student teams to crack one problem.

Step three: We create an online collaborative platform to trigger healthy competition and also collaboration across teams to generate good solutions. In some cases, we may protect the IPRs of the teams with the understanding that these will be transferred to either NIF or SRISTI or some such body responsible for managing the process. The protection of IPRs will in such cases be of defensive nature, i.e., to prevent others from monopolizing.

Step four: It is possible that in one cycle, none of the teams may come out with final product. Using a kho-kho model, we can create an innovation relay and selected projects are put forward for further follow up work in the next cycle. By pooling the best practices and getting feedback from users through multimedia, multi language platforms, we can certainly get the final product. Mentors from private and public sectors with professional background as entrepreneurs, academics, fabricators or mechanics may be mobilized to guide the student teams. Around 2000 mentors have already registered at National Mentor Network at www. techpedia.in.

Step five: Attractive awards will be given to the best teams or even those who contributed important building blocks of the final solution or to the most glorious failure to encourage risk taking. These awards can be given at the biennial Presidential award function of NIF so that the country celebrates the victory over persistent inertia in a befitting manner.

Step six: Entrepreneurs are invited to manufacture the final designs of technologies reducing drudgery, improving efficiency and generating employment. Risk capital fund is used to underwrite the risk of such entrepreneurs. Ideally, a distributed manufacturing strategy should be encouraged so that in a decentralized and deconcentrated manner, location-specific adaptations evolve.

It is my firm belief that with all our acts of commission and omission, the future leaders of our country will not grow with the same sense of patience that we have had with inefficiency, inertia and indifference towards the problems of disadvantaged people.

11.4 Building Value Chain and Horizontal Supply Chain to Reinforce in situ Value Addition and People to People Exchange and Marketing

Adding value for building horizontal and vertical supply chains: The reason languages evolve is to articulate multiple meanings [some intersecting partially or completely and others non-overlapping], which help in expanding the scope for imagination. It is such an imagination or even speculation, which triggers experimentation in some cases. If meanings could not be expanded, then new

possibilities would be difficult to conceive. If a language has a word for flying object, viman, thousands of years ago, it has created a possibility to conceive a flying object. But, if such an object does not get developed, then it was not because language lacked the capability to conceive or speculate but because of other institutional or cultural reasons. Value addition in local or external resources is important for improving efficiency of resource use, conservation, augmentation and dissemination of service or products to others. Formal R&D institutions perform this function within their mandates and try to expand the potential for value addition in different sectors to meet various social and industrial needs. This R&D process is not restricted to public or private sector only but can also be extended to cooperatives, labor and workers unions and informal associations of farmers, pastoralists, artisans, etc. In many cases, individuals on their own through their own resources also do research or experimentation and sometimes innovations. While support system for formal sector is well developed though even that can be improved a great deal, the one for informal sector is weak and nonexistent in majority of the countries. It is ironic because most societies facing one form or other of rural protest, insurgency, social unrest or violence realize that some of it can be traced to persistent poverty, unemployment and lack of public support for meeting basic needs. And yet, the indifference continues. The paradox is that this indifference, conceptually, leaves lot of space for local experimentation even if suboptimally and devoid of opportunities for validation through blending with formal science and technology. It is this space that we have explored in the Honey Bee Network and wish to trigger new institutional designs, which can augment ability to experiment and innovate at individual and community level. The horizontal supply chains have existed from time immemorial through weekly markets in the most interior regions whether relying on barter, cash or gift economies. But, with inroads made by modern markets and other institutions, these chains have become weaker. The perception of utility of products and services provided by local experts or entrepreneurs has also changed over time due to media exposure or deliberate public policy. A bone setter who might be a better expert than an institutional medical facility might not get as much attention of the local communities in some areas as she might deserve. This may have nothing to do with her expertise. Local products in various functional domains can be developed by pooling inputs from local villages. The value added products can be packaged for short distance and short period consumption. Such a strategy will strengthen local small loop economies and reduce carbon footprints, economize on energy consumption and reduce entropy. Some of the raw materials for vertical supply chains also are provided by the similar regions. But, devoid of any stake in the supply chain, the people mainly perform the task of collection of raw materials as laborers. Since no in situ value addition takes place, due to inflationary and other pressures, their real wage rates often go down instead of increasing. While the growth takes place in the value added sector, these regions and people therein remain at the lowest end of the value chain. Their knowledge rights are not protected and their ability to get royalty from the exploitation of these potential rights remains unexplored. Policy gaps both in horizontal and vertical supply chains are many and require systematic attention if the capabilities of local communities for sustainable

resource use and improve livelihood have to be significantly augmented. The social unrest will be otherwise an inevitable consequence Gupta (2010).

There are many more ways in which we can make the mission sustainable livelihoods a vibrant program involving the young and the motivated people. I don't think we should ever argue that public programs being bureaucratically governed have to inevitably follow an old archaic envelope. They can and they must come out of this envelope to diffuse into a more participatory, open and collaborative public policy – implementation framework. The private sector and civil society organizations can follow equally archaic processes and systems. They need to reform and restructure as much as public systems have to do. The knowledge intensive approaches discussed in this paper can help link innovations, enterprise and investments from all around in a focused manner, but with sufficiently fuzzy boundaries. The accountability should be high but structural designs should be loose. This is a subject for separate discussion.

Honey Bee Network has tried to develop a g2G model, i.e., grassroots to global which is currently applied by organizations in 75 countries. Indian model of development cannot be designed to serve only Indian needs. We should be inclusive enough to share our insights, innovations and institutional capacity with other countries which are willing to engage with us. The countries that wish to lead always share and involve other cultures in their growth processes. It is not surprising that countries which are likely to decline in future have already started becoming more introvert and protectionist in their outlook. More than 2,000 years ago, India shared the Buddhist philosophy far and wide. Those countries which learnt from this philosophy have shifted the center of the world eastward. We have to take the right cues. Our culture need not become a culprit. We have to select the right metaphors and meanings to transform our vision for future.

A global innovation foundation based on the philosophy and the practice of Honey Bee Network may not be too far. If creative people around the world get opportunities to craft their own world, one would not have to invent policies for making society compassionate, collaborative and accommodative of various social segments. It is the failure to nurture grassroots creative potential that has fuelled so much of social anomie. May be peace through inclusive innovations and participatory institutions is the next mantra of development.

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Chapter 12
Fantasías 2.0: Digital Literacy and Social Inclusion in the South Through Collective Storytelling

María Florencia Ripani

Abstract This chapter focuses on *Fantasías 2.0*, a participative educational project developed in Argentina in 2009 to promote digital literacies and social inclusion of vulnerable children in Buenos Aires city. In this initiative, children collectively created an imaginary world by drawing and recording sounds, which became reality with the help of digital media. The children's creations were assembled in animated movies to be presented in different communication and cultural platforms, including a large-scale digital installation. The case is innovative in the use of digital storytelling with participative approaches mediated by visual communication, and enhanced by digital media. After summarizing relevant frameworks and analyzing the case, the paper suggests that digital literacies and social inclusion can be promoted by projects encouraging creativity, play, imagination and fantasy, by inviting children and young people to become content and story creators, where drawing, collaborative work and digital media is crucial to enhancing their experience.

Keywords Collective intelligence • Digital literacies • Information and communication technologies (ICT) • Social inclusion • Storytelling

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12.1 Introduction

Fantasías 2.0[1] is a participative educational project developed in Argentina that aims to promote digital literacies and social inclusion among vulnerable children in Buenos Aires city, through creativity, playing, fantasy and collaborative storytelling based on visual communication. It invites children to collectively create an imaginary world by drawing and recording sounds, which becomes reality with the help of digital media. The story, represented by a large-scale digital installation made of animated movies, is shared with different groups of children, who engage with imagination and storytelling and make their own contributions to the creation.

Fantasías 2.0 is a grassroots project that I started in 2009 as a personal initiative with support from a Spanish multinational and in partnership with a local non-governmental organization (NGO). It later scaled to a wider initiative supported by the Ministry of Education of Buenos Aires City.

This initiative intends to create the opportunity for vulnerable children to engage with their imagination and fantasy to collectively create a story, through which they express values and ideas as a group through original imagery, characters and plots that are later shaped with digital technology and transformed into animated movies to be presented via different communication and cultural platforms, such as digital installations in art galleries and schools, and internet publications. This gives vulnerable children a voice, allowing their cultural productions to be shaped with state-of-the-art digital resources, and for them to become part of the new media landscape, which would otherwise be inaccessible to them.

Digital storytelling approaches to empowering vulnerable people have strongly relied on writing and oral expression (see, for instance, the cases collected by Watkins and Tacchi 2008); thus, *Fantasías 2.0* is innovative in its use of participatory approaches to Information and Communication Technologies (ICT) mediated by visual communication and enhanced by digital media. The project relies on the power of drawing, creativity and fantasy for children to create meaning, project their future and promote social change, while exploring how ICT can augment the experience by creating a bridge between imagination, the physical world and digital environments (Winkler et al. 2007).

The project includes workshops for children to participate in, and helps them to understand the digital storytelling production process, thereby developing new media literacies that create avenues for digital inclusion.

In this chapter, I will develop a framework to address the importance of creativity, imagination, fantasy and play as key experiences to promote not only happiness and motivation in a group of vulnerable children, but also the symbolization of ideas associated with their socio-cultural context and social change opportunities. I will also review literature about the essential importance of images to our construction

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[1]The Spanish word *Fantasías* means fantasies. 2.0 comes from web 2.0, and is intended to connote the collective and participatory work behind the project.

as subjects and as sources of meaning creation. In addition, I will include references about the challenges to literacy within the context of digital culture, focusing on key new media literacies developed in the project that help to promote digital inclusion.

The following sections will describe the project and its phases, the idea and approach underlying the initiative, the partners involved and the implementation process, from which observations and reflections will be made following the ideas developed in the framework.

12.2 Framework

12.2.1 Creativity, Imagination, Fantasy and Play

There is plenty of literature about creativity, imagination, fantasy and play, and their relevance to happiness, motivation, education, cultural experience, future projection and social change (e.g., Freud 1994; Bachelard 1971; Rodari 1993; Paley 1990; Winnicott 1982; Robinson 2011; García Canclini 2007; Martín-Barbero 2001; Freire 1995).

Cultural experiences start with creativity, of which the first manifestation is playing Winnicott (1982). Freud (1994) states that the "first traces of imaginative activity" (p. 500) can be seen in play, which he defines as "the best loved and most absorbing occupation" (p. 500). He suggests that when a child plays, "he creates a world of his own or, more truly, he rearranges the things of his world and orders it in a new way that pleases him better" (p. 501), which is therefore a way of fulfilling desire by borrowing "the objects and circumstances that [the child] imagines from the tangible and visible things of the real world" (p. 501). The child takes the activity "very seriously" (p. 501) and expends "a great deal of emotion on it" (p. 501).

Rodari (1993, p. 18) states that imagination is mind itself, as a whole, and not a simple ability that stands alone. He suggests that teaching to think inevitably demands teaching to invent. He analyzes a variety of activities based on playing and storytelling with children, including stories created by children. He maintains that the invention of a story by a child is a creative and aesthetic action, which fully involves the child's mind and personality in terms of reacting to his own images, judging them and conducting associations.

Through the analysis of real cases, Rodari (1993) suggests that when children freely create stories, they sometimes introduce metaphors of concepts, even mathematical ones, that may create the bases for future awareness and understanding (p. 26). He adds that narration goes beyond play and becomes a form of rationalization of experience, and represents an advanced phase of the command of reality (p. 120).

Rodari (1993) emphasizes that fantasy is the basis of stories, and boredom the worst enemy of thinking. Therefore, in order to spark children's imagination for story creation, he suggests starting with what he calls a "fantastic binomial"

(p. 18, 19): two words that are considerably different from one another so as to avoid obvious connections and recall fantasy. He quotes "horse-dog" as a bad example, and "dog-cupboard" as a suitable fantastic binomial, which can be randomly created.

The author also argues that the creation of stories by children, within a context of freedom and fantasy, generates happiness and enjoyment. He says that children need optimism and confidence to face life, and that utopia has a singular importance in education, since believing in a better world is an indispensable source of motivation. Within this context, he proposes that it is essential to help children to imagine their own future and destiny.

In this respect, Freire (1995) highlights the importance of hope in the struggle to improve the world with regards to inclusion. Reflecting on the pedagogy of the oppressed, he stresses that the task of the "progressive educator" is to "unveil opportunities for hope, no matter what the obstacles may be," and that "without hope, there is little we can do" (1995, p. 3).

Bachelard (1971) also refers to the power of future projection and imagination. He calls for active participation in "the creating imagination," suggesting that "certain poetic reveries are hypothetical lives which enlarge our lives" and that "the dreamed world teaches us the possibilities for expanding our being within our universe." He suggests that the dreamed universe has a "futurism," awarding imagination with a "principle of direct stimulation of the psychic becoming" (p. 8).

Fantasy play, in the form of storytelling and dramatization, is addressed by Paley (1990), who considers playing to be a unique, joyful experience: "Discovering and using the essence of any part of ourselves is the most euphoric experience of all. It opens new passages and establishes new routes" (p. 6). She considers "play and its necessary core of storytelling [as the] primary realities in the preschool and kindergarten, [which] may well be prototypes for imaginative endeavors throughout our lives" (p. 6). She states that it is possibly the only dimension that younger students can understand from beginning to end, and that they are able to visualize abstractions from inside a story. Nevertheless, the author does not conceive play as a mere resource through which to build knowledge. She indicates that "play is the model and play is the goal" (p. 7).

In addition, Paley stresses the importance of imagination when it is constructed as a collective experience:

> The fantasies of any group form the basis of its culture; this is where we search for common ground. That which we have forgotten how to do, the children do best of all: They make up stories. Theirs may be the original model for the active, unrestricted examination of an idea (1990, p. 5).

Creativity is also considered a great source of joy and problem-solving by which to imaginatively address local needs within a changing context García Canclini (2007). Robinson (2011) stresses that being creative is the basis of human development and innovation, and facilitates social change. He argues that "creativity is the greatest gift of human intelligence. The more complex the world becomes, the more creative we need to be to face its challenges" Robinson (2011, p. xiii). He suggests that in a fast-evolving world there is an increased need for people who are

capable of being creative and working in teams. Within this context, he stresses the importance of creativity as a way to go beyond the world as we see it, and the need to be able to recreate it. In his words:

> The great revolutions in human history have often been brought about by new ideas: by new ways of seeing that have shattered old certainties. This is the essential process of cultural change (2011, p. xvi).

Robinson (2011) suggests that everyone has creative capacities, and that the real challenge of education is to develop them – in other words, to learn to be creative. He also rejects the division between academic work and the realm of creative production, and the idea that the sciences have a higher hierarchy than the arts:

> The rationalist tradition has driven a wedge between intellect and emotion in human psychology; and between arts and the sciences in society at large. It has distorted the idea of creativity in education and unbalanced the development of millions of people. The result is that other important abilities are overlooked or marginalized (p. 107).

Within this context, Robinson (2011) questions the traditional conception of intelligence in educational systems and stresses that there are "forms of knowledge or expressions" (p. 118) that can only be experienced by activities related to the arts.

> There may be no agreed definition of intelligence but we might agree here that intelligence includes the ability to formulate and express our thoughts in coherent ways. We can do this using words and in numbers. We can also visualize, we can think in sound, in movement and in all the many ways in which these different modes interact. Musicians are not trying to express in sounds ideas that would be better put into words (p. 118).

Based on the quotation above, it could be said – with the same degree of assertiveness – that children do not express in drawings ideas that would be better explained in words.

In order to examine the importance of accessing the realm of images, it is worth exploring literature from the documentary field. One of the assertions of the field is that ideology is inseparable from and dependent on images and the imaginary ("a psychic realm of significant images around which our sense of identity forms" Nichols (1991, p. 8)). Images are essential to our construction as subjects, and one of the most powerful sources of meaning creation. Images are easily perceived as "self" rather than a "representation of self."

> It is worth mentioning that in their creations, children interact with reality and practice forms of representation and symbolization Fantin (2008), a process that is mediated by their sociocultural context. Children's drawings should therefore be conceived as meaningful and powerful representations of their experience and articulations of their world, which demands an awareness of the particular context of the drawing action Atkinson (1991).

Consequently, it may be suggested that the creation by a specific community of characters, settings and the whole story through images will result in a projection of their imaginary, at least in an implicit way. This would contain culturally authentic iconography featuring some of their rituals, beliefs, dreams, and representations of elements from their everyday lives, since images are meaning structures through which children can understand and explore their sociocultural world (Kress and van Leeuwen 1996; Atkinson 2005).

12.2.2 Digital Literacies

Digital inclusion transcends mere access to technology and demands certain competences and skills associated with digital culture that need to be developed by educational activities and effective ICT integration into communities and institutions within their social context (Jenkins 2009; Lévy 2007; Buckingham 2007; Livingstone 2009; Gigler 2008; Tacchi and Grubb 2008). Different terminology is used to refer to the convergent abilities necessary to promoting digital inclusion, ranging from new media literacies (Jenkins 2009) and media and digital literacies (Livingstone 2009) to multiliteracies (Cazden et al. 1996). In this article, I propose using digital literacies and new media literacies as synonyms and umbrella terms to encompass all competencies and abilities required for users to be included in, and become full participants of, digital society.

The idea of multiliteracies was introduced by The New London Group to afford the multiplicity of communication channels and growing cultural and linguistic diversity. The authors proposed that "the use of multiliteracies approaches to pedagogy" would enable students to "[create] access to the evolving language of work, power and community and [foster] the critical engagement necessary for them to design their social futures and achieve success through fulfilling employment" (Cazden et al. 1996, p. 60). The broader understanding of literacy proposed by this group of authors includes increasingly significant representational forms within the communication landscape, such as visual images, which have traditionally been marginalized against written words (Kress and van Leeuwen 1996; Kress 2003, 2010; Castells 2005). With the emergence of multimedia content, digital media creates a unique scenario in which the written texts, images and sounds are integrated within the same platform for the first time (Castells 2005; García Canclini 2007).

> Knowledge creation and social representations are organized not only through the written words and books, but also via other emergent forms of communication that are part of popular culture – including audiovisual media – which can pave the way for new forms of imagination and social creativity (García Canclini 2007; Martín-Barbero 2001).

People "need to develop expertise with the increasingly sophisticated information and entertainment media that address us on a multi-sensory level, affecting the way we think, feel and behave" (Berson and Berson 2003, p. 164). Multimedia and digital art can be multi-sensory; interactive installations are a good example of how the feeling of occupying a fixed and finite physical space is reconfigured via the introduction of infinite flows of computational culture, with emergent and aleatory relations rather than predictable outcomes (Munster 2006), a pattern that coincides with that of imagination and fantasy (Rodari 1993).

Digital literacies have a similarly empowering effect on writing and reading skills: they enhance vulnerable people's capabilities to enable them to make strategic life choices and to achieve the lifestyle they value (Gigler 2008).

In this context, social development can be "enhanced through the effective integration of ICT into communities and institutions. This kind of integration can

only be achieved by attention to the wide range of physical, digital, human and social resources that meaningful access to ICT entails" (Warschauer 2003, p. 14, cited in Livingstone 2009, p. 54). Furthermore, "the ability to access, adapt and create new knowledge using new information and communication technology is critical to social inclusion" (Warschauer 2003, p. 9).

Digital society is emerging within a new social landscape, in which being connected and interacting with others are core values. Most of these interactions take place through digital media and cyberspace, and become dramatically relevant for knowledge creation and circulation (Lévy 2007).

Producing, publishing and sharing content is becoming increasingly available. This opens new doors to popular culture, in the form of participatory cultures (Jenkins 2006). Research suggests that emergent participative practices – including those related to social connection, civic engagement and sharing creations with others – may help to develop skills valued in the modern workplace, diversify cultural expression and empower the conception of citizenship, among other potential benefits.

Jenkins (2009, p. xii) suggests that access to participative culture works as a new kind of "hidden curriculum," with direct impact on success at schools and work. The author indicates that the acquisition of all necessary skills and competencies does not occur via the mere interaction of children and youth with popular culture, and therefore stresses the need for "pedagogical intervention" (p.xii). The purpose of this intervention is to overcome the unequal access to practices and knowledge that facilitate participation, and the difficulties in understanding how media representations affect the perceptions of the world and the gap between traditional professional training and socialization, apart from the necessary skills to become media makers and community participants.

