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Innovations in European Rural Landscapes

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Hubert Wiggering · Hans-Peter Ende ·
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Editors

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Editorial

Innovations in European rural landscapes – InnoLand research, development and implementation

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1 Rural landscapes – a challenge for research

Boundary conditions for rural landscapes in Europe such as globalisation, climate change, claims to land use etc. are subject to a constant, dramatic change. Under global market conditions, the manufacture of marketable products and/or (ecosystem) services is increasingly facing pressures of competition. Moreover, requirements on high-quality, custom-tailored products are emerging all over the world. On the one hand, these requirements result in a new type of demand for production and technologies, on the other hand extensive and multidisciplinary knowledge is required to be able to meet the manifold calls for a sustainable development of rural landscapes in the future, too, to minimise new risks and assess consequences of use.

Thus, regional innovations will have to focus on appropriate reactions on the changing boundary conditions and on optimisation for actual and upcoming demands on ecosystem services, aiming at an integrated concept for the target area. Also the widespread mutual dependencies between the rural and urban spheres have to be taken into account as specific challenges and chances for unique regional innovations.

During the past a wide range of production structures and significant regional differences had existed. Just a few decades ago the main – in some cases the only – interest of producers (e.g. farmers, foresters etc.) was to enhance the production efficiency of the sites, resulting in relatively mono-structured rural landscapes and soil erosion, nutrient losses, groundwater pollution, decrease in biodiversity and landscape aesthetics. During

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the last few years much more attention has been paid to natural capital and non-productivity issues of rural landscapes and ecosystems (Costanza et al. 1997). Again today the demands for regenerative energy and thus also biomass production call for more intensive land use systems.

These developments do mean that agriculture is not longer the only basis for rural development. Farming is no longer the economic activity supporting the rural economy (cf. Nowicki et al. 2007; Potter and Burney 2002). To invert the current trend towards the demise of rural society is a big challenge. Current urban structures cannot be expected to revitalize the rural landscapes. The crucial question is which additional opportunities for the use of land come up that can contribute to renewed economic activities within the rural regions. Regions offering a wider range of products and services may gain advantages in competition. On the other hand specialisation my also be an option as there is a renaissance of quality food production competing e.g. with energy farming.

Rural landscapes in general are multifunctional (Wiggering et al. 2003) at the same time supporting scenery, biodiversity, productivity, regulatory, socio-economic, and socio-cultural functions (De Groot 1987; Bastian and Schreiber 1994; Mander et al. 2007). Are rural landscapes today per se a result of human impacts? For sure, they always have been changing frequently as a product of human intervention into natural processes. Does this mean that we have to accept a degradation of landscape diversity to rather monotonous and uniform rural landscapes of intensive agriculture - as a result of recent policy? Is this a cliché that we have to cover again and again? For sure not. It will be shown in this book that other approaches are available. Our view is based on the heterogeneity as a most evident characteristic of rural landscapes. Landscape – ecological, agronomical and socio-economic perspectives need to be established in order to respond appropriately to this heterogeneity.

The theory and empirical knowledge of territorial ecological networks provides a framework for the design of large-scale, heterogeneous and spatially structured rural landscapes (Opdam et al. 2006). Ecological networks seek to address almost all landscape functions (Mander et al. 2003; Von Haaren and Reich 2006). The number of functions covered varies due to scale and spatial distribution (Antrop 2004). In some respects, there is a parallel development for the agricultural sector and rural areas in general: here, multifunctional landscapes provide unique features for the future European agriculture (Potter and Burney 2002). Hence, there is a demand for a multifunctionality concept of agriculture (Vanslembrouk et al. 2005; Dalgaard et al. 2007; Deybe 2007; Vejre et al. 2007), and also other sectors such as forestry (Möller et al. 2002; Slee 2005; Wolf and Primmer 2006), agroforestry (Wiersum 2004) and agricultural water management

(Groenfeldt 2006). Such conceptual approaches of multifunctional land use help to merge economic and ecological focuses, by emphasising the rule that economic action is per se accompanied by ecological utility: commodity outputs (e.g. yields) are paid for on the market, but non-commodity outputs/ecosystem services (e.g. landscape aesthetics) are public goods without markets (Wiggering et al. 2006). Schemes of agricultural production often provided both outputs by joint production, but with technical progress under prevailing economic pressure, joint production decreases through the decoupling of commodity from non-commodity production (Piorr et al. 2007; Wiggering et al. 2006).

Most of the existing approaches to landscape research focus upon the biophysical characteristics of habitats and sites and tend to ignore the social values associated with landscapes and habitat features. As a result, current approaches only partially resolve the problems we face when dealing with a multifunctional landscape (Haines-Young et al. 2006). Therefore, new concepts and methods in landscape research are needed to study the link between landscape heterogeneity and landscape functionality, as well as integrative and associated research concepts (disciplinarity, multidisciplinarity, interdisciplinarity and transdisciplinarity) (Fry 2001; Brandt 2003; Tress et al. 2005; Pedroli et al. 2006). Rural landscapes should be seen as a multifunctional and holistic entity that provides the framework for the governance and interdisciplinary study of spatial units (Matthews and Selman 2006; Mander et al. 2007).

2 Integration of research, development and implementation

On the regional scale of rural landscapes, being studied as a whole as coherent regions, only very limited assessments of effects caused by land use changes have so far been possible. While the tools for complex landscape analysis and land use impact assessment have been developed steadily in the last few years (see, among others, EU Integrated Project SENSOR; www.sensor-ip.org), practical implementation of innovative land use changes on landscape level to date remains restricted to field experiments for the clarification of a few defined research questions for a restricted period of time.

To be able to prove the applicability, practicability, and above all the sustainable effects of selected land use strategies for entire regions, the consistent integration of research projects and development projects with coordinated implementation strategies is necessary. An integrated research, development and implementation project must comprise whole regions,

with their enterprises, landowners and decision-makers, have a long-term orientation, involve diverse local players directly in the planning und practical implementation and be scientifically monitored throughout its duration. Owing to the enormous complexity of the systems to be studied simultaneously in this process, such a project must include a great variety of scientific and technological disciplines, several sectors and industries as well as different sets of politics.

Objective of such a project conception is to avail of scientific knowledge and practical experiences of the local players using the latest computer based technology in such a way that fallow potentials of a future-oriented development for increasing value added in rural landscapes be mobilised without generating unmanageable risks or hardly remediable effects. In this process, the methodology leading to a holistic distribution of use systems, optimised for each individual user or enterprise, and being transferable to other regions throughout Europe, takes centre stage. Regions following this approach will have a lead in knowledge and a corresponding advantage in competition.

3 The role of the regions

The future perspectives of rural regions and their competitiveness within a globalising world has been a constant political concern during the last decade (OECD 2005; 2006; Nowicki et al. 2007). Within the European Union, regional development of rural areas is promoted under the overall aim to maintain a balance between social cohesion and economic competition objectives. Although rural development policies and structural support funds are established and under continuous improvements, no recipes for successful pathways have been generalised so far. On the contrary, the current economic crisis will even challenge the developed experiences and established routines. Innovative regional behaviour might require another turn.

Selected regions are to be given the chance to lead the way. What is decisive here is that these regions act and react under realistic boundary conditions and develop possible solutions by themselves, with the best possible support by science and research. Only from this kind of experimental set-up is it to be expected that policy-relevant knowledge can be gained. The entire chain of effects is to be analysed, from political interventions to the implementation of concrete measures and the analysis of ecological, economic and socio-cultural effects.

In order to initiate such innovations in selected rural regions and to implement them in a sustainable way, the European Union programmes could

serve as a promotional approach. In the regions' competition for these funds the precondition should be fixed that the development plan has been set up in cooperation with a research institution and close cooperation for the duration of the promotional period is ensured. Here, the task of the research institutions is to, besides monitoring the assessment of the development of rural landscapes, especially contribute considerably to determining the decision process through scientific knowledge and by the support of anticipatory assessments through – among others – simulation models (Zander et al. 2007).

4 Connecting regions and science in joint research

In the competition of the regions, research is becoming a site factor in rural landscapes, too. Especially regions which decide in favour of a close cooperation with research will have competitive advantages with respect to limited promotional funds. In the future, regions will thus look for interfaces with research themselves to a bigger extent than in the past and ensure an improved diffusion of new research approaches out of self-interest.

Research, on the other hand, takes special advantages as well, as large-scale future-oriented developments and the effects of innovations will not only be analysed and assessed but actively influenced on the level of the landscape.

In the centre of this idea, there is the hypothesis that in regions e.g. shaped by agricultural and forestry production the durable reconciliation of the diverse requirements on productivity, quality, resource conservation and securing of income will succeed with the help of innovative, knowledge- and technology-based cultivation, land use and natural resources processing systems. In this connection, innovations as a key to increased value added for rural regions are to be sought predominantly in the developing knowledge-based European bio-economy. Potentials for a sustainable development also safeguarding the regional income are seen especially in the creativity as well as the specific knowledge and experience of all players involved in the development.

5 The InnoLand-Net – our common approach

Upon this overall diagnosis a network of interdisciplinary research bodies has been established, the InnoLand–Net. The InnoLand-Net partners have the common goal to systematically support European rural landscapes' sustainable development by the generation, the implementation and the

monitoring and evaluation of innovative land use processes at a regional scale. Key features of this joint research and action approach for landscape development are a clear solution orientation, a continuous stakeholder involvement and a systemic scientific approach integrating social and natural sciences' perspectives – an innovative process with regard to the complexity of disciplines, space and time.

The core issue of the InnoLand-Net is to promote and accompany innovation processes in rural landscapes that face drastic changes. In these regions, boundary conditions for land use are being altered by external drivers like globalisation, demographics or climate change. To highlight these transformative forces, the programme focuses on problems at the crossing of socio-demographic trends like migration, depopulation and urban agglomeration, and environmental changes that are translated by the intensity of productive land use (Fig. 1).

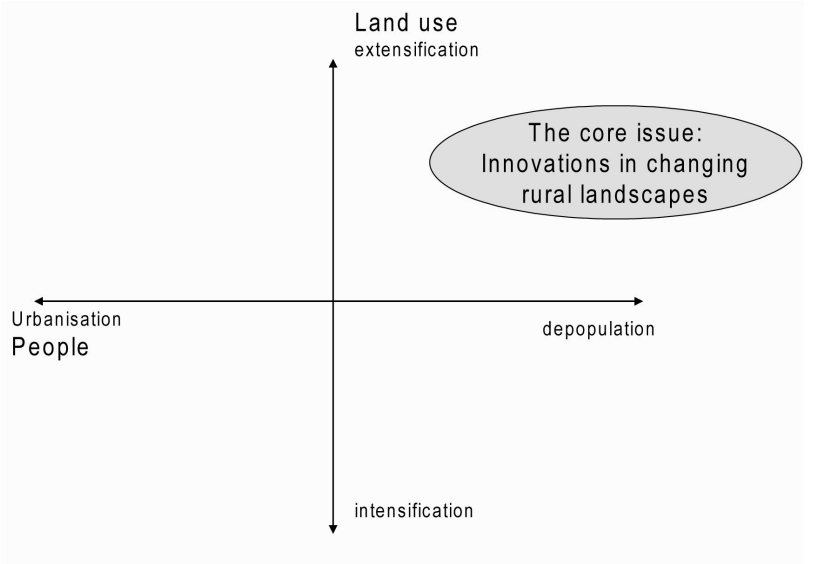

Fig. 1. The InnoLand core issues.

The InnoLand-Net joint programme comprises three components with distinct objectives. The first component is to design, to develop, to implement and to evaluate innovations that respond appropriately to the dramatic challenges rural regions are facing in the fields of sustainable resource use combined with balanced socio-economic developments. This component will reveal the diversity of possible actions and reactions that shape rural landscapes at regional level. The second component is the common methodological approach which links all partners conceptually and realises the transdisciplinary science – practice cooperation in an exemplary way.

This common framework will consist of key principles, procedures and tools for integrated inter- and transdisciplinary research and action. Its features are presented in the next chapter. Working within a common conceptual framework in a set of diverse rural regions will provide the basis for comparative evaluation of research processes and outputs and thus, substantially advance the bases for integrative sustainability research at landscape level. The third component takes into account the political conditions of innovative landscape developments and aims at the identification and the strengthening of coherent policy ways for rural regions' sustainable development. In this scope, the following questions are to be investigated:

- What political and economic boundary conditions are required to establish the land use strategies developed for test regions in cooperation with local players in such a way that they will be durable?
- Do intended effects really occur after a change in land use or adaptation of land use and if not, due to what reasons?
- Have the indicators of sustainability of use been adequately chosen, is there a need for further modification and specification?

6 Innovations in European Rural Landscapes – this book

An integrated research, development and implementation programme of the kind described above, which comprises entire regions with their enterprises, landowners and land users, has a long-term orientation, includes the local players directly into the planning and practical implementation and is monitored scientifically all the time, has so far been unique, at least in Europe. Therefore, the programme also aims at strengthening the scientific competitiveness of the involved research institutions on the national level of the different countries as well as the European level.

Among the partners of the InnoLand-Net, the experimental regional approaches to the design for and the implementation of innovations at landscape level have reached different degrees of advancement – although all are more or less in a beginning phase. Within this book the upcoming ideas and discussion about the described research and action programmes and already first steps into an implementation procedure are exemplified for different countries from all over Europe. Although all regions are different in their spatial scope, biophysical conditions and socio-economic features, every case is concerned with either trends towards land use intensification and increasing population pressure or land use extensification which

occurs frequently conjoined with outmigration or unfavourable demographic structures.

The *Slovenian Goriška Brda* region is the smallest one among the six cases. Here, land use extensification through forestation in the Northern part meets land use intensification especially in viticulture in the Southern part. The region's InnoLand approach aims at realising a sustainable resource use in this context, especially with regard to water management.

Extensive forms of agriculture and the maintenance of traditional landscape structures is also the topic in the region of *Castelo de Vide* in *Portugal*. The InnoLand approach in this – also rather small-region investigates the interdependencies between various societal interests on such rural areas and farmers' actual land use and sets the basis for a better concerted future land management.

The *Trnava District* in the *Slovak Republic* is the InnoLand region with the highest population density in combination with an intensive agriculture. Given the favourite ecologic and landscape amenity site conditions, the InnoLand approach in this region is centred on the objective to conceive and implement an integrative development concept that maintains all landscape functions in a balanced manner.

While the first three regions cover an area between 70 and 700 km^2, the next three are considerably larger, varying between 3.500 and 5.500 km^2. The *Croatian Zadar region*, although affected by agri-structural challenges and by munitions' relicts of the civil war has high potentials to intensify agriculture by a sound water management. The InnoLand approach here seeks to develop and implement a concept that seeks the integration and the respect of ecological and socio-economic concerns in this development pathway.

A sustainable water management is equally the central concern in the InnoLand region *Uckermark-Barnim* in *Germany*. This region with a dominantly integrated agriculture and a strong demographic gradient from urban sprawl to severe outmigration opted for a Zero-Emissions Water management strategy that will be realised in the frame of the InnoLand approach.

The Scottish InnoLand region *Orkney Islands* and *Scottish Border* has structurally a similar feature as the German one – the one part is characterised by urban pressure and population increase while the other is shaped by land abandonment and outmigration. However, in this case the InnoLand approach focuses not the resource management level directly but the question of how local, regional and national rural land use policies are

developed and how even marginalised actors can be integrated in such a sustainable landscape management.

A cross-regional comparative view highlighting selected natural, the agricultural and socio-economic issues is provided in the chapter 'The InnoLand regions'. And finally, at the end of the book, first conclusions are drawn highlighting similarities and differences between these innovative regional experiments in preparation.

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The InnoLand approach – experimental research and action in Europe's rural regions

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Abstract

The chapter presents the methodological approach that is general to all case studies presented in the book. First of all, the conceptual background and the guiding principles such as inter- and transdisciplinarity, stakeholder involvement and exchange and learning, are presented and discussed. In the next section, a common understanding of research as a process is elaborated and a phasing concept is presented and operationalised. Finally, conclusions on the expected outcomes both for the scientific communities as well as for political and practice stakeholders are drawn and discussed.

1 Rural regions need integrative research and action approaches

It is the central concern of the InnoLand network to support and accompany development strategies of rural regions in Europe that undergo specific external challenges in both the socio-economic sphere, such as demographic changes, migration or urban sprawl, and within the productive land use systems such as intensification or extensification processes. Large-scale, regional research as it is conceived here, means tackling the problems and development needs of the European rural areas in an interrelated manner that addresses economic, social and environmental issues in the sense of sustainable development at a landscape level. Innovations for land

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use systems both technical as well as institutional have to be designed, implemented and evaluated in order to attain rural regions prepared for competition and sustainable ways of landscape use.

From the side of scientific actors, supportive action can come from integrated research that addresses rural regions with interdisciplinary and problem-oriented approaches (DFG 2005). However, this core issue shall not be investigated from a scientific perspective only. On the contrary, research with the aim to contribute to a sustainable development of rural regions has to deal with land use issues in exchange with practitioners, regional stakeholders and political decision-makers. It has to be an integrative action-oriented research (AR) in its proper sense, focusing practical problems, realising a systemic conceptual approach that successfully involves multiple perspectives (Stringer 1996; Reason and Bradbury 2008). At least, it must be a common decision on the research design and the implementation strategy.

Such a science–practice cooperation approach is different from classical research projects in at least three conditions:

- The objectives and the expected outcomes of the regional InnoLand projects have to be relevant similarly in scientific and practical terms.
- The approach chosen has to be integrative what means comprehensible and acceptable for practitioners and political stakeholders as well as acknowledged in the scientific community and appropriate to provide relevant scientific results and
- The process of cooperative research and action has to match organisationally both with regional decision-making and governance processes as well as with the scientific agendas.

More on the objectives and expected outcomes of the regional InnoLand projects will be presented in the frame of each of the case studies in the following chapters. Here below in the next section, we elaborate on the guiding principles and concepts that are at the foundation of the common InnoLand approach and which can be adjusted by the partners, respectively.

2 Guiding principles and concepts for the common approach

From sustainable development research we learned that inter- and transdisciplinarity are constitutive elements for the scientific support of regional change projects (Brand 2000; Mogalle 2001; Müller et al. 2002). Stakeholder

involvement and actor participation in deliberative and decision making processes are another crucial component that requires conceptual clarity (Hickey and Mohan 2004; Oels 2007). Finally, the organisation and realisation of such regional scale and multi-actor change processes demand also for specific personal qualities such as an open learning and exchange attitude.

2.1 Inter- and transdisciplinarity

Interdisciplinarity is commonly understood as academic work that brings together usually unrelated scientific disciplines and transgresses the large fields of humanities and natural sciences for the sake of a complex situational understanding (Tress et al. 2007). Integrative research projects necessarily unite scientists from different disciplines in order to jointly work on practice problems. Mittelstraß (1987:154ff) stresses that this cooperation is not only about overcoming classical boundaries but rather about the reorganisation of scientific questions and knowledge. A first challenge for successful cooperation is hence to overcome disciplinary boundaries and to develop a common research design on an interdisciplinary basis. Situational diagnosis from a narrow perspective does not yield fruitful results. The complex regional reality consisting of physical, socio-cultural, economic and political determinants has to be reduced to the determining factors that shape the rural regions' development potentials. This is what we will call the descriptive baseline for each InnoLand region. On this basis, assumptions about the impacts of possible innovations in sustainable land use will be elaborated.

Secondly, in the ongoing process of interdisciplinary cooperation, it is essential to continuously develop and confirm a common understanding of the subject on the basis of a common language (Tress et al. 2007). Comparative analysis of transdisciplinary research projects revealed considerable differences in the expectations and objectives of the involved actors. However, these differences were not as drastic between the "science" and the "practice" actors as expected but much more distinct between natural and social scientists or between university employed and privately funded researchers (Loibl 2005). Obviously, in both dimensions – the disciplinary scale as well as the organisational affiliation – professional orientation leads to specific ways of expressing and actualising one-self.

Further on, transdisciplinarity means cooperation of scientists from various disciplines with non-scientists, which can comprise politicians, stakeholders and/or practitioners in the proper sense representing dominantly own interests, within a research project (Nagel et al. 2004). In the last decades, transdisciplinarity has been intrinsically linked to sustainability

management research because it is seen as a necessary condition for the initiation of intended societal change processes. The quality of transdisciplinary research is therefore a result of both the capacity to translate practical problems into scientifically relevant questions and the capacity to develop practically relevant solutions (Brand 2000: 15).

Recently, several journals have dedicated special issues to transdisciplinarity (TA 2005; GAIA 2007). Congruently, a general deficit of philosophy of science has been noted: inter- and transdisciplinarity researchers are just about to establish the epistemological bases (Zierhofer and Burger 2007), to organise the scientific body (Grunwald and Schmidt 2005) and to institutionalise a differentiated scientific debate (Kueffer et al. 2007). Explicitly, Grunwald and Schmidt (2005: 5) start with a general lamentation that although "*a lot has been said about inter- and transdisciplinarity, some has been practiced, little is reflected and understood"* (Translation of the author, emphasis in the original text). Further on, they state that despite decades of research in specifically created organisations, *"no routines and no methodological canonisation"* have been developed. One reason they advance is the nature of the research problem: usually transdisciplinary research addresses problems with a high concreteness and contextuality and therefore inevitably requires the establishment of common grounds each time anew.

Here, the cross-European regional InnoLand approach attempts to exemplarily practice and reflect transdisciplinarity by the elaboration, implementation and evaluation of a coherent and concerted methodological approach that allows for systematic reflection on the impacts of the applied principles. This does not mean to overcome the disciplinary borders only. This does much more mean, to let the neighbouring discipline(s) participate in the different methodological approaches, and not only to merge these different methods, but much more to develop them to a common tool to solve the rural landscapes´ problems.

2.2 Stakeholder involvement

Participation of stakeholders in research and action projects can be realised in manifold ways. Arnstein (1969) was one of the first to differentiate and to assess various manners of participation that was practiced in community development, e.g. Two decades later, Pretty et al. (1995) adjusted this "ladder of participation" in order to characterise the interaction between (scientific) experts and practitioners (Table 1). Both schemes have in common that there is an ascending degree of practitioners' involvement in decision making, control of resources and responsibility for results. The authors clearly express the conviction that 'real' participation only begins if the

involved actors have a share in decision-making and can exert influence e.g. on the project's objective and the application of resources (stage 5–6; Table 1).

Table 1. A typology of participation (Pretty et al. 1995: 61).

Typology	Characteristics of each type
1. Passive Participation	People participate by being told what is going to happen or has already happened. (Unilateral announcement by project management; information belongs to external professionals)
2. Participation in Information giving	People participate by answering questions posed by externals professionals. (People have no opportunity to influence proceedings; findings are neither shared nor checked)
3. Participation by Consultation	People participate by being consulted, and external people listen to views. (External professionals may modify their assumptions; no share in decision-making, no obligation to integrate people's views)
4. Participation for Material Incentives	People participate by providing resources, for example labour, in return for food, cash or other material incentives. (It is common to see this called participation, yet people have no stake in prolonging activities when the incentives end)
5. Functional Participation	People participate to meet predetermined objectives related to a project, which can involve externally initiated social organisation. (These institutions tend to be dependent on external initiators, but may become self-dependent)
6. Interactive Participation	People participate in joint analysis, which leads to action plans and the formation of new institutions or the strengthening of existing ones. (Groups take control over local decisions; people have a stake in maintaining structures or practices)
7. Self-Mobilisation	People participate by taking initiatives independent of external institutions to change systems. (Self-initiated mobilisation, collective action which may or may not challenge existing inequitable distributions of wealth and power)

Goals and objectives of participation as discussed in the literature can be regrouped in three overriding categories:

1 Emancipatory objectives in the sense that participating individuals through own action become aware of one's capacities and power,
2 Political aims so that through citizens' participation parliamentary democratic decision making can become more complete with respect to socio-cultural diversity, and

3 Instrumental reasons as that through direct participation human resources (e.g. working force, social capital etc.) can be more easily mobilised for an envisaged task (cf. Hickey and Mohan 2004).

While "instrumental" participation is obviously not compatible with the conditions of transdisciplinary research and action, and mostly rejected by change management theorists and practitioners (Reason and Bradbury 2008; Cooke 2004; Pretty et al. 1995), emancipatory and politically rooted participation has the potential to substantially back up individual and social learning and transformation (Gaventa 2004; Zilleßen 2003). Hence, one determinative factor to judge the quality of participation is to analyse how access to and distribution of power is handled. Here, it is decisive whether or not pre-existing power structures are accepted and reproduced within the context of a new project or questioned and opened for change by the way of e.g. transparency in decision making procedures, a redistribution of voice rights and others.

When making stakeholder involvement work, a special attention has to be paid to the science-policy and the science-practice interfaces, where information exchange and decision making takes place. Making such cooperation effective among actors from different organisational backgrounds requires a cautious handling of procedures and time schedules, clear planning as well as flexibility and adaptability. Truffer (2007) coins the term "interface management" which describes the challenge to handle and provide the available knowledge in a way that any actor gets access to and power about the information s/he needs in a given moment of the project's course. Truffer stresses that such a pro-active and flexible interface management is one essential ingredient for the success of transdisciplinary research.

Summarising the findings for application in the regional InnoLand approach, it is of highest priority to clarify the objectives of participation and why actors others than scientists should be involved in the research and action process. Since there are already several decades of practical experiences with participatory methods, which have too frequently been used as a fig leave (Rauch 1996; Cooke and Kothari 2001), it has to be emphasised that the application of participatory methods has to follow well-defined objectives, which have to be described in details and last but not least accepted by the stakeholders for every case study in this book, separately.

2.3 Mutual exchange and learning

The InnoLand approach clearly supports the programmatic "turn to action" as a general paradigmatic orientation after decades of a prevailing "turn to

language" in science (Reason and Bradbury 2008). Of course, the concept does not deny the necessity of antecedent phases of analysis and reflection when preparing action. However, knowledge as a tangible result of research is not longer an uncontested product which can be easily gained by the way of classical methodologies. The concept of knowledge has substantially been extended by the help of a sociology of knowledge (e.g. Berger and Luckmann 1997; Wehling 2002; Weingart 2003). Positivistic thinking has been analysed here and criticised for its mere material and reductionist approach, and with reference to the biology based auto-poiesis concept from Maturana and Varela, information and knowledge were conceived as dependent on the perceiver's view point and hence subjectively and socially constructed (e.g. Röling 2002). Again, critics deplore a complete neglect of the natural world within the community of social constructivism (Wehling 2006). Hence, a "postconstructivistic" perspective should be adopted which conceives knowledge as the result of "*practices* of generating, attributing and justifying knowledge" instead of assuming that there is "pure" knowledge either in an objective or in a subjective sense of meaning (Wehling 2006:86–87, own emphasis). In this rationale, knowledge exists in relation with one or several "knowers" who successfully apply it both in discourses as well as in action. In addition to this, the existence and significance of non-knowledge, especially of "unknown unknowns", increases the challenges of knowledge handling because it extends "the accountability of the sciences *beyond* what is explicitly known or not known, thus encompassing the material configurations in which scientific practices are enacted" (Wehling 2006:95, emphasis in the original). Similarly, action researchers insistently plead to adopt a multi-perspective *extended epistemology* that integrates positivism "in arguing that there is a 'real' reality" and constructivism "in acknowledging that as soon as we attempt to articulate this we enter a world of human language and cultural expression" (Reason and Bradbury 2008:7).

Such a differentiated conception of knowledge has wide-ranging implications within an action-oriented research approach: human-being related knowledge can not simply be handed over from one actor to the other and consequently, the classical "knowledge transfer" becomes a kind of "practicing knowledge together". In other words, learning has to take place, interactive learning, that is not restricted to the acquisition of appropriate data and techniques but that comprises second order learning. Second order learning means that awareness about one's knowledge and doing is complemented by reflexive processes about the reasons why one is doing something and how it could be done in a different way, as a basis for the exchange with others (The SLIM project 2004). As represented in Fig. 1, the collective transformation of a situation happens as a consequence of

changes in understanding and in practices that result from interaction and exchange of perceptions, opinions and experiences within a group of actors.

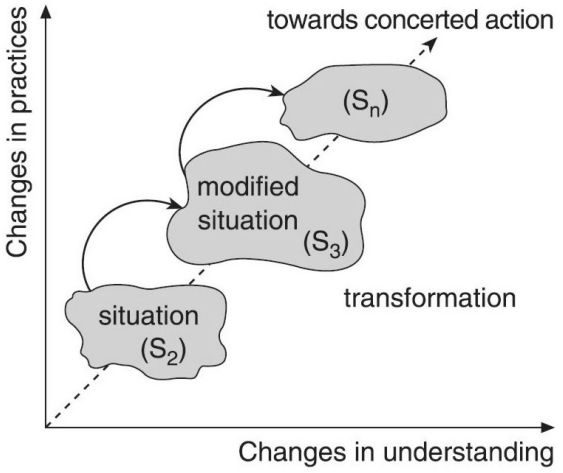

Fig. 1. Transformation as result of concerted learning and action (The SLIM Project 2004:19).

With regard to the transdisciplinary InnoLand approach, it becomes obvious that the success of such "transformative development" depends on the alternately integration of manifold understandings and sets of practices. In every case, facilitating actors will be needed who are in charge to make the interdisciplinary and actor-specific differences transparent, who question professional habits of understanding and communication and who actively mediate between diverging perspectives. Nevertheless, the willingness to review one's preconceived assumptions and to be open for learning is a necessary requirement for all people involved.