Jenkins (2009) maintains that the focus should be on how to create opportunities for children and youngsters so as to enable them to become full participants in our society by developing the necessary competencies and skills:

> Schools and afterschool programs must devote more attention to fostering what we call the new media literacies: a set of cultural competencies and social skills that young people need in the new media landscape. Participatory culture shifts focus of literacy from one of the individual expression to community involvement (p. xiii).

The set of new media skills suggested by Jenkins includes collective intelligence, a concept created by Lévy (1997). He defines this as "a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills" (p. 13). He developed the concept based on the premise that "*No one knows everything*, everyone knows something, all knowledge resides in humanity" (p. 14), meaning that even when one person can learn from another, he will never be able to capture everything the other knows, and therefore knowledge will remain distributed. Lévy (2007) also says that collective intelligence involves putting together memory, imagination and experience through knowledge exchange and new forms of organization and coordination in real time.

Lévy (1997) adds that there is a new humanism that "incorporates and enlarges the scope of self knowledge into a form of group knowledge and collective thought" (p. 17), and that:

> In an intelligent community the specific objective is to permanently negotiate the order of things, language, the role of the individual, the identification and definition of objects, the reinterpretation of memory. Nothing is fixed" (p. 17).

He also suggests that, in the near future, cyberspace will become the essential mediator of the collective intelligence of humanity (Lévy 1997).

Jenkins (2009) suggests that contemporary education does not usually foster the value of collective work. Instead, the focus is on training autonomous problem solvers. He says, "whereas a collective intelligence community encourages ownership of work as a group, schools grade individuals" (p. 76). Moreover, he contends that taking part in knowledge communities requires teamworking abilities.

Understanding media within the context of participative culture also implies acknowledging new forms of cultural production of audiences, as citizen-consumers, that take place as part of ordinary media use (Burgess and Green 2009). Jenkins (2006) indicates that, in contrast with previous notions of audiences, in which producers and consumers had clearly differentiated roles, they can be now seen as "participants who interact with each other" (p. 3).

Consumers do not just produce content; its circulation also depends on their active participation. Jenkins addresses the fact that not all participants are equal, and acknowledges that corporations are more powerful than individual consumers, or even groups of participants. He suggests, though, that collective intelligence can be understood as an alternative force of media power, in which consumers can learn to control the flow of media and interact with other consumers.

12.3   ICT as Cultural Forms

ICT is an umbrella term, which goes beyond computers and encompasses digital media together with other resources and platforms. The concept should be understood as cultural forms, rather than technological devices: "They convey images and fantasies, provide opportunities for imaginative self-expression and play, and serve as a medium through which intimate personal relationships are conducted" (Buckingham 2007, p. 151). The social relevance of ICT is not in its instrumental use, but in culture itself, as it creates new forms of perception, sensitivity and language (Martín-Barbero 2001). ICT is, in fact, the foundation of teenagers' socialization since videogames, television, radio, the Internet and movies – among others – provide them with models and patterns of behaviour (Martín-Barbero 2006).

Buckingham (2007) suggests that media literacy can provide a conceptual framework that is suitable to be used for digital literacy. It includes four essential components: representation, language, production and audience. These concepts

are based on the assumption that media represent the world, rather than simply reflecting it. The selection of fragments of reality, the way in which the material is produced and the perspective from which the story is narrated inevitably embody implicit values and ideologies. Therefore, literacy should involve understanding the grammar of representation of digital media, as well as its codes and conventions and the ways in which they are constructed.

Digital media makes it possible to enhance teaching and learning processes with the recording, production and recreation of images and sounds (Miguel and Ripani 2011). According to Lévy (2007), the digitalization of information consists of translating or coding it into binary digits. This can be done with both images and sounds. Digitalized content can be easily modified in a computerized environment, which allows levels of intervention that transcend those accessible via offline techniques. The author states that a single digitalized image can be used as a pattern to produce a group of images in a process that becomes a new universe of sign creation. This process could easily be used to describe the production of digital collages out of pieces of scanned drawings, which are later animated.

In addition, the way in which a digital animation is displayed will result in different ways of perceiving it. For example, showing an animation on a computer screen has limitations in terms of size, since the image is restricted to the limits of the monitor. The majority of audience members are likely to remain seated, without having much interaction or physical contact with the images. In contrast, digital spaces, such as those conveyed in museums and exhibitions with human-scaled films screened on walls, allow higher levels of perception and corporeality and therefore result in increased implication (Munster 2006).

12.4 Approach and Project Description

I developed *Fantasías 2.0* in Buenos Aires after working for the BBC in London for 4 years. Before leaving the United Kingdom to settle back into my home country, Argentina, I was a New Media Executive Producer at the BBC World Service. At the time, in 2007, the BBC was one of the world's media leaders in creating projects involving audience participation in the production of content.

These initiatives were intended to promote interaction among members of the public and the broadcaster itself, within the context of convergence and participatory culture – as has been addressed in the framework. Video Nation[2] was a BBC project that, for example, invited members of the audience to narrate and share their everyday life in videos, or submit amateur footage to report news – just two of the many examples of the emerging scenario in which, as Jenkins (2006) states, "grassroots and corporate media intersects" (p. 8).

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[2]More information about the BBC Video Nation can be found at http://www.bbc.co.uk/videonation/network/ (accessed 08/10/2012).

These emerging forms of cultural production from the new media landscape inspired my idea of creating a project in which vulnerable children would become the artists of a digital story. The idea of transforming the audience into producers was translated into letting the children become artists.

Therefore, the project involved inviting a group of children to collectively imagine and create a fantastic world. The initiative included workshops to prompt children to draw characters and settings, invent a plot and then record the sounds of their imaginary world. These creations were used as raw materials for the production team to assemble the setting and characters into a digital collage, gathering pieces of different drawings together. Following the story outline, the collage was transformed into an animated movie which was used to produce a digital installation, where the fantastic world was to come alive.

This was conceived as the first phase of the project, which was developed in partnership with the Casa Rafael Foundation. This institution facilitated access to a group of vulnerable children attending arts workshops in the La Boca neighborhood, in the south of Buenos Aires. In this phase, the name of the project was expanded to: *Fantasías 2.0: La Isla Murguera*,[3] with the second part of the title referring to the imaginary world created by the children.

The workshops to produce *La Isla Murguera* took place in 2009, in the premises of a volunteer *fire station in the La Boca neighborhood, where the Casa Rafael Foundation develop some of their activities. The participants included* approximately 30 children and young people, most of whom were aged between 5 and 12 years old.

The first two workshops were focused on creating a fantastic world via drawing (see Fig. 12.1). The only restriction that the children were given was that the setting was to be an island. They were told that this island would be special because it would be collectively created by them and every single habitant and anything that happened would be entirely dependent on their wishes, which would make it a very unique place. It was also stressed that the creation would be collective, and called for them to produce not individually, but as a team.

The children used a number of elements, such as pencils, fibers, and white and colored papers of different textures to produce their drawings, which were exhibited on walls. They were then asked to collectively name the characters, and define their personalities and powers and their roles in the story, as well as the characteristics of the setting.

In the two sessions that followed, the children were invited to record the sounds of the story they created, interpreting character and background noises by, for instance, blowing to represent the wind, and using ordinary and simple elements, such as saucepans and sticks, to play percussion music.

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[3]The Spanish phrase *la isla* means "the island" and *murguera* is an adjective that indicates a relation to *murga*, which is a popular musical and dance genre typical in Buenos Aires and Montevideo.

Fig. 12.1 A girl drawing a flower that will be part of *La Isla Murguera*

The configuration of activities was designed to promote collaborative work; the workshop's coordinators organized the activity in such a way that all of the children involved produced together or in groups, leaving almost no room for individual work.

The animation film produced from the children's creations, and later transformed into a digital installation, together with a slideshow of the production process, was presented in *Telefónica's* art gallery at the end of 2009. Casa Rafael's children were invited to the launch of the exhibition, and were given certificates naming them "artists" and recognizing their contribution to the project, along with recordings of the animated movie of *La Isla Murguera.*

In addition, they participated in workshops showcasing the different stages involved in the digitalization and animation of the material they produced, and were provided with computers to produce collages of themselves with the characters they created.

The second phase of *Fantasías 2.0* has support from the Ministry of Education of Buenos Aires City, and is still being implemented (See Box 12.1) It involves presenting the digital installation of *La Isla Murguera* to thousands of students from state primary schools – most of whom are from vulnerable areas – together with workshops (see Fig. 12.2). Children are invited to join the fantastic world of *La Isla Murguera,* reflect about collaborative work and digital storytelling techniques, and recreate the material to add their own contributions. Some of these additions are later shared with children from Casa Rafael, who receive updates on the project periodically.

Following the rationale of collective intelligence, the implementation process of the project was designed to build bridges between the children who created the

Fig. 12.2 Children from state primary schools in Buenos Aires participating in a *La Isla Murguera* workshop

leading story (*La Isla Murguera*) and the groups of students who would meet and contribute to the previous creations. Therefore, the interrelation of the first and the second phase was conceived as a way of putting together different pieces of fantasy and story creation by different groups of children that do not meet physically, thereby enhancing the value of collective work. It is worth mentioning that although these activities are not always facilitated by digital media or cyberspace, they may help children to acquire social skills that young people need in the new media landscape (Jenkins 2009).

Some of the resulting creations of the project were published on the internet, including the animated movie of *La Isla Murguera*, which can be accessed from the project's blog or YouTube.[4]

The second phase of the project includes enhancing the digital installation with interactive features, and integrating physical actions from the public to dialog with the digital installation. The interactive version of *Fantasías* 2.0 is expected to reach schools in 2013.

The first phase of the implementation process included data collection in a variety of formats to enable an analysis of the case, such as still images, videos, audio recordings and annotations of situations and interviews. Although information is also being registered in the second phase, as it is still under implementation the analysis of the case will concentrate on the first phase.

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[4]The blog's address is https://sites.google.com/site/fantasiasweb20 accessed 31/08/2012, and the link to access the animated movie on YouTube is http://www.youtube.com/watch?v=MVWv73jnApw.

Box 12.1: Partners

Partners: Background Information

I designed *Fantasías 2.0* while attending an interactive arts program organized by *Fundación Telefónica,* the local branch of a foundation of the multinational telecommunications company *Telefónica*. The foundation is devoted to social innovation with a focus on education and knowledge-building and transfer. As part of this strategy, the foundation promotes educational and artistic activities relating to digital culture, including an 8-month interactive arts program. The activity – which is coordinated by prominent local artists and curators – includes support to develop a digital arts project and present the first prototype in an art gallery, which became the first installation of *Fantasías 2.0.*

Foundation Casa Rafael, which agreed to develop the first phase of *Fantasías 2.0* with children attending their workshops, is a small foundation that works with populations in extreme conditions of vulnerability in Buenos Aires to promote the wellbeing of children and young people. The foundation organizes art workshops and activities which trigger children's creativity and confidence, promoting their development and social inclusion. This includes drawing, painting, music, puppetry, literature, drama and dancing. Those who join the workshops generally make their productions individually, and occasionally attend performances and exhibitions.

The mission of Casa Rafael and their target population made it an ideal partner with which to develop *Fantasías 2.0*. The workshops take place in the neighborhood of La Boca, one of the poorest and most polluted areas in Buenos Aires. The local community faces a variety of social problems derived from material and social exclusion, which includes different forms of violence, drug-related crime, unemployment and dysfunctional families. A large part of the population lives in shanty towns and squats. Some of them earn their living by walking the streets at night and digging into trash in search of cardboard and other recyclable material that can be exchanged for money. Some children do this work together with their parents.

The second phase of *Fantasías 2.0* involves support from the Ministry of Education of Buenos Aires City, as it has implemented the *Plan Integral de Educación Digital* (PIED), a comprehensive program designed to promote the integration of schools into the digital culture. Within this context, *La Isla Murguera* started touring schools in 2010, and was presented in 2012 at a massive digital festival, which was attended by more than 3,000 students.

12.5   Observations

In order to organize the observations of the case, I will suggest indicators that emerge from the framework. These are interconnected and influence one another, and therefore the observations might encompass multiple indicators.

- Participation and engagement (including corporal attitude)
- Group knowledge and teamwork
- Digital storytelling implications and awareness
- Happiness and motivation
- Creativity
- Cultural iconography
- Visualization of ideas in the story (symbolization)

Children participated in *Fantasías 2.0* with noticeably high levels of engagement, motivation and positivity. This was demonstrated by the increasing number of participants who joined the workshops instead of attending other activities offered simultaneously in which they worked individually. There was even a child with integration and behavioral difficulties who joined the sound workshop and was particularly active when the group performed *murga,* a popular music genre which is particularly appreciated in the local community. This moment, and many other parts of the project in which the group of participants worked together, contributed to increasing the enthusiasm among the children.

The rising engagement was evidenced in the corporal attitude. Whereas at the beginning of the first session the children were quiet and did not show much enthusiasm, as the activities progressed they became excited, moving around to see each other's drawings and cooperate with one another.

There were several cases in which the children colored drawings done by others, showing signs of ownership as a group (Jenkins 2009). Similar attitudes occurred with the plot building, when children collaboratively created the character profiles regardless of who had done the drawings. In general terms, there was an awareness of this project being the shared construction of a whole universe, rather than a mere sum of independent pieces placed together.

The feeling of collective ownership and knowledge (Lévy 1997, 2007) was also perceived during the children's visit to the installation at *Telefónica*'s art gallery. When they saw the *La Isla Murguera* installation for the first time, and discovered the digital world built on their fantasies and imaginations, they became visibly excited and enthusiastic.

According to observational records, the children jumped to touch the flying whale and moved with the rhythm of the *murga;* they embraced each other and stood against the walls with the images being projected over their bodies – as if they were entering the island – and continuously asked adults to photograph them. They became euphoric, running from one corner to the other, going outside the room and then entering again. "Let's go to the island," said one of the girls on coming back to the room in which the exhibition was being presented, while a boy placed a sculpture of a flower drawn as part of the story inside the projection area (see Fig. 12.3), as

Fig. 12.3 A boy holding a drawing of a flower that has been transformed into a tangible sculpture over the projection of *La Isla Murguera*

though he might be able to blend physical objects with the projection. (See details about the characters in Fig. 12.5 and about plot in Fig. 12.4).

These actions contend, as proposed in the framework, that digital spaces with high-scaled projections allow more compelling forms of perception than those offered through the limited confines of computer screens, enabling different parts of the body to experience and feel the story being told (Munster 2006).

In written feedback about the project, most of the ICT facilitators that coordinated the project's workshops agreed that the digital animation of the children's drawings was one of the most engaging aspects of *Fantasías 2.0*. One of them expressed that "what the children most liked was the fact that they could create objects and bring them to life." This feeling coincides with the testimony given by Lourdes, one of the girls involved in the project, in a video interview shot to collect feedback about the installation: "We found everything we have done and designed, just like that, everything! [. . .] We were so happy." Lourdes's comment highlights the fact that the children's implication increased due to the fact that the "living" digital world presented was actually shaped by the movement of their hands and their creativity and play, while digital technology was key to creating a new universe.

It can therefore be inferred that the digital installation was perceived by the children as the materialization of their story, a process in which digital media was crucial for the creation of tangibles out of their imagination and a link between this and physical reality (Winkler et al. 2007). This reinforces the idea that media, with its evolving technology, creates new means of representation and, consequently, emerging forms of sensitivity and perception that change methods of knowledge creation and circulation (Martín-Barbero 2001), thus facilitating new forms of social imagination and creativity (Martín-Barbero 1987).
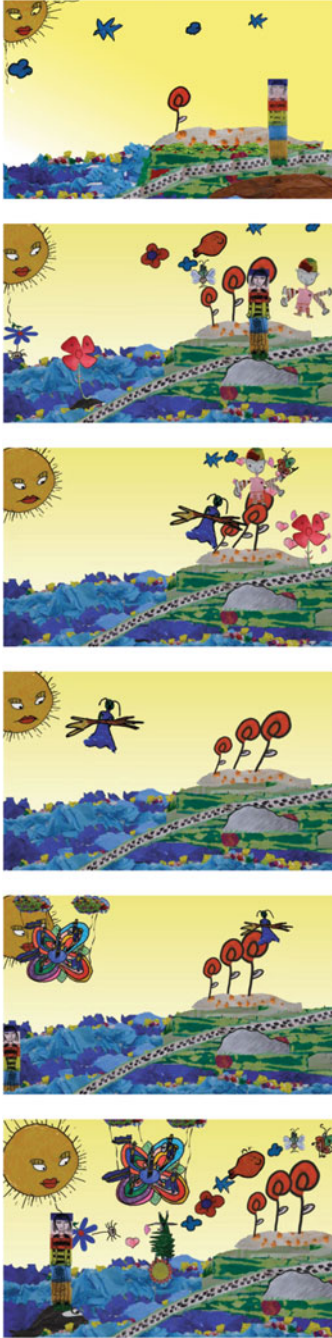
The story takes place on a beautiful island, where the sun has a happy face, the sea is blue and there are flowers on the crests of the waves. An ant swings over the scene by hanging from the sun's hair, and a girl named Arcoiris emerges from the sea. She is a guest of the island and has special powers: she can breathe and speak underwater and all men fall in love with her. Living clouds with crazy shapes start to travel through the bright sky and giant flowers walk the colorful landscape. Florito falls in love with one of the flowers and showers of hearts spread across the island. Other fantastic characters appear, such as a butterfly writer and a green alien travelling on a flying carpet. The characters all come together, start dancing joyfully and move together from the ground to the sky.

Suddenly a witch appears, frightening and threatening everyone. All the characters leave and the island becomes deserted and sad as the witch celebrates her victory. But it will not last. There is only one thing that can frighten away the evil witch: music. As a *murga group* enters the scene, she flies away. The *murga* is being performed over a big flower, which serves as a flying stage hanging from colorful clouds. The members of the *murga group* – who are dressed in the Boca football team's colors – continue dancing and playing music as all the characters come back and join them in a party, which gives a happy ending to the story.

Fig. 12.4 Plot

Image	Name	Profile
	Arcoiris ("Rainbow")	- Can breathe and speak underwater - Communicates with animals - Greets visitors to the island - Boys fall in love with her
	Abejorro ("Bumblebee")	- Rainbow's pet - Flies around her
	Ballena ("Whale")	- Vegetarian - Eats flowers from the sky and the leaves of underwater trees
	Florito ("Flying Boy")	- Walks and flies - Falls in love with Flor Rosa ("Pink Flower")
	Flor Rosa ("Pink Flower")	- Falls in love with Florito - Enjoys walking - Wish could fly
	Extraterrestre ("Alien")	- Likes making new friends - Uses a flower as a spaceship
	Murgueros (members of *murga group*)	- Play magical tunes every night - Invite all island habitants to dance and have fun - With their special music, they frighten away the witch
	Bruja ("Witch")	- Terrifying and evil - Likes scaring everyone - Afraid of music - Flees from melodies
	Flor murguera (*murga's flower*)	- Travels by hanging from clouds - Works as a flying stage, carrying the *murga group* across the sky
	Mariposa ("Butterfly")	- Travels by hanging from clouds - Works as a flying stage, carrying the *murga group* across the sky
	Ballenita ("Little whale")	- Flies and dances - Has been happy since the day she was born

Fig. 12.5 Characters

The digitalization of the images produced by the children transformed them into patterns that could be be easily manipulated (Lévy 2007), showcasing how technology enters into visual semiotics through facilitating and favoring certain kinds of meaning, and also "through the differential access to the means of production and reception which it provides" (Kress and van Leeuwen 1996, p. 233).

The perception of the digital animation as a certain dimension of reality did not prevent the children from developing an awareness of the digital storytelling techniques behind the installation, which constitute relevant aspects of new media skills (Jenkins 2009; Buckingham 2007; Livingstone 2009). Furthermore, the fact that they participated in the project and followed the process from start to finish gave them insight into the way in which much of the media they consume is produced. This assertion coincides with the disclosures of the mother of one of the participants in the project, who also volunteers at the Casa Rafael Foundation: "It is the first time [the children have] produce[d] something like this, actively participating, following [the whole] process [of] production until the very end and understanding [it]; they really feel they have created a world and know how it was done because they actually did it."

The whole experience, and particularly the exhibition, proved to be highly motivational and fulfilling for the children. In addition to the significant reactions commented upon in previous paragraphs, this is evident through messages the children left on the wall where the digital installation was projected. For instance, Irina wrote "I would stay here forever," and Cari said "I would spend hours contemplating this scenery."

The fact that the gallery was a modern building located in an upper-middle-class neighborhood in the center of the city added more excitement to the experience. The building contrasted with the simplicity of the fire station where the workshops took place, and the even more rustic homes in which some of them lived. The exhibition at *Telefónica*'s art gallery gave them access to an unexpectedly sophisticated place, since those who are socially deprived do not normally have access such venues, even public ones. During the visit, for example, the children were amazed by the transparent automatic elevator. In fact, some of them confessed that it was their first time taking an elevator. Moreover, the project helped them to develop a piece using state-of-the-art technology and techniques, which are not commonly accessible by vulnerable populations; that was presented also on online platforms and schools.

The production resulted in a versatile invention of drawing discourses (Atkinson 1991), which blended fantastic and surrealistic figures with representations of some of the children's most valued cultural expressions. Among the characters created by the children (see Fig. 12.5) were an amusingly shaped alien, a character with both arms and wings who fell in love with a flower, a vegetarian whale, showers of hearts and Rainbow, a girl who could speak with animals.

As displayed in Fig. 12.4, Casa Rafael's children created a story with a happy ending. There is an initial explosion of diversity, with the appearance of a number of peculiar characters; a moment of tension, connoted by the threat of the witch, and the positive outcome with the appearance of the heroes in the story: the *murga* group, which represents a popular artistic expression involving music and dance that

is typical in the Montevideo Buenos Aires region and is especially popular within the La Boca neighborhood. With no obvious connections, the *murga* and the witch seem to form the fantastic binomial (Rodari 1993), which was naturally created and introduced by the children through the creative process.

I will concentrate on the role of the *murga* as one of the many observations that can be made about the cultural iconography employed in the piece (Nichols 1991), the visualization of ideas in the story (Paley 1990) and, ultimately, the meaning creation through images (Kress and Van Leeuwen 1996; Atkinson 1991, 2005; García Canclini 2007; Martín-Barbero 2001). As a proper interpretation of children's drawings requires understanding the context of production (Atkinson 1991), it might be worth providing background information about the *murga*. Influenced by ancient cultural forms coming from African slaves and the European carnival, *murgas* are performed as parades through the streets, with a group of people playing percussion instruments and waving flags, and others dancing to the roar of the drums. The *murga* is a popular artistic genre that has a remarkable connotation of social equality and celebration. Those who join the *murga* feel in communion, and differences are disregarded.

Considering its social connotations, it could be suggested that the appearance of the *murga* group among the children's production was not arbitrary within the context of the creation of an ideal imaginary world. It could indeed be inferred that it had a double symbolic meaning. On the one hand, as was explained earlier in this section, the *murga* connotes social equality, an ideal that, within the context of the ending of the story, could be seen as having been accomplished. On the other hand, the *murga* group in the story is not just any *murga* group, but is actually wearing the colors of Boca's football team, which makes it one of the most relevant elements of identification in the story since the body – the way it is dressed or its movements – incarnates culture (García Canclini 2007). Consequently, it could be inferred that this is an element taken from the children's reality that functions as a mediator or bridge to the fantastic world of the island, which eventually leads to equality (Atkinson 1991).

Throughout the project, the children collectively created a story of inclusion, promoting confidence, their identity as a group and their cultural values, but most of all hope, which is essential in the struggle to improve the world (Freire 1995). They created the characters and easily identified with them. Therefore, their dream of inclusion for the personages is also – in a symbolic dimension – a dream for themselves, since their fantasies are the basis of their culture and a place in which they build confidence and examine and project ideas for their future (Paley 1990; Rodari 1993; Winnicott 1982).

Other references to the children's social identity can be found within the story. An example is the colorful setting created by the children, considering the fact that painting houses in different, intense colors is one of the most outstanding characteristics of the urban features of the Boca neighborhood. In addition, it is remarkable that, coming from one of the most polluted areas in Buenos Aires, the children decided to create a clean and gleaming setting. It seems that, through the story, the children aimed to overcome the environmental challenges of Boca.

It is worth mentioning that the project was also engaging for Casa Rafael's authorities, who published the outcomes of the project in the foundation's magazine and on their website, which has access to the video animation of *La Isla Murguera* uploaded to YouTube as part of the project.

12.6   Balance and Reflections

The observations displayed in the previous section suggest that digital literacies and social inclusion can be promoted by projects encouraging creativity, play, imagination and fantasy by inviting children and young people to become content and story creators, where drawing, collaborative work and digital media are crucial to enhancing their social experience.

The case suggests that the outcomes of playing and imagining a story, which is one of the most fulfilling experiences and opportunities to rearrange the world in a way that pleases children and allows them to project their futures, seem to be augmented when expressed in drawings that are collectively assembled and consequently represented using digital media. In this context, ICT creates new means of representation and perception that enhance the symbolic world created by children, embodying it in tangible outcomes which materialize their fantasies via a vivid and multisensory approach.

This is revealed through the observations of *Fantasias 2.0* expressed in the previous section: the children collectively created a story of inclusion with a happy ending, wherein a kind of utopia is established that has an essential role in education, since hope is a crucial source of motivation to transform the world. The symbolization is even more meaningful considering that the creators of *La Isla Murguera* are vulnerable children and that through their identification with the characters they invented, the outcome of inclusion in the story is ultimately projected as a goal for themselves. As suggested in the framework, "the fantasies of any group form the basis of its culture" and the stories created by children "may be the original model for the active, unrestricted examination of an idea" (Paley 1990, p. 5).

It might be worth mentioning that the project was deliberately designed so that the production process began by inviting children to draw, as opposed to writing the story and illustrating it later, following the traditional marginalization of visual communication against writing. As stated in the framework, the ability to express our thoughts and create meaning can be done not only in words but also in sounds or via visualization: children therefore do not express in images ideas that would be better explained in writing. It can be suggested that the process of drawing with their own bodies, the subsequent digitalization of images, and the animation and visualization in digital spaces with high-scaled projections enhanced the possibilities of symbolization for the children, who perceived the installation as the materialization of their fantasy.

This was accomplished while the children developed teamwork and digital storytelling skills, and became content creators, which are essential digital literacies. I would like to stress the importance of the project's pedagogical intention to promote collective creation and consequently a positive assessment of group ownership as opposed to individual authorship, since collective intelligence is essential to develop the digital literacies that children and young people need in the new media landscape. Whereas individual production was the traditional process employed by the workshops the targeted children had been attending, by championing collaborative work, *Fantasías 2.0* paved the way for emerging forms of production associated with collective intelligence.

Through the project, the children managed to create new knowledge using ICT, which is crucial for social inclusion, and presented their original imagery, characters and plot using different communicational and cultural platforms, such as online publications and art galleries, that would otherwise be inaccessible to them.

In addition, the relationships between those who coordinated the project and led the pedagogical intervention, the children themselves, and the foundations involved (Casa Rafael and *Telefónica*) were also framed by the collective intelligence paradigm, since it implied acknowledging that these actors were different from each other and that their knowledge and experience did not coincide, making its integration and interaction an ideal scenario for mutual enrichment.

Finally, I would like to highlight the sense of fulfillment and empowerment provoked by the fact that the children were the protagonists of this construction, which was freely shaped with their own ideas and imaginations. Playing throughout the project's creative process and the collective creation of ideas proved to provide not only a source of happiness and enjoyment, but also a place to build empowerment since play – as referred to in the framework – is possibly the only dimension that children and young people can understand and control from beginning to end.

The project proposed a very specific and carefully designed plan for a multi-dimensional and meaningful integration of ICT into the target community, considering a number of physical, digital, human and socio-cultural aspects, and acknowledging that digital inclusion does not equate to mere access to technology, but fundamentally a matter of education. This transcends the realm of the written word and information and demands multi-sensory approaches to perception and representation, since ICT relates not only to technological devices, but also to cultural forms that convey images and fantasies, and create opportunities for imaginative expression and play.

Future actions related to this case may include studying the implications and involvement of children in the interactive installation currently under development. *Fantasías 2.0* is also suitable for replication, since storytelling is a wide field that can be developed, even with very limited and simple resources. At the time this chapter was being written, early conversations were being conducted with universities in Brazil to replicate the project.

Although it might be worth considering this case for promoting digital literacies and social inclusion, the challenge of facing socio-cultural inequalities fundamentally demands public policy-making that transcends the scope of the case reviewed. In the struggle to improve the world, vulnerable individuals, communities and society in general also need ways of anchoring in practice ideas and ideals, since, as Freire (1995) proposes, hope is necessary but not enough.

Last but not least, Box 12.2, below, summarizes the chapters insights into the factors that influence the implementation of successful collaboration.

Box 12.2: Collaboration

Collaboration

Regarding the collaborative approach, I would like to comment on some aspects that might have positively influenced the development of *Fantasías 2.0*. One of these is the fact that *Telefónica's* foundation had a local branch managed by people engaged with the local culture of Buenos Aires. This helped with some practical aspects of the project. For example, advice provided by one of the tutors of the interactive arts program was key in identifying the Casa Rafael Foundation as a possible partner.

It also helped that Casa Rafael is a small foundation without much bureaucracy, which allowed it to open its doors to *Fantasías 2.0*. As I started the project as a personal initiative and with limited help and time, any delays or exhaustive formal requests as conditions to make progress would have been a real challenge. Instead, the authorities of the foundation were considerably proactive and showed an affinity with the initiative. In written feedback about the project, Christine Pintat, the director of Casa Rafael, stressed that "the collaboration worked very well with proper dialogue between the project leaders and Casa Rafael's staff".

Nevertheless, there is a need to address the fact that embarking on something innovative means that funding resources do not necessarily match the plan outlined. This was one of the challenges of the project. Although there was some original support from *Telefónica*, the help was limited because the support came from a program to develop artistic projects, and not for socially oriented initiatives involving vulnerable children.

It took almost a year to make progress and receive further support from the Ministry of Education, and this was almost exclusively achieved by personal motivation and proactivity. As it was never intended to be a profitable activity, I had limited time to work on it. The project could have been further developed in a shorter period of time if an organization had fully supported its development from the point of inception.

Box 12.2 (continued)

A suggested action to promote innovation in sustainable development initiatives is the creation of cooperative integrators. Funded by a variety of donors, these organizations would provide funding and central services to promote new and creative projects with a multidisciplinary approach. They could create registries of people who are interested in organizing or supporting projects, and facilitate networking for bottom-up collaboration. They could also offer centralized management services to help different social entrepreneurs to develop their projects.

Another suggested line of work is promoting multidisciplinary and open-minded approaches among donors and entrepreneurs. Innovation is closely related to emergent cultural practices; it therefore goes through different dimensions of life, and consequently involves a number of fields. Therefore, shaping projects within the limitations of a particular discipline or field reduces the projects' impact.

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Chapter 13
Innovative Sustainable Partnership Between UNESP and a Rural Community: The Bamboo Project

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Abstract A successful partnership has been established between one of the most prestigious universities in Brazil, the São Paulo State University – UNESP, and a rural community located in the state of São Paulo, Bauru, Brazil. Within the ambit of this project, the farmers of this community, who are at constant social risk, receive training to enter the bamboo production chain. This training involves planting species of commercial interest, handling bamboo clumps to produce seedlings and stems, treatment and drying, in addition to techniques for processing, treatment and utilization in the construction of lightweight structures and for the production of artisanal and processed products, thus adding value to the material and providing a source of income for these families. This partnership resulted in several mutual benefits, e.g., the formation of a group of trained farmers, called the "Viverde Agroecological Association," which can replicate this process by including new families in the project, as well as the establishment of partnerships to disseminate and support the project, and the training of UNESP students in product development and in scientific activities. This partnership project has received several awards for sustainability in Brazil, such as the 2009 Odebrecht

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Keywords Bamboo • Brazil • UNESP • University • Rural community

13.1 Introduction

Few people today doubt that ecological problems will increasingly constrain development, industrial processes and human settlements, and the twenty-first century is already considered the century of the environment. Thus, the search for nonconventional renewable materials and energy sources has become a global priority at the beginning of this century.

Much has been said about the need to seek Sustainable Development that meets the needs of *the* present generation *while* ensuring that future generations also develop (Wilkinson et al. 2001). However, it is increasingly clear that sustainable development can only be achieved through the establishment of partnerships between the multiple actors in society (the *market,* civil society and the public sector). The establishment of partnerships in pursuit of Sustainable Development is so important that the United Nations (UN) established that one of the eight Millennium Development Goals is collaborative work among the various actors in society (Sarkis 2012).

Partnerships tend to be even more important for South American countries, i.e., countries that are not yet developed, because they enable the combination of skills, maximization of the use of scarce resources, knowledge exchange, and the capacitation of low-income populations seeking to better their lives.

In this context, this chapter describes a partnership between a public university and a rural community in Brazil aiming to transfer knowledge of the cultivation of bamboo and its supply chain for the rural community involved in the project by planting a kind of renewable resource. This process can contribute to income generation and avoid migration of families from rural to urban areas while at the same time avoid cutting down native trees; renewable material such as bamboo. This process can also generate income in a sustainable way, respecting social aspects, cultural characteristics, and looking for a balance between rural and urban contexts.

The bamboo project is based on the following main concepts:

Sustainability: is the ability to manage any situation or fix any problem taking in accounting economics, socials, and environmental aspects (Hart and Milstein 2003);

   Sustainable Development: a way to reach good quality life conditions in the present time and to the future generations (Hart and Milstein 2003);

Sustainable innovation: is a innovative process or product aiming to improve an economic and social reality with smaller environmental impacts (Boons et al. 2012);

Collaboration/Partnership for sustainable innovation: any kind of multi-stakeholders cooperation for the co-creation and/or dissemination of sustainable innovation (Othman and Omar 2012).

This partnership was established between São Paulo State University (UNESP), located in the city of Bauru, state of São Paulo, Brazil and a rural community called "Assentamento Rural Horto de Aimorés" [Aimorés Garden Rural Settlement], located near the University. Inside this settlement, there is a group working with the University. This group was called "Viverde" and nowadays it is called Viverde Agroecological Association." The goal of this partnership was to introduce the Bamboo Project to the community, seeking to generate income and to ensure this population remains rural, based on the use of bamboo as a raw material. This project is based on the successful application of bamboo based on the findings of Hidalgo-López (1974), Liese (1985), Lee et al. (1994), Inbar and Rattan (1995), Janssen (2000), Cnbrc (2001), Filgueiras and Santos-Gonçalves (2007).

This partnership project has received several awards for sustainability in Brazil, such as the 2009 Odebrecht Award for Contributions of Engineering to Sustainable Development, the University Outreach Award (UNISOL), the 2010 and 2011 Banco Santander Award, the 2010 ProExt/MEC Award (Ministry of Education and Culture), and the 2012 3M Institute for Sustainable Development Award. All of these awards are related to the outreach bamboo project that contributes to the occupation of rural areas, poverty alleviation, and use of a renewable, natural, and abundant material – bamboo – integrating in a single project multiple stakeholders: academics, community, students, and companies. We believe these factors attracted the aforementioned awards.

Thus, we consider this case an innovative collaborative partnership focusing on sustainability, because there are positive findings in environmental performance (use of the bamboo), poverty alleviation and reduction of social risks (earning income), and economics results (the bamboo products are being commercialized in a successful way). This case can also be considered innovative because it is related to a new pattern of university-community collaboration, based on the whole bamboo chain, aiming to achieve sustainability goals. This project is forcing the University to rethink outreach in a more sustainable way. Also, the products developed with the bamboo are quite innovative, in terms of products design. Finally, the bamboo project was proposed both from outside the University (the community) and by scholars. They worked together in other past projects. This is also an innovative approach to university outreach design.

The characteristics of the partnership, its beneficial results, and some of the challenges still to be faced are described below. Finally, we highlight some lessons from this case.

13.2   Characterization of the Partners and the Material Used

13.2.1   *São Paulo State University: UNESP, Bauru, SP, Brazil*

The São Paulo State University is known for its quality, and in 2012, was listed by the Times Higher Education World University Rankings as among the world's top 100 Universities with less than 50 years of activity in the field of Higher Education (Times Higher Education 2012).

   Another factor that ensures the quality of education at UNESP is the university's infrastructure, which includes 1,900 laboratories and 30 libraries. Students and teachers have at their disposal museums, horticultural gardens, vivariums, botanical gardens and experimental farms. Scientific research and technological activities are an important area of action of the University. Undergraduate and graduate students can choose to participate in this research, assisting teachers or developing their own projects, be they undergraduates or working on their master's dissertations and doctoral theses. UNESP also stands out for the quantity and quality of the services it renders to the community. These services include: medical and dental care, legal advice to needy people, guidance for micro- and small entrepreneurs, psycho-pedagogical assistance for children with learning disorders, and weather forecasting for farmers. Its services also include the development of projects in partnership with companies and municipalities, aimed at solving problems of basic sanitation, education, transportation, food and health.

   The School of Engineering at UNESP Bauru offers four undergraduate engineering courses: Civil, Electrical, Mechanical and Production Engineering. In addition to undergraduate courses, the School of Engineering currently offers postgraduate programs in Mechanical, Production, Electrical, Civil and Environmental Engineering. The departmental sectors of the School of Engineering responsible for the Bamboo Project, which involve the management, cultivation and characterization of bamboo, are the Experimental Laboratory and the Wood and Waste Processing Laboratory, which belong to the department of Mechanical Engineering. The experimental cultivation field contains a collection of 25 bamboo species, cultivated on an area of 1 ha (10,000 m^2).

13.2.2   *The Rural Community: Aimorés Settlement*

The rural settlement of Aimorés Gardens is situated on the divide between the municipalities of Bauru and Pederneiras, in the state of São Paulo, Brazil, 15 km away from UNESP Bauru, and has about 350 families settled by INCRA (National Institute for Colonization and Agrarian Reform) in 2007. From these 350 families, about 30 families have some collaboration with the UNESP and about 20 families are voluntary engaged in the Bamboo project. It is necessary to make clear that:

- Only a few people from the rural community were aware about the benefits of bamboo before joining the project.
- More and more families outside of the bamboo project are interested in becoming part of this initiative.
- In Brazil, this initiative could be considered the first one covering the entire bamboo supply chain (from plantation, harvest, handcraft and commercialization) based on a strong and day-to-day partnership.

The basic purpose of this community is to generate income by working on the land, and it has been seeking sustainable alternatives to ensure that its families remain in their rural environment. The settlement's primary focus is to ensure its food subsistence, but it must also generate income through sustainable alternatives, such as the bamboo project described herein. One of the first basic needs for the settlement's socioeconomic development was the construction of a community building to accommodate this project, which was also a suitable site for community meetings and for the planning of direct local actions and the installation of its electric power grid.

Brazil's federal land reform program aims to allocate unused land to farmers who, for various reasons, are deprived of decent conditions for survival.

The community building, which is made of bamboo, has dimensions of 450 m^2 and serves to house the project in the settlement itself. A workshop under construction (in bamboo), will be used for the manufacture of products and for local training. Construction involves the community, and UNESP professors and students.

Farmers choose their individual area/land; each family can explore this area of land independently of the other farmers. The settlement is huge and with a low population density. It makes it rather difficult to foster group or collective actions, since the families are physically very distant from each other, thus significantly hindering communication and the organization of groups. Therefore, the project proposed, initially, to work with a group of families called the "Viverde Group," which was working in a collaborative way several years ago. Thus, the bamboo project was proposed both from the outside of the University (the community) and by scholars. They worked together in other past projects. This is also an innovative approach for university outreach design.

The Viverde group, already had some experience in community and collaborative work with the production of organic vegetables, breads and cheeses, and was looking for new job and income opportunities.

In this context, some professors of the University visited the settlement to talk about the possibility of a partnership. They presented an outreach project involving the cultivation of bamboo, and the many possibilities using bamboo to generate income and a better quality of life. About 30 families were engaged in this first presentation.