As the preceding paragraph showed, an integrative regional research approach involves multiple actors and integrates a broad range of perspectives and viewpoints. It will be impossible to fix a clear "beginning" of the project and an "end", and there will be no uncontested "state of knowledge" which can be improved but rather a constant accommodation of interpretation and opinions. As a consequence, the project should be understood rather as a regional process in which science is intervening and obtaining feedback than as a science driven event. As a backbone and orientation line for such a process, the next section outlines the common procedural scheme for the InnoLand case studies.

3 The joint procedural scheme

Given the challenging situation that the InnoLand projects consists of interdisciplinary teams in interaction with regional groups of actors who are themselves integrated into complex institutional and political structures, a common ground for the working process has to be established. This common ground is proposed here in terms of a joint procedural scheme which comprises the following phases: diagnosis, dialogue and joint action, and reflection and evaluation (Fig. 2).

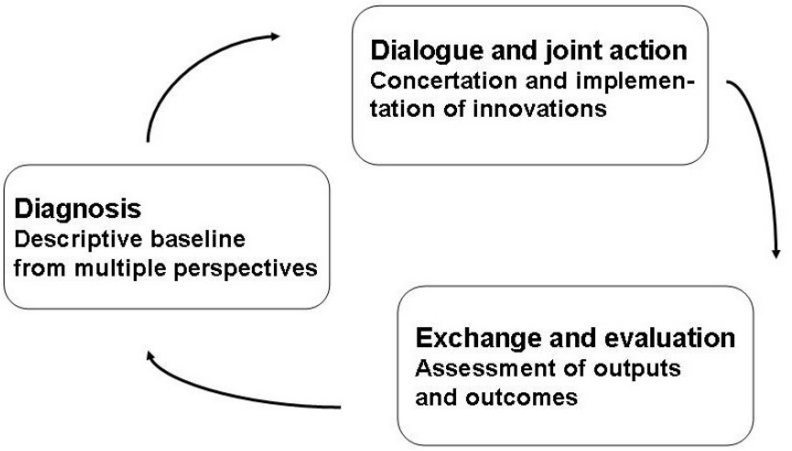

Fig. 2. The InnoLand joint procedural scheme.

Diagnosis: A situation analysis of each InnoLand region is elaborated, uniting multiple disciplinary perspectives, which constitutes the descriptive baseline. In parallel, stock is taken of the scientifically available innovations and solutions responding to pressing regional challenges. Research and action hypotheses are formulated which can integrate the different scientific aspects of the regional study. The analytical approach to the InnoLand regions can be structured by four major components which are aspects of the "landscape" in its broadest sense: (i) policy, (ii) institutional, (iii) regional and (iv) physical space and place.

The policy landscape

The policy framework for Europe's rural regions is determined by the Common Agricultural Policy (CAP) and the regional programmes that realise the Structural and Cohesion policies. With regard to the CAP, two key developments of European rural policy are in evidence now, and

which will grow in significance over this programming period and the next (i.e. 2007–2013 and 2014–2021): (a) an increase in the proportion of support coming from Pillar 2 (strengthening the development of rural areas) with proportionally less support coming from Pillar 1 (direct payments), and (b) an overall decrease in the amount of support monies available for rural areas. In parallel, social and structural funds for infrastructural and educational measures will increase. Also of consideration are those policies affecting rural areas, although not specifically designed for rural areas; these are national policies in health, transport, education etc. It is important to "map" these as they form a vital part of the rural-within-regional contexts studied and allow to take a "territorial" rather than "sectoral" approach to the analysis (see, for example, OECD 2008).

The institutional landscape

Current policies as well as societal phenomena reveal a shift from government (top-down) towards governance (bottom-up and horizontally implemented). This means that people, agencies and institutions can and will be increasingly responsible for shaping their own futures in their locations. Examples are seen in regional government through the partial devolution of community-level planning, and through the mainstreaming e.g. of LEADER within the Rural Development Regulation (RDR [Council Regulation 1698/2005]) for the first time. This raises a range of questions about capacity to adapt at local levels that is capacity within place-based communities and within communities of practice. It also raises the (less well-researched) issues of capacity within institutions, including regional government, to absorb the increased participation of communities on the ground.

The regional landscape

As part of this "devolution" and move towards subsidiarity, regional agents and regional administrations are increasingly responsible for budgets, writing and implementing development agendas, and forming new partnerships to deliver new priorities. Many new partnerships are with a range of agencies from public sector, private sector and research/education (so-called Triple Helix) or even including the citizen as "third sector" or voluntary sector (the so called Quadruple Helix). Here, it is the function of the regions as "territorial bodies" (OECD 2008), to provide a corporate identity and thus, bring together actors from many sectors, such as agriculture, forestry, tourism, health, transport, into a territorial strategy. Appropriately fulfilling this function will constitute a new challenge in many regions.

The physical level

Finally, physical landscapes have a number of functions (Wiggering et al. 2003), with some landscapes having more functions than others. External

drivers (such as e.g. climate change, demographic pressures and counter-urbanisation) act as pressures on vulnerable landscapes, and there can be tension between different functions as the drivers change with time. In the main focus of the InnoLand regions there are the resource management problems related to intensification or extensification of land use.

Dialogue and joint action: On the basis of the situation analysis, concerned stakeholders, entrepreneurs and civil society actor groups (representing the Quadruple Helix) are identified and contacted. A dialogue is initiated with the objective to contrast scientific and practical perspectives, to enhance anticipatory goal setting and innovation testing and to improve the concerted innovation generation and implementation of science and practice. In parallel, political and institutional framework conditions of these regional development efforts are reflected and the interdependencies between local/regional action and rural development politics will be used. This process rightly takes an investment of time and effort on the part of all parties, and leads to the "co-construction" of the research problem and of the appropriate journey to take through that problem or set of problems or challenges.

Reflection and evaluation: The dialogue and action process will be documented and evaluated on the basis of an ongoing reflection process that takes place in a group of different actors from the fields of science, policy and practice. Successful and failed change processes will be analysed and assessed. Expected outputs are a better knowledge on regional rural innovation processes, the identification of rural regions assets and specific adaptive capacities, conceptual bases to increase the investment effects of interventions and a toolkit for assessing locations and most appropriate interventions. This will help the InnoLand regions to increase the effectiveness of the political funding (through targeting) and to achieve their wider rural development objectives, particularly important with the proportional enlargement of Pillar 2. Secondly, cross-regional substantial information bases for the bottom-up development and refinement of rural policies will be elaborated that can support future ex-ante policy assessment (e.g. SENSOR, www.sensor-ip.org). It may also be possible therefore to develop diagnostic tools in relation to the likely implications of policy implementation within regions.

4 Expectations and conclusions on the conceptual approach

As outlined in the previous sections, the common InnoLand approach that will be implemented in a set of different European regions is characterised by

- a regional land use – landscape sustainability management orientation,
- the parallel application of common principles and guidelines,
- a common procedural understanding of the scientific actors and by
- repetitive efforts to realise an integrative stakeholder involvement in a science–policy–practice dialogue.

First of all, it is expected that for every region the enhanced science – practice cooperation on regional land use challenges will significantly improve the region's competitive capacities in the realm of the EU's Lisbon strategy. Detailed information on the kind of challenges and problems faced and the innovation that shall be implemented and tested regionally is given within the case study chapters. However, cross regional conclusions on this level will be limited: Although all regions deal with natural resource and landscape management questions, the topics are so different that it will be difficult to draw general conclusions on this regard.

However, the exploration of regionally conflicting land use functions and the implementation of sustainable ways to abate "landscape tensions" while maintaining their diversity will reveal similar patterns that are repeated.

Also, there will be similar practical outcomes on the procedural level: all regions will equally establish and work in a cluster of heterogeneous partners, with a scientific, an administrative or an entrepreneurial orientation, but united by a common objective. This up to now rather unconventional form of cooperation in rural areas will create synergies and increase regional options for development. And, the InnoLand approach will allow for a comparative structuring, monitoring and appraisal of these parallel cooperation processes. Especially the development of evaluation criteria that are meaningful to researchers and to those other partners from public, private and third sectors will be a major output likely to set the basis for generally applicable procedures and thus, substantially contributing to future regional cooperation within the EU. At the same time, such indicators which are appropriate to characterise rural change and development processes will be of political relevance when designing and implementing structural policies.

Methodologically, there will be the adaptation and the refinement of tools already existing, and the design and development of new tools of which some might be very informal heuristics in the beginning, e.g. those used by planners, development officers etc. Additionally, the scientific appraisal of the respective capacity-building within the multiple regional partnerships will be another output which will strengthen the community of inter- and transdisciplinary research.

On these conceptual bases, the InnoLand approach aims at demonstrating that an experimental research and action programme applied within a set of European rural regions provides the backbone for successful addressing severe land use challenges at a landscape level.

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The InnoLand regions – a comparative description

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The InnoLand approach addresses regions as landscapes and *vice versa*. Thus, the InnoLand conception of rural regions is derived from the problem-oriented approach described in the previous chapter: guiding for the selection and hence delimitation of a region are the perceived major challenges which shall be addressed in the course of the respective InnoLand project. Hence, InnoLand regions are territorial entities in terms of administrative borders although their spatial extension is not prescribed previously and not one for all. Rather, the approach to the InnoLand regions resembles to the holistic conception, geographers use when addressing 'landscapes'. This term – widely applied and extensively discussed in several natural and human sciences – shall here be understood as "unity of natural conditions and their use in the process of societal reproduction" (Haase 1991:931) and qualify the InnoLand "region". Actually, neither the term "region" nor "landscape" implies a distinctive size or spatial dimension for an area (Knierim 1994) and therefore, InnoLand regions may vary in size accordingly. Eventually, the spatial extension is directly connected to the specific land use innovations this region has decided on.

Of course, the second meaning of landscape implies its appearance and visual *gestalt* (Hard 1975; Meeus et al. 1990) and this is an aspect which is always part of the common sense conception of a landscape. Thus, in the transdisciplinary InnoLand approach the landscape as a visual component of a region becomes a part of consideration and analysis. Summarizing, InnoLand regions are shaped by the combination of a set of proper preconditions and diverse external influences which makes them unique and essentially contributes to their image and identity. Therefore, the InnoLand approach is necessarily an integrative one, with the objective to valorize regional strengths and to encourage endogenous development potentials, particularly by land use innovations and at a landscape (perceptible) level.

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In the following a brief overview is given on the six InnoLand regions' qualities and characteristics. Outstanding figures are highlighted and some conclusions are discussed with regard to the specific challenges in land use and socio-economics that these areas have to cope with in the future.

1 Some geographical properties

There are six countries in which InnoLand regions are located: Croatia – County of Zadar, Germany – Counties of Barnim and Uckermark, Portugal – Castelo de Vide municipality, Scotland – Orkney and Scottish Borders, Slovak Republic – Trnava District and Slovenia – Goriška Brda municipality (Fig. 1; Table 1). Not all of the regions are similar administrative units; however each of them corresponds to a well distinguished geographical entity in the sense of one or a set of related landscapes. The areas are distributed all over the European Union and located in Eastern as well as in Western, in Central as well as in Southern Europe (Fig. 1). Data sources substantiating the next paragraphs were mainly public statistical databases on different levels of solution. Nevertheless, in some cases additional data are appended, generated from recent research projects or research programs taking place in an analogous context.

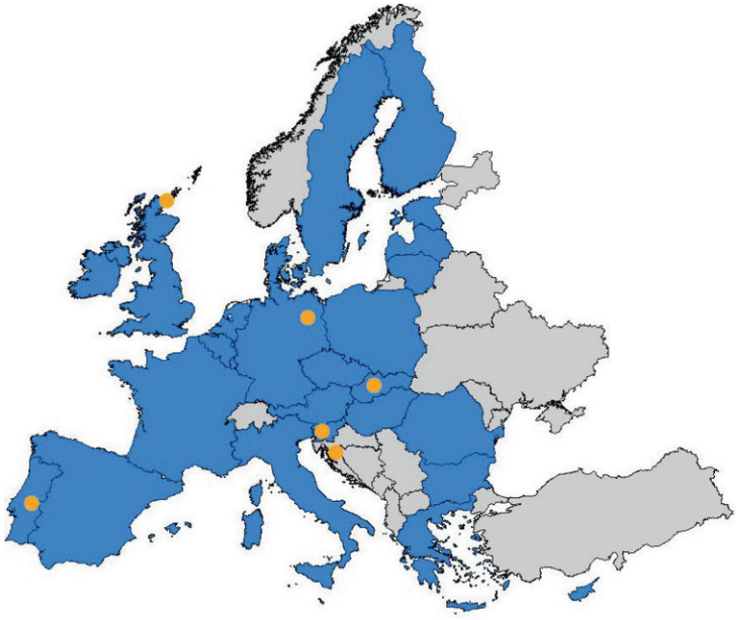

Fig. 1. InnoLand regions' distribution over Europe.

The size of the Innoland regions varies considerably from 72 km^2 in Slovenia (Goriška Brda, Slovenia) till 5722 km^2 in Scotland (Orkney and Scottish Borders), and some regions constitute only a small part of the country (0.3% for Castelo de Vide, Portugal), while others make up till 6.4% (County of Zadar, Croatia). Several regions are hilly like in Slovenia, Slovak Republic and Portugal with elevations up to 800 m, while the Croatian and the German regions are rather flat landscapes.

With regard to the climate, the regions belong to three different climatic zones: the mediterranean, the subcontinental/continental and the maritime. The coldest average climate regions are in Germany and Scotland, meanwhile both the lowest average minimum temperature and the highest average maximum temperature were registered in Trnava District (Slovak Republic), the easternmost region. Only Goriška Brda gets more than 1000 mm of precipitation per year in average and this is far above the amounts of precipitation in other regions. The smallest amount of rainfall gets both the Barnim-Uckermark region in Germany and the Trnava District in Slovak Republic.

Table 1. Site characteristic data of the regions.

		Slovenia	Portugal	Slovak Republic	Croatia	Germany	Scotland
Physical properties	Unit	Goriška Brda	Castelo de Vide	Trnava District	County of Zadar	Barnim, Uckermark	Orkney/ Scottish Borders
Area	km^2	72.0	265.8	741.3	3643.3	4552.4	2225.0/ 4743.0
Share of the country	%	0.4	0.3	1.5	6.4	1.3	2.8/6.0
Min	m.a.s.l.	53	125	130	–4	–0.5	2.0
Max		709	826	768	1591	138	479
Annual temperature							
period		1963–1990	1954–1980	1951–2002	1981–2004	1961–1990	1971–2000
Average	°C	11.8	12.7	9.4	15.2	8.3	8.0
Average Min		6.2	9.0	–1.8	12.5	4.7	4.0
Average Max		17.9	16.4	19.6	17.7	12.6	12.0
Annual amount of precipitation							
period		1963–1990	1954–1980	1951–2002	1981–2004	1961–1990	1971–2000
Average	mm/a	1456	900	560	851	554	895
Min		986		315	588	322	466
Max		1871		805	1196	755	1690
Climate zone		Medi-terranean	Medi-terranean	Continental	Medi-terranean	Continental	Temperate

Thus, due to the differences in site situation the InnoLand network comprises a brought variety of landscapes on the one hand. On the other hand, this variety stands for the general heterogeneity of rural regions in the European Union and the accession candidates, hence a selection which prepares the bases for the transfer of project results and experiences into other regions and adequate situations.

2 Agricultural structures and land use characteristics

Agriculture is the most important land use actor in five of the six regions. Only in the Slovenian region forests dominate the landscape spatially (see Table 2).

An especially high level of arable land prevails in the Trnava District and in Barnim-Uckermark, which doubles the overall EU average of 26%. The other regions have considerably less farmland and likewise only little grassland. In the Mediterranean regions, permanent crops like vineyards and olive trees are prevalent. Residential use of the area is the highest in the Slovenian and the lowest in the Portuguese region (Table 2).

Table 2. Land use characteristics.

		Slovenia	Portugal	Slovak Republic	Croatia	Germany	Scotland
Physical properties	Unit	Goriška Brda	Castelo de Vide	Trnava District	County of Zadar	Barnim-Uckermark	Orkney/ Scottish Borders
Agriculturally used area	%	32.3	77.9	71.7	64.3	49.7	43.6/ 80.0
Farmland	%	1.3	7.6	66.8	7.2	41.7	16.0/ 27.6
Grassland	%	7.9	2.1	4.5	7.9	1.2	40.0/ 24.0
Forest	%	58.1	6.6	17.8	38.5	30.1	0.1/6.0
Permanent crops (incl. vineyards, olive trees)	%	28.2	14.0	2.9	4.5	0.1	2.0
Land area in housing /residential use	%	4.9	0.7	2,4	1.3	1.2	0.5

Only limited data exist about irrigation and this only for the regions in Mediterranean climate. Here, the share of irrigated area on the overall agricultural area ranges between 0.2% in Croatia and 1.9% in Castelo de Vide, Portugal. Even less is known about the state of the water management facilities and institutions which are of major importance in the Croatian, the German and the Slovenian region, where a sustainable water management is part of the future challenges.

While the number of farms is no structural indicator here, given the variation in size of the InnoLand regions, the agricultural structure can be

characterized by the average farm size and by the composition of farm types within the regions (Table 3). The largest average farms size can be stated for Barnim-Uckermark (258 ha) and smallest average farm size is given in County of Zadar (0.24 ha), whereas the average European farm size is about 11 ha. This range clearly indicates the huge structural differences of the agricultural sector among all European regions, and the likely adjustment processes that can be expected in those regions with a high number of comparatively small farms, as can be seen in County of Zadar and Goriška Brda.

Equally, farm types and land use structures differ among the InnoLand regions. The German region Barnim-Uckermark is the only one with a high share of livestock farms, whereas in the Mediterranean regions permanent crop and horticultural farms constitute the respective majorities. None of the regions has a straight agricultural vocation where the number full time farms dominate: in Germany and Slovenia part time farming concerns 45 and 69% of the holdings and in Portugal up to 75% of the farms are run with a subsistence orientation. Clearly, the German region has a distinctive orientation towards organic farming with 9.9% of all farms registered under this label, what is above the average in the European Union (4.3%). In all other regions the share of farms with organic farming is below the average of European Union. With regard to the relative area under organic farming, Trnava District in Slovak Republic and Barnim-Uckermark reach a similar quota of roughly 5%.

Table 3. Agricultural structural data.

		Slovenia	Portugal	Slovak Republic	Croatia	Germany	Scotland
Physical properties	Unit	Goriška Brda	Castelo de Vide	Trnava District	County of Zadar	Barnim-Uckermark	Orkney/ Scottish Borders
Number of farms		830	304	43	14,413	876	952/1316
Average farm size	ha	2.80	75	320	0.24	258	14/196
Farm structure							
Full time	%	13	8	24.5		29	41/48
Part time	%	69	17	66		45	16/12
Subsistence farming	%	18	75	9.5			43/39
Farm type							
Field crop farming	%	1.93	33,9		5.0	55	0
Livestock farming	%	1.32	62.5	57.2	55.1	41	100
Horticulture farming	%	96.75	3.5	39	21.6	4	0
Vineyards and orchards	%			2.7	17.5		0
Share of the farms with organic farming	%	0.6	1.31	0	0.9	9.9	2.6/4.9
Area of organic farming	%	0.5	2.84	5		4.6	1.0

Crop production is very diverse among the regions what is expected due to very diverse climatic and other production conditions. While wheat, rape and maize are typical crops in the central European regions, permanent crops, fruits and horticulture are more frequent in the Mediterranean regions. However, there are some specific crops or land use systems in almost every region which dominate (e.g. montado in Castelo de Vide, peach in Goriška Brda, maize in Trnava District, rye in Barnim-Uckermark). With regard to animal production, the regions differ less than in crop production. There are two regions where cattle is the main animal production (Castelo de Vide and Goriška Brda), two regions with a high number of chickens (Orkney and Scottish Borders and Trnava District) and in the German region, pig production is prevalent. A mixed livestock structure and a considerable number of animals can be noted for the German, the Portuguese, the Scottish and the Slovak regions, while in Croatia a

clear specialization is prevailing and in the Slovenian region, the livestock sector is of no relevance (Table 4). Most of the farms there are vineyards.

Table 4. Animal production data (average of the last 4–5 years).

		Slovenia	Portugal	Slovak Republic	Croatia	Germany	Scotland
Physical properties	Unit	Goriška Brda	Castelo de Vide	Trnava District	County of Zadar	Barnim-Uckermark	Orkney/ Scottish Borders
Number of cattle	N°	236	4427	15,158	3229	74,405	226,169
Number of horses	N°	12	272	324	–	–	3154
Number of pigs	N°	179	113	32,865	4686	95,157	2089
Number of chicken	N°	insignific.	1881	814,044	307,940	13,957	1,323,278
Other sheep, goat etc.	N°	–	9896	128	–	18,023	–

Taking the described site characteristics in the regions into account, the current ways of productive land use might not always be "site adequate" with regard to the maintenance of the natural resources. More often external factors e.g. due to market intervention and money from special European or national agricultural or other structural funds etc. are the reason for this specific land use scheme.

3 Socio-economic characteristics

Most of the existing approaches to landscape research focus upon the bio-physical characteristics of habitats and sites and tend to ignore the socio-economic values associated with landscapes and habitat features. As a result, current approaches only partially resolve the problems we face within the InnoLand network. Landscape within this context is seen as a multifunctional and holistic entity that provides the framework for the governance and interdisciplinary study of spatial units. Although the various ways of productive land use have a major impact on the regional appearance as a landscape, there are more factors which determine a region's features and potentials as e.g. material infrastructures, cultural heritages and traditions and people's economic situation.

Starting with the economy, the highest GDP per capita is registered in Barnim-Uckermark (47,956 EUR/person) (Table 5), a figure that clearly exceeds the average GDP in the European Union (28,213 EUR/person). In all other InnoLand regions, the GDP per capita is below the average, with the lowest in the county of Zadar in Croatia. Gross added value (GVA) in the primary sector is noted between 3% and 15% – a range that shows a considerable variation of the regions with regard to the importance that agriculture and forestry have for the regional economies.

Equally, the unemployment rate varies extremely among the regions: while the County of Zadar and Barnim-Uckermark are marked by a particularly high rate of 20% which is nearly three times the European average (7.1%), while this figure is clearly less critical in Castelo de Vide, the Scottish regions, Trnava District and in Goriška Brda.

Table 5. Rural socio-economic characteristics.

		Slovenia	Portugal	Slovak Republic	Croatia	Germany	Scotland
Properties	Unit	Goriška Brda	Castelo de Vide	Trnava District	County of Zadar	Barnim-Uckermark	Orkney/ Scottish Borders
GDP in the area	€/per.	13,496	5627	7830	5082	47,956	16,964/ 14 986
GVA of primary sector	%	3.0	15.0	3.28	3.0	2.6	14.3/10.4
Unemployment rate	%	3.5	6.0	5.6	20.9	20.5	3.4/2.5
Population density	inh./km^2	80	14	171	59	69	20/24
Level of education							
Medium	%	49.2	21	36	47.9	65	
High	%	8.1	8	10	10.7	28	31.4

Population density is low in the majority of the regions. Even the figure for the Trnava District which is comprising an urban centre is just slightly above the OECD indicator of 150 inh./km² characterizing rurality. And, the figure is extremely low in the Portuguese and the Scottish regions where infrastructure provision and maintenance is likely to challenge future developments. Also, the inspected data for the education level shows remarkable differences: in four of the six regions only 10% of the active population has acquired a high level of education.

Protected areas, especially those under IUCN status, are another indicator for a region's natural values, ecosystem services and attractiveness for tourism. In Castelo de Vide almost the whole area is under nature protection regime (94%) while in Slovenia this figure is insignificant (Table 6). The number of bed places per 1000 inhabitants is the highest in County of Zadar (411), in Castelo de Vide (366), and on the Orkney Islands, what indicates the touristic attraction of these regions, meanwhile 0.3 in Goriška Brda and 11 in Trnava District indicate that tourism is not very strong vocation there.

Table 6. Additional indicators data.

		Slovenia	Portugal	Slovak Republic	Croatia	Germany	Scotland
Properties	Unit	Goriška Brda	Castelo de Vide	Trnava District	County of Zadar	Barnim-Uckermark	Orkney/ Scottish Borders
Area of nature protection	%	0.4	94.0	20.0	18.7	50.5	2.4/6.0
Number of bed places in the region	per 1000 inh.	0.3	366	11.0	411	38.3	260/ unknown

Already these selected indicators reveal that agriculture is no longer the main driver for rural regions' development. Farming is no longer the only economic activity supporting the rural economy. What will be the enhancing factors for functioning animated rural landscapes with a vivid rural society? Current urban structures cannot be expected to revitalize the rural areas. The crucial question is which additional opportunities for the use of land come up that can contribute to renewed economic activities within the rural regions. Regions offering a wider range of products and services may gain advantages in competition. On the other hand specialisation may also be an option as there is a renaissance of quality food production competing e.g. with energy farming. This shows that it is necessary to discuss new concepts for the development of rural areas in the future.

4 Conclusions

Looking at the specific challenges in land use and socio-economics the chosen InnoLand regions in the different countries have to cope with in the future, it isn't surprising, that the envisaged pathways and expected changes of these regions also are quite different. Due to the respective site

situation, to the biophysical characteristics, culture and tradition as well as former and recent policies and politics there is a broad range of what is defined as an innovation – varying from nature protection activities competing e.g. with an intensification of food production or energy farming, installing new technologies or planning approaches or aspects of the upcoming discussion about bio-economies.

All chosen InnoLand regions are under pressure to modify their established land use systems due to changing politics, market situations, demographic changes, climate change etc. Therefore in these regions basically there is a broad preparedness to follow innovative opportunities for land use changes.

In the context of the discussion about the European Common Agricultural Policy (CAP) the following questions arise:

- Are terms like "agriculture" and "rural" synonyms as well as "rural development" and "regional development"?
- How much subsidiarity is needed or how far do common approaches seem appropriate?
- How will the 2008 Health Check drive changes?
- Do we need more coherence in rural policy as a European approach with a new system?

Having these questions in mind, the necessity is evident to localize the biggest rural cohesion problems in the different European countries. At least in the agricultural sector innovations are moving faster than policy. There doesn't seem to be a consensus in the societal and political discussion on whether agriculture should be integrated into other policy areas in order to promote rural cohesion rather than treating agriculture as "special case". Further on, no consensus seems to exist on whether the so-called First Pillar (market intervention) needs to persist in perpetuity to keep farmers on the land and promote environmental protection and tourism etc. or be phased out instead, with funding directed towards the development of public goods through the Second Pillar (development of the rural areas s.st.). Communicating the role of agriculture to a wider society is viewed as essential. Major adjustments are necessary before the year 2013. For this reason, the InnoLand programme in the different countries is to understand and to promote this discussion too.

Thus, more attention is needed on identifying public goods. The discussion on what we are trying to achieve has to take place. The aims of agri-environmental policy have to be redefined now.

The regions have to learn now where to find new sources of income and employment. But this does mean a new quality of competition between regions all over Europe.

The key to rural competitiveness is the availability of the necessary skills as the base. Education and training is the key. And it is one of the aims of InnoLand approach to prepare people in these regions now for this upcoming competition. As an example, making agri-business competitive means getting consumers to cover the true costs of production. Fostering entrepreneurship is a key challenge. Policy needs to target at attracting micro businesses and at understanding where markets and opportunities do exist. Considerable infrastructure issues surround this in order to get products to markets.

Collecting all these upcoming questions, we also have to raise the overall question whether we should replace the CAP with a European Landscape Policy? This would mean to deploy EU funds where farmers and land managers deliver external environmental benefits.

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Goriška Brda (Slovenia) – sustainable natural resource management for the prosperity of a rural area

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Abstract

Favourable future perspectives for rural regions need a balanced enforcement of competitiveness and social cohesion. The Goriška Brda region (72 km^2) is situated by the Slovenian-Italian border. Certain areas in Goriška Brda are subject to intensive land use change, mainly from forest and grassland into vineyards. Future challenges in water, soil and land management are closely connected with the researchers' knowledge in dealing with the sustainable use of natural resources and the development of future socio-economic stability. An integrative combination of socio-economic analyses (e.g. SWOT) and environmental simulations (e.g., a SWAT model) will be made and confronted or upgraded with stakeholder experiences and knowledge, always in dynamic dialogue with regional policy, resulting in consensus.

1 Introduction

Several powerful limiting conditions from economic, social and environmental fields impact on rural areas. This is fairly constant dynamic evolution, rather than more or less static stages. The next expected milestone in this process is the end of the financial period of the European Union Rural Development Plan (RDP) 2007–2013 (EU 2007). After this period, the model of subsidies in agriculture will change and rural regions that are unprepared could face problems. Favourable future perspectives for rural regions need a balanced enforcement of competitiveness and social cohesion. The competitiveness of rural regions and sustainable methods of landscape use can be achieved by designing, implementing and evaluating technical as well as institutional innovations.

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The joint efforts of many actors are crucial for maintaining and developing economically sound landscapes and thus the diverse identities and visual characteristics of rural areas.

For this purpose, we must also strengthen the capacity of rural regions to invest in and conduct research and technological development activities, in a way that can contribute significantly to economic development. This should be done by maximising the potential for the successful involvement of regional actors.

It is necessary to improve links among regional authorities, legal entities conducting research and the local business community. Rural regions have no choice but to enhance the sustainable use of natural resources and the natural and man-made environment. For the Goriška Brda region, this means water, soil and land management, which should be solved in innovative and inter-sectoral approaches and by the development of regional specific strategies and technologies supporting the emergence of some priority lead markets, also identified by the European Commission: e.g., renewable energies (water, forest and soil management), bio-based products (water, forest and soil management), sustainable construction (forest management) and recycling (water, land and waste management). However, in searching for innovations in or for rural regions we have to bear in mind that sustainable development requires balanced pillars of natural conditions and the environment, of social conditions or development and of the economy in the region, although these are always in a dynamic relationship.