After that, these families visited the University, to know more about how the project operates within the bamboo production chain, from planting until harvest and manufacture of products, which requires a time of learning and implementation, until the income generation and improvement. About 10 families that initially came

to learn more about the bamboo project did not continue. Transportation between the university and their lands was difficult for this group, which also has the lowest initial knowledge on how to earn an income using bamboo as input and how UNESP can contribute to the project.[1]

The 20 remaining families in the Viverde group were trained in the bamboo production chain and its members became the disseminators of bamboo technology within the community. The first author of this Chapter was the main responsible for the training sessions, with the support of some UNESP's students. The main subjects of the training sessions were:

- Bamboo culture;
- Bamboo handcraft and uses.
- Bamboo as a renewable source.
- Environmental impacts of the bamboo culture.
- Very basic fundaments of accounting and cooperative work and management.

The development the Viverde group resulted in the creation of the Viverde Agroecological Association in 2011. This association is an implementation model for the bamboo project, which serves as a multiplier or a mirror of the new tool to be introduced in the community. The association is composed of about 20 families, who already have a little experience in the marketing of agricultural products outside the settlement through their production and sale of vegetables and homemade foods (cakes, breads, cookies and candies).

The target public of the project in the community is low-income families (lower than one minimum salary), whose adults generally have little schooling (up to fourth grade) and whose children and adolescents attend school.

Thus, the project presented here was largely developed in the laboratory of UNESP, which has the field (raw material) and laboratory (machines and tools) infrastructure necessary for the development of direct actions, and practical learning. In the first phase, the Viverde group farmers were easily convinced and trained in the bamboo production chain, involving: the planting, management, harvesting, production of seedlings and stems, drying and treatment, as well as theoretical knowledge about the main species, their uses and techniques for processing, treatment and construction of lightweight structures, and artisanal and processed products, already made in the University. Participants of the Viverde group came to UNESP once a week to fabricate the products.

The second phase consisted of the formation of a group of Design, Architecture, Arts and Engineering students, called the "Taquara Group," which also underwent training in the bamboo production chain to qualify them to work with the farmers on the project. The students engaged in academic activities in the subjects of the courses that used Design Outreach in products developed in the classroom. This action was successful and as a consequence of the products' high quality and

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[1]We expected that these families will later join the project, after they observed the benefits achieved by pioneering families.

reputation, the group is currently earning a monthly income through its participation in local fairs and through partnerships, and is beginning to accept orders. The bamboo products can be found online (www.flickr.com.br/photos/grupoviverde) and in some outlets of a huge Brazilian supermarket chain named Pao de Açucar.

13.2.3   The Basic Material of the Partnership: Bamboo

The main raw material used in the partnership is bamboo, which has been cultivated and utilized at UNESP Bauru since 1994, where 25 species of economic importance are cultivated. One of the most versatile bamboo species cultivated at the university *is Dendrocalamus giganteus*.

Historically, humans have used bamboo for food, shelter, tools, utensils and a myriad of other items. It is estimated that bamboo contributes to the livelihoods of over a billion people today (Sastry 1999).

Most of the species native to Brazil are ornamental and are associated with forests. All the cultivated bamboo species are called exotic, originating mostly from Eastern countries, from where they were brought and introduced since the time of Brazil's discovery, except for the species *Guadua angustifolia*, which originates from South America and is widely used in Colombia (Pereira 2001).

Bamboo is the fastest growing plant on earth, taking on average of 3–6 months for a culm to reach its maximum height of up to 40 m in giant species. The amazing vitality of bamboo; its versatility, lightness, strength, and ease to work with (using simple tools); and its beauty in natural and processed form are qualities that have given this plant the longest-standing and most varied roles in the evolution of human culture (Farrelly 1984).

Since bamboo is a predominantly tropical, perennial, and renewable plant which produces culms (annually) without the need for replanting, its agricultural potential is significant. In addition to being an effective sequestrator of carbon, it possesses excellent physical, chemical and mechanical properties. Bamboo can be used for reforestation, for the restoration of riparian forests, and as an environmental protector and regenerator, as well as in various applications in both untreated or processed form. However, its use is poorly recognized, be it due to lack of knowledge about its species, characteristics and applications, or due to lack of specific research and the insufficient dissemination of available information. In Brazil, its use is restricted to traditional applications such as handicrafts, fishing rods, furniture, in the production of edible shoots and in the manufacture of paper (Pereira and Beraldo 2007).

According to Pereira (2012), although bamboo is not considered an exclusive solution for environmental problems and/or to offset the substantial decline in our forest resources, it can be considered an alternative low cost material that deserves to be exploited. The utilization of cultivated bamboo and its production chain can benefit the environment and generate income (employment), thereby avoiding the migration of rural communities to urban areas.

The cultivation of bamboo is consistent with the principles of sustainability, since bamboo is a perennial plant that grows rapidly and produces stems annually. If managed properly, it can be used from one generation to the next over long periods of time.

Data regarding the average bamboo productivity are highly variable because they depend on the geographic region, the species in question and the spacing of planting, as well as local climate conditions and the cultivation treatments applied. This productivity may range from 20 to 30 t per hectare. Although Brazil has the largest reserve of natural bamboo in the world (the states of Acre and Amazonas alone have approximately seven million hectares), it is one of the countries that least uses this natural resource, except in northeastern Brazil, where over 40,000 ha/year of *Bambusa vulgaris* are cultivated for the manufacture of cellulose pulp (Pereira and Beraldo 2007).

With regard to its leaves, McClure (1993) described the series of leaves that emerge from the successive internal nodes of a bamboo culm during its growth phase as cauline leaves. These leaves vary in size, shape, and coverage according to the position where they emerge on the stem. On mature stems, the bracts (also known as cauline leaves) that cover the nodes from the middle of the stem to close to its base are generally considered agricultural residues

The use of cauline leaves for the manufacture of particleboard has also been described in studies conducted by Battistelle et al. (2008), who aimed to develop particleboard made of agricultural wastes, increasing the economic value of a product relegated to organic fertilizer. Five different traits were determined for testing and the results indicated that the inclusion of up to 25 % of cauline leaves in the composite did not affect the strength of the newly developed material. The particleboards were used as ceiling material in the Agricultural Waste Management Laboratory.

Besides the many advantages of using bamboo, in Brazil this culture can be considered new and emergent, in contrast to Asian countries. Only recently has the Brazilian government suggested the culture and use of bamboo in diverse activities, the Brazilian Federal Law N. 12.484, approved in September 2011, being one such example.

13.3   A Brief Description of the "Bamboo Project"

The partnership project between UNESP and the rural community is part of a larger project called the "Bamboo Project," which has been under development in the Bamboo Experimental Laboratory since 1990. The purpose of this project is to develop the cultivation of bamboo as a raw material for the manufacture of products, since bamboo can substitute wood in many cases, thus contributing to reduce the felling of native forests for timber. The "Bamboo Project" involves the introduction of priority bamboo species (of technological and economic interest) for the supply of raw materials, the production of stems, physical and mechanical characterization,

processing, treatment, development of lightweight structures, and artisanal and processed products (glue-laminated bamboo), which can generate income and add value to the raw material. The project also involves teaching (undergraduate and postgraduate courses) and extension activities in the community of the Aimorés settlement.

13.3.1 Involvement of the Academic Community of UNESP

Since 2009, UNESP at Bauru has been engaged in scientific and extension activities involving students of Design, Architecture and Urban Planning and Civil, Mechanical and Production Engineering who participate in the "Bamboo Project" in activities aimed at the fabrication of sustainable products using bamboo as a raw material. The group is renewed annually through a selection process, in which veteran students are in charge of presenting the physical structure of the Experimental Bamboo and Wood Processing Laboratory. The focus of the project is based on the three dimensions of sustainability: Social, Economic and Environmental.

Older students train new students in scientific and extension activities that are already underway. These activities include the manufacture of various objects, using all the machinery employed in processing bamboo stems and in fabricating the products, as well as the handling, harvesting and treatment of different bamboo species cultivated at the university.

The group meets weekly to study and discuss scientific texts, raising social, environmental, and policy-related issues in order to expand their knowledge about the theme of Sustainable Development. These discussions enable the study group to develop several proposals, which are then executed in parallel with the project.

13.3.2 The Farmers' Involvement

One of the project's first activities with the group of farmers was an inaugural lecture aimed at making initial contact with the families of the settlement and raising their awareness. This event, which was attended by the project coordinator Prof. Dr. Marco Antonio dos Reis Pereira, of UNESP, and by a representative of INCOP, the Technological Incubator of Popular Cooperatives of UNESP, presented the Bamboo Project and the entire production chain of bamboo, aiming to encourage the farmers' participation in the project.

The initial lecture served as the starting point for the project. Its purpose was to explain the university's bamboo-related activities, in order to attract new stakeholders, as well as unify proposals involving the project team and farmer groups (called Viverde), who later visited the Experimental Area of UNESP.

One of the first activities with the group of farmers was to visit the homes of local farmers to diagnose their family needs and to impart prior knowledge about bamboo cultivation in order to more effectively plan the actions to be developed. In this step, a questionnaire was applied to collect and quantify information about the families' income, housing and educational status.

The second step consisted of proposing the development of the project, following activities already undertaken by the Bamboo Project, using the knowledge acquired about bamboo species, the seedling production, cultivation, planting, and handling techniques; the processes of treatment, drying, and processing; and lastly, the techniques for building structures and fabricating products.

Workshops for seedling production and harvesting of the mature stems (3 years), were aimed at ensuring proper handling, removing younger stems to ensure the continued production of new shoots.

After the stem were harvested, they were cut and treated preventively by immersion in tanks or by the Boucherie system using octaborate (boron-based product harmless to humans and the environment) to prevent attack by xylophagous insects.

The weekly training activities in the manufacture of products continue to the present day in the Experimental Laboratory.

Since 2010, the Viverde group has been producing a variety of objects and utensils such as cutlery, vases, salad tongs, cups, wine holders, caipirinha kits, garlic presses, etc. The products fabricated by the Viverde group are shown on the website: www.flickr.com.br/photos/grupoviverde.

The types of products to be fabricated are chosen based on dialogue and exchange of ideas among members of the cooperative and students, as well as on indications from consumers during participation in artisanal fairs.

13.4   Public Recognition of Teamwork

The group has received several invitations to participate in handicraft exhibitions, including one from the social action committee of the "Pão de Açúcar" group, one of the main economic groups in Brazil which owns a large supermarket chain, in which only groups linked to social initiatives that seek to generate income through the sale of artisanal products are invited to participate. In 2012, the Viverde Association is signing an agreement with Brazil's Caras program, which should provide a steady income for the community, since 55 stores of the "Pão de Açúcar" group distributed throughout the Brazilian territory participate in the Caras program.

Another venue in which the group participates to generate income, which is sponsored by the municipal government of Bauru, is the Ubá Fair which is held fortnightly in Bauru for the sale local handicrafts. This exposure has enabled the rural families to register with the official artisans, which has led to their formal recognition by the municipal government. What caught the attention of visitors was

the exhibition tent taken to the Fair, which differed completely from the standard tents or booths, and is made of bamboo in a geodesic shape.

13.5   Participation in Events

Several meetings were scheduled for the participation of the Bamboo Project, among them the Regional Agroecology Meeting held by students of Forest and Agronomic Engineering of UNESP Botucatu.

The group participated in several other academic meetings in 2010, one of which focused on University Extension, in order to analyze the trends and perspectives of Extension in Institutions of Higher Education, and especially the University Extension Projects of the Schools of Sciences, of Architecture, of Arts and Communication, and of Engineering of UNESP Bauru.

In these scientific meetings, students are encouraged to work on research and produce articles for other events. This enables them to disseminate and enhance their knowledge and extend beyond their university education.

13.5.1   Practical Experience for Students

Another activity proposed by undergraduate students of the Production Engineering course, which joined the project, was the development of actions aimed at improving productivity and optimizing production through the implementation of the Five Senses (5S) in the workshop. The 5S consist of a set of Senses of Action: utilization, cleanliness, health, discipline, housekeeping and control of stock through the separation of objects of the Viverde Project, PPE (Personal Protective Equipment) and tools. The entire workshop was organized and labeled with the names of the people responsible for each area, as well as production dates and product descriptions.

As part of the activities involved in transferring the Bamboo Project to the community, 120 bamboo seedlings of the species *Dendrocalamus giganteus*, *Guadua angustifolia* and *Bambusa oldhamii* were planted in the common area of the settlement, all of which have an excellent utilization potential, as way to ensure the supply of raw material for the development of the project.

Another activity the students and farmers engaged in was the construction of a kiosk at the Angatu fishing site close to the city of Bauru. The kiosk was designed by Civil Engineering students, and the farmers had the opportunity to participate in an on-site training course in bamboo construction.

According to the community's point of view, the leader of the Viverde group told that the main challenge of the project is the distance between where the University and the community are located. According to his point of view "[. . .] the distance between the group and the University is about 17 kilometers [. . .]

there is no efficient transportation for an everyday contact and interaction." The positive comments of the Viverde's leader are related to "[. . .] our group is stronger, and we know more about the bamboo project and its potential to jobs and income generation [. . .] we are closer to the University's students and professors and they are helping us to improve quality of life." Overcoming this challenge can contribute to the engagement of more families in the bamboos project.

It is clear that the marketing demand is increasing. The awards received play a relevant role in this process, because people in general want to know more about the bamboo project, its products, and the benefits to the rural community.

13.6 Final Remarks

This chapter attempted to systematize the profile of an innovative project that is being implemented through a partnership between UNESP and a rural community located near the city of Bauru, in the state of São Paulo, Brazil. The project is aimed at training the rural community to achieve more sustainable development, earning income through the cultivation and use of bamboo while simultaneously preserving the environment.

After training the initial group of farmers of the "Viverde group," they have become the replicators of the project in the community of the Aimorés settlement. The project was transferred to the settlement by transplanting 120 bamboo seedlings to supply the raw material and by building a 450 m^2 bamboo workshop to accommodate the activities of the project. This workshop will serve as a workshop and school to hold talks and disseminate acquired knowledge, and in future will be a nucleus of development of the project, attracting new members, especially young people, wishing to join the project. This area will be equipped with machinery, which has already been purchased with resources from partnerships and prizes, to help support the fabrication of products and also provide better working conditions. In a second phase, the workshop should be expanded to also accommodate the community's cultural and leisure activities.

After only a few years, the Bamboo Project has already generated several benefits, such as:

- Involvement of various sectors of society (teachers and students of UNESP, rural families, civil society and the market) in the search for more sustainable development.
- For the Project Coordinators and for UNESP, the opportunity for extension, research and publications.
- For students, contact with a reality different from their own, and an opportunity to use the knowledge they acquire in the classroom in a practical application.
- For rural families, the opportunity to engage in artisanal activities and earn an income.

- Introduction to bamboo cultivation, the bamboo production chain, and its enormous potential as a renewable and readily available raw material.
- A real case of collaboration for sustainable innovative products using bamboo (a renewable resource) with results for poverty alleviation.
- Designing university outreach projects should start with small projects, to share knowledge between university-community members, and going to a more developed and increased projects. This was the case of the bamboo project, which started after some small and initial collaboration between the rural community and the UNESP.

The main challenges of the project are local development and the inclusion of more families, and especially young people, in the project. Another challenge is to disseminate, among the other residents of the Aimorés settlement, the notion that bamboo is a raw material that serves to substitute timber, and that its cultivation can reduce the felling of native tree species. However, the greatest challenge of the project is the generation of a steady legal income for each member of the cooperative, with social security rights institutionalized in the country (health and education).

Another challenge is the physical distance between the rural community and the University campus. There are not enough transportation resources to facilitate a higher contact between these two players. Maybe, the partnership should be increased, including the Prefecture to make an easier transportation available.

From this successful partnership in the South, researchers and policy-makers in the North can learn the following:

- Universities, in addition to cutting edge research that contributes to the state of the art, should engage actively in the development of the local community.
- Bamboo and other renewable resources can be not only a source of income but also of valuing artisanal skills, and are also less polluting.
- Innovation projects should consider not only environmental but also social benefits.
- Social challenges deserve attention, such as workers' rights and the legal guarantees of those involved in the project.

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Chapter 14
"The Biofuels Program": Decreasing Rural Poverty and Environmental Deterioration Through Cooperative Land-Use Innovation

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Abstract Collective action engagement can enable individuals to overcome self-interestedness and work toward shared goals but to "get the institutions right for cooperation" requires an understanding of how the particular set of market and nonmarket relationships really work for participants. In the context of the biodiesel value chain in Brazil, this paper uses a case study to explore how institutional arrangements need to evolve if they are to foster the productive and sustained inclusion of small farmers in collective action to promote sustainable innovation as a regional economic development strategy. The analysis suggest that collaborative arrangements between policy-makers, Petrobras and grass-root representatives acting as agents of farmers shaped the design of the program and provided political and economic incentives for its implementation. However, institutional and socio-technical innovation failed to take-off because during implementation. The number of farmers engaged with the program was only a half than forecasted and productivity was even lower. A primary source of disincentives was the lack of direct engagement of small-farmers in decision-making and the dominance of institutional and cultural arrangements excluding small farmers from linking mechanisms to engage with external agencies. This suggest the need for policy intervention to foster

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inclusive collaboration based on repeated interactions and community governance mechanisms building trust and common understanding about potential course of actions.

Keywords Institutional analysis • Biofuels • Brazil • Land-use innovation • Rural poverty

14.1   Introduction

Innovative uses of land by small-scale farmers and their incorporation in sustainable value chains can be an important driver for sustainable development in transition economies. However, history and the institutional arrangements that exist in each region for natural resource use and ownership may deprive small-scale farmers of incentives to change from the traditional use of their lands to more sustainable uses integrated into local, national or international commodity driven markets (Barichello et al. 1995; Barbier 2004). Public policy can create new institutional arrangements shaping incentives which will encourage individuals to see their individual self-interest aligned with the common good (Steketee 2010). Therefore, one of the most pressing issues for developing nations is how to design and implement such polices. However, there are not enough case studies of environmental and social sustainable policy interventions focused on increasing well-being of small agricultural producers, especially in transition economies (Flora 2010).

This paper aims to contribute to filling such gap by analyzing incentives and disincentives for small farmers to engage with policy intervention aimed at reducing social vulnerability and environmental deterioration in the in the area of Guaribas in northeast of Brazil, the country's poorest region. This policy, part of the Brazilian Biodiesel program, promotes the implementation of innovative agricultural production models in socially and environmentally vulnerable drylands.

The Brazilian Federal Government has focused the program on the production of castor beans, an environmentally friendly crop that can be grown in small farms in conjunction with subsistence agriculture. Thus, the program can deliver positive impacts on biodiversity protection and soil fertility. Additionally, by inserting small scale family farmers in the global supply chain of biodiesel, the program aims to consolidate a financially viable and socially just agrarian production model to challenge the growth of large industrial farms which help to perpetuate rural inequality (Zapata and Nieuwenhuis 2009).

The program design has sought to overcome most of the criticism to bio-fuels production. First, a range of environmental challenges are addressed. Castor farming is compatible with agricultural practices contributing to safeguard diversity and soil fertility, since castor crops grow well in conjunction with other native species. Castor thrives on the co-existence with other plants, then clearing fires are not needed. Castor benefits from co-existence with subsistence farming and grows well in land unsuitable for intensive farming, thus a trade-off between food and fuel is

avoided. Production is neither intensive in the use of fossil fuels nor in nitrogen fertilizers nor in pesticides, thus there is no major polluting impacts. Second, regarding impacts on poverty and growth, production of the crop in small extensions of land appear to be economically and technically feasible in the context of current expected production quotas, thus providing a niche market for small farmers and local entrepreneurs. Finally, linking small farmers to the biodiesel supply chain may empower them and increase their social capital.[1]

One of greatest difficulties encountered in the design of the program policy structure was to combine the production of large scale farmers with small scale ones. Large scale farmers make use of soy, while small-scale farmers have a wider range of feedstock crop options but currently tend to rely on castor. The two types of participants have significantly different production models. Large scale farmers have a highly sophisticated production model with mechanized production and significant economies of scale. They are also very organized and received a significant amount of credit. On the other hand, small scale farmers use traditional labor intensive techniques, are disorganized and have limited access to credit.