2 Regional conditions of the study area

2.1 Geography and topography

The Goriška Brda (Brda, for short) region (72 km^2) is situated by the Slovenian-Italian border, which divides Brda between the Slovenian (Goriška Brda) and Italian (Collio) parts. The most visible topography characteristics are ridges of hills with steep slopes, orientated from north-east to south-west. The upper parts of the valleys are much deeper, narrower and steeper; while the lower part of the area is wide and suitable for other intensive agriculture than vine-growing or fruit-growing. The average slope inclination of Brda is 28.9% or 16.1° (Ažman Momirski et al. 2008). Land owners have consequently constructed terraces covering 29% of the total area, for easier cultivation and to prevent erosion (Ažman Momirski et al. 2008), of which almost 70% is used for vineyards.

2.2 Geology and soil

The geology of the area is characterised by flysh sediment, with the exception of the far northern and eastern edge of the area, where limestone and dolomite prevail. In the majority of the research area, and especially in the southern and eastern part, eutric brown soil on eocenic flysch (cambisols [eutric]) with anthropogenic influence (hortic cambisols [eutric], anthrosols [eutric]) and acric regosols prevail. On the northern and eastern edge, rendzina on limestone and dolomite (leptosols [eutric]) prevail. In the river valleys, the most common soil associations are deep gleysols (eutric), and eutric brown soil on alluvium and colluvium (cambisols [eutric] and fulvic cambisols [eutric]), with signs of stagnic properties (stagnosols and planosols) in some areas (DSM 2008).

2.3 Climate

Goriška Brda is wide open towards the south and west to the Friulian lowlands and to the Adriatic Sea, only 20 km away. This exposure gives a warm and sunny submediterranean climate, favourable for the growth of vine and fruit.

Winters in the Brda region are mild, with an average January air temperature (1963–1990) at Vedrijan (central Brda) of 3.4°C. Climate changes have been observed, with the average temperature having risen from 2.9°C in 1961–1971 to 3.4°C in 1963–1990 (Ažman Momirski et al. 2008; ARSO 2008). Summers are hot, with average July air temperatures over 21°C (Fig. 1).

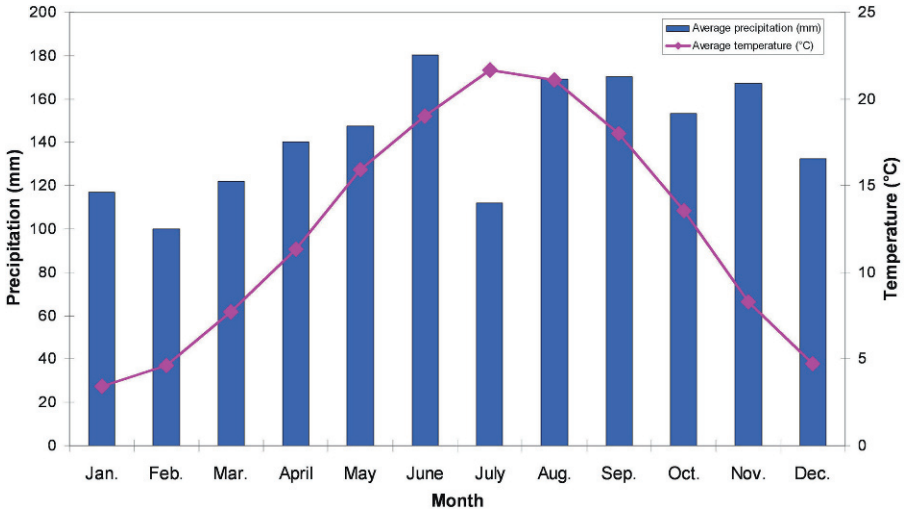

Fig. 1. Monthly average precipitation and temperature for the Vedrijan meteorological station in Goriška Brda for the period from 1963 to 1990 (ARSO 2008).

Data for precipitation monitoring at the Vedrijan gauging station shows average annual precipitation of 1482 mm (1963–1990). The highest average monthly precipitation is in June (180 mm) following by September (170 mm) and August (169 mm) (Fig. 1). In spring, the quantity of precipitation rises steadily from February (100 mm) until June, enabling agriculture soils to become soaked with water before summer.

2.4 Hydrology and water quality

Goriška Brda has a dense network of streams and rivers of 1.9 km/km^2 (Kladnik 1996). Most are smaller streams, only the rivers Reka, Kožbanjšček, Birša, and Pevmica are bigger. The rivers have a stormy character due to the flysch geology and high precipitation rates. The water quality does not cause any serious problems. However, pollution can be noticeable in certain sections, as reported by Ažman Momirski et al. (2008).

2.5 Designations

Several objects in Brda are designated as objects of natural value (Ažman Momirski et al. 2008). In the upper part of the Kožbanjšček river catchment, there are three designations; first are areas of natural value, second are areas of geomorphologic particularity and third is an area of Natura 2000, in which Sabotin hill at the extreme eastern end of Goriška Brda is also designated.

2.6 Challenges in land use

In recent years, a rise in the total area of forest was recorded, from 48% at the beginning of the millennium to 53% in 2008 (Ažman Momirski et al. 2008). Due to the high population and need for firewood, forest has always been degenerating in the past, leaving only less valuable wood and shrubs (Vrišer 1954). A transformation of land use occurred in the 20th century. A slow but steady extensification (Kladnik 1996) of the whole area is still in process, but it is strongly dependent on exposition and slope. However, certain areas with better natural conditions, especially in lower Brda, are again subject to intensive land use change from forest and grassland into vineyards and, to some extent, to orchards. Kladnik (1996) divides the area into upper and lower Brda for a number of natural-geographical reasons (elevation, slope and geology). The biggest difference in land use types between the two areas is the percentages of forest and vineyards (Fig. 2). Ažman Momirski et al. (2008) compared the two areas and calculated that forest covers 80% of northern and only 30% of southern Brda. Vineyards cover almost 26% of the whole area, but only 6% of northern and 42% of southern Brda. According to the Austro-Hungarian cadastral (published in

1819) the percentage of vineyards and forests covering northern Brda was 15 and 30%, respectively. Vineyards in southern Brda covered almost half half (45%) and forests 17% of the area.

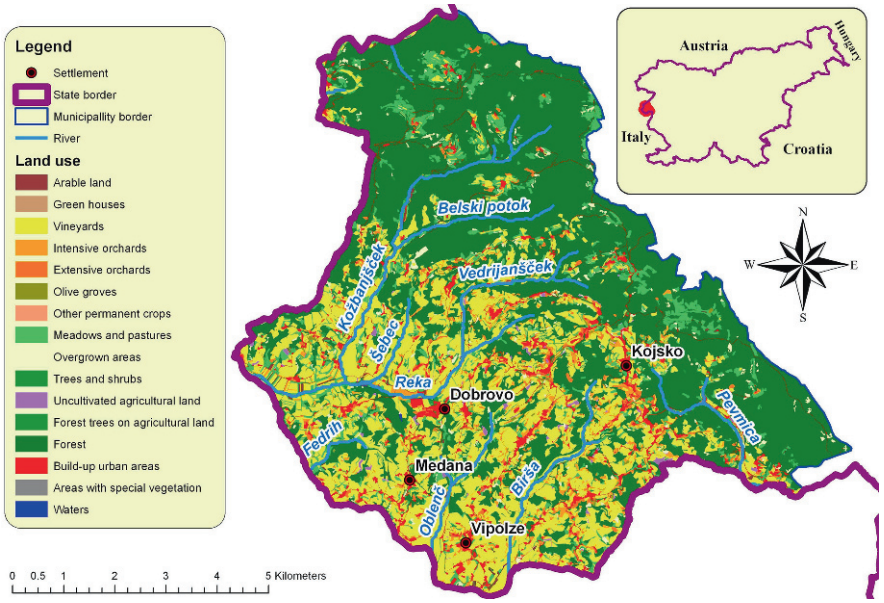

Fig. 2. Current (2008) land use and river network of the Goriška Brda municipality (MKGP 2008).

2.7 Demographic situation

According to the census data in 2002 (SURS 2003) Goriška Brda, with 5,765 inhabitants, is a fairly densely populated area. It consists of 45 settlements, with an average of 120 inhabitants. The lower part of the area, with 100 inhabitants per km², is particularly densely populated, while there are less than 50 inhabitants per km² in the upper part of the area.

2.7.1 Past demographic situation

At the time of the Austro-Hungarian Monarchy, e.g., in 1869, Goriška Brda had 8,928 inhabitants. Since then, there has been a constant tendency of population stagnation and decrease, particularly in the period 1910–1981, when the population decreased by almost half (Savnik et al. 1968). The main reasons for the decrease were emigration connected with the crisis of local agriculture, gradual adaptation farms to more modern farming methods and the political circumstances (Ažman Momirski et al. 2008). Between 1880 and 1910, the upper area of Goriška Brda was strongly

affected by emigration, which further intensified after the Second World War, when the population declined by 22%. The reasons were the large number of workers made redundant due to the introduction of socialist co-operatives and gradual mechanisation of farming. During the 1960s, deagrarianisation, lack of off-farm working jobs, poor traffic infrastructure and the unfavourable location near the international border caused further depopulation. Goriška Brda reached the lowest number (5,409) of inhabitants in 1981. By 1991, the number had increased to 5,758 inhabitants, due to improved traffic infrastructure, better off-farm employment opportunities and commercialization of agriculture (viticulture) (Ažman Momirski et al. 2008).

2.7.2 Present demographic situation

Today, the Goriška Brda area is faced with problems associated with the previous population dynamics in the region. The most critical one is the unfavourable age structure. According to data in 2007, the age index of Goriška Brda is 178.5, while for the entire Slovenia the comparable value is 146.4 (SURS 2008a). Increased immigration into the area during recent years has to some extent improved the situation. The share of the older population in Goriška Brda is 18.6% (SURS 2008b).

Due to the lack of off-farm employment opportunities in the region and in the nearby urban centres, the poor traffic infrastructure and weak daily migration, Goriška Brda is still one of the most agrarian regions in Slovenia (Ažman Momirski et al. 2008). In 1961, the share of the farming population in Goriška Brda and Slovenia as a whole were 76 and 31%, respectively, while in 1991 they were 24 and 7.6% (SURS 1962; 1992). With the integration of Slovenia into the European Union, this item of data has been replaced with the share of households producing food. In 2002, this share for Goriška Brda was 58.4%, whereas for Slovenia it was 42.8% (SURS 2003). The share of households involved in cattle production is 26.8 and 27.2% for Goriška Brda and Slovenia as a whole, respectively (SURS 2000). The agrarian character of Goriška Brda is expressed through the share of persons employed in agriculture; in 1961 and 2002 this share was 82 and 18.8%, respectively, considerably higher than for Slovenia as a whole (4.0%) (SURS 1962; 2003). Nowadays, the largest share of the population is employed in services (59.2%), which significantly contributes to the low unemployment rate of the region (3.5%) in comparison with Slovenia as a whole (6.5%) (SURS 2008c). The high share of daily migrations over the state border since the integration of Slovenia into the European Union contributes considerably to this low rate (Ažman Momirski et al. 2008).

3 Innovations and new strategies

The foundations of modern rural development policy paradigm are integration and reconciliation of economic, social and all physical environments. The authors' vision is not only to work with four differentiating complexes, as in the EU Rural Development Plan (2007–2013) (EU 2007), but to combine the entire strategic direction and develop a new integrated system. In the case of Slovenia and, consequently, Goriška Brda, an integrated system to monitor rural development policy has not yet been constructed and evaluation of obtained results does not for the most part take place. This minimises the possibilities of performing quality evaluations, which would enable more qualified decisions for rural development planners.

3.1 Water, soil and land use management

Future challenges in water, soil and land management are closely connected with the researchers' knowledge in dealing with the sustainable use of natural resources and the development of future socio-economic stability.

During this research, innovations will focus on solutions dealing with improving the quality of surface waters, with an emphasis on sediments and phosphorus levels; improving irrigation systems and building small dams or water reservoirs for the storage of water surpluses for use in drought periods; and point source pollution from households.

Innovations will also focus on afforestation of the northern part and less favourable research areas for vine growing; changing land use from pasture to forest. We will introduce stakeholders and farmers to the possibility of adjusting natural afforestation by planting economically more valuable plant species. Afforestation should not just be automatically classified as a bad process, since under certain conditions (appropriate forest management), it can also bring environmental and financial benefits.

The next innovation will be directed towards more sustainable land use management in vineyards and towards seeking the most appropriate areas for new ones. Winegrowing, with its characteristic land use management should not just be seen as a good process, because it brings economic benefits, but also as a cause of accelerated erosion problems in the area. The erosion effects are very well seen in examples of landslides and surface water quality.

The last innovation in this segment is focused on lowland flat areas, where there is high interest in building projects, since costs are lower than building on slopes. The expansion of built-up areas on lower quality agricultural land can be a good solution in certain situations, as long as we are able permanently to protect the best quality land from becoming built-up land. We should be careful, since there is always a tendency to designate

certain land as of lower quality, which can lead towards the silent expansion of built-up areas.

The most fundamental problems of natural resources (water quality and availability, water pollution, soil pollution, land availability, sensitivity for landslide, inclination, land use, afforestation, intensification, etc.) must be identified. A system must be established of identifying the weakest link and solving problems based on the weakest link (water, soil, land use) – e.g., eco-technologies. The solution which is optimal for all three concerned environment factors (soil, water, land use) must be sought. The solution of one factor must not weaken the others. The solution of the environment factor must not upset the equilibrium between the environment and socially and economically sustainable development. Synchronization of all above mentioned factors is crucial for the successful introduction of innovation to the area.

3.2 Agricultural methods

Looking to the Goriška Brda municipality as a whole, it can be seen that the area has an irregular development pattern, which also applies to agriculture. The southern, lower, more easily accessible and, in terms of relief, more open part of Goriška Brda is well developed, with intensive viticulture, while upper Brda (including the major protected area) lags behind in development and is also affected by intensive abandonment of land and overgrowing with forest. Tourism is beginning to evolve here, since they are more traffic isolated from the central part of Slovenia and the rest of Brda (but, on the other hand, only a few kilometres from Cividale del Friuli in Italy), there is little possibility for employment outside agriculture (except a few agro-tourism businesses and art galleries, for example, in the settlement of Breg at Golo Brdo), which is why emigration affected this part to a greater extent.

Viticulture is currently the most important agriculture branch, which is still spreading and demanding new land, while old vineyards are being modernised to meet the demands of contemporary harvesting technology. Modern viticulture has pushed the traditional Mediterranean harvesting methods into the background.

The joint marketing promotion of local wine producers is the task of the Brda consortium, which has no major success to show for the moment (Markočič 2008) and so innovation and promotion in this field is currently domain of those wine producers who, at the beginning of the 1990s modernised their production with the support of state funds (e.g., Kristančič, Erzetič, Dolfo etc.). The development of winegrowing has already now started to reach its limits (all suitable locations are already occupied, and market conditions are getting more difficult on both local and international

markets). In this situation, ecological agriculture is seen as the only marketing niche and new innovative strategy**.**

In this context, we are planning the development of winegrowing in the direction of introducing production with an explicit orientation towards nature protection and preservation of traditional cultural landscape elements (e.g., terraces), which would also be used as a comparative advantage in shaping, market recognition of the wines from Goriška Brda. Within this innovative framework, we could also integrate innovative usage of local resources, such as wooden posts for vineyard trellises from local forests, which are spreading through the overgrowing of abandoned agricultural areas. Posts are traditionally made from robinia (*Robinia pseudoacacia*), a very invasive species in the area, which is overtaking natural species such as oak and beech. Wood from overgrowing areas could also be used as biomass within the development of agro-tourism, which is also going to be guided by the principles of nature protection and preservation of traditional cultural landscape elements.

In addition to the increasingly developing viticulture, fruit growing (peach, cherry) is also acquiring importance; its significance is greater on full-time farms, where fruit is an important additional source of income. The fruit is sold either at the farm or in the main markets in the major cities of Slovenia (Ljubljana) and Italy (Trieste) Olive growing has also been increasing recently, since, because of the far north location of Goriška Brda, the extra virgin olive oil produced has an extraordinarily high quality with a low level of acids. However, in many cases, opposite trends can also be observed, i.e., the abandonment of existing fruit plantations. In this sector, in addition to the existing support for broadening the restoration of abandoned orchards and olive groves, the introduction of other non-food products from olives and fruits (oils, soaps, wooden products) are planned as an innovation in the agricultural sector.

An increase in rural tourism can also be observed in Goriška Brda. The contemporary approach to tourism connects locally specific economic activities, such as viticulture and fruit growing, which are already traditionally important activities in Goriška Brda. We plan to strengthen the role of tourism as a means of enabling the preservation of the cultural landscape, assuring the cultivation of land and preventing the emptying of the countryside. Agriculture could be still further linked with the tourist offer, which has already been partly realised with recognisable quality farm tourism and the offer of wine shops, and their inclusion in wine roads (wine, fruit), and annual, traditional, recognisable and well-attended events (wine and cherry festival, Brda and Wine, Wine and Poetry, etc.).

4 The research action process

4.1 Planned research steps

The project group links an interdisciplinary group of regional stakeholders, policy makers and researchers from the Biotechnical Faculty (University of Ljubljana). All of them have experience in the field of situation analysis and actively cooperate with policy makers in the field of agriculture, spatial planning, environment and natural resource management. This interdisciplinary cooperation aims to bring viable solutions for the larger regional change process.

The introduction of research and innovation will be carried out in three working phases.

4.1.1 Situation analysis and diagnosis of the region

Analysis of all sector innovations introduced for developing and strengthening the economy and environmental situation in the area. In the case of already concluded innovations, or innovations in process of implementation, a careful review will be carried out to assess the impact on the research area. The review will be based on an assessment of past and present economic innovations, a review of sectors and organisations responsible for the implementation of innovation measures and two-way collection of information, review and analysis of data sources (data accessibility, compatibly and territorial collection).

The review will be systematically by sectors:

- structural (agriculture, food industry, forestry);
- economic and socio-economic;
- biota (diversity, areas of high natural value);
- water sources and soil hydrology parameters;
- climate change;
- land use in rural areas.

The final segment of this phase will be the identification of innovation and expected outcomes by sectors, separately and together.

4.1.2 Dialogue and joint action in innovation implementation

The second phase of the project contains conceptual and organizational testing of innovations on a local territorial level, in cooperation with researchers, policy maker and stakeholders. For the support of innovation, information technologies will be organized for collecting two-way information and innovation impact assessment analysis.

In the light of newly established theoretical knowledge, socio-capital will be differentiated into “bonding” and “bridging” (Putnam 2000). The

first type is formed in tightly connected groups (family, neighbourhood, village community), and the second is developed in various interactions among groups on both mezzo and macro levels. Scientific sources (Hanžek and Gregorčič 1999; 2001) have identified a very low level of social capital in Slovenia, especially in the countryside. Impact assessment cannot be based only on the evaluation of certain parameters (values) of final results (number of jobs, companies, clean environment, biodiversity, etc.) (Dwyer and Findeis 2008); the selection of parameters has to be wide (including socio-economic parameters). This is the only proper way of evaluating the impact of innovations and their long-term contribution to the wealth of the region.

The impact of economic, land use, soil and hydrology innovations on the local community will be checked by collecting data and two-way information from existing databases and communication with stakeholders, policy makers and innovation users. This will enable us to assess whether the existing system is capable of recording and effectively monitoring innovations, also in socio-economic terms. Where shortcomings in the system are detected, database sources will be supplemented and examined in terms of the resolution of information that we need for quality assessment of innovations.

We will assess how innovations can help in detailed planning of agricultural land use, based on the optimal use of growing potential. Land use growing potential analysis will be based on soil parameters obtained from the soil map, climate and topography. Water availability or limitation will also be taken into consideration.

4.1.3 Exchange and evaluation of innovations

Innovation impact evaluation will be performed with a combination of direct gathering of data from local users, stakeholders and politicians, structured individual and group interviews and through workshops. On the basis of these results, a final evaluation of the system in terms of the rate at which, in the initial implementation framework, it is capable of executing and monitoring the aims of innovations. In the event of shortcomings, operational suggestions for improvements will be proposed.

Effective innovations are important for better living conditions for the inhabitants of a particular area. An organization plan will be established for monitoring innovations in the future. It will consist of methodological and organizational suggestions for realisation.

The research project will establish a formal framework for cooperation between the institution and relevant stakeholders, in the form of a monitoring board for innovation development. Direct incorporation of developers and final users of the evaluation system in the research project process,

will directly include the results of innovation in the future regional decision support systems.

4.2 Regional stakeholders

Stakeholders in Goriška Brda can be divided into two groups. One is a proactive group, which is well aware of the development problems of the region and they are seeking innovations for the long term secure socio-economic development of the region. The other group consists of stakeholders who are either unaware of the development problems or, which is more common, are indifferent to it, since they only come to the region periodically as tourists and holiday house owners.

4.2.1 Stakeholders aware of the problem of the lack of innovations

The stakeholders who are well aware of the development problems in the region are first of all the municipal council, the wine cooperative – Zadruga, producers' associations (olive growers, wine producers, fruit growers and beekeepers), independent small wine producers, Kmetijska svetovalna služba (KSS) – Agricultural Extension Service, Regionalna razvojna agencija (RRA) – Regional Development Agency, small entrepreneurs in tourism and processing. On the initiative of the local municipal council, some of them have already started to form a consortium for promoting local products and services. Another initiative, also from the local community, is the establishment of local craft-business zones.

4.2.2 Stakeholders not aware of the problems

Stakeholders who are not fully aware of the problems or are indifferent to them, are bigger enterprises that only have subsidiaries in the region, the older population, and people who come to the region only on an occasional basis to enjoy in second homes, who see the present state of the region as ideal for their needs.

5 Outcomes of regional changes

The approach described above is part of a larger regional process already underway. The link among researchers, stakeholders and policy makers has already been established. This relationship must now be moved to a higher level with the introduction of innovations. This means incorporating the most recent science knowledge with stakeholders' experiences in accordance with regional policy (we could speak about harmonisation of science-practice and science-policy dialogues), which will result in significant progress in development of the area.

The outcome will be an innovative integrative combination of socio-economic analyses (e.g. SWOT) and environmental simulations (SWAT model). The results of the analyses and simulations will be confronted and/or upgraded with stakeholders' knowledge and experience, as well as policy directions, thus constructing a strong local network (using endogenous factors) by which the region can become strong and well prepared for the circumstances of the global market.

5.1 Economic growth and job creation

The authors expect the proposed innovations to be beneficial for the majority of the inhabitants. Circumstances that favour the success of the planned innovations are:

- the region is surrounded by two highly developed EU regions (high GDP capital) with high purchasing power, and
- the region is close to the border with Italy, which enables even easier access for Italians, who already traditionally express interest in visiting the region.

The open border with Italy also brings various examples from the business world, earlier searching for business opportunities, more tourist recognition and specialisation and market oriented agricultural households, as well as a strong impetus to self-promotion of high quality products (wine trade).

Identified potentials also include high-quality tourism and the secondary sector, i.e., small food processing plants (fruit processing, organised fruit selling). This can be developed at various levels, from smaller operations in different industrial branches to small and medium sized companies, which would or already do successfully contribute to an acceleration of local development, all of which would contribute to a higher level of local employment and self-employment.

In view of the socio-economic structure, the potential interest in self-employment is assessed as high. In order to alter the existing emigration of the younger generation and ageing of the local population, the municipality is planning to support the development of some basic small industries with the establishment of a trade-industrial zone in lower Brda. The planned development of the tourist infrastructure is also well congruent with planned innovation, so some synergetic effect can be expected through the promotion of agricultural production oriented towards nature preservation and conservation of elements of the traditional cultural landscape.

5.2 Sustainable use of natural resources

Our aim is to achieve through innovations awareness that only close dialogue and participation among stakeholders, policy makers and science can

bring a successful outcome in the sustainable use of natural resources. The outcome will also include formation of a methodological tool for monitoring the realization of innovations.

It is expected that the quality of surface waters will increase through balancing afforestation and vineyard areas, thus providing better living conditions for wildlife. Improved irrigation and water reservoirs can balance water shortages in the rivers, which are often dry during periods of drought, so conditions for wildlife and agriculture would stabilise.

Fragmented land ownership and lack of information on the part of owners will cause problems, especially when dealing with afforestation and increasing vineyard areas. It is expected that such types of innovation will be highly time consuming. However, through proper dialogue and joint action with all included partners, outcomes can include a reduction of erosion on steep slopes and sediment levels in rivers; and bringing new ecological value where forest strips are introduced.

Evaluation of soil and land use properties in the area will highlight areas of low agricultural or environmental importance. Equally, areas of high environmental importance and suitability for agriculture will be defined.

However, all of the outcomes will have to be measureable and mutually synchronized, since successful introduction of innovation to the area can only be seen over a longer time frame.

5.3 New trademarks and markets

The area already has established consortia for promoting the marketing of local products (wine, fruits, olive oil, cultural and touristic events). A consortium that was established by a group of individuals and the Brda community has developed the trademark "Brda, dežela opojnih trenutkov" (Brda, land of ravishing moments). Members of the consortium are aware that the region needs a trademark which assures the quality of local products because Brda, due to natural conditions, cannot count on mass production. Considering the planned innovation of promoting production with a distinctive orientation towards nature protection and preservation of traditional cultural landscape elements, the existing trade mark can be used to promote this new direction of production.

In addition to the traditional offer of high quality wines and other agricultural products, the idea of keep visitors in the area for a longer period has recently been strongly present in Goriška Brda, so the extent and quality of the touristic offer need to be strengthened. This trend is already attracting some foreign investors (mostly from Austria), which suggests that we can expect an extension of the traditional markets in Slovenia and neighbouring regions in Italy also to Austria and further to German speaking countries.

5.4 Stakeholder networking

A very strong system of networking can be observed in Goriška Brda. Existing social networks form a system of concentric circles, in which organisations with a social character (voluntary firemen, rural women's group, choirs, etc.) build the strongest networks. However, it is very positive to see that stakeholders' networks, which are important for realisation of planned innovations (olive oil producers, wine growers, tourist society etc.) are already building the next circle, which means that their networks are also fairly strong and they represent a strong bonding and bridging potential in the context of existing social capital. The importance of these networks is especially great in the overall promotion of the region, because these societies organize some well-known events (cherry days, days of poetry and wine, etc., which already have a strong reputation outside the region itself.

Business networks of stakeholders are also well developed. The strongest network is certainly formed by the local cooperative, which unites the majority of local grape and olive producers and thus secures their economic subsistence.

The next most important network is a consortium for promoting regional products, which is developing and promoting the trademark for local products and services, and which can also be well used to promote newly developed products and services that will emerge from our proposed innovations.

A third stakeholders' network is created among enterprises operating in local craft-business zones. There are currently six enterprises active in these zones, which are considered to be an important job creator. Their role, together with the local wine cooperative, in the further development of the region is also connected with the widening of local markets to more global ones, especially in a system of concentration of production of individual small producers into more significant quantities.

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The changing role of farming in a peripheric South European area – the challenge of the landscape amenities demand

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Abstract

The role of farming has been changing in many European rural areas, especially in the most peripheric areas, where production has ceased to be viable or is threatened in the present market context, but the countryside is valued by society through other functions it provides. Within this new paradigm, where the territorial role of farming is stressed, there is a need to understand and assess how the cultural and amenity functions, that nowadays are based in the rural landscape as a resource, depend on the land management undertaken through the farming sector, and how do the users of these functions value the outputs of farming activities. Increasing knowledge on this demand is required for informing new management orientations at the landscape and the farm levels. In order to integrate all factors, innovative solutions to be designed need to have this information as a stepping stone.

In the municipality of Castelo de Vide, in Southeast Portugal, due to specificity of the landscape, there is already a growing demand for cultural and amenity functions. This chapter is based on a survey undertaken in this municipality. Different groups of users of the landscape, representing the various landscape functions, have been considered. The paper shows what are the landscape areas, and within them, the land cover patterns preferred by the different users, for their activity, and what are the landscape elements that influence choices. And through this preference survey, the paper analyses the role of farming for the performance of these cultural and amenity functions, and what may be synergies and conflicts to be considered for future management options.

1 Introduction

The rural landscape depends directly of the transformations by the land use systems in place. According to the OECD nevertheless, rural space cannot

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anymore be defined through the importance of the agricultural sector, which has been decaying both in economic and in social terms. Rural areas can be identified through their population density, independently of the economic activity of that population. The increasing importance of other sectors in rural economy can even in the future support farming, if new synergies are developed.

Progressively, the countryside has been turning from a space of production into more a space of consumption – at least in some regions of Europe, the less competitive in production terms, often more attractive as provider of amenities (Holmes 2006; Wilson and Rigg 2003; Wilson 2007). Thus a new concept has emerged, relating to multifunctionality as an attribute of the landscape, rooted in a reinterpretation of agriculture contribution to rural development and the rural space, and the changing role of farmers and a larger community of land managers in the so-called "consumption countryside" (Potter 2004).

Several functions supported in the rural landscape are expected from several users: owners and farmers, hunters, visitors and tourists, inhabitants – both locals and neorurals, those who develop economic activities based on the landscape, nature conservationists and environmentalists, involved technical staff, and many others. The jointness between functions, i.e., the way the several functions relate to each other, positively or negatively, raises fundamental issues for the future management of the landscapes, both for the private and for the public policy sectors (de Groot 2006). For the farming sector, its role in the process of transition of the countryside, facing this new social demand, is still to be defined (Wilson 2007). Many questions emerge that both landowners, at the farm level, and decision makers, at a local or regional level, are struggling today to answer (Durand and Van Huylenbroeck 2003).

These new questions raise challenges for research that demand new types of approaches and eventually combination of methods. As a first step, there is a need to identify the functions and demands, in each specific landscape, i.e. assess what do the new users of the rural landscape look for, or what do they value (Wiggering et al. 2003). This means identifying which pattern best suits their expectations, if the preferred patterns for the various functions are common or divergent, and if they may be combined. There is also a need to assess which functions can be combined in each landscape and which landscapes may support different functions (Wiggering et al. 2006).

Furthermore, as a second step, the renewed role of farming needs to be identified. It is still the agricultural sector which determines the management of rural landscapes, but more and more there is a transition in the dominant paradigm from a productivist to a post-productivist, or non-productivist

perspective (Wilson 2007). The present question is how the various functions supported by the landscapes depend on farming management or could rely on other types of management. And also, facing the reduction of production, how these new functions can contribute for the maintenance of the land use systems in place or the shaping of new ones (Vejre et al. 2007).

The present chapter presents and discusses the results of a research project emerging from the above mentioned questions. The goal of the MURAL project was to assess the expectations of various users for the rural landscape in a municipality in the North East of the Alentejo region (Fig. 1). The main question was which pattern (considering the distribution of land cover classes and intensities of uses already in place in the area) best suits each function considered. And also, what type of farming system is more adequate for maintaining the preferred pattern. The groups of users represent the most relevant non-commodity functions that already correspond to a social demand in the area. They stretch from ecotourism and hunting, to new and second residence (neorural inhabitants and people with second residence), weekend stays and cultural identity. Further in this chapter, people with second residence and weekend visitors will be included in the neorurals group, since they share common characteristics (urban people searching for better life quality conditions).

The chapter is structured as such: (1) introduction, (2) characterization of the case-study area – the municipality of Castelo de Vide, (3) methodology, (4) analysis and discussion of results concerning the landscape preferences, (5) discussion on the challenges these preferences raise for the future, and (6) conclusion.

2 The municipality of Castelo de Vide

The municipality of Castelo de Vide is located in the Northeast of the Alentejo region, close to the Spanish border (Fig. 1). It is integrated in São Mamede Natural Park, also a Natura 2000 site. Due to the presence of the mountain chain in the South of the municipality, there are some high points, as São Paulo (700 m), Facho (762 m) and Urrea (782 m). Among its major water resources, there is the Sever River, tributary of the Tagus River. The Sever River serves as border between Portugal and Spain. The municipality of Castelo de Vide covers a territory of 264 km^2, with a total of 4144 inhabitants in 2000, and a very low density of population (15.64 hab/km^2). This municipality has been classified as an area of *extensive agriculture with environmental quality, in diversified territory*, according to the typology established for the whole country concerning the dynamics

and changes of rural areas in Portugal (Pinto-Correia et al. 2006; Pinto-Correia and Breman 2008). This means that it has a diversified landscape with conservation and environmental values, with potential for a multi-functional use, maintained through extensive farming systems, threatened now by the globalization processes going on.

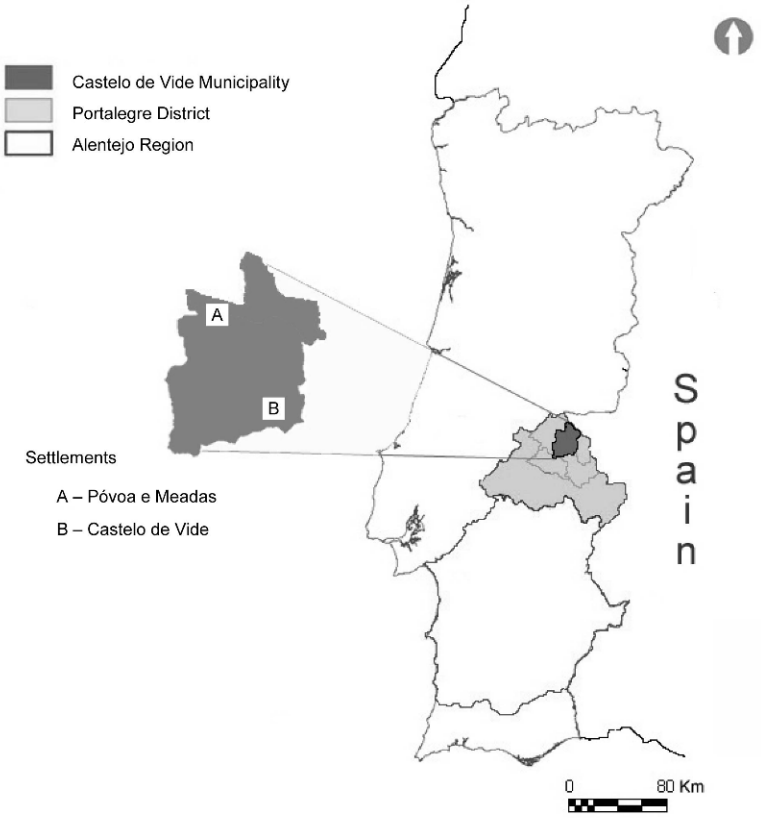

Fig. 1. Location of Castelo de Vide's Municipality.

It is also a municipality where land cover has been rather dynamic during the last years, resulting mainly from the extensification processes of the silvopastoral systems, but also from the forestation of agricultural areas. On the other side, it is a diversified area, with wild and poor areas close to the Sever River to the North, silvo-pastoral systems in large properties in the centre, small scale mosaic around the town of Castelo de Vide, and the mountain hills of São Mamede (Pinto-Correia and Primdahl 2009). The combination of the biophysical conditions and extensive agriculture has culminated in diversified land use patterns. Archaeological sites, religious

monuments and other man made elements add a heritage value to these already humanized landscapes. Also the presence of rock outcrops has resulted throughout time, in the construction of stone walls, contributing once again as a valued cultural element to the landscape.

Due to this diversity, a particular climate, more mild than in the surroundings due to the proximity of the São Mamede mountain, and also its cultural heritage, the municipality has been attracting since some years ago diverse types of users, both for recreation as for week-end stays and even settlement of neorural inhabitants, both Portuguese and foreigners.

3.1 Landscape character areas

Four landscape areas have been identified (Fig. 2): (a) Schists, (b) Agro-Silvo-Pastoral, (c) Olive grove mosaic; (d) São Mamede Hills.

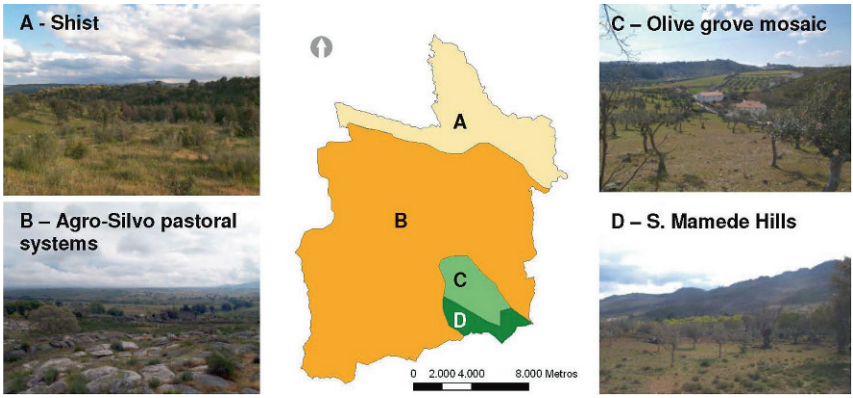

Fig. 2. Landscape areas of Castelo de Vide's municipality.

The *landscape area of Schist (A)* has a very open and harsh character, which can be explained by its very poor soils developed from schist rock, and the consequent vast extension of shrub areas, areas of dispersed tree cover of cork and holm oak *montado* (the silvo-pastoral system characteristic of the whole region of Alentejo) and fast growing forest areas (Eucalyptus). The properties here are very large (>100 ha) comparatively with the other landscape areas. There is a high potential for nature conservation and hunting.

The *Agro-Silvo-Pastoral landscape area (B)* represents the biggest landscape area in the municipality. Pastures are combined with high and low shrubs, broad leaf and evergreen oaks, annual cultures and rock outcrops. Livestock production is the main activity. These elements can be found all over this area, however the densities in which they occur can

change very much, providing more open or more closed areas, though maintaining the same landscape character.

The *landscape area of Olive Grove Mosaic (C)* represents the area where the municipality town, Castelo de Vide, is located. Surrounding the village, mainly to the north, there is an area of smaller properties (<20 ha), with olive groves, vegetable gardens, fruit trees and vineyards, resulting in a very diverse, dynamic and living character mosaic landscape. There is a decrease in vegetable gardens and an increase in permanent cultures, as the olive groves. This trend follows along the increase of neorural inhabitants, searching for a better life quality, but not connected to farming. Prices of land here are high, as the pressure for building or restoring houses is high.

The *landscape area S. Mamede Hills (D)* corresponds to a small part of the Mountain of S. Mamede, which continues further south-east. The distinct character of this area has mainly to do with the presence of the hills, which create a microclimate, more humid and with higher precipitation than the surroundings. There are areas of shrub, and also oaks and chestnut trees, but a large part of this landscape area is covered by monospecific forest plantations, of pine trees mainly. Some have been affected by fires in the last years.

2.2 Main changes

For the whole area, an analysis of the land use change and dynamics from 1968 to 2005 (Fig. 3), shows a strong increase of shrubs, especially between 1980 and 1995, and also of permanent crops and of forest areas. On the other hand there is a decrease of annual crops. These changes reflect a trend towards an extensification of the land use systems, even if the components of the system are kept the same, at the landscape level.

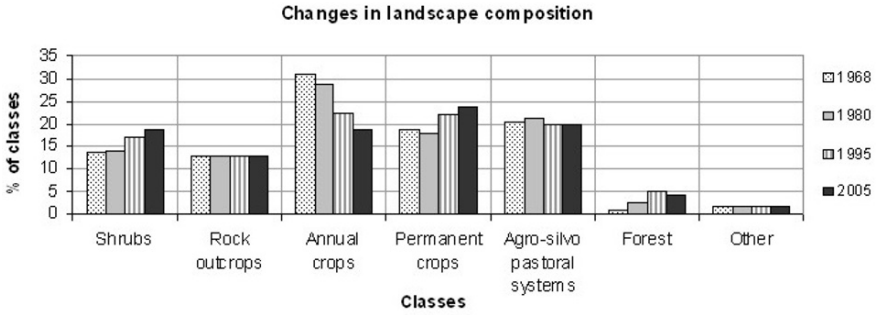

Fig. 3. Changes in the landscape composition in 1968, 1980, 1995 and 2005 (Santos 2007).

The farm number and average size have also been changing. The number of farm units has decreased from 1989 to 1999 (Table 1), but the average

area and dimension of the farms has increased (average size farm – 28 ha in 1979 and 68 ha in 1999), which proves a trend to concentration of farms, which can be more competitive. The number of farm units with less then 5 ha, decreased considerably, in 20 years it has been reduced to less then half. On the other hand, the number of farm units with more then 100 ha, increased (Table 1). Also the number of farmers with an income exclusively or mainly from the farm has been decreasing. The total of farms with an income from an external source has increased, underlining the loss of competitiveness of the farms, and the need of landowners to seek for other incomes.

Table 1. Dimension of the property and number of farm units in the municipality of Castelo de Vide, in 1979 and 1999 [Source: INE – RGA/99 (http://www.ine.pt)].

	Year			
Municipality of Castelo de Vide	1979		1999	
	Nº Farm units	Area (ha)	Nº Farm units	Area (ha)
Without SAU	1	–	–	–
0–5 ha	335	531	150	293
5–20 ha	79	735	42	364
20–100 ha	69	3314	55	2847
>100 ha	29	9591	57	17,206
Total	513	14,171	304	20,710

Concerning size, the small farm units (0–5 ha) are many; however they occupy a very small area (1%). The number of medium (20–100 ha) and big (>100 ha) farm units is rather low (37%), though occupying 97% of the total area.

Concerning farming systems, two main types must be distinguished (Figures 4 and 5): (1) the large farm units with extensive silvo-pastoral systems, and (2) the small farm units related with olive groves, in a mosaic with grazing, vegetable gardens, fruit orchards and vineyards. In large properties the cattle production for beef is dominant, while in the small property two management types can be found: the maintenance of the traditional farm system, today as a hobby activity, and combining olive oil with sheep production; and the innovation by neorural inhabitants, who maintain an increasingly extensive system and introduce some innovation, but without market objectives. Here the second homes, or new houses for neorural inhabitants, are progressively larger in number.

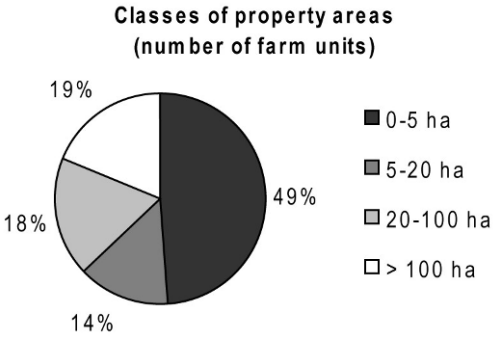

Fig. 4. Classes of property areas in the Municipality of *Castelo de Vide* [Source: INE – RGA/99 (http://www.ine.pt)].

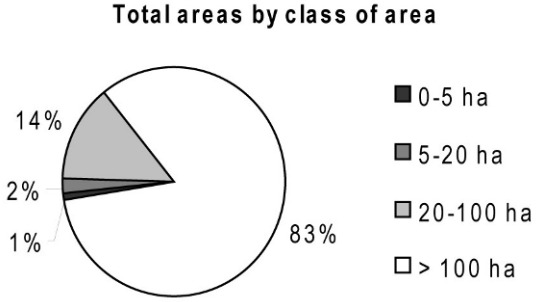

Fig. 5. Percentage of the total area by class of area [Source: INE – RGA/99 (http://www.ine.pt)].

3 Methodology

The methodology applied can be divided in several phases: (1) characterization of the municipality of Castelo de Vide, biophysical and socio-economic conditions and the land use systems in place; (2) identification of the non-commodity functions, particularly the cultural and amenity functions, that are more relevant today; (3) identification of different landscape areas in the municipality; (4) selection and manipulation of photographs representative of each landscape area, and representing the various land use combinations and intensities in each landscape area, to be used in enquiries; (5) definition of the enquiry and of the sample of users; (6) enquiries; (7) data analysis and discussion: opening up for the sequence process of the diagnosis – dialogue and joint action – exchange and evaluation.

3.1 Characterization of the municipality of Castelo de Vide

The biophysical and socio-economic characterization of the municipality was based on published information, as well as statistical data and maps, on soils, morphology, farm structure, land cover, population, demography and sectors of activity, etc. For the understanding of the land use systems, the first and more general information was obtained from key-persons interviewed in a first step of the study, as staff from the agricultural administration and farmers associations. More detailed information was obtained from the interviews to a sample of land owners, covering all types of farm units in the different areas of the municipality.

3.2 Identification of relevant cultural and amenity functions

The identification of the most relevant non-commodity functions that reflect a direct and explicit social demand, as cultural and amenity functions was based on a first round of open interviews to local key people. The interviewed were elected people at the municipal level, technical staff and responsible people from the sector organizations as the agricultural administration and the office of the Natural Park of S.Mamede, and also from local NGOs, and also experts who previously have studied this municipality from a socio-economic and cultural perspective. Those interviewed expressed what are the activities and processes going on already in the municipality concerning the countryside, and how the area was seen from those who demand it and from those who live there. The following functions were selected: hunting, ecotourism, settlement of neorurals (including second residence owners and weekend visitors), and also the cultural identity (local inhabitants).

3.3 Identification of landscape areas

A first delimitation of the landscape areas was based on literature about the municipality and the crossing of maps with information on the biophysical (morphology, altitude, hydrography, soils, etc.) and socio-economic (settlements, property structure, heritage buildings) characteristics. Fieldwork complemented the analysis, and a first definition of the landscape areas was achieved, following landscape character assessment criteria applied at national level (d' Abreu et al. 2004). This definition was adjusted through a survey based on photographs representative of each landscape area identified. The survey was composed by a questionnaire to 35 local inhabitants distributed geographically in the municipality, and also along ages, gender and profession. The final landscape areas were then defined, after adjustment of composition and limits to the opinions expressed by the locals.

3.4 Photographs representing each landscape area

The land cover pattern within each landscape area is known, from the land cover maps COS 2000, produced at 1:25 000 for the whole country. The land cover classes and the pattern of distribution in each landscape area were identified, with focus on the most represented classes, the dominant class and the most frequent combinations. Photographs of the whole municipality area and all possible land cover classes and land cover combinations were obtained with a few days interval (Spring 2007) so that the season and atmospheric conditions were similar in all photos. The aim was to obtain photos that could be considered as representative of each of the fours landscape areas and, within each area, of the land cover types most significant (Dramstad et al. 2006).

Photographs were used as visual stimuli, as they offer a reliable tool for characterizing preferences on different types of landscape patterns (Val et al. 2006; Dramstad et al. 2006; Tilt et al. 2007). Nevertheless, taking in consideration the fuzziness of this extensive Mediterranean landscapes, and the need to distinguish between different levels of intensity which do not in reality correspond to very sharp differences in the land cover, computer edited photographs are more indicated than real photographs for obtaining a clear preference distribution (Surova and Pinto-Correia 2008). Edited photographs also make it possible to control the exact aspects and elements to be distinguished.

Each of the four landscape areas was treated separately. Representative photos of each landscape area were grouped, and from those, one single was selected by the team, as the photo that best could represent the landscape character of that area (Val et al. 2006). With this photo as the basis, new versions were produced through manipulation. The final photos, for each landscape area, have the same background, the same horizon levels and the same sky. Each photo shows a specific land cover class, so that the set of photos covers all those which are relevant in the area, in the relevant levels of intensity. The homogeneity of the photos concerning the background aims at concentrating the attention of the respondent on the components and elements that really matter for the survey objectives (Al-Kodmany 1999).

Further, other landscape elements that are present in this municipality, both natural (rock outcrops) and cultural (stone walls, farm houses, paths, cattle, village), have also been added to other versions of the same photos, so that they also could be object of choice by the enquired. The selection of these elements was based on results from a previous survey, also about users' preferences, but based on real photographs, taken in all points of a grid covering a stratified random sampling of the municipality area (Ramos and Teixeira 2006).

In the present study, from the whole four landscape areas, a total of 69 photos were produced, with different combinations of land cover class, intensity, and presence or absence of the above mentioned elements (examples in Figs. 6, 7, 8 and 9).

3.5 Enquiry and sampling

The enquiry contains a first section for the characterization of the enquired, and two other sections. The second section concerns the selection of the photographs and reasons for the choice, in several steps; first between the four landscape areas, and then, in each of them, the preferred land cover class, level of intensity of use, and the presence or absence of elements. The third section concerns the representations and expectations for the landscape in the area – data that will not be analysed in the present chapter.

As to the sample, individuals related to each of the functions were considered: (a) hunting; (b) ecotourism; (c) settlement of neorurals (including weekend residences and weekend visitors); (d) local inhabitants, and (e) land owners/farmers. The last ones were also asked about the management of their farm unit. Each person was enquired as representative of one of the functions considered in the analysis. For example, a hunter, or a ecotourist, may also be a local inhabitant, but if he is approached as hunter, he is asked to reply as a performer of that activity. The same for neorurals, they may be also landowners, but when enquired as neorurals, it is in this role they should reply. And this distinction has proved to be very well understood.

The sample was built by direct contacts, through a snowball process, starting with key-informants. This approach depends on long stays by the team members in the municipality, as personal contacts are crucial for the quality of the sampling. The objective was to obtain a purposeful sampling, according to the principle of the maximum variation (Patton 1990), with a minimum of $n = 30$ for each function. The enquiries were done directly by members of the project team, in two phases: May and June 2007 for the farm management inquiries and between April and June 2008 for the landscape preferences survey. A total of 208 enquiries were done.

3.6 Data analysis

Data was analyzed in two steps. The first considering separately the enquiries in each user group, through a descriptive statistical approach, where the preferences within each group were identified. First the preference in-between the four landscape areas. Than for each landscape area, the preferences in-between land cover types, levels of intensity, and the

elements present. The distribution of the reasons for choices has also been analysed here in the same way.

The second step of the analysis included all enquiries, through a multiple correspondence analysis, considering as active the variables related to the preferences expressed, concerning the choice of photos, and as passive, or explanatory, all other variables, both those related with the profile of the respondent and those related with the reasons for the choices presented. The multiple correspondence analysis organizes all data in groups of characteristics and responses, being the active variables those who define the groups and the passive those which illustrate the profile of the group.

This analysis is the core of what can be considered as the diagnosis phase, concerning landscape values and management. On the basis of this assessment, proceeding for dialogue and joint action is the next step. An open meeting has also been organized, where the diagnosis has been presented and discussed with all participants. The development of dialogue process and of joint action and, later, of exchange and evaluation involving all parts, is a next step that was not reached by this research, at this phase.

4 Landscape preferences by different users

4.1 Preferences group by group

The enquired didn't show any problem in choosing in between the photos representative of the four landscape areas, and the results of the survey are extremely clear. As it can be seen in Fig. 6 preferences are rather divergent.

The landscape area of São Mamede Hills (D), the mountain area in the southern edge of the municipality, is one of the less chosen, except by the neorurals. For those, the reasons pointed for choosing this area refer mainly to the presence of the hills, the aesthetical aspects, and the nature associated. Not surprisingly, the most well cared landscape, the Olive Grove Mosaic (C), is quite much preferred by neorurals, but undoubtedly the most preferred by landowners and local inhabitants. These groups express a preference for a more humanized landscape, with small open areas and arable land. This landscape is also chosen due to the proximity to the village. The olive grove landscape corresponds to a rather small area in the municipality, close to the town of Castelo de Vide, but though the most frequently preferred. The proximity to the town and the density of occupation and population settlement is certainly related to this preference pattern.

The Agro-Silvo-Pastoral landscape (B) is the largest in the municipality, occupying most of its area. Nevertheless, it is only mostly preferred by hunters and ecotourists. Their preference is due to the diversified pattern (mixture of open and closed areas), and also the more "naturalized" character of the silvo-pastoral systems, in relation for instance with the small scale olive groves of the area C. Other reasons for these choices however differ considerably among hunters and ecotourists. The hunters chose this area mainly because they relate it with a variety of game species; the ecotourists chose this area mainly by aesthetics and associations with nature, in its bucolic dimension. The landscape unit of Schist (A), is also quite much chosen by hunters and ecotourists, mainly for the same reason as the landscape from area B. This area is the less preferred, what can be explained by its harsh nature, lack of qualities for production, and also the weak relation of the locals with what is seen as periphery in the municipality. In sum, areas A and B occupy most of the municipality, but they are in fact only much appreciated by hunters and by ecotourists and, within those, mainly by foreigners or at least people from outside the region.

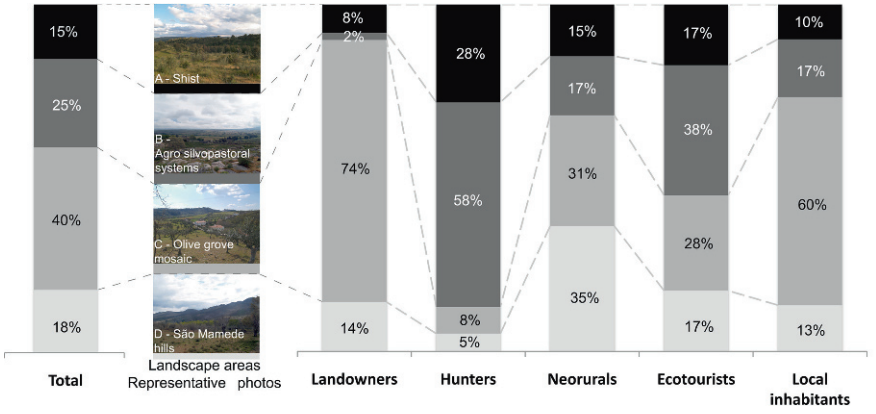

Fig. 6. Distribution of preferences, by the different groups of users, concerning the representative photographs of the four landscape areas (A, B, C, D) and the total percentage of chooses for each photograph. In some groups of users the sum does not give 100% because in some cases was not chosen any photo.

Concerning the preferences within each landscape area, between various land use intensities with different elements, some interesting results can be explored. For instance, within landscape area B, the most open montado was the most chosen, both by landowners and neorurals, however with different combinations of elements, explained by specific reasons. The reasons are directly related with the functional relation of the group with the landscape (Fig. 7).

Landscape area - Agro-silvo-pastoral systems

Landowners	Neorurals
Elements	**Elements**
Cattle + House	Rocks
Reasons	**Reasons**
Higher capacity for occupation/intensity	Aesthetic and sensorial aspects
Land occupation	Nature\Natural aspects
Land form\Physiography	Species\Biodiversity

Fig. 7. Landscape area B, represented by the open Montado: elements chosen, by landowners and neorurals. To the left the signs of a more human used landscape, the house and path and cattle (preferred by landowners) and to the right the signs of a more naturalized landscape, the stone outcrops (preferred by neorurals). The reasons for the preferences are also expressed.

In the area B (Fig. 8), the different types of land cover and intensities of use correspond to a clear distribution of preferences. The *Montado* system, in it various forms, gathers more interest than the open areas with no trees. As for those, the area of grazing with dispersed shrub, corresponding to natural pastures, the most common in the area, is almost not chosen. As for shrub, is becomes more interesting, for hunters mainly, and also for ecotourists – but it is never chosen by landowners, and only some few local inhabitants and neorurals chose it. The open *Montado*, which expresses a better cared management and an on-going livestock production, is the most preferred land cover type in this landscape area. Especially for landowners, together with the open *Montado* of *Quercus Pyrenaica* (a more specific type of this area), this is with the most attractive land cover. Neorurals, ecotourists and local inhabitants have, concerning this landscape area, a similar preference distribution, concentrated on open *Montado*, *Montado* with shrubs and just shrubs. Nevertheless, locals chose very little stone outcrops as diversifying elements (Table 2), and prefer the images were all other element, signs of human occupation, are present. Ecotourists, on

another side, appreciate quite much these stone outcrops. Landowners and hunters are again the groups with most well defined or specific choices, in relation to the remaining groups. Also the choice of elements shows this specificity (Table 2): hunters chose massively the stone outcrops, interesting as game refugee, and never cattle or houses; landowners chose more cattle and the house, sign of human occupation, and farm production.

Table 2. Distribution of preferences, by the different groups of users, concerning the elements and combination of elements chosen for the Landscape Area B – Agro silvopastoral systems and the Landscape Area C – Olive grove mosaic. In grey and black are indicated the elements that have been particularly most chosen, by each group.

			Land-owners (%)	Hunters (%)	Neorurals (%)	Ecotourists (%)	Local inhabitants (%)
Landscape area B	Agro-silvo pastoral systems	n/a*	2	0	2	0	0
		No elements	8	22.5	19	10	10
		Cattle+rock outcrops+house	8	0	17	22.5	**33.3**
		Rock outcrops +house	4	5	10	10	23.3
		Cattle+house	**56**	0	6	2.5	6.7
		Cattle +rock outcrops	0	0	4	7.5	3.3
		House	12	0	15	5	10
		Rock outcrops	0	**72.5**	**23**	**37.5**	13.3
		Cattle	10	0	4	5	0
		Total:	100	100	100	100	100
Landscape area C	Olive grove mosaic	n/a*	4	0	2	0	0
		No elements	2	**65**	0	7.5	7
		House+sheep +village	**62**	0	25	27.5	**57**
		House+village	6	0	6	7.5	13
		Sheep+village	4	0	15	15	10
		House+sheep	12	0	0	0	0
		Village	2	32.5	**48**	**40**	10
		House	4	2.5	0	0	3
		Sheep	4	0	4	2.5	0
		Total:	100	100	100	100	100

* not appliable - when inquired not choose a photograph in the previous question

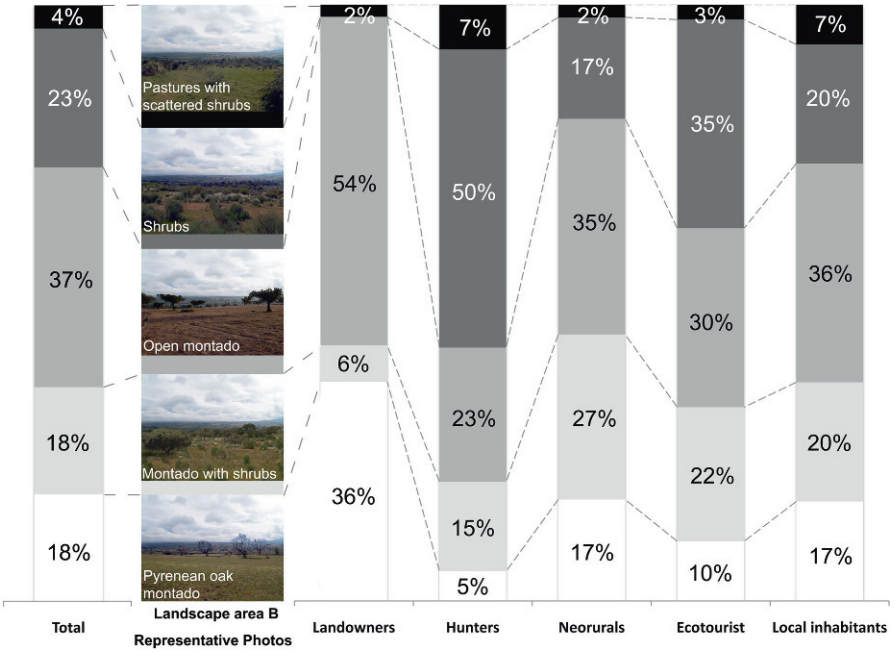

Fig. 8. Distribution of preferences, by the different groups of users, concerning the photographs of Landscape Area B – Agro silvopastoral systems and the total percentage of chooses for each photograph. In some groups of users the sum does not give 100% because in some cases was not chosen any photo.