The central policy instrument used to incorporate small scale farmers has been the "social label" scheme. The scheme provides to the biodiesel producers that purchase minimum specified feedstocks from small scale farmers with a "tax break" with regard to two federal taxes (PIS/PASEP and COFINS).

Small scale farmers and large scale farmers constitute the suppliers of vegetable feedstock. The seed production is given to the crushers that make vegetable oil and transport it to biodiesel refineries.[2] At the moment, in the northeast region of the country, the only biodiesel industry that has the legal mandate to operates with small scale famers and is being supported by the benefits provided by the "social label" scheme is Petrobras Biocombustiveis, the state owned energy giant (Sisdagri 2010). The firm also provides technical assistance, distributes seeds and has set up 5 year contracts with the small scale farmers. In this sense, it is. Once biodiesel is produced, it is directed to the distributors that mix it with the traditional diesel at a 5 % combination. The mixture is then sold to consumers at the gas station. In the country, only trucks, and few utility vehicles are allowed to be diesel powered. There is no production or imports of diesel powered passenger cars.

The program was designed by the government in collaboration with Petrobras and representatives of the politically influential rural grassroots movement "sin tierra". It was launched with large political attention by the central government that took the step to officially present the biodiesel program as a key policy measure to alleviate the lingering problems of the rural poor. There was an unquestionable understanding that the program will be a success in terms of small

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[1]There are important differences in terms of sustainability impact between biofuels generation 1 (like ethanol) and generation 2 (such as biodiesel). Such discussion is beyond the scope of this chapter; see for instance Zapata and Nieuwenhuis (2009), for further information about the debate in Brazil.

[2]Large scale producers can sell their production directly to oil producers.

Table 14.1 Productivity of family farmers in the Territory *Serra da Capivara (2008/2009)*

Municipality	Tons	Hectares	Productivity (ton/ha)
Anísio de Abreu	8.8	30.3	0.29
Bomfim do Piauí	1.1	3.0	0.36
Caracol	56.2	111.5	0.5
Coronel José Días	1.5	2.7	0.56
Fartura do Piauí	37.8	66.3	0.57
Guaribas	4.2	10.5	0.4
João Costa	2.5	12.5	0.2
Jurema	5.5	17.9	0.31
São Braz do Piauí	5.1	25.5	0.2
São Lourenço do Piauí	1.2	8.0	0.15
São Raimundo Nonato	49.7	63.4	0.78
Várzea Branca	2.6	9.6	0.27
Total	**176.3**	**361.1**	**0.49**

farmer participation and economic benefits. However, most small-scale farmers were not interested in planting castor and many of these who participated had economic losses due to price fluctuations in the fuel market. There was also a strong relationship between productivity levels and participation of small-scale farmers, leading to low productivity.

The results were particularly disappointing in the north-east, the poorest region in the country, where the program has been heralded as the start of an agricultural revolution to end chronic poverty. Pilot projects indicated that under proper conditions productivity of 1,5 t/ha of castor can be reached (Freire de Sousa and Figueira 2009). Table 14.1 shows how far below such target is the average productivity of small-scale farmers in Serra da Capivara (2008/2009), the most deprived territory in the northeast and the focus of this chapter.

This chapter uses a case study approach to investigate the causes of failure in participation, focusing on the analysis of institutional arrangements that may deprive small-scale farmers of incentives to change from the traditional use of their lands to more sustainable uses. Forty-two face-to-face semi-structured, 1 h long interviews were conducted with small scale family farmers Petrobras representatives, local authorities, policy-makers and technicians responsible for the technical assistance of the small scale farmers in the north-east of Brazil. Interpretive analysis was carried on using coding schemes derived from Institutional Analysis and Development framework – IAD. Making use of, IAD it is possible to understand how institutional structures can influence the success of collective action that directly shape sustainable innovation (see Fig. 14.1).

The IAD framework, as presented in Fig. 14.1 below, analyzes the interaction between different stakeholders or actors in an "action arena", where actors interact in a bounded environment, constrained by context exogenous variables such as biophysical and material conditions, attributes of the community, institutions and
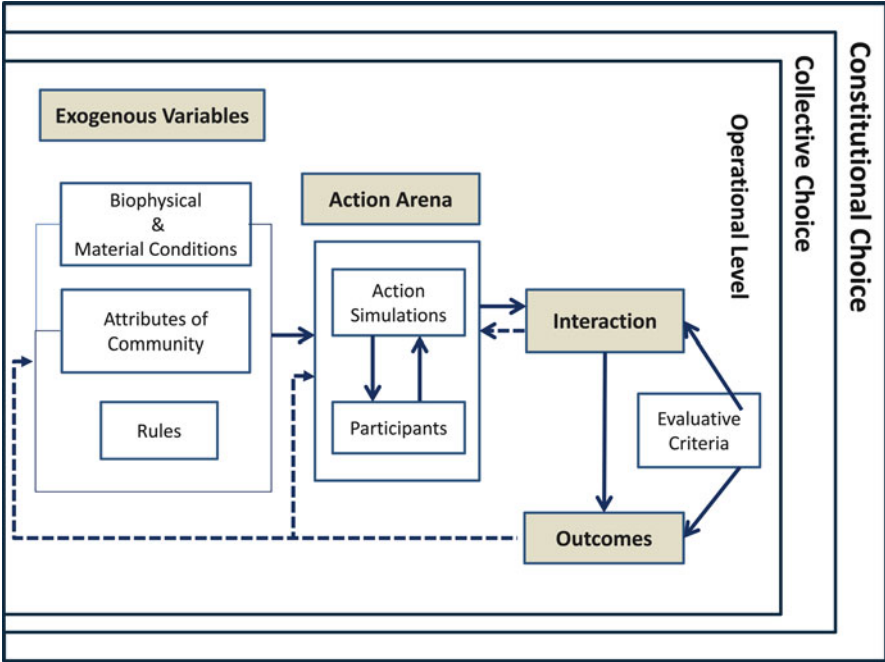
Fig. 14.1 The IAD framework (Adapted from Ostrom 2005)

rules-in-use (Ostrom 2005). The framework is particularly concerned with understanding how patterns of interaction between the actors are affected and effected by their context, leading to certain outcomes. The process is iterative, outcomes further influencing action arenas, modifying actors and, interactions and over time, also influencing context (Ostrom 2005).

The focal unit of institutional analysis is the action arena. This is a "*social space where individuals interact, exchange goods and services, engage in appropriation and provision activities, solve problems, or fight*" (Ostrom et al. 1994, p. 28). An actor is the individual or group functioning as a corporate actor, who takes action (Gibson et al. 2005, p. 27). An action situation occurs when two or more actors interact to jointly produce an outcome (Ostrom 2005). Action arenas are stages for social bargaining (e.g. a meeting, the implementation of policy, a supply chain) on which actors may choose to cooperate or not (Di Gregorio et al. 2008).

Three sets of exogenous variables constrain action situations and order actors' relationships in particular patterns (Ostrom 2005; Ostrom et al. 1994).

The first set are biophysical and material conditions, representing the physical world in which action arenas are located, affecting the "physical possibility of actions, the producibility of outcomes and the knowledge of actors" (Ostrom et al. 1994). The second group are attributes of community such as: "the values of behavior generally accepted in a community; the level of common understanding

that potential participants share (or do not share) about the particular types of action arenas; the extent of homogeneity in the preferences of those living in a community; the size and composition of the relevant community; and the extent of inequality of basic assets among those affected" (Ostrom 2005, pp. 26–27). The third set of exogenous variables are rules. Rules refer to: "the set of instructions for creating an action situation in a particular environment" (Ostrom 2005, p. 17), rules can be formal (laws, regulations, et al.) and informal (how things are done, cultural and religious codes of conduct), they define what actions are "required, prohibited, or permitted and the sanctions authorized if the rules are not followed" (Ostrom et al. 1994, p. 38).

Finally, the framework describes three successive and interrelated levels of outcomes: operational, collective choice, and constitutional choice (Ostrom et al. 1994). Operational level outcomes include the results of day-to-day activities that affect the physical world directly. Collective choice level outcomes are the rules created by decision-makers to shape operational level activities. Finally constitutional level outcomes are the results of decision about how collective choice actors are selected and which patterns of interaction will define relationship among participants of the collective choice body (e.g., voting rules, representation). Actors may move among the different levels, looking for the best outcomes within a given set of rules or bargaining to shape collective or constitutional choice rules to their benefit. The analysis in this chapter is focused on the collective choice level.

14.2 Analysis

14.2.1 Key Context or Exogenous Variables

14.2.1.1 Biophysical/Material Conditions

The biophysical conditions vary from setting to setting but two have been generally identified by the literature as important influences in patterns of interaction between actors: geographical environment (ecosystems, climate) and characteristics of the resource (scarcity, distribution, predictability) (Di Gregorio et al. 2008; Ngaido and Kirk 2001). Erratic environments characterized by situations of duress or high uncertainty (i.e. scarcity and uncertainty in the supply of ecosystems services, risk of natural threats) tend to encourage bounding and formation of social capital. For instance, in many dry-lands with unpredictable rainfall, the physical environment creates pressure for people to consolidate higher-level institutional arrangements (e.g. Ngaido and Kirk 2001), the more dispersed the resources are, the more difficult to exclude others from using. The more predictable the resources are, the more accurate the design of institutional arrangements for its management can be (Di Gregorio et al. 2008).

The Environment

The area where research has been carried out constitutes one of the most deprived in the country, partly because of the harsh weather that includes arid climate conditions with long dry seasons and erratic rainfall. Soil fertility is low, with erosion and desertification further threatening ecosystems and soil quality. Droughts and low quality of arable lands peak in Guaribas, Most lands are marginal and unused since traditional cash crops like soybeans, cotton and coffee cannot withstand the arid northeast climate.

Di Gregorio et al. (2008) suggest that lack of alternatives would make a powerful incentive to accept innovation, therefore having a positive influence on the acceptance of castor bean farming. Additionally, the harsh environment may have developed bounding and networking skills also favoring participation in collective action (Ngaido and Kirk 2001).

The Resource

Castor bean, often grown and harvested through subsistence farming, thrives in harsh subtropical and tropical weather. Compared with food crops, the castor-oil plant is an economic crop, requiring simple agrarian practices and little economic investment. Castor bean can be grown on marginal lands, which are not competitive with food production lands. It is resistant to disease and not threatened by animals due to its toxicity.

Castor has strong adaptive capabilities, growing in flatland and slopes, and develops better when grown in conjunction with other plants. It has 50 % oil content and can yield up to 350–650 kg of oil per hectare without fertilizers requiring only moderate rainfall (approx 600 mm) and can withstand long periods of drought (Roetheli et al. 1991). The crop needs little maintenance during its growing periods but the oil seed has to be collected by hand. Its needs of soil fertility are very low, thus ideal to replant marginal lands to prevent desertification and erosion. If not used in biofuels production the seeds main is use is manufacturing of lubricant and pharmaceutical oils.

All the above suggest the crop can provide small farms with a viable income from current non productive lands. Additionally, the dispersion of the resource and the need of manual labor to hand pick the beans reduces risks of some farmers being excluded from using the resources, or industry farms co-opting production . Castor bean does not compete with food production or other activities therefore there is no potential conflict over the use of land with other economic activities and actors. There is neither need to choose between traditional subsistence farming and castor bean, since the seed can be grown in small farms in conjunction with subsistence agriculture. Its toxicity may present a problem for mixed used of land, particularly coexistence with cattle or sheep in grazing lands. However, Roetheli et al. (1991) minimize the risk of animal poisoning arguing that animals "sense" the bean toxicity and do not feed on it In essence, the biophysical conditions seem to have a positive influence in the development of interactions leading to innovation

14.2.2   Attributes of the Community

In addition to scarcity of resources, droughts and soil infertility affecting agriculture, this area of the country has experienced constant emigration of rural workers to urban areas. Human capital has been eroded in most communities due to the emigration of the young and most skilled laborers. Low Natural and Human capital makes Piaui one of the poorest areas of the country with very low IDH and high reliance on subsistence farming and informal economies. The lack of communication infrastructure structure further increases the vulnerability and isolation of rural communities. In particular, the town of Guaribas has been largely known in Brazil as the poorest town in the country, with the lowest IDMH of the country (0.479), which accounts for very low education, wealth and longevity levels. Rural population relies on subsistence agriculture, informal economy transactions and governmental social benefits.

The region is also the focus of intense political debate and media scrutiny. The issue of rural inequality has been launched into mainstream political debate by militant landless peasant organizations, which advocate land invasions in an effort to reduce poverty. These organizations are well organized and politically influential, with high bonding, bridging and linking capabilities to mobilize people and resources. Particularly strong in the northeast, they have endorsed the program from its inception and pressured the government to anticipate its launching.

The government has taken Guaribas the example that would should the effectiveness of some of the most important pro-poor governmental programs including the biodiesel program and the "bolsa familia" cash transfer program. Due to the fact that this is a very deprived area of the country, a program that would foster the development of an economic activity liked to the small holders has especial interest. In essence, the attributes of the community also seem to have a positive influence in the development of interactions leading to innovation.

14.2.3   Rules

14.2.3.1   Formal Rules

In terms of "constitutional rules". The basic policy structured implemented to support the Brazilian biodiesel program was based on the following pillars:

 i. The government established a minimum percentage of biodiesel to be mixed with traditional diesel providing demand for the newly constituted biodiesel supply chain;
 ii. The production of biodiesel from different oil seeds is to be fostered from diverse regions of the country;
iii. A wide range of producers are encouraged to take part in the supply chain of the biodiesel, including large scale and small-scale producers.

iv. Especial economic instrument are crafted to make the activity attractive to small-scale producers, including amongst others the "social label" scheme.

The "social label" scheme is what IAD calls a "Collective Choice level Rule." A regulatory instrument to foster the participation of small farmers in the biodiesel chain, by giving a tax break to firms that purchase at least the minimum stipulated amount from small scale family farmers (PNPB 2009). In order to do so, the firms have to set up individual contracts and provide technical assistance to the small scale farmers. Therefore as predicted by IAD – "constitutional level" rules shape "collective choice rules" which in turn influence "ordinary rules". In this case the contracts shape relations between the oil producer (currently Petrobras, and previously Ecodiesel) and small farmers. This contractual rigidity does not work well with vulnerable communities who tend to distrust written contracts, in particular when they have not been part of the negotiation process (Yakovleva and Munday 2010). In general, economic incentives tend to work better with more educated and individualistic communities (Dryzek 1997). The communities in the area do not have a long-term lived experience of benefitting from this type of incentive structure so that a pure bureaucratic and top-down character of formal rules may be a constraint to engage farmers in the program. Trust in contract type modalities is something that needs to be built up given the subsistence nature of the farmers and the previous engagement with contract modalities which in some ways may have strengthened their more risk-averse nature.

14.2.3.2 Informal Rules

In many instances, rural inhabitants appear to be religious people. In the region in question, the Catholic priests have a large political influence and has been responsible for organizing small-scale farmers associations. More generally, the Catholic Church is very active in the region and serves as an important stakeholder with political implications. In Sao Raimundo Nonato, for example, the mayor is the local priest. Aside from the Catholic Church, associations of farmers and landless farmers are also very dynamic in rural Brazil and have pushed for the inclusion of small-scale farmers in the program (i.e. movimento dos sem terra). Most of the farmers that are part of the biodiesel program are also part of these associations. Some of these farmers were not land owners until a few years ago. They received land from the central and local government as part of a large strategy to redistribute land in the northeast region of Brazil. In fact, their participation in these associations helped them to receive land. In this sense, these farmers are inserted into local community associations that possess an elected president and representative that help to give them voice in these policy processes. In the associations there is solidarity among the members. They help each other in relation to work and other activities. However, these types of relationships must be situated in the context of high inequality in the rural area of Brazil, where there are very large land owners, who possess vast resources while small-scale farmers are deprived of land and financial resources. However, the political leaders of the small farmers have

also become highly "articulated" with the state and central government which has incorporated some of the discourse. The central government praises equality and seeks to enhance opportunities for small-holders and poor families. It is also worth indicating that for the farmers, environmental preoccupations are minimal and that they are more worried about short-term subsistence and economic gain.

The strength of embedded informal rules, suggest a culture where personal values and emotional bounds are of paramount importance. These communities will favor tradition and common sense or lay knowledge over scientific wisdom and technical reassurances. Mutual respect and trust need to be achieved to gain legitimacy as a source of advice. This can be only achieved through repeated interaction. To be successful such interaction must be an empowering experience and must engage the farmers in decision-making (Vazquez-Brust et al. 2009).

14.3   Analysis of Actions Arena

14.3.1   Actors

14.3.1.1   Petrobras Biocombustíveis

The Brazilian Petrobras firm has largely invested in the biofuels market to establish itself as a world player in the biofuels market, with the constitution of specific firm to take care of the biofuels market area – Petrobras Biofuels (PBio). It has heavily invested in the construction of biofuels refineries, in the northeast region of the country and it now has the capacity to produce 171 million liters of biodiesel per year. PBio has become the central stakeholder that directly deals with the small–scale farmers. Currently, in addition to agreements with large-scale producers, it has contracts with 35,000 small scale producers and has the explicit goal of enhancing their participation as the refineries can incorporate production from close to 59,000 small-scale family farmers (Interview with PBio representative).

One of the main objectives of PBio is to establish itself as the central player in the lucrative European and American markets that also mandate minimum biodiesel requirements. In this respect, the investment in small scale family farmers may have positive effects for the image of the firm and more broadly to the production of biofuels in general. Recently, debates on the negative social and environmental impacts of bi created a negative perception of biofuels in the European markets. The participation of small scale farmers in the biodiesel value chain may help to diffuse criticisms about negative social impacts of biofuel production (T&E 2010) while enhancing the corporate social and environmental of the Petrobras Group.[3]

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[3]Despite the large investments that the firm is making the market, castor seed that is bought by the firm is not presently turned into biodiesel, because it has a larger value for the cosmetics and pharmaceutical industry. Aside from that, the interviews have revealed that there is a technological

14.3.1.2 The Small Scale Farmers

The small scale farmers have been a central stakeholder in the constitution of the program. The intention to incorporate small scale farmers in the new national market process is the result of a grassroots movement – sao tierra[4]- that arose around the time when president Lula was first elected. Several representatives from small-scale farmers associations and other social movements were the initial proponents of the program. The small scale farming sector in Brazil has had very a good relationship with the central government, as several of the local leaders were later invited to take up public positions in Ministries related to social security and small-scale development in the capital, and they helped in the design and to a much lesser extent on the implementation of the program. However, in spite of sao tierra leaders evident influence in the constitution of the program, small scale faming in Brazil has particular characteristics that are central for understanding the extent to which these famers can participate in the supply chain of biodiesel. In general terms, farmers in the most deprived areas of the country do not have long-standing experience with the production of commercially viable crops. They tend to rely on subsistence farming supplemented by conditional cash transfers from the government, such as the *bolsa familia* program. Others are able to commercialize part of their production in informal economies and local markets, but there is no relation with national and international markets. Most of the farmers are illiterate or only partially-literate

14.3.1.3 The Technical Assistance

The technical assistance that is provided to small scale farmers is given by staff hired by Petrobras and local authorities to provide agricultural assistance to farmers in the regions. In the selected region that the research has been conducted EMATER-PI is the major player. EMATER (Instituto de Assistencia Tecnica de Extensao rural do Piaui) is a branch of the Brazilian government that is established in the region. In the state of Piaui, rural extension services began in 1966, when the estate branch of the national EMATER was founded. Several important rural extension projects were developed during the 1970s, but during the 1980s the institution was underfinanced. In order to focus resources, the EMATER-PI concentrated on helping the small-scale farmers and working with local communities. Several cooperatives were formed to help commercialize the products of small scale farmers. From 2003, the Piaui estate reorganized the technical assistance service so as to, provide a greater focus on the small scale producers, and in order to take into account gender and race issues and so as to respond to the needs of semiarid regions

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barrier to mix biodiesel produced from castor beans and biodiesel produced from soy. According to interviews conducted at the Candeias refinery in Bahia, where PBio also has a research laboratory, these technological hurtles could be surpassed in the next few months, but presently prevent the full integration of small-scale and large-scale farmers.

[4]Landless in Portuguese.

14.3.2   Patterns of Interaction

The relationship between Petrobras and the small-scale farmers is formally dictated by a multi-year contract that is signed between the two parties.