In area C – Olive Groves (Fig. 9), landowners, as expected, chose the land cover that gives them more guarantees for farming production: the intensive olive grove. Once again the hunters and ecotourists are in line choosing the one that is more naturalized, the extensive olive grove; however this choice is due to different reasons. Neorurals and the local people in this case chose the mosaic, where olive grove is combined with patches of open pastures, mostly because of aesthetics and diversity. Regarding the elements chosen in this area (Table 2), there are also major differences in the choice made between the various groups of users.

As can be seen in Table 2, hunters stand out completely from the other groups, also in the choice of elements in the landscape for landscape area C, since they chose the photos without any element involved. This is mostly because both the livestock and the proximity of people interfere with the presence of the game. Landowners are once more in line with the local inhabitants and they tend to choose the full range of elements (the view to the village, the sheep, and the houses). This choice is primarily due to its local identity, as the locals like to see the elements they always knew in this landscape. The proximity to people is something important for these

two groups, since it gives them some security and wellbeing, opposed to isolation. The neorurals and ecotourists in this case are in close association because their choices are similar, considering the village alone as the most important element. They like this small scale pattern but prefer the slightly more quiet landscapes, a bit isolated, with no evidence of human presence. The town is an element that aesthetically fits well in the landscape but is far enough to permit still the feeling of isolation and quietness.

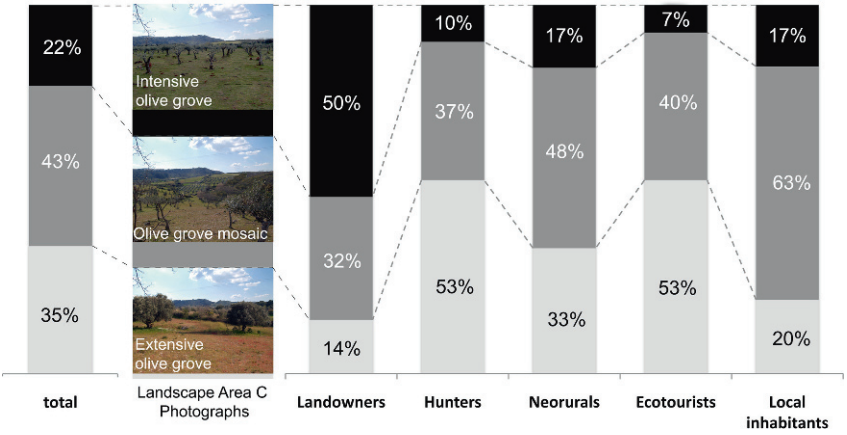

Fig. 9. Distribution of preferences, by the different groups of users, concerning the photographs of landscape area C – Olive Grove Mosaic and the total percentage of chooses for each photograph. In some groups of users the sum does not give 100% because in some cases was not chosen any photo.

4.2 The multiple correspondence analysis: preferences and expectations of all enquired

The analysis based on a multiple correspondence analysis showed the emergence of six groups of users with different preference patterns. These are not the pre-defined groups that were covered by sample for the enquiries, but other groups, emerging from the analysis, where all cases were considered and analysed together, and in relation to each other. There are nevertheless close correspondences in between the groups.

Group (1) Hunters: Related with hunting, where farming is recognized to be important to maintain a diversified land cover pattern (open areas combined with some dispersed bushes). This group prefers more naturalized landscapes, without human elements, and tend to choose the photos according to the conditions for the game species. Concerning the elements, hunters have a tendency to choose the rock outcrops because some game species use them as refuge, and they rarely chose other elements like cattle, houses, and view to the village.

Group (2) Foreigners: Related with foreign people: mainly based on the environmental quality and an appreciation of the natural heritage, with a bucolic appreciation of what is seen as nature. These people prefer extensive used areas, connected with natural spaces. They also attach a lot of value to cultural heritage elements like the village and stonewalls.

Group (3) Young outsiders: Related with younger neorurals and ecotourists, many of them students, and female. The preferences are mainly based on the esthetical quality and a search for nature experiences. Like the group before, they tend to prefer extensively used areas with the presence of historical heritage elements.

Group (4) Ecotourists: Related with ecotourists. The preferences are mainly based on diversity. They acknowledge the role of farming as the main activity building the landscape, so they tend to prefer farming landscapes, where the human action is clear, and combining some nature and cultural heritage.

Group (5) Locals: Related with local inhabitants. Most of them are female, and have a low education level. They tend to use the landscape for leisure activities related with nature. This group prefer humanized landscapes where farming practices are still a determining factor. They like to see all elements that contribute to the local character: cattle, rocks, houses and view to village. The preferences are mainly based on the esthetical quality, and a lot of value is given to the local historical and cultural heritage.

Group (6) Farmers: Related with farming. There is an expectation in relation with farming, considered as fundamental for this landscape and the countryside as a whole. In general, this group prefer more open landscapes, with arable land, with cattle, and human elements (houses, village, etc.). The reasons for their preferences are always connected with a higher capacity for occupation/intensity, land occupation and land form\physiography.

The results show a clear definition of the preferences by hunters and by farmers, which can be opposed. The other groups are less well defined, as the above analysis shows. The original groups of users are subdivided, and may have mixed preference distribution. Nevertheless, even if the type of user (hunter, neorural inhabitant, owner of a second home, ecotourist, local inhabitant, and farmer) has not been determinant for the construction of this analysis, the various representations and preferences are associated with the groups of users. This confirms that the groups considered do really correspond to different preferences and expectations for the rural landscape:

The analysis could be deepened much further. In this first attempt, it is possible to understand the various preferences and how they correspond to different land cover patterns, and therefore also to different land use systems, or different levels of intensity of the same land use system. Furthermore the reasons for the preferences have in some cases been more determining for the coherence of the groups than the landscape pattern by itself. This means that the groups are searching for specific goods and services in the landscape, which can be associated with various landscape patterns – within the possibilities in this municipality. For instance the neorurals seek for a more extensive management and more naturalized environment independently from the land cover itself.

5 Discussion: management challenges for the future

5.1 Diagnosis

The research done in the municipality of Castelo de Vide, on landscape preferences, confirm that significant differences emerge from each function group (Rogge et al. 2007), but also according to socio-economic background (education, gender, nationality) and to landscape features (openness, wilderness, diversity, man made constructions, etc.). Thus, not only the different users look for different landscapes, but also one particular landscape may support different functions for different people (Heilig 2003). Even more interesting than the preference distribution is thus the identification of the reasons for the choices, which leads us to the understanding of what are people looking for in the landscape they use – so that the unavoidable change for the future can be best oriented taking care of the social demand from various sides.

In general terms, landowners prefer the most open landscapes (no bushes and no rock outcrops), with the type of land cover corresponding to more profit. On the other hand, neorurals tend to value more extensive farmed landscapes, even when they also are landowners. Neorurals can be settled in the town, but also frequently in a small piece of land in the surroundings of Castelo de Vide, i.e., in the area corresponding to landscape area C.

From the land management point of view, landowners and neorurals (who also can be landowners) are the two main user groups more directly connected to farming. However, each group background; define whole different goals and ways to manage the land. These differences are already producing changes in the landscape.

The more traditional landowners have been responsible for the present multifunctional landscape – built upon production function only. Though, the enquiry on the land management at farm level has revealed a low capacity for innovation and low interest in other functions besides agriculture and hunting, what contributes to the maintenance of a strong dependency from the agriculture activity, where the main economical income has been originated.

Within the large scale properties of landscape area A and B, some strong trends seem to shape already the future of agriculture on these areas, as a result from both global and local factors. These point in the sense of decreasing competitiveness and decreasing support, and thus agricultural extensification or abandonment. Only hunting seems to be an alternative or complementary activity considered by large landowners – but it does not correspond to an income source capable of supporting land management on its own. The function ecotourism also underline the preference of more extensive and naturalized farmed landscape, and there may be an overlapping of interests. In fact, hunters and ecotourists prefer the same landscapes but for entirely different reasons. Hunters prefer the landscapes connected with the species they like to hunt, while the ecotourists prefer landscapes mainly for aesthetic purposes and nature expectations. Nevertheless, both groups prefer low disturbance landscapes with scarce presence of humans. Similar areas can be interesting for the two functions, but conflicts may also emerge – each group would prefer to be alone in the landscape. Further, the landowners don't take advantage in the same way of these two functions, as only hunting is considered seriously. Nevertheless, there may be solutions supported on the combination on very extensive farming, with quality products to be sold in the market, and both hunting and ecotourism activities, managed in combination, at the landscape level. These are also the type of landscapes that, is this region, present highest conservation interests, and therefore also conservation goals may be coincident. A new mode of rural occupancy, as described by Holmes (2006), combining in a specific balance protection, production, and also consumption, can be the solution for its future management. Here farming should be adapted to the other functions which may be valuable in the area, and as such also supported by these functions (Holmes 2006). The new solutions need still to be designed, and the landowners supported in implementing them.

As for what concerns small farms, the ageing of traditional farmers and the lack of incentives for the young generations regarding agriculture may increase the trends referred above. On the other hand, the small farms are being purchased by neorurals and as second houses for weekends and holidays. The unintentional multifunctional landscape built by traditional

farmers, in a small scale property structure, has become a strong attraction factor for outsiders. The new housing in this area has become a high potential function as a result of the existent landscape. And the new owners have a different attitude, other environmental and aesthetical concerns, and a different capacity of innovation and investment, since the main economical income is independent from the land property. There are contrasting trends coming out of this new type of ownership. Some new owners aim for an intentional multifunctional and extensive logic, which results in the increase of bushes and other vegetation, and thus a changing character in the landscape and higher risk of fires. Some others, both those who chose to live there and week-end visitors, are aware of the value in this landscape and the need to care for the traditional uses, and maintain traditional olive groves, or even recover shrub covered areas, or even plant new areas, or start new orchards or vegetable gardens. Nevertheless, the landscape is changing, as it is turning more in the sense of a low density residential area. With urban new owners comes also the enlargement and architectural changes of the traditional existent houses. Shrub patches and shrub encroachment of the old network of paths are increasing. And otherwise in turns into a garden type landscape, inspired on the traditional olive grove mosaic, but not oriented for production and only weakly supported in a landscape integrated vision. Here the rural occupancy corresponds to another combination of consumption, protection and production, where mainly the first is the driver, in what may be called an *amenity* landscape (Holmes 2006).

In the case of the second houses, the work in the land has here been secured by the older small farmers, working as farm workers or through different kinds of agreements. Nowadays, with the progressive ageing of those older farmers, this represents a service to be soon extinct. Not only did these farmers provide their work, but also their knowledge on the land use systems and the potentialities and limitations of the area, in agricultural terms. Without them, the new owners will be much more lost when they try to recuperate an old irrigation system or an old grazing rotation. One possible scenario for the future is that the landscape that motivated urban outsiders to live and bring their investment and innovation capacity to the area, can be changed in such degree that it may contradict the initial character of the existent landscapes. The challenge for the future is to balance and enhance the existent functions, integrating innovation in the traditional landscape, towards a multifunctional and more sustainable landscape. As such, also here new schemes of management support, or agreements, need to be set in place, if the valued qualities of this landscape are to be maintained.

5.2 Dialogue and joint action

In Castelo de Vide, the analysis undertaken demonstrates clearly the differentiation of landscape areas, which have diverging characteristics, but also different management questions and are the object of different demands. It is clear that they should not be faced in the same way in the future. Nor in what concerns farming nor in what concerns the non-commodity functions. The distribution pattern of the preferences by users may support differentiated strategies for management, and thus also the correspondent types of farming. In areas as in Castelo de Vide, it would demand that farming assumes its new territorial role – there seems to be no other way out, for the farming sector. This transition may be supported in the conceptual discussion on new core modes of rural occupancy, by Holmes (2006), supported on the work by Barr (2005) and Marsden (2003) and others. This process of transition needs also to be based on dialogue and discussion on the alternative options, involving not only inhabitants and technical staff, but all types of stakeholders dealing with the area – like the users of the landscape which have been object of this preference study.

A session of presentation of the diagnosis, and of the related discussion, has been organized in Castelo de Vide, when all results were ready (Winter 2009). The session was visited mainly by technical staff, from different bodies. The local population, as well as neorurals, ecotourists, or hunters, were weakly represented. Though, from the discussion, some interesting points for further dialogue have emerged. The landscape preference study expresses differentiated values, synergies and conflicts, that open up to a process of collaboration that still has to be developed. The local development association and the municipality board have showed more than once their interest in progressing in that sense – but this phase is still to be developed.

5.3 Exchange and evaluation

This phase has not been started yet in Castelo de Vide, even if the awareness for the need to proceed in this sense is there, among decision makers and involved partners.

6 Concluding remarks

It is not new that new possibilities for rural areas, and particularly for the most peripheric areas, are supported in a new understanding of the role of farming and the acceptance that other functions may be leading in defining land use management (Durand and Van Huylenbroeck 2003; Wilson 2007). As described by Marsden (2003), in between the *agro-industrial dynamic*, based on productivist action and though, and the *post-productivist dynamic*, which sees the rural as a consumption space and where nature and the

landscape are commodified, there could be place, in rural landscapes which are today as multifunctional as in Castelo de Vide, for the building up of a *rural development dynamic*. This would demand an acceptance of a new role for agriculture, combined with the production role, and also an awareness and appropriation by the involved actors of some values of the rural space which are lost or are getting lost in the present situation, but can be renovated (Marsden 2003). Castelo de Vide seems to gather the potential that makes this transition possible. It is still to be seen who will lead the process and how central policies and institutions will support this transition.

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Problems in agricultural landscape management arising from conflicts of interest – a study in the Trnava Region, Slovak Republic

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Abstract

The agricultural landscape of the Slovak Republic has faced significant changes in the recent years. The country's transformation from central socialist planning to the market economy represents the basic driving force behind these changes, which in turn have caused many new, not only environmental, but also social and economic problems in the region. These problems are often mutually connected. For example, the change in agricultural land utilization has had a considerable impact, often negative, on the biodiversity and landscape stability in the region, and the pollution of particular parts of the environment requires investment into the eradication of these effects and the implementation of new technologies. The closing of industrial operations having a negative impact on the environment is often connected with increasing social problems – rising unemployment and increased negative psychosocial issues, for example. It is not possible to favour the development of one area over others, i.e. to favour economic profit over environmental or social stability.

The evaluation of the present problems requires the application of new and innovative approaches. Considering the above assessment, it is clear that the usage and management of the land and its resources needs to be dealt with comprehensively, and an integrated approach should be applied. Its application in practice would contribute not only to the amelioration of environmental problems, but also to the intensification of socio-economic development of the region in harmony with the capacity of the natural resources. The new approaches and innovation were tested and applied in the study area, which is the agricultural region of Trnava, West Slovakia.

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1 Introduction

In recent years, the Slovak Republic has faced many substantial socio-economic changes, which have also been reflected in the environmental sphere. Slovakia has made the transition from central planned economy to market economy. These structural changes have also had a negative impact on social and environmental spheres and have been the cause of new problems. In the social sphere, these problems include job loss for a workforce skilled only in specifically industrial or agricultural production, rise of unemployment, and worsening socio-economic and psychosocial conditions due to these processes. The migration of populations, partly the migration of rural population to urban areas to find work opportunities, as well as the migration of urban population to rural areas in search of a better living environment, is also a relatively new phenomenon.

These processes are reflected in the changing demographic structure of the population in rural areas, in the change of their lifestyle, and also in the change of the landscape itself, including its perception. There has been in addition a major change in the structure of agriculture: the desertion of agricultural land, a drop in the intensity of agricultural production, and a rise in the pressure on agricultural land as well as on other natural resources, due to the aggressive promotion of investment projects among other things.

In the sphere of the environment, a considerable number of new problems has emerged, such as the negative impact of abandonment of agricultural land on landscape biodiversity, desertion of land, decreased population of native plant and animal species, increase of monocultures in plant production, increase of synanthropic species, rearing of high-yield cattle in livestock production, falling ground water levels, an increased load on the regional water regime, and greater pollution impact on ecological systems, as well as progressive soil compaction, erosion, and salinisation.

These problems are often mutually connected. For example, changes in land use considerably influence the extent of biodiversity and landscape stability. Emigration and the resulting demographic changes represent the major driving forces behind the changes in the use of the land.

The inherent cause of these problems concerning the agricultural landscape is the enduring sectoral approach to the evaluation of the agricultural landscape, wherein the non-functional utilisation of the agricultural land is preferred. The primary goal of this paper is to present an evaluation of the problems resulting from the encounters of conflicting interests in the rural region of Trnava.

2 Regional conditions of the study area

The study area, the Trnava region, represents a typical agricultural landscape in the Slovak Republic. The region is located in the West of Slovakia (Fig. 1). Administratively, it consists of 45 rural settlements and one urban settlement Trnava, which also fulfils the function of the administrative centre of the region. With its area of 741 km^2, it is considered a medium sized district of Slovakia. At present, the region has 127,292 inhabitants.

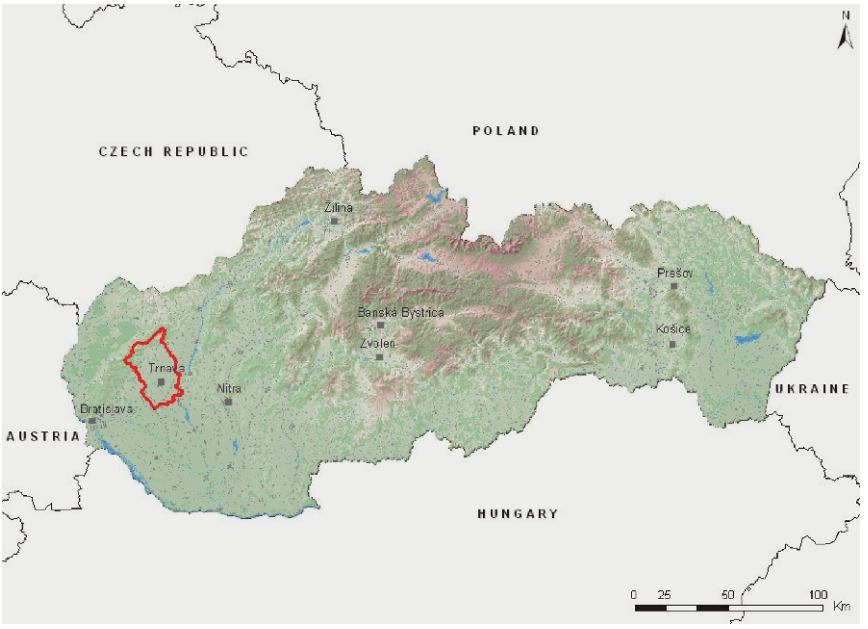

Fig. 1. Localisation of the study area.

2.1 Land use

Agricultural land dominates the landscape structure of the region. It amounts to an area 53,107 ha in size, which represents 71.6% of the total district area. Up to 93.1% of agricultural land, arranged in large blocks, is intensively exploited. Arable land covers the central and southern part of the study area. Cereals are the dominate crop on the arable land. The intensity of the utilisation of agricultural land decreased significantly after 1990, and a lot of not easily accessible locations remain abandoned. The use of synthetic fertilizers and mechanised farming equipment has also decreased significantly. Forest covers an area 13,190 ha in size, representing 17.7% of the region‘s total area. It is concentrated in the sub-mountain

villages and cadastres in the northern part of the region, and is part of the Protected Landscape Area (PLA) of Malé Karpaty. In addition to its productive functions, the forest fulfils a host of important non-productive functions in that it is an eco-stabilising, microclimatic, soil- and water-protective, and anti-erosive presence in the region. The rather significant changes in the use of the land occurred as a result of the collectivization of agriculture that took place in the 1960s. During this time, the forests were replaced by agricultural land. The land usage is presented in Fig. 2.

2.2 Natural conditions

As far as the geomorphology is concerned, the territory in question consists of two basic geomorphic units: the Podunajská Lowland (Figure 3; part of the Trnavská Hill Land and Podunajská Plain) and the Little Carpathians (Fig. 4). The Podunajská Lowland makes up the core of the territory, i.e. its central and southern parts. The Little Carpathians form the north-western boundary of the territory. The tallest elevation is the Záruby Mt. (768 m above sea level) and the lowest point (130 a.s.l.) is the mouth of the Váh River next to Šúrovce.

Two groups of Cambisols and Rendzinas are characteristic for the mountain or sub-mountain parts of the district. The most fertile soils, particularly Chernozems and Chernitsas, dominate in the greater part of the lowland. The district extends to the catchment of the lower part of the Váh River. The pattern of the streams flowing in the NW-SE direction is parallel. In terms of their runoff regime type, the streams are classified under the upland-lowland category with the rain-snow runoff regime (Atlas SR 2002).

The territory extends over two climatic zones: (i) warm and (ii) moderate (Izakovičová et al., 2006). The lowest positions of the district areas situated in the warm zone are characterized as dry to even very dry with moderate climate, while the climate of the hill lands is warm to cold.

According to the phytogeographic division of Slovakia (Atlas SR 2002), this territory can be divided into two parts: the lowland and the Little Carpathian mountain range. The lowland falls under the classification areas of the Pannonian flora (Pannonicum), the circumference of the Euro-Pannonian xerotherm flora, phytogeographical district of the Podunajská Lowland. With regard to the composition of species existing in this territory, thermophilic plants both in natural and synanthropic vegetation dominate. The territory of the Little Carpathians falls under the classification area of the West Carpathian (C*arpaticum occidentale*) flora, the phytogeographical district of the Little Carpathians. Prevalence of the Carpathian forest flora is typical for this territory. The oak, oak-hornbeam and beech forests dominate the study area.

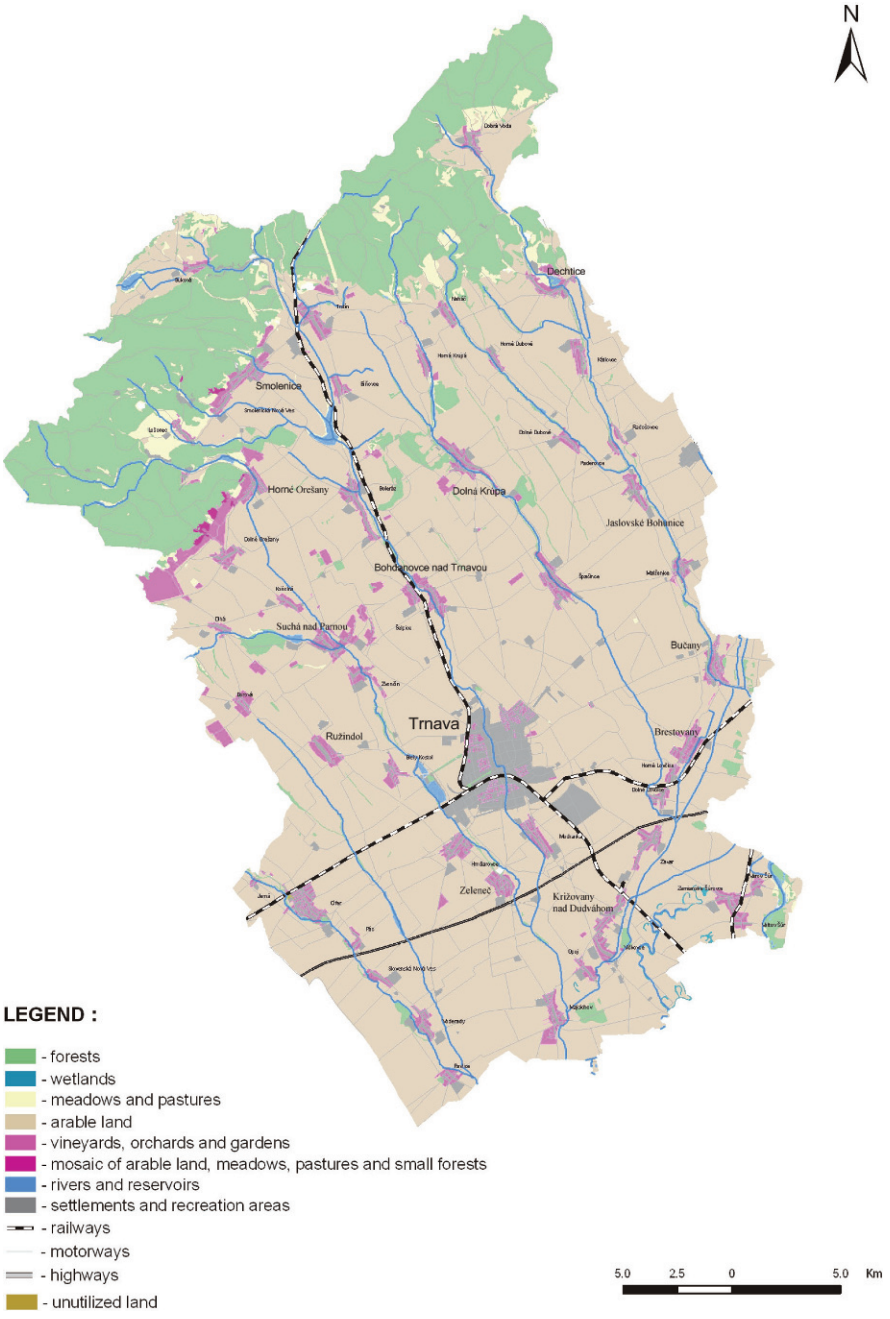

Fig. 2. Land usage in Trnava.

Fig. 3. Landscape of Little Carpathians (Photos by Z. Miklošovičová and M. Moyzeová).

Fig. 4. Landscape of Podunajská Lowland.

The territory is part of the zoogeographical area with the occurrence of steppe animals and their zoocenoses in contact with species of the Carpathian forests. It is the Pannonian section of the Euro-Siberian province of steppes with occurrence of many thermophilic species, which have spread

from refuges of the Tertiary fauna situated in the Mediterranean area. They consist predominately of populations of the Pontian-Mediterranean centre (Atlas SR 2002). The upper wooded part of the district including the Little Carpathian mountain range represents the zoogeographical province of broadleaved woods. Mixed steppe and forest fauna is typical for this area.

2.3 Natural resources and potentials

The potential and functional use of any territory is predetermined by its natural conditions and the subsequent availability of specific natural resources. In the study area, top quality soils (Chernozems and Chernitsas on loess) are prevalent, and together with the climate, offer a high potential for the development of agriculture, agro-tourism and the cultivation of wine grapes.

The northern part of the territory offers a high potential for forestry development. A portion of the forest area is exploited while another part constitutes a protected forest. Forests with special purposes cover an area of 566 ha. The greater part of these forests is situated in the north of the territory where it is linked to both large and small protected areas and zones of protected water sources.

The majority of forest canopies in the territory in question are parts of the Protected Landscape Area (PLA) of Malé Karpaty. Numerous PLAs protected under the fourth and fifth level of conservation are situated in the territory; there are three Protected Areas (PAs), eight Nature Reserves (NRs) and two National Nature Reserves (NNRs). Four localities of the *Natura 2000* system proposed for the National List of the Proposed Territories of the European Significance exist in this district. Above all the Carpathian and the Pannonian oak-hornbeam forest, caves not accessible to the public, lowland and sub-mountainous mowed meadows, and sites of Orchidaceous are subject to conservation. Three localities (Malé Karpaty, Pusté Úľany–Zeleneč and Trnavské Rybník) are among the protected bird areas of the European Significance in this region.

2.4 Demography

Rural settlements dominate the settlement structure. In terms of population size, medium-sized municipalities with populations of 500–1,500 and urban populations (54.52%) prevail in the district.

The greatest population density corresponds to the urban settlement of Trnava, where there are 971 inhabitants/km^2, with the district average being 171 inhabitants/km^2. However, population density does not exceed 100 inhabitants/km^2 in the majority of settlements.

Age structure in the settlements of the district is not favourable. Population in productive and post-productive age prevails in the majority of

settlements; children represent a comparatively small segment of the population. The vitality index is below 1 in the majority of settlements, indicating a population in regression. Only three settlements can boast a vitality index value above 1. The main cause of this predominantly ageing population is the low increase in population. The decrease in population is due largely to social and economic changes, which have led to a worsened economic situation for many families, particularly the young ones.

The situation regarding increased migration in the study area is more favourable. Recently, a marked increase in migration has been observed in the district. It is connected above all with the influx of investment into the region. In comparison to other regions, there is a notably greater foreign population, encouraged by the construction of production plants for such international firms as PSA Peugeot-Citroën and Samsung. With regard to population migration, an increased movement of the urban population to rural areas prevails.

Approximately half of the overall population (50.5%) is economically active. The majority of this workforce is employed in industry and services (41.50% and 51.69% respectively). In comparison to other districts of Slovakia, the Trnava district ranks positively in terms of unemployment. The unemployment rate in the region is 5.35%, compared to a national average of 9.9%.

2.5 Economic basis

Industry and agriculture are the principal components of the local economic basis. Industry is concentrated in the city of Trnava. Significant branches of industry include machine engineering, electrical engineering and glass manufacture, which enjoy a historic tradition in the city. Machine engineering is concentrated on the production of car and spare parts, metal facilities, and repair. The electrical engineering industry is also important here. The local food industry concentrates on the processing of domestic farm products. The local energy industry is represented by the nuclear plant in Jaslovské Bohunice.

Agricultural production is of particular significance, as the territory possesses soils of the utmost quality. The chief entities involved in the exploitation of the Agricultural Soil Pool (ASP) are the farm cooperatives together with private companies. Private farmers exploit a portion of the ASP as well. There are 192 private farmers active in the district. Private businesses in the area have been subject to a steady decline, due at least in part to the accession of the Slovak Republic to the European Union, which has had a decidedly negative impact on the conditions under which the private farmers must work and live. In spite of the fact that the district enjoys a high farming potential, employment in agriculture is negligible,

either due to the gradual curbing of livestock production, which is more labour intensive than the production of crops, or to the increased mechanisation of crop production, which has resulted in a decreased demand for labour.

Grains, such as wheat and barley, are a dominant crop due to their high yield and low production costs. Maize is also grown, as are the more recently introduced crops of oil plants and early potatoes. Cultivation of sugar beet had also been common in the past, but has completely disappeared since the accession of the Slovak Republic to the EU. A portion of the ASP (2.7%) is also used in the cultivation of orchards, gardens and vineyards. The share of permanent grassland in the region is very small. Winegrowing was also popular in the past because the region possesses favourable geographic conditions for this crop. However, due to adverse socio-economic conditions, the cultivation of wine has decreased recently. Vineyards now cover only 1.1% of the total district area.

An additional disadvantage faced by those engaged in agriculture in the region is their forced reliance upon obsolete machinery and the financial inaccessibility, especially for private farmers, of new equipment. The deteriorated relationship of the people to the land represents yet another barrier to the wider expansion of private farming in the region.

Forestry plays no significant role in the local economy, as the area covered by forest is not large (only 17.7% of the total district area, the bulk of which is included in the PLA of Malé Karpaty, already limiting its potential for exploitation. That little engagement in forestry that does exist in the region is centred on felling and partial wood processing.

Tourism has become the most dynamically developing branch of the national economy in recent years. The development of tourism has been shaped by numerous cultural, historic, natural and socio-economic factors. The natural potential for tourism in the region lies in the mountain ecosystem of the Little Carpathians, an area ideal for both summer tourism and for the development of winter sports like sledging, and down hill or cross-country skiing.

Farming prevails in the deforested central and southern parts of the region, lending this area potential for the development of agro- and rural tourism. Development of this potential is also favoured by the position of the territory along the route of the Little Carpathian Wine Road and the long-standing viticulture tradition maintained by the locals. It must be noted though, that this potential is not fully exploited, and the industry of agro-tourism remains poorly developed in the region. In recent years, however, hobby farming and weekend cottages have gained in popularity. Water bodies and reservoirs are visited heavily in summer, mostly for the enjoyment of water sports and recreation. The region does feature a great

number of cultural and historic monuments, but the development of tourism depends largely on the current socio-economic conditions, particularly where the level of service offered in the accommodation or catering branches is concerned. The network of accommodation and catering facilities in Trnava is insufficient and the quality of services is also lacking in many of those facilities that do exist.

2.6 Conflicts between nature and society

Some conflict can be observed in the region between the forces of socio-economic development and the defence and preservation of the natural environment and its resources. The problems resulting from this conflict stem mostly from the non-effective and inappropriate use of the natural resources in the study area. The various types of problems resulting from conflict between nature and society in the region have been identified as follows (Izakovičová et al. 2006):

- *Conflicts between socio-economic development and nature conservation.* In the Protected Landscape Area Malé Karpaty, the extraction of building materials is carried out directly in the protected area and frequently in other smaller-scale protected areas as well. Extraction is profitable only for the entrepreneurs and the employment rate is insignificant. It is essential that these mining activities be discontinued in the protected area. Due to the development of recreation in the area of the Little Carpathians and in the Protected Area Trnavske Rybníky, it seems likely that fishponds in this area and the fate of the waterfowl dependent upon them will be the next battlegrounds between economic development and nature preservation. Air pollution caused by the illegal release of chemicals represents a further threat to the protected areas. Illegal dumping also threatens in particular the elements of the territorial system of ecological stability (TSES) and other gene-pool localities situated close to the areas used for agriculture. Another problem is the threat to hydric biocorridors, which represent biocorridors of several grades, posed by the low level of water quality in rivers, as well as the violation of elements of the TSES by the barrier effect (the split of biocenteres and biocorridors by transport corridors or the collision of regional biocorridors with transportation lines such as highways). The disturbed spatial stability of the territory due to high anthropisation (central built-up part of the study area) and the monofunctional agricultural landscape with prevalence of arable land in large blocks with a minimum share of ecologically stable elements represents serious problems in this category as well.

- *Conflicts between socio-economical development and protection of natural resources.* In the Trnava district, the activities of socio-economic development have been colliding with the need to protect the region's most fertile land. There has been an intensive occupation of the best quality land by construction of industrial structures, industrial parks and dwellings. Paradoxically, many existing industrial structures are abandoned and unused, their economic value decreasing rapidly. In terms of sustainable development, it would be appropriate to reconstruct them and to consolidate investments. Another manifestation of this conflict is the threat posed to both surface and ground water by intensive agricultural practice, particularly by the chemicals released through agricultural activity into the water. A similarly significant source of ground water pollution is the seepage of animal waste from farms. This conflict is gradually being resolved, however, as a consequence of Slovakia's accession to the European Union, and the subsequent implementation of EU legislation and hygienic standards. The mismanagement of soil by owners and users presents still another conflict, causing the degradation of the soil especially through compaction and erosion-accumulation, among other processes.
- *Conflicts between landscape preservation and human activity.* In protected areas, i.e. zones of hygienic protection of water resources and other protective zones, limits have been placed on the use of these areas, which frequently affect socio-economic development as well as the development of urbanization. In many cases they are the zones of limitation for property or utilization right. Compensation for the loss of profit is not provided. The need to solve this social problem is becoming increasingly urgent.
- *Conflicts between socio-economic development and quality of environment.* On the one hand, there are industrial operations in Trnava, which are significant sources of employment and constitute the economic fundament of the region; on the other hand, however, they represent a heavy burden on the local environment. At present in the Trnava area, there are 39 major and nearly 230 mid-grade sources of air pollution. Every year, 249 metric tons of solid elements, 116 tons of sulfur dioxide, 513 tons of nitrogen dioxide, and 1,055 tons of carbon monoxide are emitted into the air. More than a half of the major sources of this pollution are located in Trnava. At present it is impossible to put an end to them, because this would likely result in a dramatic rise in unemployment as well as a drop in the economic efficiency of the region. For the sake of sustainable development it is necessary to install more effective technologies limiting the production of pollutants. An additional problem caused by human activity in the region is the violation of the

aesthetic quality of the environment through the reduction of agricultural land to mono-functional use.
- One cause of the problems cited above is the general difficulty of reconciling the unilateral, mostly economic interests seeking to exploit the resources and potential of the area. Stated briefly, the basic conflict is a conflict of interests.

3 Innovation and a new strategy

Land used for agriculture currently represents the most significant part of land in terms of area. Any attempt to solve the problems resulting from the clash of interests in the region will require the application of sustainable landscape management. The primary tool for the practical implementation of sustainable landscape management is *integrated* landscape management. Integrated landscape research must aim to evaluate the land based on its three interdependent dimensions: environmental, social and economic, analysing the connections and dependencies between these dimensions with the ultimate goal of defining landscape management as such that it would regulate the socio-economic development of the land in harmony with its natural, human, cultural and historical potential. It is based on matching the offer, which is represented by the resources of the region, while the demand is represented by the needs of the community for growth and development. The discrepancy between the offer and the demand, irrespective of the properties of landscape resources, is the determining factor of not only the environmental but also the human problems in the region. The approach should be focused on solving the current problems and on the prevention of new environmental and socio-economic problems, as well as on developing a long-term perspective with an eye towards the rational and sustainable utilisation of the region's natural and cultural-historical resources.

The aim of integrated landscape management is to create a landscape management strategy such that the focus is the improvement of the overall quality of life, respect for the natural environment, landscape stability and biodiversity, the protection and rational usage of the natural, cultural, and historical resources and environmental protection in region.

Integrated landscape management is based on seeing the landscape as the integration of natural resources in a certain area. This area represents the integrating scope or scene in which all resources are occurring in layers – geological resources, water and soil resources, climate, biotic resources, and morphometric parameters. Space is interpreted as integration of the natural resources in a given area. Every point on the earth's surface represents

a specific homogeneous entity of mutual combination of the above-mentioned resources (landscape-forming components, which, through their attributes are capable of satisfying human needs and as such act as natural resources in relation to human society). Central to this process is the understanding of the landscape as a geo-system – a complex of natural resources (Miklós and Izakovičová 1997). The core of the evaluation is therefore the decision-making process based on establishing a delicate balance between the complex qualities of the landscape and the demands and impacts of human activities on those qualities.

Sustainable landscape management is a process that aims to reach the optimum organization, utilization and protection of the landscape. As such it aims to suggest the most suitable locations for human activity within a given territory, and to see that, following the development of the location, the necessary measures are put into place to ensure proper functioning of those activities in the given locality. Therefore, it is an approach that tackles the *where and how* questions in order to ensure that human activities in a given territory are as compatible with natural conditions as possible (Miklós et al. 1985).

The aim of the landscape-ecological optimalisation in the region is therefore to manage the current landscape-ecological problems resulting from the encounters of various disparate interests by creating a system in which natural resources are used in a rational way.

The basic aims of innovation in the region are:

1. *Increase and preservation of the overall ecological stability of the landscape* is the most general but complex condition for conserving the gene pool, biological diversity, stability and the natural functioning of ecosystems. Through that, the conservation of the natural productive capacity of the landscape is also achieved. The preservation of ecological stability is therefore primarily achieved through the landscape-ecological optimisation of the spatial structure of landscape – through the appropriate distribution, utilization and protection of landscape elements. At present, the disturbed spatial stability of the territory, due to the high anthropisation in the central built-up part of the study area and the monofunctional agricultural landscape with its prevalence of arable land in large blocks with a minimum share of ecologically stable elements, also represents serious problems in the region. The protected area, elements of the territorial system of ecological stability (TSES) and other eco-stabilizing areas are threatened due to the expansion of recreational activities, the exploitation of raw materials, the release of chemical pollutants into the air, and illegal dumping of waste. The increase of territorial ecological stability is a basic condition for sustainable development in region.

2. *Protection and rational utilization of natural resources*, in particular of air, water, soil, biotic and mineral resources. The state of natural resources is determined by their quantity and quality conditions. The protection and rational utilization of natural resources can be realized partly through the optimal collocation of resources and activities in the area and by application of the appropriate technologies, i.e. eco-technologies. Most of the evaluated freshwater streams in the region have been categorized under the fourth and fifth level of pollution, indicating high and very high levels of water pollution. Sewer drainage from industry and canalisation are the chief contributors to the pollution of local streams. Two uncontrollable and very dangerous sources of water pollution are illegal waste dumps and runoff of chemicals used in agriculture.
3. *Improvement and protection of the local human environment*, meaning preserving the quality of air, drinking water and the food chain, as well as the aesthetic quality of the environment, while reducing negative influences like noise, radiation and waste. The protection of the environment against unfavourable influences requires primarily the optimisation of the technological processes used by the production branches of industry, whereas the preservation of the aesthetic quality of the environment indicates primarily the optimalisation of land cover.
4. *Innovation in the development of agriculture, bioenergy and tourism in the region* – The goal of sustainable development in the district must be the specification and calibration of measurements according to the specific spheres and activities relevant for the given region.

- *Tourism:* Promotion of a competitive and sustainable tourist industry based on the natural and cultural-historical potential of the region. Concentration on cognitive, congress tourism, and agro-tourism (for example, to make use of the Little Carpathian Wine Road).
- *Agriculture:* Support for the competitive agricultural entities to ensure a sufficient production of healthy foodstuffs with the effective use of the most fertile soils and labour force with respect to the protection of nature, stability and biodiversity, natural resources and a healthy environment. Agriculture is the sector with the ideal conditions for the production of biomass in the region:
  - Straw biomass from cereals, oleiferous and energetic plants – burning and combustion
  - Seeds of oleiferous plants and of cereals, as well as root crops – liquid biofuels
  - Wooden waste from vineyards and from self-sown wooden species on permanent grassland – burning, combusting

- Yard dung, dungwater – biogas
- Green plants, silage and hay – biogas.

Apart from phytomass and dendromass, waste biomass is available from livestock production, consisting primarily of animal manure. That of cattle, sheep, goats, pigs and poultry is suitable for energetic exploitation.

- *Forestry:* In consideration of the region's low forest coverage and the location of essential forest ecosystems in the Protected Landscape Area Malé Karpaty, it is necessary to ensure that forest management activities support the priorities of non-productive forest functions.
- *Settlement development:* Promotion of innovative and progressive management based on the principles of democracy, mutual understanding and solidarity, ensuring the optimal quality of life for the people.

The principles of integrated landscape management are generally widely accepted, but in real practice their consequent application is very rare. Such is the situation in the Slovak Republic as well, despite the fact that the development of integrated landscape management in the region is also supported by the EU's Rural Development Plan (2007–2013).

4 Research action process

A project group has been assembled, comprised of an interdisciplinary team of researchers from the Institute of Landscape Ecology at the Slovak Academy of Sciences, as well as policy makers and local stakeholders. The group has ample experience in the field of integrated landscape management. The methodology of landscape-ecological planning – LANDEP (Ružička and Miklós 1982), elaborated upon at the Institute of Landscape Ecology, SAS – was mentioned in AGENDA 21, Chapter 10 as one of the recommended methods for the integrated control of natural resources in the region.

Research and introduction of innovation will consist of three basic working phases.

4.1 Situation analysis and diagnosis of the region

The aim of this analysis is the elaboration (textual and graphic) of the basic features of the components that make up the landscape in the study area. They represent the choice, creation, assessment and spatial differentiation of the indices of these landscape features and individual components of the landscape.

On the basis of content, the elaboration of these analyses can be divided into three basic blocks:

1. Resource analysis – characterizing the basic conditions and possibilities for land development. The focus here is on the evaluation of the qualitative and quantitative properties of individual resources in the study area and their spatial differentiation, which determine their potential and spatial basis for development.
2. Sectoral analysis – analysis aimed at the evaluation of the current state of development in particular sectors, including an examination of the application of innovation to agriculture, industry, tourism, services and so forth within each sector.
3. Analysis of the use and protection of resources – identifying the present state of the use of individual resources in the study area, the aim being an assessment of the impact (positive or negative) of human activity on individual resources.

The end product of these analyses will be a set of proposals for the effective application of innovation such that it supports a strategy of sustainable development in the Trnava region.

The core mission of sustainable landscape management is to ensure the landscape-optimal use of the land in question. However, sustainable landscape management is a wider and more complicated issue, and its effective implementation must include the following additional steps:

- The implementation of technological advancements – to establish effective technologies focused on eliminating excessive production of pollutants with the goal of minimising the impact of allochthonous substances and other contaminants on the respective environmental elements. Also necessary is the application of the appropriate technologies in agriculture and forestry, as well as in the development of bioenergy production technology.
- The sector-by-sector regulation of plans for development and land use – placing regulations on the usage of the particular resources by production and non-production entities is necessary if showing preference to the development of one area over another and if conflict of interest issues are to be avoided.
- The campaigning for public awareness of the principles of sustainable development, primarily by stakeholders and policy makers – the goal being to create an effective system of education promoting sustainable landscape management and sustainable development among the people of the region. Only a sufficiently educated public is able to put the principles and criteria of sustainable development into practice. The environmental and legal awareness of the region's populace is currently still

lacking. The majority are unfamiliar with the basic strategic developing documents, and are unaware of the environmental laws, their rights and responsibilities. Members of local government such as city mayors are likewise ignorant to this information. The region consequently suffers from a lack of a positive attitude towards natural and cultural values, resulting in the threats to the environment posed by the dumping of waste and other forms of general environmental degradation.

4.2 Dialogue and joint action in innovation implementation

The second phase of the project will focus on the development of creative dialogue between different groups of local stakeholders.

Stakeholders in the region can be divided into the following categories:

- Policy makers on the national, regional and local level – who have the ability to transfer the scientific knowledge to the decision-making processes at the regional and local levels,
- Planners, designers, and representatives of the state administration – who can transfer the scientific knowledge to the sectoral documents,
- Individual entrepreneurs – who will have the final task of putting the innovation into real practice in their individual enterprises, working processes, and so forth,
- Association of the Small Carpathian Region – this is an association of representatives from the individual rural settlements, as well as businessmen and entrepreneurs from the region. The basic goal of this organisation is to promote cooperation between the individual interests of the region and to coordinate activities aimed at sustainable development. It will cooperate on the elaboration of a strategy for sustainable development and will provide for communication between scientists and policy makers,
- Educational institutions – which will provide the transfer scientific knowledge to the educational process, developing the environmental awareness of the public,
- NGOs – which will be responsible primarily for the control of the processes involved and for activities promoting and popularising the goal of sustainable landscape management. They will play a significant role in creating environmental awareness among the people of the region and in the realisation of activities for the improvement of the human environment.

The research project will establish the formal framework for cooperation between these different groups of stakeholders in the region. The goal of this cooperation will be the transfer of scientific knowledge and innovation into real practice.

The proposed innovation will be tested in the model territory – a study area in the village of Suchá nad Parnou. The Institute of Landscape Ecol-

ogy already has an established relationship with this village. It has worked in cooperation with the municipality and Parish administrations, with the Hunting Association Zelený Háj, with the local school and with local entrepreneurs. These organisations have collaborated in the realisation of several environmental projects, including the recent and very significant joint-establishment of the Natural Environmental Laboratory, and of the Model Elements of the Territorial System of Ecological Stability (biocentre and biocorridor; Figures 5 and 6) in the village of Suchá nad Parnou.

Fig. 5. Eco-centre Suchá nad Parnou.

Fig. 6. Urban biocentre Suchá nad Parnou.

4.3 Exchange and evaluation of innovation

The third phase of the project will focus on the evaluation of innovation, exchange of experiences and dissemination of results. The evaluation of

the innovation will be realised on the basis of indicators. The set of proposed indicators must respect all three pillars of sustainable development – environment, social and economic (Agenda 21 1996). The set of indicators will be proposed by the organisations that participated in the project. The indicators will then be re-evaluated by the stakeholders (policy makers, experts, local users, representatives of NGOs). The personal interview, questionnaire and stakeholders workshop will be used as a basic tool for evaluation of the indicators and the proposed innovation. Experts will review the proposed innovation as well.

The exchange of experiences and dissemination of the results will be realised through the following means:

- Presentation on web pages
- Presentation of results in the scientific journals
- Presentation of information in the media
- Organisation of press conferences
- Organisation of workshops
- Organisation of excursions
- Printing of informative booklets and leaflets

A more detailed dissemination plan will be proposed in the future.

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Harmonization of agricultural intensification with long-term ecological integrity in Croatia

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Abstract

Rural areas in Croatia have great resources in the shape of natural assets and landscapes, which is an excellent basis for the economic development and rural employment. In this context, integrated water resources management is an issue of high significance. The prevailing system of uncoordinated water resources management cannot sustain the increasing water needs of the various expanding factors. This study focuses on the activities cut across the rural, environmental and socio-economic issues of water resource management in Zadar region (Croatia). The problems associated with inadequate management of natural resources have to be solved systematically by a participatory approach established on several key issues: (1) agricultural development with strengthening farmers' organization, (2) rural infrastructure by investment in irrigation infrastructure, and (3) irrigation related environmental and social measures. The review of institutional and legislative support to optimize performance of the irrigation system was done, as well as the measures that promote sustainable use of natural resources.

1 Introduction

One of the main goals of the EU common agricultural policy is to establish an agriculture harmonized with the natural resources of a region and the needs of the wider community that constitute the all-encompassing rural landscape. Agriculture is recognizable as an activity whose primary role of food production has become merely one of its many roles, from preservation of landscape beauty to meeting the increasingly more demanding requirements for food quality and safety. As the agricultural policy of the Republic of Croatia strives to follow these trends, in its strategic documents and legal

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regulations increasing attention is being paid to development of rural regions. Although still in the initial stage, these endeavours lead to an integral and multidisciplinary approach to rural regions development where until recently agriculture was the main and almost exclusive source of employment and earnings. The increasing deterioration of the natural resource base, especially inappropriate water management, represents a serious treat to both agricultural production and nature protection. The proclaimed strategic goal of rural development measures is to create favourable living conditions in order to stop depopulation and attract new population. In this way, the importance of promoting dialog and joint action among members of the agriculture and rural life community, at both national and regional level, was stressed. In a spirit of over-arching InnoLand concept, this study discusses the way to re-energize countryside by innovations in production and environmental protection.

1.1 The status of agriculture and rural life

Croatian agriculture is characterized by a years-long downward trend in production, unbalanced supply and demand, constant negative foreign trade balance and gradual decline of its share in the GDP. Lack of competitiveness of the current agriculture is a result of the low technological level of production, small crop-production parcels, small number and poor maintenance of amelioration systems and low yields. Frequent droughts incur agricultural damages and at the same time agricultural areas are insufficiently irrigated, making use of a negligible part of water potentials. Part of the problems associated with inadequate management of natural resources has to be systematically solved. It is expected that the measures of systematic organization of agricultural infrastructure, consolidation of agricultural areas and introduction of irrigation and new production technologies will result in more efficient agricultural production. This will also instigate changes in the production structure through introduction of profitable crops, which are mainly imported today, and will ultimately have a favourable macroeconomic effect.

Marked diversity of different parts of Croatia and the associated different socioeconomic problems make it necessary to start solving the said problems in smaller regional units earmarked as priority areas. Problem of depopulation of rural parts and abandonment of agricultural land is especially pronounced in Zadar region, which besides intensive tourism used to be characterized by lively agricultural production. Depopulation is the main constraint to the development of the area. Such circumstances discourage investments into communal infrastructure; abandoned rural landscapes are unattractive to visitors, with an adverse reflection on catering and tourist activities. Also, remote areas overgrown with weeds and low

forest underbrush pose a constant risk of forest fires. To conclude, abandoned parts of neglected landscapes with low prospects of being provided with infrastructure discourage settlement or retention of the current population.

Major constraints to the development of agriculture, not only in Zadar region but in the whole country, are small farms and fragmented land, cultivation in consociation, shortage of irrigation water and lack of irrigation systems, production organization, product marketing and processing, and selection of crops according to market demands. In the former state (before Croatia gained independence) agricultural infrastructure, including irrigation, was mainly accessible to state-owned enterprises. Private farmers, though they used most of the arable land, had no access to this infrastructure.

1.2 Efforts made by national and regional policy

Agricultural and rural development issues are playing a more central role in national development plans, and Croatia are developing policies and plans to improve agriculture and encourage rural development. Among these actions, the National Project of Irrigation and Agricultural Land and Water Management in the Republic of Croatia (NAPNAV) (Romić et al. 2005) was initiated by the Government of the Republic of Croatia being aimed to find a systematic solution to the problems of low technological level of agricultural production and inadequate management of natural resources at the national level, and to make equal the production conditions for state-owned enterprises and private producers. Pursuant to this strategic document, units of regional administration (counties in case of Croatia) were assigned the role of coordinating interests of institutions managing public goods and natural resources, on the one side, and interested agricultural producers on the other side. In the implementation of the National Project, Zadar region has committed itself to harmonizing individual requirements with the development plans and irrigation plans for the County as well as to solving a series of operative problems relating to the National Project implementation (Romić et al. 2007).

1.3 Research focus

The common aim of the InnoLand program is to enhance the sustainable development of rural landscapes in Europe where the boundary conditions for land use are being drastically altered. The core issue of the European Innoland network is to develop an integrative approach nesting the landscape level issue within the regional socio-economic and natural conditions. As the contribution from Croatia to the approach the common InnoLand goal, this chapter describes the planning of the construction of an irrigation system for agricultural areas in Zadar County,

aimed at improving the current agricultural production and exploiting natural resources in a sustainable way. It's an objective of the medium-term national strategy towards sustainable improvement in agriculture and rural life. This can be accomplished by the dialog and joint action among government ministers, regional administration and different business entities, particularly organisations linked to rural areas, as well as members of scientific and academic communities.

The overall objective of the study is to promote an integrated and balanced water resources through innovative institutional solutions in ecologically and economically viable irrigated agriculture.

The study is divided into four phases:

1. A detailed spatial analysis of the region and evaluation of natural resources;
2. Current state of agriculture, irrigation status and needs of modernization;
3. Definition of priority areas for irrigation and assessment of the size of coverage, and
4. Estimation of the socioeconomic effects of the construction and application of the irrigation system.

2 Case study area: regional conditions

The total area of Zadar region is 3,643.33 km^2 with 162,045 inhabitants. It has an important geographic position in the central part of the Croatian Adriatic coast, where it connects the northern and southern parts of the Croatian littoral as well as southern Croatia with its other parts (Fig. 1). About 3,632.9 km^2 of the water area of the Adriatic Sea also belong to the County, which is of great transport and economic importance for the region, enabling its connection with almost all parts of the world. The City of Zadar is the County centre and the fifth largest town in Croatia. The region has a very complex spatial structure as a result of diverse geomorphologic units: numerous islands, channels, straits, sea penetrating deeply into land, indented coast, fertile soils of Ravni Kotari and karst of the hilly-mountainous part. An outstanding geomorphological feature of Ravni Kotari is the Lake Vrana.

Resources and the environment play the major role in rural development initiatives. Therefore, the environmental conditions of the area have been analyzed first.

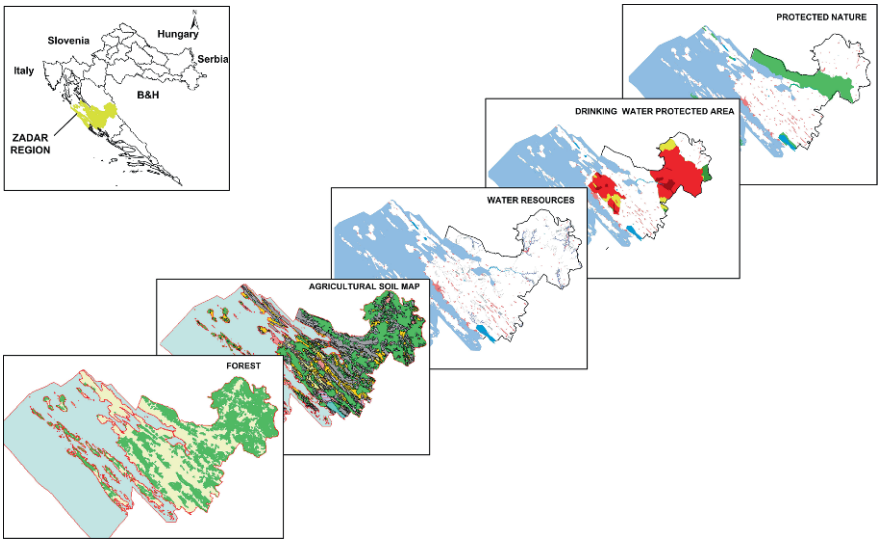

Fig. 1. Geographical setting and environmental features of Zadar region.

2.1 Geology and hydrogeology

Geological structure of the region is characterized by Mesozoic rocks in its inland part and by younger Mesozoic and Cainozoic deposits in the coastal part. Old Palaeozoic, Permian and Carboniferous rocks crop out in higher parts of Mt. Velebit. Calcareous Jurassic, Cretaceous and Tertiary rocks prevail, notably limestones. Triassic, Jurassic and Cretaceous deposits prevail in mountainous parts. Lower parts of valleys are filled with younger deposits (flysch) dating from the Eocene, Pleistocene and Holocene. Geomorphology of the region can be divided into several parts, each having its own specific features (Fig. 1). Different development potentials are predetermined by the specifics of natural-geographic, demographic and economic characteristics of each of the spatial-developmental units.

Hydrological regime of the region is typical of karst areas. Most of the terrain is built of pervious calcareous deposits and the watercourses are related to the presence of impervious deposits (Eocene flysch and Quaternary deposits). Only their end parts are of permanent character. The complex relief and karst characteristics of the region resulted in complex surface and underground hydrography, with a number of catchment areas. River Zrmanja is certainly the main watercourse of this area. Lake Vrana (surface area 30 km^2 and only about 3 m deep) lies parallel to the coast and is the largest natural lake in the Republic of Croatia. The catchment area drained through several permanent and occasional streams spreads over an

area of about 480 km^2. Lake Vrana is a cryptodepression and provides a huge accumulation space into which water is drained through natural surface and underground conduits or through manmade canals. The lake is an ecologically valuable and sensitive area, protected by its Nature Reserve status (wildlife and migratory bird sanctuary and an important water resource of the whole region). The Vrana basin is also the area where modern organized agriculture has the longest tradition. Lake water is naturally brackish because of the proximity to the sea and permeability of the karst barrier. Most waterlogged areas and bogs have been turned into agricultural land while the remaining bog habitats are now nature reserves.

2.2 Climate

Its climate diversity allows Zadar region to be divided into two parts, a littoral and a land part, with a number of different climate transitions. The littoral part has generally warm and dry summers and mild and rainy winters – characteristics of genuine Mediterranean climate. The hinterland part is characterized by sub-Mediterranean climate with colder winters than in the coastal part and on the islands and greater diurnal and annual temperature fluctuations. Mean annual air temperature at the Zadar Meteorological Station, for a 24 year period (1981–2004), is 15.2ºC. January and February are generally the coldest months of the year with an average temperature of 7.2ºC and mean monthly temperature fluctuations of 4–10ºC. The air is dry and the average annual insolation is 2,626 hours. Average annual precipitation is about 1,000 mm. Maximum monthly precipitation occurs in November and the largest part of annual precipitation falls in the cold part of the year – a characteristic of the maritime regime. Total annual evaporation for Zadar is 1,600 mm, of which about 60% occurs in the warm part of the year – in June and July. Due to unfavourable distribution of precipitation over the year and small amount of precipitation in the growing season, drought periods are common in the Zadar region.