Petrobras provides seeds free of charge along with bags for farmers to store the seeds. A minimum price is guaranteed. For example, this price was set on the price paid in Irece Mamona stock exchange in 2009. If the price at the time of trade is higher the small holder receives the operative price. This reduces the uncertainty related to the production of oil producing bean crops.

The contracts allow Petrobras biocombustíveis to calculate the production of castor for the next 5 years and to understand how far it can rely on this source of vegetable oil. For the small-scale farmers, PBio is a monopsonist and this poses long term risks for this newly established relationship. If the firm can't provide additional investment to small-scale family farmers in the future, or if there is no additional technical assistance from other technical assistance institutions, farmers may be in a vulnerable economic situation and may not have the intensive to produce more seeds for the production of biodiesel.

Technical assistance is provided by Petrobras combined with EMATER-PI. EMATER – PI Works directly with producers and their families, searching for ways to enhance the productivity and commercialization of small-scale famers. Nowadays, it operates in 223 towns, with 16 regional and 78 local offices. EMATER takes research knowledge from EMBRAPA, a Brazilian agricultural research corporation linked to the Brazilian Ministry of Science and Technology. Petrobras guarantees that technicians will visit the farm on a regular basis to provide information in regards to planting and maintain of corps. The technicians need to be able assess how the production is developing so that any potential problems can be corrected. Petrobras also needs to have an estimation of the production.

The technical assistance supports a production model, which intercrops castor with *Caupi* bean seeds, for a wide range of regions in the northeast region. This enhances the productivity of castor while minimizing the potential for food vs. fuel issues.

14.4   Outcomes/Evaluation

Evidence collected from interviews indicates that family famers may secure a 20 % increase in wages. Due to the low level of incomes/revenues involved, this appears to be a major opportunity for them to enhance their material conditions.

However, productivity levels are far below targets. The average productivity of small-scale farmers area is only 30 % of the figures estimated in pilot studies as achievable under proper conditions. Low production in the region is related to low participation rates, and in some areas there was no participation at all.

The government has acknowledged that production has not materialized as was anticipated. As a consequence, after the first year of the program, the Government dropped by 50 % the minimum percentage of feedstock that producers needs to purchase from family agriculture in the region so as to secure tax benefits.

Insufficient product offering hints at a fundamental failure in the system of incentives to foster participation (and continuity) in the program. It also points to potential governance problems affecting the implementation of sustainable innovations. As a consequence, the business model of innovative uses of land is neither efficient (costs of the large scale design, bureaucracy, technical support and subsidies support largely offset productivity benefits), nor effective (low participation leads to low impact in terms of reduction of poverty, vulnerability and environmental deterioration).

Analysis of IAD factors reveals institutional arrangements creating disincentives and affecting the outcomes of interactions between farmers, technical assistance and Petro bras. Analyzed in isolation, biophysical/material conditions seem to provide incentives for participation in the program. However, when investigated in conjunction with attributes of the community and rules, powerful disincentives are unveiled by interviews.

14.4.1 Attributes of the Community, Informal Rules and Perceptions of Castors Production

It is relevant to indicate that the informal rules of land use in the north-east region of the country play an important role, as they respond to the local traditions and affect how the small-scale farmers perceive their participation in the program. Generally small-scale family farmers have traditionally focused on the subsistence production for their families. In this sense, taking up another crop that may not provide an assured economic stream to the family is viewed with caution by some of the farmers who also indicated that this was their first experience with a commercial crop and were unsure about the economic return.

Dry-lands communities are highly risk- and uncertainty-averse. They perceive any change as a threat to its survival if it implies trading-off resources used for subsistence, including time. Resistance to innovation grows the more radical the innovation is and the more uncertainty there is about its impact on subsistence livelihoods. Although additional economic opportunities would, in theory, enhance the livelihoods of farmers, if they perceive that they do not have enough material resources – including time – they will be resistant to take up another crops to complement their production of subsistence crops. Family farmers are usually not willing to trade their time for crop subsistence to grow another that is to be sold, as they may not have enough resources, During the interviews, many farmers indicated that a steady food supply for their families is their priority, and that they would prefer to focus on food crops that can be used for subsistence instead of oil producing crops for commercial use.

The physical characteristics of castor bean seem to an important issue that increases uncertainty and creates a need for additional resources. In areas where the small-scale farmers main focus is livestock production (specifically sheep and goats) they are not interested in producing castor beans because the bean is toxic if eaten and can poison humans and animals. Thus, it is necessary to invest time to physically separate animals from castor bean plantations. There is also need to prevent children being in touch with the seed. However, it is important to indicate that the toxicity of castor facilitates the storage as rats are kept away.

Other farms have considered the economic return of producing biodiesel to be low to compensate the risks and time invested. Given the low productivity and the low price offered in past years, the activity is considered to have low economic returns of the invested labor. Most of these farmers do not possess any machines and the techniques involved in agricultural production are fairly primitive, thus increasing doubts that time devoted to the crop will affect subsistence activities.

There also ingrained perceptions of the bean as a bad weed without any value, better to be avoided or destroyed. Reframing castor from pest to valuable good requires changing deeply held beliefs, and it is a process that takes time, trust and repeated positive experiences.

14.4.2   Action Arena: Rules

14.4.2.1   Legal Rules

The contracts proposed by Petrobras (and Ecodiesel before that) are an institutional innovation for small-scale farmers who traditionally trade in informal economies and follow informal rules- and in the early years they expressed some resistance toward signing the contracts. Most of them are illiterate or partially-illiterate and do not have a proper grasp of the legal significance of the contracts that are signed. As the present contracts are for 5 years, for some of the farmers this is a long timeframe were in they must commit significant time and labor toward honoring the requirements of the contract. There is thus a large trust factor that must be factored in, when farmers have to commit to 5 year contracts. Even when they agree to sign the contract, it is unclear to what extents the farmers see the contract as legitimate instruments or feel bound by them. In the first phase of the project, it was observed that some small-scale farmers did not comply with the contracts that they had signed. Contracts are usually negotiated between local associations and national representatives of agricultural farmers and there is typically no mechanism to involve small-farmers individually in the negotiation. Thus, the patterns of interaction have been largely shaped by rules designed without direct engagement of the farmers.

14.4.2.2 Economic Rules

In the context of the initial program design, small-scale farmers were expected to organize themselves in local groups so as to move up in the supply chain of biodiesel by forming biodiesel extracting companies. However, in deprived areas of the country, farmers are distributed over large rural areas, and this constitutes a large logistical barrier for organizing, for selling the production and for accessing technical assistance. The geographical dispersion of the farmers makes them not only spatially but also socially isolated. Farmers are badly organized and very few of them belong to local associations that can organize to protect their interest and constitute a unified voice. Up to date, only one local association in Irece, Bahia, has been able to receive state funding to buy a crusher, but this is not in operation as of now. In terms of commercialization, farmers have indicated that it is more convenient for them to sell the produce to the middleman than to sell to the oil producer (owned by Petrobras). This is because the middleman usually goes directly to the farm and pays the farmer in cash at the moment of the transaction. The oil producer takes up to a week to pay farmers since delivery needs to be at the factory; this is a crucial disincentive for cash-strapped small-scale farmers who have had to invest in advance to mobilize the production of feedstocks. However, the prices offered by middleman are typically lower than could be obtained in the factory and thus, reduces farmer benefits.

The lack of organizations associated with farmers and the lack of experience with commercially driven activities has led to a number of them defaulting on credit. A number of farmers that contracted financial responsibilities in the first phase of the program have not been able to pay back the loans. The capacity to product future earnings is very limited and some of them do not understand the financial and legal terms requested by financial institutions. Credit default has been a large problem in the northeast region, not only in castor production but also in case of other crops.

Obviously, the poor economic performance of first-mover castor-producing farmers is also a disincentive for potential new upstarts who have doubts about the benefits of the program. Time is required to build a relationship of trust between small-scale farmers and Petrobras.

14.4.2.3 Informal Rules

All informal rules seem to act against the program. Distrust of science appears to be embedded in rural Catholicism, and distrust of economic instruments and bureaucracy is also embedded in no-land (sao terra) grassroots philosophy. Tradition points to castor as a poison weed. Farmers' history of reliance on informal trade makes economic instruments and contracts difficult to understand and hard to relate to. Isolated communities tend to be suspicious of outsiders intentions and knowledge (Benn et al. 2008). Communities dependent on subsidies are very conservative; they

tend to assign more importance to potential losses than they assign to potential benefits, therefore framing innovation as a risk (Moody 2007). Religious values also emphasize pastoral experiences, trust and human contact. This is not an incentive to stay in a program where implementation mechanisms used are largely devoid of direct relationship between Petro bras and the farmers. Negative experiences in terms of economic losses, inadequate technical assistance and exclusion from decision making only reinforces existing prejudices.

14.4.3   Interactions

The only action-situation for interaction between farmers and "outsiders" was the technical assistance program. The interviews indicated that technical assistance was a large problem in the past 4 years. It has been non-existent or scarcely provided for in certain areas. Farmers have tended to rely on traditional production techniques instead of rapidly embracing novel techniques. This has been the case with the techniques proposed to cultivate castor when additional labor is required and when they confront traditional beliefs. The proposed techniques indicate that productivity can be enhanced by a factor of 10, but this may contradict some of the popular beliefs regarding the production of castor. One of the examples is the necessity to plant two seeds close to each other and so that after both plants are half-way grown the weakest are terminated. This enhances the productivity of the second year, and is a characteristic of the hybrid seed distributed but it may be difficult for farmers to hold out until the second year.

The following reasons emerged in the interviews as to the link between low productivity rates and the production mode adopted by small-scale farmers.

- Inadequate technical assistance for soil management. Farmers have low knowledge of correct soil management technologies. Technical assistance did not address this problem satisfactorily. When – if – guidelines were provided, they were generic and failed to give practical advice for particular soil productivity problems.[5]
- In the context of the program, farmers were often dealing with technical assistance for the first time. Some farmers indicated that before the involvement of Petrobras, EMATER-PI was not present in the area. Other indicated that following the technical recommendations is not straight forward. They also clearly showed that are not used to following instructions from outsiders,
- Other areas simply lacked proper technical assistance. Some farmers appear to want to stick with traditional farming techniques that are part of their culture for many years.

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[5]EMATER is currently working on a proposal for soil correction to increase productivity. Petrobras is financing the project.

Another area of conflict relates to the intercropping system. During the interviews, farmers have expressed their preference of having the power to choose which would be the most appropriate crop to do the intercropping, as some prefer to use maize instead of beans. Maize has a more stable market, and has the reputation of being less risky. However, EMATER-PI's opposition to maize is also related to competition for light and nutrients that maize poses for castor as they are similar size plants. In principle Petrobras is not against the use of maize, but the technicians are instructed to request additional space between the crops so that the castor bean plants have enough space and natural resources to develop.

The bean that EMATER, following Embrapa support, has been promoting to be intercropped with castor is not a common species. Farmers have also indicated that they are not used to that variety, and in the beginning they were unsure about the result. Intercropping with local traditional varieties is not recommended because of the growth pattern that is horizontal rather than vertical and which threatens the growth of the castor plants. Local varieties are also easier to be manually peal. However, rejection of local varieties undermines the much-advertised positive impacts of castor production in biodiversity production.

Farmers have also tended to feel excluded from decision-making affecting their livelihoods. As mentioned before, farmers want to decide what crop would be most appropriate to do intercropping because they recognize that such selections may affect their subsistence. Not only farmers distrust technical assistance but they also feel that grassroots representatives participating in the design of the project (but noticeable less involved in implementation) failed to voice their concerns.[1] As one of the farmers noted "they (sao tierra representatives) are no longer "us", they forgot what is like making a living here and do not bother to come to see."

As a consequence of all the above, mistrust on the part of some farmers in the general design of the program may cast doubt about the quality and longevity of the technical assistance provided to them. This may have cascading effects and cause doubts about the usefulness of scientific advice and may heighten previous uncertainties and suspicions about the project. Some farmers consider that the technical services are more oriented toward audit purposes than actually providing practical support in the field. Thus farmers view it as a monitoring rather than as a training and collaboration tool.

14.5 Discussion and Conclusion

An interesting finding of the IAD analysis is that there are very few action-situations where the two main actors (Petrobras- small farmers) directly interact in a pattern of repeated contact, The most common pattern of relationships finds interaction between Petrobras and small farmers being mediated by third party actors. These third party actors can serve as representatives of farmers' interests (sin tierra), exploit entrepreneurship opportunities in the supply chain (middle-man), have being delegated agency by Petrobras (Embrater) or carry on an mediation rule

as regulatory imposition (oil producers forced to buy from small farmers). In many cases the third party actors do not directly benefit from the success of the program and thus have no direct stakes.

As a consequence, the institutional design of the program accumulates power in Petrobras (central to the program and highly linked) while denying power to small farmers (low links and centrality). More specifically, the program has no arenas for small farmer's social bargaining with policy-makers or other stakeholders. Secondly, institutional and cultural arrangements exclude small farmers from linking to mechanisms to engage with external agencies, both in terms of links between poor groups and those in authorities or between small scale producers and global supply chains. Thus potential small entrepreneurs are unable to benefit from networking and create the bonds with outsiders required to draw resources and influence policies in support of innovation (Pretty 2003). This lack of "linking capital" is a powerful disincentive to sustainable innovation and entrepreneurship, reduces community governance (Tickmayer and Duncan 1990; Pretty 2003) and contributes to perpetuate chronic poverty (Di Gregorio et al. 2008).

Technical assistance is only action situation where farmers have interaction with outsiders. In theory, this program is an opportunity to create collaborative bonds through repeated contact and interaction between farmers and technicians. Collaborative modes involving physical contact and oral communication also fit better with the attributes of the community and its reliance in informal rules and implicit commitment Repeated contact can create trust. Positive experiences in terms of advice enhance the legitimacy of technicians and the innovations they endorse, therefore reducing uncertainty. Good results also have a demonstration effect and can act as collaboration multipliers, providing incentives for reluctant farmers to participate in the scheme and increasing the commitment of farmers already engaged. In this respect, the results of technical assistance has been somehow disappointing, suggesting that rather than creating trust, it has reinforced mistrust and doubts about the program. Technical assistance offered an opportunity to build trust and linking capital, however it backfired and only incentivized distrust and desertion from the program. The attributes of the community shaped negatively their assessment of the benefits and risks in the castor program. Despite scientific assessment suggesting that the program is highly beneficial, in the farmers' perception growing castor bean appeared to be a high risk activity with uncertain consequences for their economies of subsistence. This creates a disincentive for additional farmers to join and for participating partners to further engage with program). Again, technical assistance could have been tailored to change this perception, instead it was provided without adaptation to the needs of small farmers and without mechanism to counterbalance disincentives stemming from community attributes and rules. For instance, farmers were expected to form commercial associations but no legal or business training and support was provided to them even when it was evident that many farmers were only half-literate.

Assistance was perceived as a tool for control and monitoring disguised as advice. Crucial in forming this perception was the resistance of technicians to

engage small-farmers in decision-making. Farmers wanted to decide what crop would be the most appropriate crop to do the intercropping but technicians imposed their views.

Monitoring of others is one of Ostrom's (1989) design principles for successful management of shared resources, and this is much easier to do when there is observability. Observability of resource use is another factor that contributes to conflict mitigation by increasing transparency and reducing suspicion. We suggest that both monitoring and assistance roles are crucial for successful management of innovation (Ostrom 1980) but roles have to be transparently purported. Ambiguity creates suspicion and mistrust.

Nakao et al. (2007) emphasize how challenging it is for companies to make social and economic benefits compatible in the long term. Not only may benefits not be attained by all stakeholders but certain groups, such as those who are particularly vulnerable, may be negatively affected by a firm's activities (Walley and Whitehead 1994). However, if the vulnerable stakeholders are "engaged" in entrepreneurial initiatives, their cooperation and honest adaptation can influence companies to make their economic goals more compatible with those stakeholders' needs (Wall and Marzall 2006). To this end, it is necessary and urgent for more vulnerable groups to join proactively with the rest of stakeholders and with the companies themselves in directing Petrobras activities toward cooperative actions (Pater and van Lierop 2006).

Petrobras should promote more inclusive and sustainable modes of collaboration. This entails engaging its more vulnerable stakeholders, such as small farmers, in a way that empowers them while also contributing to sustainability. Numerous studies have pointed out the importance of stakeholder networks (Rowley 1997; Roloff 2008) and their influence strategies (Frooman 1999) in orienting company behavior. Therefore, if a company is to contribute to inclusive sustainability (in this case breaking the poverty-lack of integration vicious circle) the stakeholder management model it uses must have integrated and entrepreneurial perspectives in responding to stakeholder networks and influence strategies. These perspectives must give priority to innovative solutions that reduce both environmental deterioration and social vulnerability. (Vazquez-Brust et al. 2009). The quantity and quality of entrepreneurship within the stakeholder networks is a key resource for developing innovative and sustainable solutions (Brugmann and Prahalad 2007; UNCPSD 2005). Thus, entrepreneurs -both in community, political or economic networks related to small farmers- should be identified and engaged by Petrobras.

The role of networks is also highlighted by the literature in governance, Adger et al. (2006) argues that the success of governable arrangements depends on the perception of fair distribution of cost and benefits, demonstrated by the ability of various institutions to command trust among stakeholders. However, trust is costly, it is created by repeated interactions and can quickly destroyed by gaps in access to information and decision-making. Boundary or bridging organizations are essential. These organizations play an intermediary role between arenas or levels (constitutional, collective, ordinary) and facilitate the co-production of knowledge (Cash et al. 2006). They provide an arena for the development of linking capital

and trust building through vertical and horizontal collaboration and collaborative learning processes. Bridging organization can be the result of coalitions or build in existing with high levels of social legitimacy across sectors (i.e. the church). A boundary organization could have contributed to all three important design failures in the biofuels program (lack of arenas for engagements of final users; lack of mechanisms to build linking capital and entrepreneurship, lack of mechanisms counterbalancing institutional constraints).

In the northeast of Brazil the community stakeholders network includes highly resourceful stakeholders groups which (although involved in the design of the biodiesel program) had a negligible role in the implementation of the project but can still play the role of boundary or bridging organizations. In particular, the Catholic Church, the "sin tierra" grass-root movements and universities, should be proactively engaged by Petrobras to create incentives for innovation. These organizations are part of community networks, but also "bridge" community networks with political and economic networks. Each of these stakeholders has specific resources (i.e. legitimacy and mobilization skills, knowledge) and command trust at different levels (constitutional, collective, operational). The former two are powerful "informal rule makers" at the "collective action level" thus can help Petrobras to engage and empower small farmers.

Recently drastic changes have been observed in the program. First, the social label scheme began to be monitored by the National agency for Natural gas, Petroleum and Biofuels – ANP (Agência Nacional de Gas Natural, Petróleo e Biocombustíveis), and some of the most important refineries have been excluded from the benefit, making Petrobras the solely certified company to benefit from the Social label scheme. Second, Petrobras, following the political will of the central government has revamped the relationship between small-scale farmers and refineries, moving in the right direction to increase participation and inclusive collaborative models. There is evidence of more action situations and opportunities for engagement. For the small-scale farmers, in the northeast region of Brazil, Petrobras began to directly deal with them, creating a new relationship. The firm has hired technical assistance, distributed seeds and has signed several contracts with small scale farmers to pay a minimum price for castor bean. The firm is also fostering the creation of local associations and the use of diverse sources biodiesel sources, including sunflower and cotton, to include more farmers.

In summary, our analysis suggest that collaborative arrangements between policy-makers, Petrobras and grass-root representatives acting as agents of farmers shaped the design of the program and provided political and economic incentives for its implementation. However, institutional and socio-technical innovation failed to take-off because during the implementation of the program, agency to empower farmers through collaboration was given to technical staff unwilling to engage with the farmers' perspective and distrusted by farmers. As a consequence, the potential of technical assistance as arena for collective action was not realized and collaboration did not take off. Therefore, there was no counterbalance to prevailing institutional arrangements which created disincentives for small farmers to participate, As a consequence the primary and secondary effects of the program

in terms of income generation, social inclusion, biodiversity loss and deforestation have been disappointing. A primary source of disincentives is the lack of direct engagement of small-farmers in the design of the program and the dominance of institutional and cultural arrangements excluding small farmers from linking mechanisms to engage with external agencies. This suggest the need for policy intervention to foster inclusive collaboration based on repeated interactions and community governance mechanisms building trust and common understanding about potential course of actions.