2.3 Soils and agricultural land use

Soil types vary widely in the region. According the soil map of the scale 1:50,000, 17 soil types were identified as well as 77 soil type sub-units, on the sub-type, variety or form unit base. A part of the land was hydroameliorated by open channel network.

About 59% of land in the region is used for agriculture (Table 1). The type of landscape is mostly directly associated with the type of agricultural production. A vast amount of the area is pastures and grasslands in hilly and mountainous part, which is mostly very sparsely populated. Arable land is concentrated to the fertile fields (“polje”) in the southern part of the County.

Table 1. Structure of the agricultural land use in Zadar region.

Agricultural land category	Area (ha)	Percentage
Total area used for agriculture	234,256	100%
Total arable land	26,189	11.2%
Abandoned arable land and gardens	9,194	(35.1%)*
Orchards	2,443	1.04%
Olives	2,817	1.20%
Vineyards	4,180	1.78%
Meadows	11,868	5.07%
Pastures	186,759	79.7 %

*Percent of total arable land

2.4 Water resources

A characteristic of the Zadar region is that it generally has sufficient precipitation in a year which, due to pervious terrain, remains very short or not at all on the surface. Water infiltration from the surface into the karst underground is fast and obstructs or in places prevents surface flow, formation of open watercourses or occasional natural lakes. Groundwater should be generally regarded as important and more or less exploitable natural accumulation of water. Mediterranean countries with much lower precipitation and higher air temperatures have been extensively and efficiently using karst groundwater resources for years. Croatia and so also the Zadar region are rich in groundwater reserves, of which use will be made in the future. The main reason for insufficient exploitation of groundwater is that its reserves and characteristics are still greatly unexplored. On the other hand, parts of the Zadar region are of strategic importance as zones of drinking water reserves.

Two catchment areas are especially rich in groundwater: Bokanjac-Poličnik and Vrana field and lake basins. Groundwater from the Bokanjac-Poličnik catchment area is already partly used. Only a negligible part of groundwater is used in the catchment area of the Vrana field and lake. Groundwater reserves outside these two catchment areas are much smaller. There are also three artificial lakes. Most of the once large and often malarious swamps and bogs have been dried out and turned into fertile land. There are large groundwater reserves in karst.

2.5 Protected nature

Zadar region has a total area of 208,218.8 ha under forests and natural heritage reserves. The plan of intensifying agricultural production by applying irrigation cannot be implemented on such areas. Among spatial restraints are also drinking water protected areas.

Official Gazzete (No. 55/2002) envisages three drinking water protected areas. Statutory regulations restrict agricultural production in water protected areas I and II. Of the overall 120,156.7 ha of land area under the drinking water protection, 8,783.5 ha are in I and II zones where no irrigation projects are foreseen.

Another serious problem, a consequence of the Croatian Homeland War, is the presence of mine infested areas. According to the data of the Croatian Mine Action Centre, 1,250 km^2 of the Republic of Croatia are still mine infested, of which 8,621 ha are in Zadar region. Some of the mined areas are agricultural land, on which the irrigation project cannot be implemented. When appropriate conditions are created, also such parts, if suitable for irrigation, will be integrated into the irrigation system.

2.6 The economy and structure of the region

The OECD's definition of the rural area is based on the proportion of the population living in municipalities with a population density lower than 150 inhabitants per km^2. For Zadar region it means that more than 90% of the population lives in rural areas. By this definition, the only parts not classified as rural are City of Zadar and four municipalities located close to Zadar.

What's more, agriculture has always been a major activity in the region, so its development is directly connected with the development of agriculture. The period of economic transition as well as the occupation of the largest part of the region during the Homeland War had an expressly adverse impact on the system of demand and supply of agricultural products. Collapse of the majority of state-owned companies engaged in buying, processing and selling agricultural products left the remaining fruit and vegetable producers almost without a market.

Before the Homeland War, Zadar region had a very intensive agricultural production. Besides production of early vegetables and fruits for fresh consumption, large quantities were intended for processing industry. Due to combat activities that went on in a large part of the region, most agricultural land were devastated and deserted. In addition, a large number of mine fields make the rehabilitation of the production more difficult. The number of inhabitants is significantly reduced compared to the period of the 1991 census. Certain attempts to revitalize production were made in the post-war years, but the pre-war level has not been reached, not even closely. The advantage of Zadar region over the other parts of Croatia is the possibility of growing various fruits, their earliness, good quality, stable production, good traffic connections and tradition of agricultural production. However, the biological potential of the region is not sufficiently exploited.

Pursuant to the agricultural census of 2003, in the overall agricultural land (18,987 ha) cultivated in Zadar region there are 79,376 agricultural parcels owned by 14,392 households. Compared to most EU countries, family farms in Croatia are six times smaller than the average size of agricultural land of farms in the EU. In line with the yields achieved, production is mainly at a low technological level. According to the data of the Central Bureau of Statistics, yields of all crops are far below those achievable by the current level of agricultural management practices and the genetic potential of modern cultivars. The situation is more favourable for perennial crops, which may be attributed both to agri-political measures and the market demand.

3 Rationale for the selection of the study area

3.1 Land use – challenges and needs

The region has more than 52,000 ha of cultivated land and this natural and economic resource demands systematic financial, technological and scientific support. In some parts of the region agriculture with animal husbandry is the only major resource on the basis of which plans should be made to increase the number of inhabitants, develop settlements, raise the standard of living, etc. The great potential for rural tourism (wilderness activities, hunting, leisure fishing) has not been fulfilled. The main reasons may be found in depopulation which has contributed to a deterioration of social and economic conditions in the remote parts but also in the vicinity of very attractive Adriatic Sea coastal area.

Rural areas vary widely in the different part of the region. The type of landscape is directly associated with the agricultural activities and the use of land. Livestock farming is concentrated in the hilly-mountainous area. Coastal parts and the islands tend towards urbanization and tourism and agriculture mainly involves growing of early vegetables, grapevine, olives and other Mediterranean fruits, as well as fishery. Agricultural land in Ravni Kotari and the area around Lake Vrana covers a total of 11,590 ha and is the most important production area of the Croatian littoral in terms of size and quality (Romić and Tomić 1997). This is a favourable area for intensive production of profitable vegetable crops. Field crops are grown in part of the Vrana basin and in other, less developed, fields.

In spite of the great agro-ecological potentials, it is though difficult to establish intensive agriculture at the current level of the land consolidation. Poor land consolidation in general means longer labour time, less chance to use machinery and access the public infrastructure. The rural economy is characterized by a large number of small farms run by their owners and

it is unusual to have any employees. Family farms, which own 91% of arable land, are small and parcels are highly fragmented. Each of the 14,413 household users cultivates on average 1.46 ha of agricultural land on 5.5 parcels of an average size of 0.24 ha. This is much lower than the national average of 1.9 parcels per household of an average size of 0.45 ha, and six times smaller compared to the average parcel size of EU farms. There are only 21 agricultural companies as legal entities. Besides these main constraints for efficient agriculture, other include growing in consociation, unorganized market and lack of processing facilities and, above all, lack of irrigation water and irrigation systems.

3.2 Innovations in irrigation management

Application of modern production technology with irrigation would certainly eliminate the mentioned restraints. The first action to be taken is enlargement of production parcels as well as of the overall area under family farms. This can be achieved by land consolidation, which is a costly measure that family farms cannot afford. Therefore, like in most of the EU countries, the government should get actively involved in the land consolidation process. The objective of land consolidation is to merge farms into larger production units, respecting the future basic canal and road networks, shape and size of the newly created production areas in compliance with soil properties and suitability for production, the windbreak belt system, drainage systems, irrigation potentials, etc. Such organized area would enable modern production giving equal conditions to both state enterprises and private farms.

Irrigation system functioning cannot be conceived without a well organized service that would manage the water distribution to sections and production parcels. Similar organization should be applied to other fields as well. Besides merging agricultural land, building new road and canal networks and application of other ameliorative practices, implementation of consolidation will also regulate the property-rights relations and produce a new land register and cadastre.

Drainage has to be installed on the land potentially available for irrigation. Such areas are currently neglected or are used extensively and after drainage installation could be used as irrigated plough-fields. All proposed interventions would greatly increase agricultural production and contribute to the rural area development.

After applying irrigation the structure of agricultural production would be orientated to the profitable crops production. The region has great potentials for growing of fruits and grape. Besides wine grape varieties, the region is suitable for table grape production. From 60 to 100 ha of new vineyards are planted annually, owing mainly to government incentives

and subsidies. New table grape vineyards have not been planted systematically, mostly because of unorganized market and high initial investments. It is worth mentioning that the number of registered wine producers bearing appellations of controlled origin is continuously increasing. Zadar region is a traditionally fruit growing area, famous especially for sour cherry Maraska cultivation. Most of the plantations were destroyed during the war and today there are only about 150 ha under peach and nectarine. Unorganized market and uncontrolled imports of agricultural products decrease interest in this production. It is assumed that it will not be established on more than 50 ha in the next 5-year period. This means that total areas will not exceed 200 ha, with annual production from 3000 to 4000 tons. Irrigation is crucial in peach and nectarine production, especially for mid- and late season ripening varieties.

4 Irrigation development – policies, priorities and expected effects

The basic concept of the NAPNAV comprises several dimensions of project initiatives. As regards rural development, the human dimension is usually placed in the foreground. As already mentioned, the project was initiated with the aim to improve the management of natural recourses, to organize agricultural infrastructure for applying irrigation and introducing new production technologies. Implementation strategy (Romic et al. 2005) defines the competences of all participants in this process (Fig. 2). Besides the existing institutions such as the public water management enterprise *Croatian waters*, establishment of new institutions at national level is foreseen. In line with the EU practice, one of such institutions is the Irrigation Agency, which would be in charge of the organization, financing and implementation of the project.

Operative requirements relating to project implementation will be solved at regional level (counties). The most important project participants are its end users – family farms, cooperatives, associations and legal entities. They are directly interested in project implementation and are instigators of the construction of particular irrigation systems. Priority criteria are defined as well (Fig. 2).

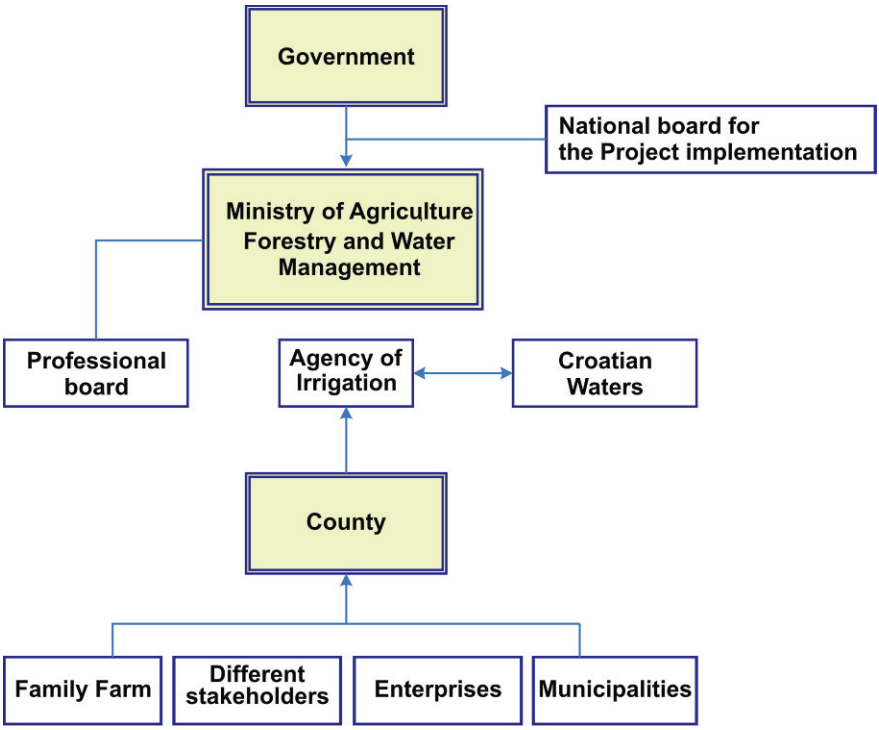

Fig. 2. Institutions participating in Project implementation – Nomination procedure.

Sound education, training and technical assistance programs are essential to sustainable irrigation practice. Few irrigation managers are adequately trained and those that are, are often civil engineers with little experience in agricultural science. Government agencies along with universities have a task to deliver the required training. Therefore, the project will certainly contribute also to rural capacity building because, in addition to employees of the system maintenance services, the education program foreseen by the project includes also owners and users of land intended for irrigation. End users must know how to apply modern irrigation methods and technologies, including selection of irrigation equipment, elements of water dosage and evaluation of irrigation efficiency. It is foreseen that educational programs will be tested through pilot-projects, two of which are located in the Zadar region.

The challenge for irrigation development is not solely the responsibility of public irrigation development agencies. Increased involvement of the private sector has often resulted in higher efficiency and profitability. Full implementation of this measure will certainly create new job opportunities

either in water management, agricultural extension, administrative and technical services at national level or directly in agricultural production. Irrigation development does cause major changes to social and institutional processes.

Procedure of defining priority areas for irrigation proceeded in several phases, and a number of criteria were applied. The most important ones were natural soil and water potentials, water deficit and socioeconomic factors. Model scheme for designing the irrigation priority map for the Zadar region is shown on Fig. 3.

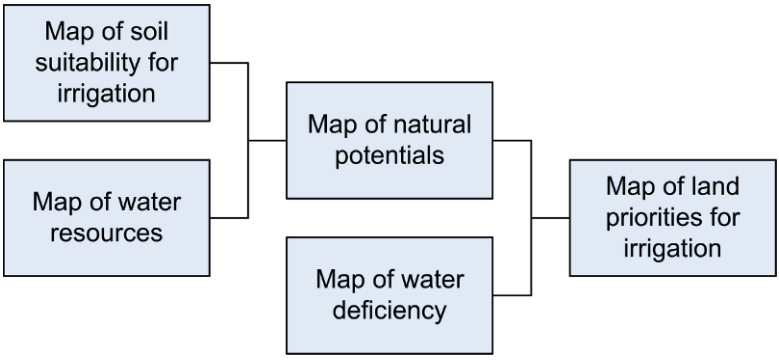

Fig. 3. Model scheme for designing the irrigation priority map for the Zadar region.

Furthermore, change in the structure of agricultural production with irrigation imposes the issue of sustainable resource management. Research done by Romic et al. (2007) showed that about 87,000 ha or 40% of all agricultural land of the region is suitable for irrigation (Fig. 3). Depending on the irrigation priority class, besides consolidation, areas should be also improved by hydroamelioration: protection from surplus surface and flood waters, embedding of pipe drainage, protection from erosion and secondary salinization.

It was estimated that Zadar region has about 30,000 ha of land highly suitable for irrigation (Fig. 4).

Without a defined rural development strategy, irrigation projects may cause more problems than they solve. When poorly planned and implemented, sustainability is threatened. The agriculture sector is a major consumer of water, giving rise to growing environmental problems.

The quantitative aspect obviously predominates in Zadar region, but the problems of water quality and pollution are increasing (Romić et al. 2003). It is clear that agriculture is not the only player disrupting the water cycle and quality. The total quantity of abstracted water in 2004 in Zadar region was more than 31 millions of cubic meters (Croatian Waters 2004).

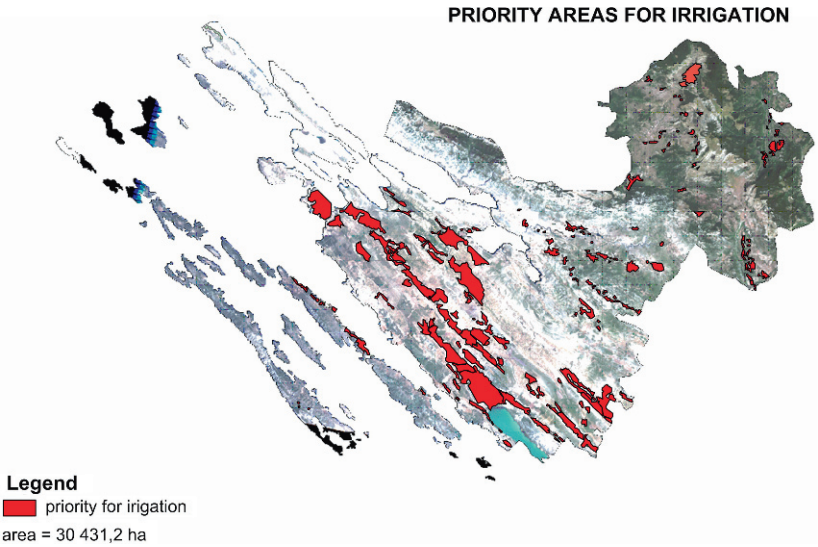

Fig. 4. Map of priority area for irrigation in Zadar region.

5 Evaluation of the socio-economic impact of irrigation plan implementation

The starting material for evaluating irrigation effects are data on the current state and structure of agricultural land, and data on areas suitable for irrigation obtained from research activities done within the Project. Applied methodology includes simple growth rate methods and calculation of economic effects, which are easily understandable to almost all end users of the research results.

All estimates represent an optimistic or most desirable scenario for the implementation of the Project over a 10-year period. Simple alteration of parameters can produce estimates for less optimistic scenarios, in dependence on the ultimate aim of estimation.

5.1 Evaluation of economic effects of the irrigation plan

Irrigation plan implementation should result in increased earnings from crop production, which would in turn raise interest in using available arable land. Proportion of uncultivated land is currently high in the region, so extension of arable areas is expected through exploitation of fallow and

uncultivated fields. It is reasonable to assume that new areas will be used for more profitable crops, namely, for vegetables and fruits.

Extension of arable land can be planned also for the categories of orchards, olive groves and vineyards, for which purpose also land outside the ploughland category is likely to be developed (Table 2).

Increase in cultivated land can be calculated according to the equation:

$$A_t = A_0 \cdot (1+r)^t$$

where:
A_t final area after t years in ha
A_0 current area in ha
r planned annual growth rate
t time period of projection in years

Table 2. Estimated changes in sown/planted areas upon irrigation plan implementation.

Type of area/plantation	Expected increase of cultivated land in a 10-year period			
	Initial area (ha)	Annual growth rate	Net change (ha)	Final area (ha)
	A_0	*r*	$A_t - A_0$	A_t
Ploughland and gardens	23,098	–	–	21,722
Fallow and uncultivated	9,118	–6.0%	–4,027	5,091
Vegetable crops	9,805	2.0%	2,147	11,952
Cereal crops	2,734	1.1%	316	3,050
Forage crops	1,383	1.1%	160	1,543
Other	58	4.0%	28	86
Orchards	2,342	1.6%	403	2,745
Olive groves	2,696	1.1%	312	3,008
Vineyards	4,077	1.5%	661	4,738
Total cultivated	23,095		4,027	27,122
Total available	32,213			32,213

Sources: Statistical Annual, Central Bureau of Statistics, and expert estimate.

Although this is a simple method for calculating continuing growth, it is just because of its simplicity and comprehensibility for end users of the plan in public administration that we find it appropriate for this purpose. It is thus possible to foresee the desirable or planned extension and structural

change of areas in the Zadar region, on the basis of which further calculations can be made to evaluate the plan efficiency.

It is worth mentioning that the plan envisages that the same level of available areas will be retained at the level of total arable land. Namely, though it can be expected that the loss of arable land will continue in the future (at the expense of urbanization, infrastructure, etc.), development of some areas is foreseen for establishment of perennial plantations.

Extension of exploited areas and improvement of crop structure will lead to increased work demand and higher earnings. Earnings will be increased for the following reasons:

1. yield reduction caused by water deficit is eliminated
2. higher product quality can be achieved
3. biennial bearing is avoided
4. production stability improves the status of producers in relation to customers.

The estimated values of income per hectare for particular groups of crops are given in Table 3. The percent income increase per hectare, due to introduction of irrigation, was estimated, as well, and finally, the total increase of annual income for the planned areas was calculated (Table 3).

Table 3. Estimated income increase in agriculture due to irrigation plan implementation, for a 10-year period.

Crop groups	Average annual income HRK / ha	Expected income increase per ha	Irrigated area ha	Expected increase in annual income '000 HRK
	I_y	$r_{\%}$	A_I	I_I
Vegetables	10,000.00	30.00%	2,413.22	7,239.65
Cereals	1,000.00	15.00%	615.82	92.37
Forage plants	750.00	20.00%	311.52	46.73
Other	2,500.00	25.00%	17.33	10.83
Orchards	20,000.00	25.00%	554.21	2,771.03
Olive groves	15,000.00	15.00%	607.27	1,366.35
Vineyards	15,000.00	15.00%	956.64	2,152.43
Total	–	–	5,476.00	13,679.39

Source: Authors' calculation based on expert estimation and research results.
HRK: Croatian currency.

Increase in annual income for particular crop groups was calculated according to the formula:

$$I_I = I_y \cdot r_{\%} \cdot A_I$$

where:
I_I is expected increase in annual income in thousands of kuna,
I_y is estimated one-year income per hectare in kuna,
$r_{\%}$ is percent income increase due to irrigation and
A_I is total area suitable for irrigation (according to Plan).

If the Irrigation Plan is implemented, an income increase of 13.7 million kuna a year can be expected on 5,476 hectares of arable land. The increase would become effective in 10 years, which period is foreseen for plan implementation.

5.2 Expected social benefits of the irrigation plan

Introduction of more intensive production technologies with irrigation and extension of arable land leads to increased work demand. Using the data on the planned extension of cultivated land and irrigated areas, this increase in work demand can be roughly estimated (Table 4). Starting data for measuring the impact on total employment are data on the employment and activities of agricultural population taken from the Statistical Annual for the year 2004. Pursuant to this source, there are about 1,944 employed persons, most of them working on family farms.

Table 4. Estimated changes in employment due to irrigation plan implementation.

Description	Calculation	Value	
(a)	Employed by legal entities in the sector of Agriculture, Wildlife Management and Forestry	–	636.00
(b)	- of which in agriculture, estimate	*(a)·90%*	572.00
(c)	Employed on family farms	–	1,372.00
(d)	Total employed in agriculture	(b)+(c)	1,944.00
(e)	Increase in work demand due to new areas, h	$(A_t - A_0)$·*100 h*	402,666.97
(f)	Increase in work demand due to irrigation, h	$((A_I$-*700 ha)·16 h)*	76,416.00
(g)	Total expected work demand, h	(e)+(f)	479,082.97
(h)	Expected increase of employed in agriculture	(g)/1,900 h	239.54
(i)	Relative increase in the number of employed	(h)/(d)	12.32%

Source: Statistical Annual, Central Bureau of Statistics, research results and expert estimate of the authors.

It is obvious from the Table 4 that work demand might increase by about 403,000 hours a year due to extension of cultivated land, and by about 76,000 hours due to introduction of irrigation on previously not irrigated areas that are suitable for irrigation. In the first case, 100 hours of work per

hectare are foreseen; in the second case, an increase by 16 hours per hectare is estimated.

Taking that an employed person works in average 2,000 hours a year, the new 479,000 work hours will require 240 persons. Compared to the current 1,944 employed in agriculture, this would mean an increase by 12.3%.

Increased employment in agriculture implies also a raise in the number of people making income in a rural area. For this reason, a positive effect of plan implementation is expected in terms of retaining the population in these parts.

As the regional irrigation plan was made in compliance with the guidelines of the national plan (NAPNAV), which envisages enhanced participation of end users in irrigation system management, it is reasonable to assume that the regional plan implementation will have a positive effect also on its management in the local community.

Through participation of interested participants in plan preparation, and then of end users in irrigation system management, modern trends in this sphere are followed. Namely, most research and professional works of the last 20 years emphasize management by users as the best way of managing irrigation systems (Dudu and Chumi 2008). Such user management, which involves organization of Water Users Associations – WUA, is usually supported by local communities and public administration, and is hence politically acceptable in most systems.

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Zero emissions region north-eastern Brandenburg – between climate adaptation and challenges for innovative land use

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Abstract

The German InnoLand Research Area is constituted by the counties Barnim and Uckermark. As part of the State of Brandenburg within North-Eastern Germany, the Research Area is a typical young moraine lowland with domination of crop production. This region – located between the Berlin metropolitan area in the south and the Polish border in the northeast – is characterized by strong gradients with respect to the intensity of land use as well as by impacts due to land use, economic power, and demographic changes. Actual challenges are high unemployment rate and increased production of energy crops despite low yields. Future challenges may arise from droughts and increasing shortages in ground water supply due to climate change. As a result of a regional consensus finding process local authorities made the decision to establish a "Zero Emissions Region" as an optimization for one specific demand. Consequently, a landscape experiment, using untreated or only partly treated waste water as contribution to a environmental sound material flow management exemplified by cultivation of reed will be conducted. A double dividend with respect to landscape functions could be obtained with this approach to solve problems with the water household and water quality and to establish a sustained production e.g. of biomass for energy production.

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1 Introduction

Changes on the energy and agricultural commodities markets, climate change and globalization as well as demographic developments will influence the use of the agricultural landscapes of Brandenburg in the next decades. The possibilities to supply landscape-bound need satisfactions in Brandenburg are connected with the fundamental question of the development of rural areas. Furthermore the regions will have to position themselves in new competitions. These exogenous changes require on the one hand pro-active adaptation strategies in the interest of a sustainable development considering rural-urban interdependencies. This requires a region-specific development of new organizational as well as production-oriented innovations. These possible developments as well as the necessary governance efforts contain on the other hand substantial conflict potentials with the advancement and implementation of guidelines for the use and development of these areas. The mentioned competition of regions within the Federal State of Brandenburg and beyond first of all concerns the supply of services and the fulfilment of substantial functions of the economy as well as the existence welfare service. Accordingly the regions must be prepared for this competition today. To install a region of Brandenburg as an "innovation laboratory" which anticipates these developments and exemplary demonstrates the paths which can be taken, creates a competitive advantage also for other regions of Brandenburg.

Therefore both from the scientific as well as the political point of view it is important to test knowledge-based mitigation as well as adaptation strategies including the necessary innovations and technologies based on the scientific expertise and the experiences already made. From the political point of view information is needed, which mitigation and adaptation strategies with which consequences are conceivable, which conflict potentials accompany with the different adjustment options, which possibilities for the influence of the processes exist, which instruments are suitable for the control and which economic and ecological effects will be connected with planning and behaviour-affecting governance interferences. From the scientific point of view it is important to analyze the processes connected with these changes, to understand the interactions between different sectoral mitigation and adaptation options, and to identify the respective driving forces and to quantify their strength of influence. In addition, suitable organizational and technological fundamentals have to be identified and their applicability has to be analyzed. In principle the local and regional stakeholders concerned should be included from the outset into the developments on all levels, which in the long run means a new quality of research.

So far only sectoral mitigation and adaptation strategies to single exogenous changes have been examined. The interactions of sectoral mitigation and adaptation strategies to the mixture of exogenous changes and their effects on a concrete region are scientifically unexplored to a large extent, although the big scientific and political challenges arise in this field (minimization of conflicts in connection with the development and implementation of mitigation and adaptation strategies of the different participants). Effects on e.g. the emission of greenhouse gases, the self-sufficiency degree, export/import portion of a region with energy or food, the effects on biodiversity and other aspects of resource protection can only be anticipated if the mitigation and adaptation reactions in other sectors or to other exogenous changes are considered. In order to make the information available for this and to meet these challenges successfully, not only a monitoring is required but also an action-led research, in the best case the purposeful change of conditions, control variables and basic conditions, thus "landscape experiments" are needed. Such an approach would have to fail if not per se and from the beginning "the stakeholders" would be involved. The decisions made by each of the land users/stakeholders are based on certain arguments and reasons and could lead to conflicts to the consequences of the decisions of others. To know why which stakeholder makes what decision is essential for a successful solution with respect to a sustainable development of the region as a whole. This means that already the research design has to be compiled together with the local players instead of not including them before the implementation of a solution.

In the past it became clear which kind of conflicts may come along with the implementation of sectoral mitigation and adaptation strategies (see wind energy). Sustainable mitigation and adaptation strategies therefore require not only technological options and the participation of stakeholders but also the acceptance by the population. By means of the pro-active approach of a "landscape experiment" (see later on) in a concrete region it could be worked out which innovations are needed region-specifically, which adjustment strategies are socially achievable and how the consent identification costs can be minimized. The findings can be used not only for the advancement of sustainable mitigation and adaptation strategies but also for the reduction of political costs in connection with the development and implementation of new guidelines for the sustainable development of rural areas.

The Federal State of Brandenburg with its characteristics regarding local, economic and infrastructural conditions and its comprehensive research potential (see bundling of competences in the research platforms "Rural Areas Berlin/Brandenburg" as well as "Climate Change" and other

networks) offers very good conditions for the installation and conduction of such "landscape experiments" and their mid- to long-term evaluation, i.e. for the assumption of a pioneer role in the European Union. Within an "experimental region" (landscape laboratory) covering the gradient from the densely populated to the rural area important findings could be acquired on how the region's society will adapt to the big challenges in connection with the securing of a climate friendly power supply, the safeguarding of food supply, the responsible management of the scarce resources water, biodiversity and soil, the potential use of genetic engineering in agriculture and forestry. In the same time the safekeeping of services of general interest in rural areas can be realized and the conflicts connected with these adaptation processes can be minimized.