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Chapter 15
Eco-Innovation at the "Bottom of the Pyramid"

Mario Pansera and Richard Owen

Abstract The projected exponential rise in the 80 % of humanity living on less than $10 a day (largely in the developing world) – the so-called "bottom of pyramid (BoP)"' – suggests that their behavior, lifestyle and consumption patterns will increasingly affect the global economy and society as a whole. While sustainability is a well-established concept in the developed world, understanding of perceptions and approaches to sustainability at the BoP (and associated behavior) is limited. In particular there is little understanding of whether this vast pool of people across the globe "eco-innovate", and if so how and why. This chapter provides an overview of the main theoretical discussions about innovation and development, with particular attention to eco-innovation creation, transfer and diffusion at the BoP. We challenge the assumption that the "poor are too poor to eco-innovate", hypothesizing that eco-innovation in the so-called South could play an important role in contributing to global sustainability. The fascinating point in such a debate is whether or not those at the BoP will be able to trigger a change of paradigm on a global basis, pioneering alternative development models that could "blowback" to the developed world. Through an analysis of empirical cases in Asia and Latin America, we demonstrate that eco-innovation *does* occur at different levels at the BoP, exploiting local potential, traditional knowledge and international connections. We discuss its potential to facilitate social inclusion and support environmental sustainability. These case studies allow us to propose some characteristics of the BOP eco-innovation process, including technological transfer, diffusion and adaptation. We consider their social dimension and the role of international cooperation, leading to development of a conceptual model as a starting point to describe the landscape, purposes and the drivers of eco-innovation at the BoP. These cases suggest that new business models and new policies that foster grassroots eco-innovation might not only be relevant for developing countries, but offer transfer potential from

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the "south" to the "north" (innovation "blowback"), notably in the context of the extended current period of financial austerity faced by developed countries and the global sustainability crisis faced by us all.

15.1   Introduction: Are the Poor Too Poor to Eco-Innovate?

Uberaba is a small town of the State of Minas Gerais in Brazil. In 2002, in response to continuous and lengthy electricity shortages, the mechanic Alfredo Moser discovered that it was possible to illuminate his house with light from the sun via plastic bottles hanging inside his house from the ceiling. By simply adding a few drops of bleach (to prevent mold growth) to water in a used plastic liter bottle, replacing the lid and then inserting it through the ceiling of his house he found he could illuminate a room with the same power as a 60 W light bulb, but with no need for electricity. Suddenly, here was an incredibly cheap way to provide light to millions of people with limited or no access to electricity, allowing them to gain one of the most basic of requirements for living, and doing so in a sustainable way. Within 9 years, MyShelter Foundation had remodelled this simple innovation and had begun to install it in the slums of Manila. By September 2011, around 15,000 "Liter Bottles" were already providing sun-light to thousands of simple dwellings all around the country (MyShelter Foundation 2012). This simple and smart solution, which costs just US$1 for each "Liter bottle", is an amazing example of "eco-friendly frugal innovation". The "Liter Bottle" is not an isolated case of frugal eco-innovation. There are several promising signals that challenge the idea that the "poor are too poor to eco-innovate". Nor are the motivations for such innovation simply energy and resource scarcity, or inability to access these, in the developing world. Poor people around the world have begun to express their unease concerning the increasing inequality and environmental degradation created by globalization (Martinez-Alier 2002, 2008; Stiglitz 2002), and are responding to this through innovation. The struggles for rain forest preservation in the Amazon Basin, for access to clean water in Bolivia or for sustainable use of land in India demonstrate that those at the so-called "Bottom of the Pyramid" (BoP) are not indifferent to, or unaware of sustainability issues.

Eco-friendly innovation, or simply eco-innovation, in its frugal version is just one dimension of eco-innovation at the BoP, but it is not the only one. Changes are taking place in emerging countries that involve processes that are much more complex than just frugal or grassroots innovation. However, the scale of the world population living at the BoP obliges us to consider this dimension, and to reconsider the way in which industry and governments look at sustainable transition (Leach et al. 2012). But "what is the BoP and why is understanding eco-innovation at the BoP important?" Traditionally, the notion of the BoP has referred to people who live with less than US$1 per day, but one may easily extend the definition to low-income

people living with less than US$10 per day (Karnani 2007a). Those people are estimated to represent about the 80 % of humanity (UNDP 2008) and 95 % of the developing world's population (World Bank 2012). In the near future, the access to basic needs, resources and energy in a world of seven billion people will be increasingly influenced by this vast mass, irrespective of where one lives. Their consumption patterns and their approach to sustainability will undoubtedly reshape the global economy and have important social implications on a global scale. Hence, we must ask how the poorest 80 % of humanity are coping with resource scarcity and environmental problems. Are they really too poor to innovate to address issues of sustainability, resource scarcity, and environmental protection?

Although pre-industrial societies have not always evolved along sustainable paths (Diamond 2005), many of them, especially rural and indigenous societies, have proved to be extremely resilient to environmental challenges (Berkes et al. 1995; Thomson 2011). Indeed, local knowledge has been co-evolving with nature for centuries to create the conditions for dynamic equilibria with nature that industrial societies have irremediably lost (Jenkins 2000). Such ethnographic and anthropological observations, combined with anecdotal evidence, lead us to challenge the assumption that "the poor are too poor to eco-innovate." But in reality there has been little or no systematic, empirical research to evaluate the magnitude and nature of eco-innovation at the BoP, and this assumption has remained largely neglected by Western researchers. Arguably, those living at the BoP sit on a vast range of assets and "ecosystem services". Moreover, they could still count on some advantages: less developed countries, indeed, could avoid the mistakes made by industrialized countries during the early stages of development as they exploit these assets and services. They could also acquire mature technology through processes of technology-transfer without the need for huge investment in R&D activities. Finally, most developing countries' economies are still based on traditional habits of production and consumption such as organic farming and sustainable land and water management practices. So it is not unreasonable to hypothesize that such an environment is a prolific forge of eco-innovation grounded in sustainable practices and behavior –we might call this process "Sustainability from the bottom of the pyramid". One potentially fascinating dimension of this hypothesis is whether or not those at the BoP could also trigger a change of paradigm, in the Kuhnian sense on a global basis that might provide an alternative development model to the present globalization process based on liberal economics. Are those at the BoP motivated by the same wealth-based aspirations that are dominant in the West and associated conscious consumption behaviors? By beginning to understand eco-innovation at the BoP, we first need to identify and understand the *conditions* that initiate new or alternative paths of innovation in developing countries. In other words, it is necessary to understand *whether* and *how* eco-innovation occurs in contexts other than those of western industrialized countries. In the last decade, the dynamic of innovation in the West has been largely studied and understood. It is now not only crucial to provide evidence that eco-innovation is taking place (and how) at the BOP, but also to identify the factors that drive and govern this process (i.e. why): the motivations. It might not be surprising to discover that sustainability and

resilience in the developing world still rely for example on social and cultural values and traditional knowledge. Furthermore, as the so-called developing countries share expectations and challenges, it would be interesting to understand whether and how sustainable practices diffuse between these countries (i.e. "South – South"), as well as whether eco-innovation practices might potentially have a disruptive impact on industrialized countries leading to what Seely-Brown calls Innovation blowback (2005) (i.e. South – North). According to Carlota Pérez (2002), who has deeply studied the dynamic of the Kondratieff cycles of modern capitalism, the next socio-technical revolution is likely to be a Sustainable Transition. As R. Kaplinsky (2011) argues, "*there are many reasons to believe that changes originating in the South will become a major driver of innovation in the 21st century*". It is probably too ambitious to think that those at the BoP will lead a global sustainable transition, but it is improbable that they are going to be simply passive spectators, and it is important to at the very least consider their potential contribution.

15.2 Innovation for the Poor Versus Innovation from the Poor

15.2.1 The Top-Down Approach

The BoP concept was introduced by Prahalad in 2005 in his book "*The fortune at the bottom of the pyramid: eradicating poverty through profits*" (Prahalad 2010). The central argument of the book is that the poor are *potential consumers* and represent an immense unexploited market. The BoP has been traditionally excluded from mass consumption because of its very limited purchasing power. The challenge, thus, for the private sector is to "*learn to do more with less and for more people*". According to Prahalad, the only organizations that are able to implement such a strategy are the Multinational Corporations (MNCs), by virtue of their ability to absorb and internalize inclusive innovation (Kanter 2008). According to Hart and Christensen (2002), "*the theory of disruptive innovation suggests that existing mainstream markets are the wrong place to look for major new waves of growth.*" The BOP in this context may be seen as a previously little explored new market, and in this "top – down" approach, an assumption must be that not only will open up this market benefit MNC's, but it will also benefit the poor themselves. In an attempt to validate the Prahalad propositions several scholars around the world have focused their attention on the BoP and there is increasing empirical research activity on this topic (Kandachar and Halme 2007). However, few attempts have been made to define a theoretical framework describing innovation at the BoP. Anderson and Markides (2007) identified some common features that characterize strategic innovation at BoP: *affordability, acceptability, availability and awareness*. Products and services at the BoP have to be not only affordable but also socially acceptable. In short, they should be adapted to social needs and cultural specificities. Moreover they have to rely on local and easily available raw materials and capabilities.

Even more important, they must promote the users' awareness of their own needs. Prahalad himself has tried to identify specific patterns of innovation based on analyses of innovation in China, India and Brazil. This research demonstrates that these countries are already aware of this potential market and are implementing four different strategies (Prahalad and Mashelkar 2010):

- Applying disruptive business models to acquire western technology: i.e. "acquire and disrupt".
- Inventing new usages and business model for acquired technology: i.e. "acquire and create"
- Creating new technology rooted in local context: i.e. "invent and create"
- Creating new business models to exploit endogenous technology: i.e. "invent and exploit"

Nonetheless, if the BoP proposition sets the scene for a little-explored territory for innovation, there is no agreement in the literature about who benefits from the Prahalad assumptions and, in particular, about the role of MNCs in this process. The majority of the cases collected do not provide a clear idea about the social and ecological effect of products targeted at the BoP. What is more, Few empirical studies specifically mention ecological sustainability (Pitta et al 2008). A number of critics have questioned the Prahalad top-down approach, as well as the very basic assumption of the poor as consumers. One of the sharpest criticisms comes from Karnani, who writes: "*This romanticized view of the poor harms the poor in two ways. First, it results in too little emphasis on legal, regulatory and social mechanisms to protect the poor who are vulnerable consumers. Second, it overemphasizes microcredit and underemphasizes fostering modern enterprises that would provide employment opportunities for the poor. More importantly, it grossly underemphasizes the critical role and responsibility of the state in poverty reduction*" (Karnani 2007b). He also mentions several cases where the impact of MNCs seemed to be less effective and was even negative. Many feminist NGOs for example strongly criticized Unilever's advertising of whitening products, which they alleged promoted racist messages among disadvantaged women in rural India (Karnani 2007a, 2009). Moreover the environmental perspective of such direct marketing to the poor remains virtually untouched. Selling shampoo in smaller packaging for example, as Prahalad suggests and Procter and Gamble is already doing in India, will actually increase waste, with minimum impact on welfare. Attempting to remedy the missing emphasis on environmental issues of the classic BoP approach, Hart and Christensen (2002) and Hart (2011) introduced the concept of the "*green leapfrog*" concept or "*trickle-up*" effect. Eco-friendly technologies and practices always represent a disruptive change in developed countries, where standard technologies are well established: they are often hampered by pre-existing technological regimes. The BoP environment, on the other hand, is a fertile ground to test and experiment sustainable technologies, such as off-the-grid energy production, organic farms, micro-finance etc., leapfrogging the barriers and hurdles that these might present in developed countries. Once tested and validated those experiments would be ready to invade Western markets with a disruptive effect (Christensen et al. 2001).

15.2.2 The Bottom-Up Approach

But innovation in the South does not occur merely as a Top-Down process. Innovation originated by users or common people to address very practical problems of daily life is usually known as grassroots or frugal innovation. This phenomenon is present in low income countries but it has also diffused in industrialized countries (Seyfang and Smith 2007). Low-cost innovation niches are quite diffused among lead users in developed countries in different fields. They usually decrease the innovation cost with respect to formal R&D activities (Von Hippel 2005). This concept of frugality basically means "*doing more with less*". Of course different countries have different approaches. In India, for instance, frugal innovations are indicated by the Hindi world "Juggad". *Jugaad colloquially means a creative idea or a quick workaround to get through commercial, logistic or law issues* (Radjou et al. 2012). Similar terms are used in other countries like *gambiarra* in Brazil, *zizhu chuangxin* in China, *jua kali* in Africa, *DIY* in the US and UK and *solution D* in France. These share some very basic features (Tiwari and Herstatt 2011): They must be (i) robust to deal with infrastructure shortcomings (such as electrical voltage fluctuation); (ii) fault resistant to cope with unsophisticated or even illiterate users; (iii) affordable for larger sections of the society. Not only is "Jugaad" innovation a revolutionary tool in emerging countries, it also represents an unexpected opportunity for Western companies that are facing low rate growth in the over-saturated markets of developed nations.

In spite of its diffusion, according to Gupta (2009), researchers have shown little interest in frugal innovation. Perhaps even more importantly, formal institutions have not been interested in embedding frugal innovation potential in mainstream innovation policy. Instead of adapting national policy to develop specialized fields of technology, frugal innovation policy would focus on the specific needs of local communities and empower people to have control on technology (Gupta 2010). On the other hand grassroots and frugal innovation have to overcome some important limitations if they are to make a significant contribution to the goal of a more sustainable world. Grassroots might be a big source of innovation diversity, but it still not clear how it can create economic and social value for its promoters (Seyfang and Smith 2007). Gupta (2010) identified many challenges that grassroots innovation needs to overcome. First, as has already been mentioned, is the need to embed grassroots level into mainstream innovation policy. Then, it is crucial to understand the motivations, impacts and possible outcomes of those innovations (i.e. through a commitment to responsible innovation, (Owen et al. 2012)). Finally it is fundamentally important to identify the conditions for germination of innovative processes and the conditions for successful diffusion. In short, it is necessary to promote local frugal innovation and move it into the global market. The next section is dedicated to explore some real cases of bottom-up eco-innovation that have proven to be successful.

15.3   Case Studies of Eco-Innovation at the BOP

As those at the BoP do not usually patent their innovations, there is a prevalent tendency to use a qualitative approach to the study of eco-innovation at the BoP. The following sections, hence, are an attempt to outline some case studies that allow the subsequent synthesis of a preliminary model describing how eco-innovation occurs and what kind of cross-country dynamics underlie this process. The model is built on secondary sources organized in eight mini case studies. The intention is not to present a complete description of each case, but rather to explore some key features that characterize eco-innovation in low-income countries and its cross-border implications. As depicted in Fig. 15.1, the geographical distribution of the cases covers part of South America and Asia.

15.3.1   Case 1: PVS in Bolivia

During the last two decades Bolivia has been pioneering the deployment of a large scale PVS (photo voltaic systems) project for rural electrification (Pansera 2012). With the help of international aid, many local NGOs and micro enterprises emerged to absorb and adapt photovoltaic (PV) technology to local conditions. 180,000 rural households have been provided with small and affordable PV systems during this period. The backbone of the initiative is the IDTR project (*Decentralized Infrastructures for Rural Transformation*) that provided access to electricity, financing 60 % of the cost of a PVS, with users being required to contribute the remaining 40 %, payable over 3 years. The program also promotes agreements with municipalities and prefectures with varying percentages. The equipment is installed by a contractor (usually a local firm), which provides maintenance for
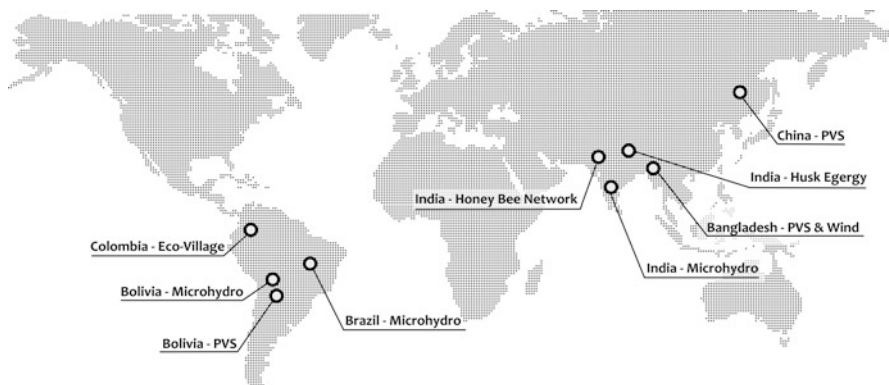
Fig. 15.1 Case Studies

4 years. This new model for PV market is called *Medium-term Service Contract* (MSC). Such a contract permits a good balance between on one hand the necessity of the local firms to minimize their financial risk and on the other the desire of the government to maximize control over energy production. The MSC allows the contractors to provide maintenance services for 4 years from the date of installation of the PVS, at which time other suppliers or the users themselves can *compete* to guarantee the correct functioning of the systems. Such projects proved to be sustainable thanks to the establishment of *alliances between local NGOs, local communities and international aid organizations*.

15.3.2   Case 2: Grameen Shakti

The Bengali company Grameen Shakti (GS) has developed an interesting market-based program with a social objective to address the energy demand of millions of rural villagers using renewable sources. GS has installed more than 3,200,000 solar home systems in rural areas in the last 10 years (Grameen 2012). GS adopted the Grameen Bank's model to provide financial packages, which reduced costs and allowed an economy of scale to be achieved. The GS model consists of training women technicians and providing them with employment and a scholarship for their children. The financial package also provides an extremely affordable annual maintenance contract. GS is also experimenting with micro windmill and biofuel technologies in innovation labs spread all over the country, drawing on local human and material resources.

15.3.3   Case 3: Micro Hydroelectric Projects in Bolivia, Brazil and India

Kami is a little Aymara community in the Bolivian Andes. The community was a place of farmers before it became a mining center. In 2000, the local community of Salesians of Don Bosco started an ambitious project to improve the conditions of the local population. With the support of the Italian company TERNA, who wished to improve their Social Corporate Responsibility profile, two old turbines of 2 MW were disassembled and sent from the Italian Alps to Kami. After more than 3 years of negotiation with the Aymara communities of Kami (who were initially concerned about the impact of the project on the communal water resources), the design of the plant was complete and built. In the spring of 2011, a 37 km of power lines were ready to connect Kami to the national grid (Terna 2012). As with Bolivia, Brazil is a perfect place for micro hydroelectric experiments (Van Els et al. 2012). The INDALMA family business, based in Santarem in the north of Brazil, patented in 2002 a turbine that is simple to build, easy to operate, low maintenance, low cost and operational capacity in low water sheds (minimum of 4 m) (UN-Habitat 2012).

Since 2000, INDALMA has installed 80 mini hydroelectric turbines in private farms and in 45 rural communities with complete success, with minimal maintenance costs and environmental impact. Kami and INDALMA turbine represent a valid alternative to big dam projects. Those mega projects have been encountering the opposition of an increasing share of the population in the developing world due to their great environmental and social impacts. As a reaction, some grassroots solutions have been proposed as "conflict resolution tools". An interesting case is the Hydel project based in the Bilgaon tribal village in the Narmada Valley, India. Since Indian independence these villages have never had electricity. Then, when the Narmada Dam project threatened to flood their land, villagers decided to tap the energy of the close waterfall through a micro-hydel system and light their entire village. The system was designed with the help of engineers from local NGOs and involved the entire community. Eventually the system provided 15 kW of electricity to light 180 householders (Aidindia 2012). Despite the villagers' efforts, in 2006 part of the community land was flooded and the plant has been seriously damaged by the flood (The Hindu 2006).

15.3.4 Case 4: Chinese Low-Cost Solar Systems

The Chinese solar industry is growing faster than in any other country. Not only do Chinese companies already manufacture state-of-the-art photovoltaic technology, but they are also engaged in finding frugal solutions to reduce the cost of renewable energy. The Hangzhou based company International Energy Market (INEM) could revolutionize the market of PV technology, selling stand-alone home solar system for less than 3000 US $. Most of the systems are designed to meet the requirement of Chinese rural villages or urban low-class people (INEM 2012). The company is an international outlet committed to find, assess and promote Chinese affordable renewable energy solutions for a very wide audience of clients. An INEM permanent exhibition in Zhejiang is already attracting the attention of many investors all over the world interested in affordable and reliable renewable energy technologies for domestic applications.

15.3.5 Case 5: Honey Bee Network

India is a big reservoir of grassroots innovators. The mission of the Honey Bee Network, founded by Anil Gupta three decades ago, is to map frugal and grassroots innovations and valorize them through innovation contests, patent application support and enterprise incubators (Sristi 2012). The network members annually undertake "innovation walks" through the most poor and isolated areas in India to scout and study local innovators. Their work challenges Maslow's hierarchy of needs, confirming that even the poorest people are able to invent and innovate

to meet their needs. Honey Bee Network, together with the National Innovation Foundation, claims to have collected thousands of grassroots innovations that wait to be patented or augmented by reengineering processes (Gupta 2012). Most of the innovations draw on traditional knowledge such as herbalist indigenous knowledge. One of the most ambitious goals of the network is to create a global network of grassroots innovators in developing world with the objective of exchanging, diffusing, and scaling grassroots solutions (Gupta 2007).

15.3.6 Case 6: Las Gaviotas Sustainable Indigenous Community

Founded by the visionary engineer Paolo Lugari, Las Gaviotas is a village of about 200 inhabitants in Colombia. With the help of engineers and scientists at the beginning of the 1980s, the local indigenous population began to restore the barren savannahs that were previously Amazonia rain forest. They have planted millions of Caribbean pine trees and discovered that their forest can produce twice as much resin as any other resin-tapping forest in the world (Gaviotas 2012). The resin is today commercialized and used to produce biofuel that is used to cover the village energy demand in combination with solar and wind systems. They have carried out a huge variety of grassroots innovation activities that include solar frugal solution, water pumps and biofuel transformation processes. Their solar systems for water heating are sold in many cities in Colombia and are an affordable solution for the large, disadvantaged, Colombian urban population (Weisman 1999). Gaviotas managed to combine local traditional knowledge, environmental sustainability and frugal innovation to provide an oasis of stability in an area ravaged by political terror and violence.

15.3.7 Case 7: Husk Power

Husk Power System (HPS) is a company set up by Gyanesh Pandey and Ratnesh Yadav dedicated to providing electricity to rural areas of India. After his doctoral study in engineering in the US, Pandey come back to India and, together with his best friend from his childhood Yadav, decided to address the problem of lack of energy affecting thousands of villages in India. They began hunting for alternatives that would fit the economic model of the rural space. Eventually they heard about rice millers in the state of Bihar who were using the old technology of biomass gasification to power their mills using rice husk. As rice husk is abundant in many rural zones in India, it is a valid candidate to serve as fuel for bio-waste gasification micro plants. After 5 years of experiments, the duo managed to modify the existing dual-fuel mode of operation that uses 35–50 % of diesel in conjunction with husk

and ended up with an efficient single-fuel-mode engine based on husk alone. In 2007, Panday and Yadav's new company lit the first village from its first 100 % biomass based power plant that uses discarded rice husks to generate electricity. At the beginning of 2012 HPS has installed 60 mini-power plants that power more than 250 villages and hamlets, serving approximately 150,000 people in rural India. HPS energy cost is very competitive. They have managed to offer \$1/W of generation, distribution and installation cost, which make HPS plants much cheaper than the standard Thermal Power Plants. Another strong point of the HPS model is their engagement with social issues of rural communities. In order to guarantee the sustainability of the plant they work closely with local communities, training unskilled young people to manage and maintain the systems. Moreover, through its non-profit branch, the Samta Samriddhi Foundation, HPS supports and finances several educational programs within the rural communities that have adopted the systems (HPS 2012).

15.3.8   Case 8: Mitticool

The story of Mitticool is an amazing journey into the ingenuity of grassroots innovators and their capacity to make the most of scarce resources. Its founder, Mansukhbhai Prajapati has grown up in a family of traditional clay manufacturers. In the 2001, an earthquake destroyed Mansukhbhai's village and surrounding area. Reading a local newspaper, Mansukhbhai's attention was drawn to a picture of a smashed clay pot, described ironically by the journalist as "Poor man's fridge broken" (Radjou et al. 2012). This image inspired Mansukhbhai and suggested him to develop an affordable fridge that works without electricity based on the principle of evaporation. "*Water from the upper chambers drips down the side, and gets evaporated taking away heat from the inside, leaving the chambers cool*" (Prajapati 2012). The fridge, which costs US\$ 50, was a success and has been sold across India and internationally. Afterwards Mansukhbhai managed to scale its production, leveraging his traditional knowledge of pottery to mass-produce a great variety of clay products such as non-stick frying pans, clay pots and water filters. Today Mansukhbhai employs a large number of people in his own community and serves consumers in India and abroad. Recently *Forbes* magazine named him among the most influential grassroots Indian entrepreneurs (Radjou et al. 2012).

15.4   Discussion

Obviously, the cases described above do not represent a comprehensive review of the grassroots eco-innovation phenomenon in low-income countries. Many other similar examples can also be found in Africa, Central America and Southeast Asia. Smith (2012) have mapped grassroots innovation around the globe and

identified several "Innovation Networks" devoted to support frugal innovation from the bottom. However, the case studies above allow us to draw some important, if preliminary conclusions (Table 15.1).

From the case studies and other studies (e.g. in Smith et al. 2013), BoP appears to be emerging as a prolific environment for eco-innovation, where the concepts of frugality and grassroots ingenuity are essential. This relationship appears to be intimately linked to local cultural values, environmental conflicts and institutional failures in meeting basic needs. From the case studies we can identify five, preliminary, features of eco-innovation at the BOP. This set of hypotheses serve as a foundation for further empirical study:

- *Environmental awareness:* The cases suggest that environmental awareness is far from absent at the BOP, and may in fact guide at least some grassroots innovators in emerging countries. Importantly, we suggest that this awareness contradicts Inglehart's post-materialist thesis of environmental preservation as being a luxury for the rich (Martínez-Alier 1995). It might reflect instances of *environmental conflict* (see the Narmada Valley conflict in India) or embody *religious beliefs* (see the sacredness of natural resources in the Aymara community of Kami in Bolivia). Thus, environmental awareness may be locally and culturally referenced through concepts of place, attachment, identity, and beliefs.
- *Social Purpose, traditional knowledge and empathy:* Eco-innovation at the BoP appears to nearly always fulfil a *social purpose*, for example, providing electricity to un-served people or empowering local communities through affordable technologies. But maybe the most important feature of such initiatives is that they are social embedded. In other words, they are not simply profit driven, but are also socially inclusive. What is more, grassroots innovation often draws on *traditional knowledge* (see Honey Bee network innovators, Mitticool case, Las Gaviotas and Kami. "*Learning how to build upon, and not over, ancient foundations and local knowledge is key*" (London and Anupindi 2011).
- *Frugality and resource constraints:* As the literature suggests, eco-innovation at the BoP usually emerges from very harsh conditions and is characterized by frugality. Material and financial resources, institutional support and technical know-how are always crucial for further development of grassroots solutions that initially emerge at the BOP.
- *Diversity:* Not surprisingly, the stakeholders involved in the process of eco-innovation at the BoP present a great deal of diversity. They can be international companies and NGOs, local entrepreneurs, and /or local communities. Similarly, the business models present very heterogeneous features that often privilege users' participation and prefer decentralization over static centralized models (London 2009). GS and the Bolivian case, for example, suggest that emerging countries are a fertile ground for experiments in decentralized energy production. A more direct involvement of local people in energy management contributes to greater innovation acceptance and support (Walker and Devine Wright 2008). Moreover, alliances across diverse stakeholders and business models that are suited on BoP's needs are also essential.

Table 15.1 Case studies summary

Case	Purpose	Innovation	Actors	Business model	Policy implication
Case 1	Rural un-served population	Low-cost solar energy incremental/adaptation	International and local NGOs, micro-firms, communities	Micro-credit, co-funding with local communities	Importance of international aid and technology transfer
Case 2	Rural un-served population	Low-cost renewable energy – frugal innovation lab – gender empowerment	Micro-credit entity, local communities	Micro-credit	Rural innovation lab and policy
Case 3	Community empowerment, environmental conflicts	Adaptation of hydroelectric technology – community management of the plant	Indigenous communities, religious communities, international companies	Cooperative approach	New policy for distributed energy production
Case 4	Reduce renewable energy costs	Wide range of innovation from high- tech to affordable solutions	Small, medium and large companies	Permanent international exhibition of local producers	Development of inter-sectoral policy
Case 5	Fostering local grassroots innovators	Traditional knowledge based innovation	Grassroots innovators	N/A	Innovation contests, patent support, engineering support
Case 6	Achieve local communities sustainability	Forest management, solar systems, biofuel	Indigenous communities	Cooperative approach	Eco-innovation as source of political stability
Case 7	Rural un-served population and local empowerment	New gasification technology	Local communities	Community-oriented approach	N/A
Case 8	Energy saving	Traditional knowledge based innovation	Local entrepreneur	Community-based production	N/A

☐ Traditional Knowledge   ☐ Wellbeing Impact
☐ Cost-Conscious Science   ☐ Environmental Impact
☐ International Linkages   ☐ Higher Complexity
☐ Local Capabilities   ☐ Empowerment

Motivations → Sources → Innovation → Value → Scale

☐ Resource Scarcity   ☐ Frugal Adaptation   ☐ Next Village
☐ Environmental Conflict   ☐ Reengineering   ☐ Next Country
☐ Lack of Infrastructures   ☐ Doing more with less   ☐ South-South
☐ Livelihood Degradation   ☐ Blowback

Fig. 15.2 A preliminary model of the eco-innovation process at the BoP

• *Need for "Glocal policy":* Finally the scenario that emerges from the cases clearly suggests the need for development of local and global policy to promote cross-country collaboration among grassroots innovators. The Tianjin declaration is an ambitious attempt to ignite such a process (Gupta 2007). On the other hand the existence of cross-border linkages from North to South and from South to South is a crucial factor for making eco-innovation work, as proven by the Bolivian case and the HPS case.

15.4.1 Eco-Innovation of the Poor: Towards a Theoretical Model

Having set the scene by describing the concept of the BoP and identifying its potential to be a source of eco-innovation at a grassroots level that might have transfer from South- South and South – North (innovation blowback), we begin to sketch the outline of a conceptual model that describes the landscape, dynamics and motivations for eco-innovation at the BoP, as a "straw man" to frame a future research agenda.

First, eco-innovation at the BoP seems to occur as an intersection of two main factors: the local context with its embedded traditional values and knowledge and the international context (see Fig. 15.2). Moreover, it originates from harsh conditions of scarcity, degradation and institutional failures. It normally draws on traditional knowledge and local potential, taking advantage of international spill-over effects. The solutions provided are often frugal adaptations and reengineering of pre-existing technologies. If successful, grassroots eco-innovations not only bring economic benefit, but also social improvement and community empowerment. Finally, scaling grassroots solutions could have a potential disruptive impact on global basis triggering a process of South-South and South–north transfer. But Eco-innovation at the BoP can be also seen as a typical development process in the
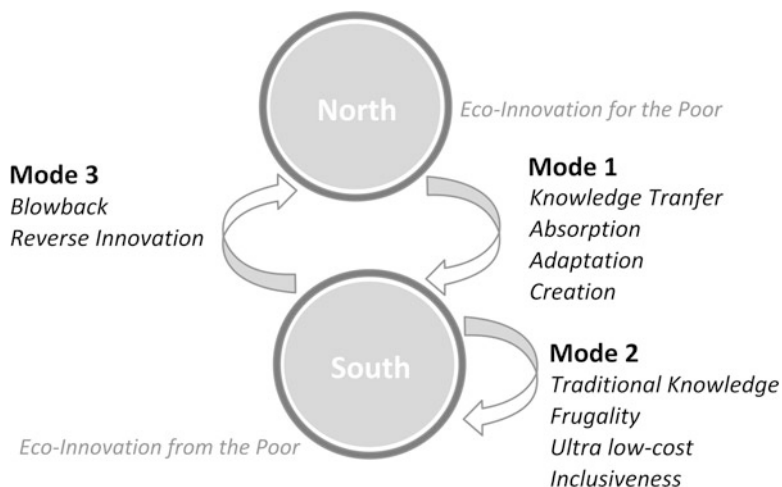
Fig. 15.3 Eco-innovation cross-border dynamics

Sen's sense (Sen 1999), where technology, organizations, foreign know-how and local traditional knowledge are the enablers and local human capital is the driver. However, though innovation can blossom from the grassroots spontaneously, it then needs to be reengineered and continuously adapted to local and global conditions. The outcome of these processes, like all innovation processes, usually implies an increase of local productivity, complexity and, hopefully, wellbeing. Electricity in the rural environment obviously has the potential of increasing productivity, but at the same time, the process of managing the plants and the energy supply implies also the increase of social complexity that is key to any development process (Tainter 2011). Development generates new competences that feedback into the process. Furthermore, successful eco-innovation can potentially scale up, invading new contexts. Grameen Shakti, for instance is already exporting its model to neighboring countries. The case of reverse innovation in General Electric (GE) proves how frugal innovation can scale from villages in emerging countries up to the North (Govindarajan and Trimble 2012).

15.4.2   *Two Modes of Eco-Innovation at the BOP and Cross-Border Implications for Sustainability and Innovation*

One of the intriguing consequences of eco-innovation at the BoP may be its cross-border implications in term of sustainability transition. From the cases illustrated above we suggest three different dynamics of cross-border relationships (Fig. 15.3).

15.4.2.1 Mode 1: Frugal Adaptation of Knowledge Transferred from the North

The dynamic of North–south transfer of industrial technology has been widely studied in the last three decades. One of the most widely accepted models identifies three steps: (i) absorption of foreign technology; (ii) incremental adaptations, (iii) indigenous creation (Kim 1980). The cases above confirm this dynamic. Mode 1, hence, is characterized by the transfer of environmentally sound technology developed in the North to the South. In both the Bolivian and Shakti cases, the eco-innovation process consists of a sequence of incremental adaptations of imported foreign technology to local conditions. In the Bolivian case, for instance, PV technology is firstly imported from abroad, then adapted to local context. Finally, the foreign solution is metabolized within the local environment through the creation of new and diverse uses of the initial configuration.

15.4.2.2 Mode 2: De Novo (South→South)

A second modality is the South-South transfer of indigenous eco-innovation, sometimes based on traditional knowledge ("grassroots, frugal"). The cases of Mitticool and the grassroots innovators discovered by the Honey Bee Network are good examples. Not only does South-South transfer imply the exchange of indigenous knowledge, but also the transfer of reengineered and adapted technology that has originally come from the North. The Chinese renewable energy market, indeed, is strongly oriented to customers in India, the African continent, and Latin America countries. The evidence suggests that this transfer is likely to increase in the future due to the saturation of Western markets and the emergence of new consumers in the South (Kaplinsky 2008).

15.4.2.3 Mode 3: Disrupting Blowback (South→North)

The idea of blowback innovation is recent (Brown 2005). Its formulation has been hampered by the assumption that emerging countries will evolve like developed countries did in the past (Govindarajan and Trimble 2012). Moreover, the products designed to address developing countries needs have not been considered as being competitive in developed countries because of their supposed low quality and low-tech nature. Cases such as GE and Tata Nano have forced us to reconsider those assumptions. Because of their huge populations, sustainability problems are especially urgent for countries like China and India. For those reasons they are likely to tackle many environmental issues years or even decades before the developed world (Immelt et al. 2009), and in potentially different ways. According to Hart (2011), the Green Leap wave has just begun and is likely to transform the world of green industry. More importantly, several Western companies are realizing that

emerging countries are a huge reservoir of frugal solutions that can be absorbed and adapted to the North (Radjou et al. 2012). The idea of "letting southern subsidiaries innovate in a frugal way" represents a completely different paradigm compared to the classical outsourcing mechanism, which dominates globalization today. The diffusion of such a paradigm would imply a major transformation in the way we look at the globalization process. In other words, we are witnessing a change from a Western-centric world to a multipolar world where innovation does not flow only in a unidirectional stream but in a more complex way, similar to the information flow typical of a network.

15.5   Conclusions and a Future Research Agenda

In the present chapter we have attempted to grasp the dynamics of eco-innovation at the BoP and hypothesize about some cross-border implications that may accompany it. The cases presented, of course, are representative of a small part of a vast, dynamic and complex landscape that will include more complex issues linked to poverty, social conflicts and geostrategic relationships. For instance, we have not described the linkages that exist or might exist between formal science-based R&D and grassroots innovation. The evidence from the cases we have described suggest emerging countries may be a prolific environment for eco-innovation, where novelty emerges from very diverse sources, including traditional knowledge, indigenous ingenuity and international linkages, and through a number of modalities we have postulated above. We have also seen that some of those activities already have the potential to disrupt the way in which Western companies innovate and handle sustainability issues. The "blowback" potential of eco-innovation in such a context will be assessed in the future by its capacity to scale and provide feasible solutions that will be able to be adapted to very diverse contexts, both in the South and North. Chinese and Indian companies are already exporting reengineered versions of grassroots innovations to other developing countries. The world of the future is likely to be a multipolar world where knowledge will move in multidirectional ways instead of flowing from North to South.

However a great deal of research is still needed to understand and model the innovation at the BoP. In particular we would propose the following agenda:

- Top-down or Bottom-up approach? There is no clear evidence about what kind of approach is more predominant, or more effective in serving the "un-served" users at the BoP (George et al. 2012).
- Motivations? The motivations for eco-innovation remain unexplored in any quantitative manner, and whether it has a social, and/or profit –orientation,
- Values? The cultural context for eco-innovation at the BOP has not been explored. In what values (local, regional, national, and international) is eco-innovation anchored, and what is the place of local identity, beliefs and attachments in this process?

- Although grassroots innovation has been proved to be a quite diffused phenomenon no systematic assessment of its impact on local communities has been carried out so far. Most of the existing knowledge is based on anecdotic material (London 2009; London and Hart 2004).
- Micro, small, big companies? NGOs, local communities? Or rather a combination of alliance between different actors? Which types of organization initiate inclusive innovation? Are there enthusiastic individuals who refuse the mainstream institutional setting? How is it possible to integrate these initiatives into a global value chain? (Kaplinsky 2011).
- Mainstream models of innovation usually neglect small-scale technology. As a consequence there is no clear understanding about how policy and institutions can foster innovation at BoP nor an effective mechanism to integrate grassroots level in the main stream S&T policy (Seyfang and Smith 2007). There is a need to research policy implications of grassroots innovations (Kandachar and Halme 2007).
- Reverse effect? Is the Green Leap hypothesis actually underpinned by empirical evidence? Nobody really knows if users in developed countries are keen to adopt frugality as a new life-style. It is not clear how companies in industrialized countries will be able to learn the frugality lessons that come from the south (Immelt et al. 2009).

This agenda is potentially relevant for several reasons. The concept of "Innovation without science" and post-modern science is not new, however there exists quite strong reticence in the academic world to accept it (Gupta 2009). The implications of such a model on the future of sustainable transition of industrial societies are almost totally neglected. While Western countries have neglected their "DIY capacity" to face the environmental challenges created by resource scarcity, frugality from developing world might represent a sustainable alternative to approach a new model of development in the North. The understanding of new business models designed to do better with less in the South could potentially trigger a new socio-technological path in a North obsessed by consumerism and very expensive and resource intensive luxury goods. If they want to accept the challenge of a new, pluralistic and multipolar world, Western companies (and society) could learn from emerging countries how to be frugal and competitive at global level. The cases of GE (Govindarajan and Trimble 2012; Immelt et al. 2009) and TATA (Brown 2005) prove how disruptive new management and business models coming from developing countries can be. It is crucial to understand such a dynamic and, if necessary, absorb and adopt it in the developed world. Finally, the research could be a useful exploratory experiment to learn some lessons from a policy perspective. How can the North support its own grassroots innovators? How can we promote small scale grassroots initiatives in Europe through an effective policy? This is totally uncharted territory.

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