2 Regional conditions of the ZALF InnoLand Research Area in Germany

2.1 Location, population, infrastructure

The ZALF InnoLand Research Area (Fig. 1) with the Barnim and the Uckermark districts is constituted by the Planning Region Uckermark-Barnim within the State of Brandenburg. This region extends from the north-eastern parts of Berlin to just south of the Szczecin Haff and represents one of Germany's least populated areas.

Both districts are predominantly rural with high unemployment rates which increase with growing distance from Berlin (Barnim district 17.1%, Uckermark district 24.7%). As employment in agriculture and forestry is 3.5% (Barnim district) and 8.10% (Uckermark district), these comparably high values reflect the physical dominance of arable land with huge fields beside extended forests.

Despite the spatial dominance of agriculture and forestry, most people are, rather decentralized, employed in the tertiary sector. Some industrial employment is concentrated at a large petrochemical site in Schwedt and at light industries in Eberswalde.

The infrastructure is dominated by one freeway (Autobahn 11 Berlin – Szczecin), two federal highways, and two main railroad lines, all directing to Berlin. Also there are highly frequented waterways provided by the Oder-Havel Canal accessing Eberswalde while connecting the main Rivers Elbe and Oder and by the Hohensaaten-Friedrichsthal waterway, taking course parallel to the Oder River, connecting Schwedt and offering access to the Baltic Sea.

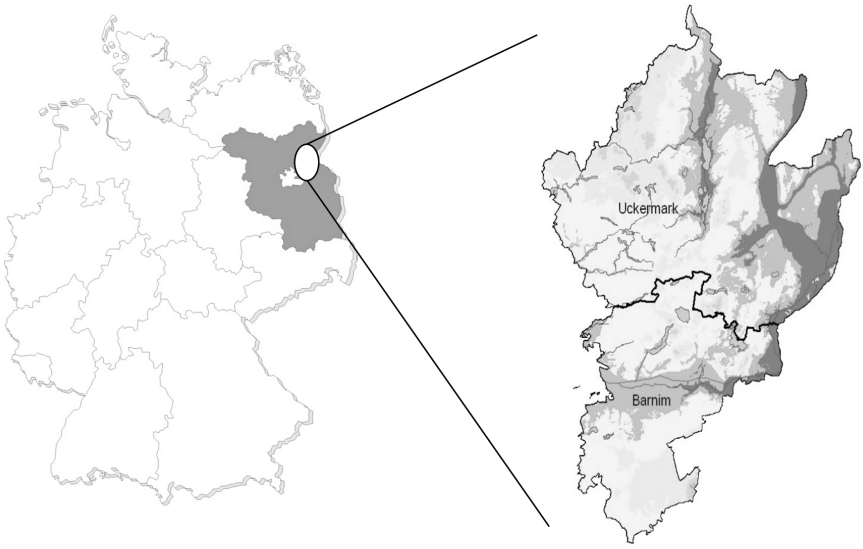

Fig. 1. The ZALF Innoland Research Area (Barnim and Uckermark County within the State of Brandenburg in the north-east of Germany).

2.2 Geomorphology and geology

The ZALF InnoLand Research Area as part of the North-Eastern German lowlands is of young pleistocene origin (Weichselian glaciation period). Hummocky basic moraine surfaces are dominating. The main landscape units are (starting in the South):

- Lower Barnim moraine plateau
- Eberswalde meltwater channel
- Schorfheide outwash plain
- Pomeranian terminal moraine ridge
- Uckermark moraine basin
- Templin moraine plateau
- Floodplain of the Oder River

Besides several more local land use activities foremost agrarian land use does have the main impact on the natural conditions. Within this context specifically management of surface water resources for purposes of drainage or water storage was very incisive.

2.3 Climate and hydrology

The ZALF InnoLand Research Area is situated in the transition zone from Western sub-atlantic climate to Eastern sub-continental climate. Therefore a gradient in annual precipitation from 700 mm at the North-Western edge (Templin moraine plateau) to just above 500 mm at the South-Eastern lowland along the River Oder is in general accordance. Also the gradient in annual mean temperature from 7 to 9°C from NW to SE fits well into that transition zone. In more detail, however, the vicinity of the Baltic Sea and the more elevated land surface in the North-Western edge specifically increase the described gradients. In addition to the extreme low precipitation (compared to average German conditions), common spring droughts and winter frost without snow cover also cause problems related to agrarian land use and to water supply.

The climatic water balance of the region is negative. Thus, throughout most parts of this region, water has become the limiting factor for the growth potential of the regional vegetation.

This situation cannot be considered stable but is under the influence of several changing forces that currently impact upon this region and may still increase in the future (Arndt et al. 2008). The process of climate change may very well count as the most influential of these forces. Current scenarios (see e.g. Gerstengarbe et al. 2003) deal with a rise in the average yearly temperature between 1.9 and 2.9ºC until the year 2055. Precipitation is not only estimated to decrease by about 10% over that same time period but is also expected to further diminish during the vegetation period. As one result, ground water formation will decrease dramatically putting an enormous strain on the entire water balance.

Spacious deforestation combined with drainage activities lowered the ground water table already in medieval times. Recently, again there is a considerable decline in the ground-water level of the plateaus (up to 1 m/30 years and more; see e.g. Driescher 2003) due to climate change and maybe land use change combined with drainage projects.

Related to the regional climate, ground-water recharge has already been almost zero, with the exception of local depression areas (Lahmer et al. 2000). In 2050, the ground-water recharge is expected to become zero in all sites of the research area with considerable portions showing a negative ground-water balance (see HAD 2003 and also Fig. 2).

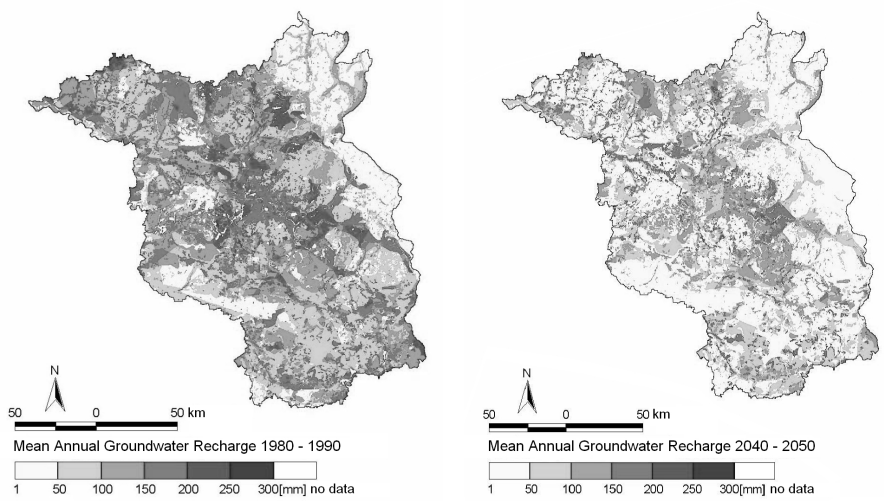

Fig. 2. Groundwater recharge in the State of Brandenburg in former years and in a climate change scenario (Gerstengarbe et al. 2003).

In summary, the ZALF InnoLand Research Area is partially rich in waterbodies, but increasingly poor in groundwater recharge leading to aggregating deficits in ground-water supply in the long run.

2.4 Soils and land use

The high portion of sandy sediments dominantly caused the development of Cambisols and Luvisols (BÜK 300 2007). Podzols are rare in the research area because of the low infiltration. Despite of the preponderance of dry conditions, numerous moist depressions induced the development of Histosols and Gleysols. Due to the young, very heterogenic relief, semiterrestric and anhydromorphic soils are indented at small scale. At the front moraines with often pushed up materials, small scale parent material variation is another cause for high spatial soil variability. Soil erosion and deposition of colluvial materials modified the pre-existing pattern of soil types by increasing the differentiation between local hilltops (with Regosols resulting from erosion of primary A and B horizons) and depressions (burying of primary soil profiles).

In summary, agriculture and forestry have to cope with soils of poor to medium fertility and water capacity. Additionally, the low precipitation is critical for many highly water dependent crops. Thus, the dominant crops are winter rye (covering one third of the cropped area of the Uckermark district, but only 15% of the Barnim district), followed by winter wheat and winter rape. Animal production (mainly cattle and pigs) since unification runs on a rather low level, concentrated at few large animal farms.

The low and moist parts of the valley systems are used as grassland. It is often managed extensively in accordance to various nature conservation levels.

In summary, the central Uckermark district offers the most fertile soils (within a generally rather low range) with arable land dominating and forests being rare (see also Fig. 3). The least fertile soils are found with the extended pine dominated forests of the Schorfheide outwash plain. Grassland management is of minor importance, being mostly restricted to valley bottoms and floodplains and often related to nature protection. The remaining landscape elements show complex patterns of forest and arable land based on small scale site differences and local historical development. Generally, the research area is rather badly preconditioned for high yield agriculture and forestry.

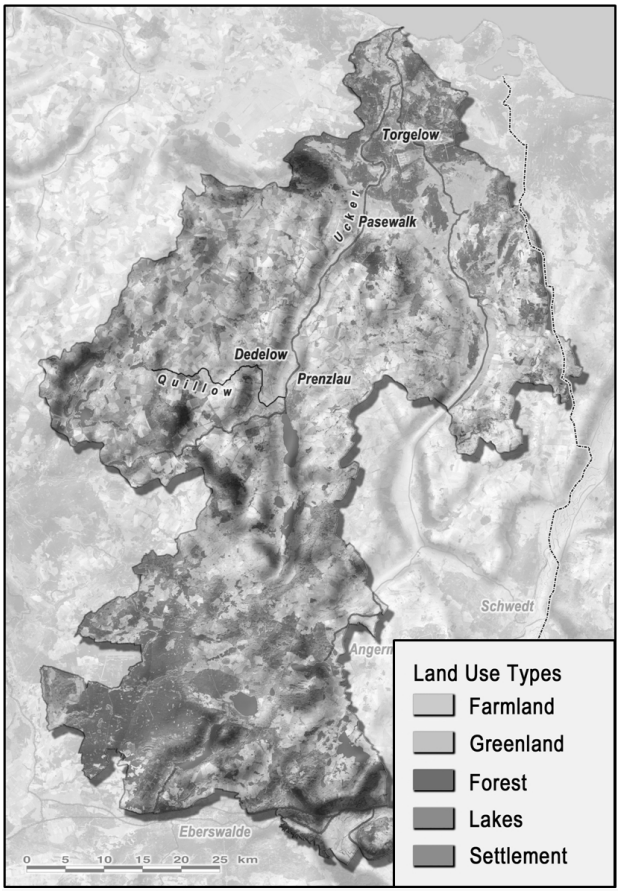

Fig. 3. Land use structure in Barnim and Uckermark district (ZALF 2008, based on DEM 25).

Climate change may more and more influence the yield level and yield stability as well as the regional water budget. This will affect land use, farm economy and also concern water supply for both developed and nature conservation areas.

The region's land use pattern will also change: wooded areas will probably grow in size, the pine forests will continue to be converted into ecologically more stable mixed forests. In addition, the trend toward more organic farming will continue, as will the cultivation of crops for raw materials and energy production (Arndt et al. 2008).

Due to the natural setting of the younger pleistocene landscape the research area is characterized by large protection areas (Biosphere Reserve Schorfheide-Chorin, National Park Lower Oder Valley). Nature conservation combined with tourism related to the large woodlands as well as to the lakes and rivers have to be considered as integrative forms of land use. Especially tourism developed more and more as a field of additional income.

3 Innovations and new strategies

Thus, the region Barnim-Uckermarck is located at the edge of the subcontinental climate, and a typical glacially originated landscape familiar in the Northern part of Europe, with sandy to loamy soils. The region is characterized by a strong socioeconomic gradient, which ranges from the densely populated and economically vital *Speckgürtel* (affluent suburbs) neighbouring the capital Berlin to the thinly populated outer Uckermark, with a high share of job-driven out-migration and serious demographic challenges. Notable strengths of the region are the rich biodiversity and a large number of lakes and water bodies, which all make it attractive for tourism and recreational activities. Land use is dominated by agriculture and forestry, and more and more threatened by water shortage and extreme weather events due to climate change. Sustainable landscape use and especially the anticipatory and integrative management of water resources with regard to the upcoming climate changes thus constitute major challenges for the maintenance of the region's competitiveness and its social cohesion.

Brandenburg decided to take the lead with respect to reduction of CO_2 emissions in Germany. The use of sustainable sources for energy production is promoted to that end.

3.1 The "BARUM energy" Initiative

When the development of renewable energies became an issue supported by the national government in Germany by the mid-1990s, it was especially the considerable growth of wind turbines that made this change in the

national energy policy recognizable in the region. Within a period of 3 years, several hundred of them were constructed in Barnim County and its neighbouring territory, Uckermark County. At the same time the region became home to several solar cell manufacturers and a substantial exploration site for the generation of geothermal energy.

Since these developments were accompanied by at least some modest positive effects on the regional labour market, the two counties joint forces and founded the "BARUM energy" initiative (Benfer 2007). While some of the early and very ambitious goals, e.g. supplying the entire regional energy demand from renewable sources and even becoming a net exporter of energy, have since been revised, the basic objectives of this initiative still remain:

- creating new and securing existing jobs in the region in the renewable energies sector,
- creating new opportunities for economic activity and regional GDP generation,
- initiating sustainable regional economic cycles,
- promoting the development of a regional cluster of renewable energy generating companies,
- increasing the region's competitiveness especially in the fields of renewable energy generation and related services.

A network of regional businesses and institutions was established to broaden the supportive base of this initiative in the region and to stimulate the development of ideas and activities to reach these objectives. Among others, these activities have since for instance dealt with

- the analysis of the region's potential for the generation of energy from renewable sources, including wind, solar, geothermal, biomass and hydro energies,
- the marketing of this initiative as a regional pull factor for the attraction of new businesses,
- the establishment of a trading facility for agricultural raw materials suitable for the generation of energy from biomass,
- the provision of renewable energy for the business community, the agricultural sector and private households at competitive prices,
- the promotion of "rational" energy use,
- the continued promotion of energy generation from renewable sources in the region,
- the expansion of the region's vocational training and research capacity in the field of renewable energy.

Although many regions in Germany and beyond have since set similar development agendas with regard to the promotion of renewable energies, the "BARUM energie" initiative still continues to grow.

3.2 The Barnim Zero-Emissions-Initiative

In addition, Barnim County started a Zero-Emissions-initiative in 2008. Although this initiative initially focused on CO_2 emissions, it is now extended to sustainable water use and dissolved solutes. Of all the federal states of Germany, Brandenburg suffers the most from water scarcity due to low precipitation and increasing evapo-transpiration. Efforts are thus being undertaken to retain water in the landscape. This includes (i) the re-use of waste water by watering riparian wetlands instead of feeding into receiving streams and (ii) the recycling of dissolved nutrients, especially phosphorus and nitrogen. Eutrophication of receiving streams and lakes will thus be reduced, wetlands will be restored, carbon sequestration in wetland peat will be enhanced, and energy and efforts invested in waste water treatment will be minimized.

3.3 Stakeholder involvement

In the Barnim-Uckermark region, the involved local authorities are the administrative board of Barnim County and the regional planning unit for the county association Uckermark and Barnim. Practice partners and stakeholders with an interest in innovation application are (i) a large agricultural enterprise (Randow-Welse GmbH & Co.KG) and (ii) the regional association for water and soil management (WBV Welse). Research partners are ZALF (Leibniz-Centre for Agricultural Landscape Research) and FHE (University of Applied Sciences Eberswalde).

Having the above presented site situation in mind, the region with its administrative structure seems to be predestined for the development of a concept to prepare for the future competition of regions. This competition might be driven by factors like the development of energy or housing needs, globalised agricultural markets, and consumption habits. To achieve social cohesion, these drivers will have to be balanced in a science-practice dialogue with a strong commitment to the regional policy design for rural development, directed towards specific, innovative ways of land use, significant change of land use structures and intensities (agriculture, forestry, industry, trade and commerce), changes of the economic and climatic framework conditions (global change), competitive production of food and energy crops, conflicts between CO_2 sequestration in biomass and green house gas emissions and many more.

3.4 Options for action

Due to the above mentioned bouquet of questions the research partners developed different options for future land use concepts:

Option 1: optimised by reaction on the development of boundary conditions

- Diversification, transition to flexible systems, adaptation
- Multifunctionality (commodity outputs (CO's) / non-commodity outputs (NCO's))
- Minimizing of risks and one-sided dependencies
- Regionality and self-supply
- Food safety and consumer protection

Option 2: optimised for specific demands:

- Low-input
- Zero emissions
- Energy farming
- High-output farming
- High-technology farming
- Recreational landscapes
- Carbon sequestration

Option 3: optimised as an integrated concept for regions

- Ensuring an integrated rural development (IRD / ILE)
- Ameliorating employment and incomes
- Secondary production (processing, commercialisation) and quality management
- Bio-Economy (e.g. functional crop rotations with renewables)
- Optimising water availability and nutrient cycles
- Environmental and nature protection

As a result of a consensus finding process with people living in the region described above (Barnim and Uckermark), local authorities made the decision to establish a "Zero Emissions Region" (see option 2 – optimized for specific demands) as one of multiple possible developments. This idea is based on the discussion about general potentials of regional material and/or energy flows in the context of

- forest wood, waste wood
- agricultural products
- agricultural residues

- solar energy
  - for electricity supply
  - for hot water supply
  - for air heating
- wind energy
- geothermal energy
- loppings, roadside vegetation cuttings
- plant and animal waste greases
- and others

In addition to this, other innovations and integrative new strategies in the fields of

- water management and
- wastewater management (reuse) as well as
- soil management and
- land management

arise in the context of material flow management systems.

Climate change will have a significant impact on the landscape water balance of the region described above, endangering water deficiency for production as well as non-production ecosystems. According to a study by Wiggering et al. (2008), a sensitivity analysis focussed exemplarily onto a part of this area reveals dramatic changes of the water balance as well as the concentration of the nutrients N and S in the percolation water if the current land use practice was maintained until 2050. Insufficient soil water supply during summer coincides with an increase of real evapo-transpiration by 20 mm a^{-1}. Decreased precipitation and increased real evapo-transpiration lead to an infiltration rate and thus a ground-water recharge of 12 mm a^{-1} on average under agricultural land, enabling the regional occurrence of years without any ground-water recharge. The N load of the percolation water declines from 60 to 40 kg ha^{-1} a^{-1}, the S load from 25 to about 10 kg ha^{-1} a^{-1}. These lower values, which may be considered favourable for the ecological landscape functions, result (if input remains constant) in N enrichment in the upper 2 m of the soil still progressing during the scenario. Despite the decrease of the loads, the concentration of nitrate in the percolation water more than triples on average (from 230 to 750 mg NO_3 l^{-1}) as a result of even more dramatically decreasing infiltration rates. The sulphate concentrations react correspondingly.

If, when, and how strong these small amounts of percolation water may influence the ground water and neighbouring ecosystems depends particularly

on the occurrence and extent of high rainfall weather extremes, which were not predictable in this study.

Although the modelling is based on highly detailed crop sampling and site data for large areas as well as an acknowledged, regionally specific climate scenario, the values reflect potentials. For example, the data do not consider denitrification processes in the unsaturated zone of the soils. In addition, the scenario does not embody a new state of equilibrium but it includes phenomena of transition such as the nutrient enrichment in the upper 2 m of the soil. Thus the conclusion is justified that very low infiltration rates with extreme nutrient concentrations will pose a persistent problem.

Not only the anthropogenic water supply but also the ecologically valuable wetland areas fed by ground water might lose their functions as a result of water deficiency and eutrophication. In addition, a frequency of weather extremes higher than assumed in the scenario would restrict the adaptability of agriculture and also release nutrients from the upper soil into the ground-water.

If climate changes according to prevalent scenarios, North East Central Europe will nearly maintain its present agricultural productivity. The ground-water recharge under agricultural land, on the other hand, will decrease dramatically, this causing, among other things, the feeding of neighbouring wetland habitats to decrease considerably or to cease.

In addition, the low ground-water recharge is connected with the problem of critically high nutrient concentrations from agricultural production, which are difficult to avoid and also have negative effects on anthropogenic water supply and neighbouring ecosystems.

Extreme weather events surpassing the moderate weather variability taken as a basis for modelling probably would result in excess of mean values with respect to water deficiency, nutrient concentrations in the percolation water and yield reductions, which would necessitate new landscape-ecological assessments.

It may be derived from available experiences that the impacts of the anticipated climate change can possibly be counteracted by a couple of adjustment measures among others:

- year-round safeguarding of the retention of precipitation by the soil,
- increased transition to conservatory soil cultivation
- site-adjusted optimisation of the production system from the perspective of the most effective water utilisation (e.g. use of cleaned waste water).

A double dividend with respect to landscape functions could be obtained with an approach to solve problems with the water household and to establish a sustained production e.g. of biomass for energy production.

Consequently, a landscape experiment on a grassland area will be conducted within the region described above.

The cultivation of reed (*Phragmites australis*) is seen as an alternative use of wetland sites to produce a renewable ressource, an industrial raw material. A high biomass productivity with underground accumulation of peat is known from natural Phragmites stands. Phragmites reeds may also be restored artificially to use their peat forming potential. Thus commercial use of riparian wetlands is possible with close to natural high ground-water levels. This could include re-use of cleaned waste water by watering riparian wetlands instead of feeding into receiving streams as well as recycling of dissolved nutrients, especially phosphorus and nitrogen. Thus, eutrophication of receiving streams and lakes could be reduced, wetlands could be restored, carbon sequestration in wetland peat could be enhanced, and energy and efforts for waste water treatment could be minimized (Table 1). A pilot study for water management and reed production has been established in the region (Fig. 4). As an alternative, elder or poplar can be grown on these wetland sites and can be used for bioenergy issues.

Table 1. Expected advantages of reed production concerning functionality (Wichtmann 1998).

Function	Advantage
Regulation	Avoidance of emissions as products of mineralization
	Filter effect for dissolved solutes in surface waters
	Creation of water retention areas with high evaporation potential
	Microbial decomposition of organic contaminants
	Utilization of the nutrients available in the sewage
Production	Accumulation of carbon in biomass and in newly developing peat
	Saving of mineral fertilizers and plant protecting agents
	Keeping full working capacity in rural areas during winter time
Information	Creates open landscapes with touristic attractance
	Creation of stable wetlands as habitat for endangered species

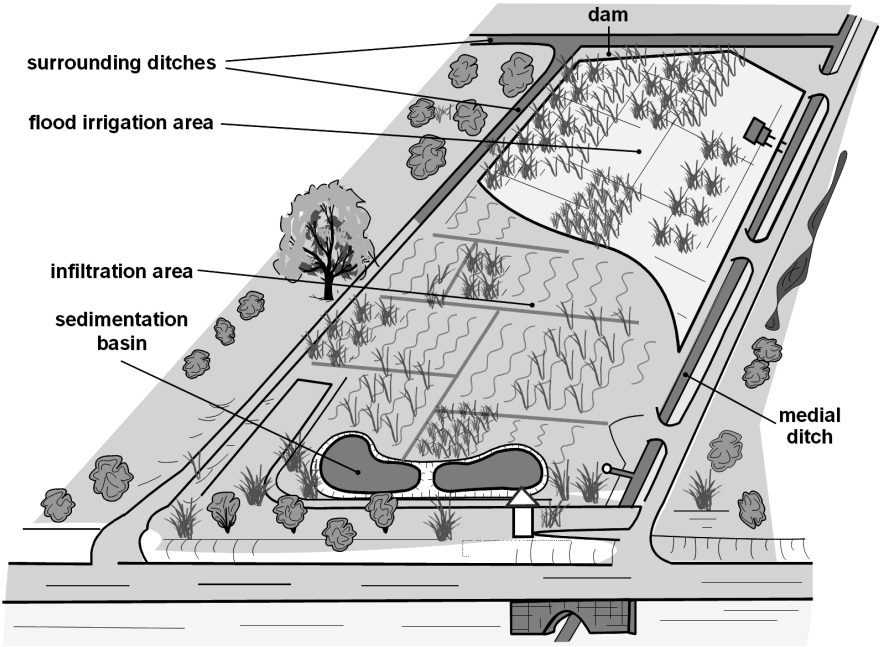

Fig. 4. Pilot site Biesenbrow: Water purification and reed production experiment (Wichtmann 1999, modified).

4 The research action process

Changes on the energy and agricultural commodities markets, climate change and globalization as well as demographic developments will – as already mentioned – influence the use of the agricultural landscapes of Brandenburg in the next decades. The region "Barnim – Uckermark" in the lowland of North-Eastern Brandenburg, Germany will be affected by these changes. Expanding North from the suburban border of the German capital Berlin over about 100 km to the rural heart of the Uckermark district, there is a strong gradient in population density as well as in infrastructure. Rural depopulation is expected to increase this gradient. Direct linkages of exchange and interdependencies with the capital Berlin, however, still exist and concern e.g. recreation and water supply.

Water management is and will be one major challenge for the region. Groundwater levels have been decreasing for more than 20 years at many sites in Brandenburg due to many fold factors including increasing evapotranspiration. Correspondingly, wetlands and small lakes dried up. Climate change is expected to further increase the scarcity of water for

agricultural production and forestry. Also, nature protection of wetlands and water supply for developed areas will increasingly suffer from drought. Regional management and technical innovations will have to focus on optimisation for actual and upcoming demands on commodities and non-commodities, aiming at an integrated concept for the research area. Hence, the region Barnim-Uckermark will be dealing with the maintenance of a sustainable landscape water balance and with strategies and technologies to successfully manage regional droughts and water shortage due to climate change.

Within a research action process in this context a sustainable water management, the so-called Zero Emissions Water Strategy, will be elaborated, implemented and tested by the research/stakeholder cluster:

- Regional planning agency (Regionale Planungsstelle UMBAR)
- Water-Soil-Management – Body (Wasser- und Bodenverband Randow-Welse)
- Institute for Applied Material Flow Management (IfaS)
- The Zero-Emissions-Initiative (Landkreis Barnim)
- Leibniz-Centre for Agricultural Landscape Research (ZALF)
- University of Applied Sciences Eberswalde (FHE).

Within the action-led research process existing approaches will be combined as elements for sustainable land use management within the region in an interdisciplinary manner. Based on this connection between research and practice solution strategies will lead to economic growth within the region.

According to Fig. 5 the research action process is focussed on four thematic fields (water storage, waste water recycling, biomass production and reduction of emissions) each of them based on several sub-projects. The thematic fields differ due to the given contents as well as to the different scales they operate on and that are considered.

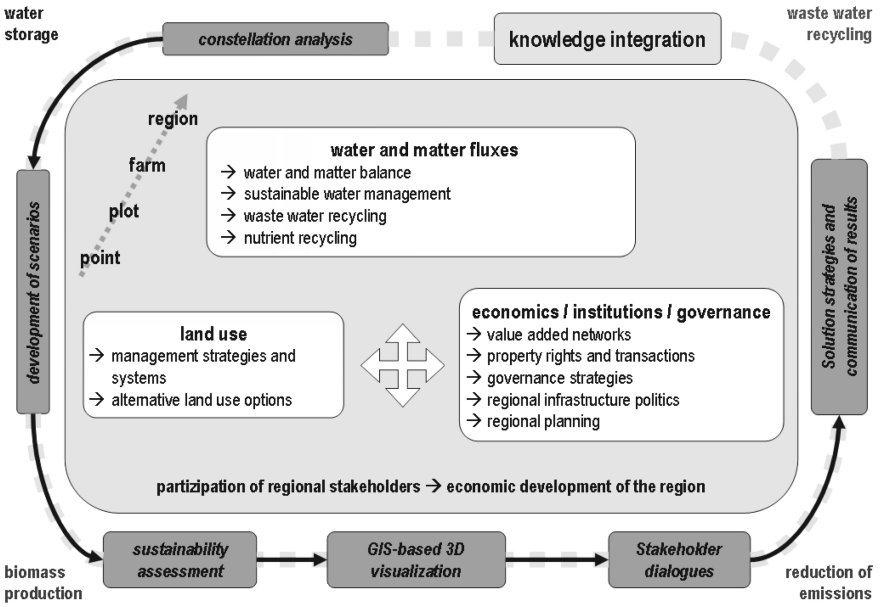

Fig. 5. Sketch with the different pillars of the accompanying research activities for the Zero Emissions Region Barnim-Uckermark.

With a first step, two pathways will be explored: one through media and the other through solution. Through media would mean an analysis of waste and emissions e.g. in the wastewater. This requires to describe the source and development of emissions and to assess the ingredients and costs of disposal from the economic point of view. Through solutions would mean to follow the different possibilities (i) of avoiding wastewater and emissions or (ii) to reuse ingredients. The latter could e.g. mean to use recycled materials and materials that are produced by use of renewable energy. Ingredients of wastewater become raw materials and sellable products, e.g., MAP (magnesium ammonium phosphorus fertilizer). The cleaned wastewater can be used for irrigation or for raising water levels in vulnerable wetlands and lakes.

5 Outcomes of regional changes

Assisting the process of regional (economic) development, by contrast, does not represent a mandatory task for county governments in Brandenburg (Benfer 2007). As a result, they enjoy a high degree of freedom and independence with regard to formulating their own development strategies, policy objectives, and means for implementing them. The passage of the

"Integrated Economic Development Concept" by the county parliament in 1997 has marked the beginning of a phase in which development efforts have since centered on assisting growth sectors of the regional economy (as opposed to trying to care for the entire regional corporate business with its roughly 10,000 businesses) as well as using public funds for the construction of key infrastructure facilities that would in turn spurn private sector initiative.

With regard to the former, a "regional innovation concept" was commissioned that identified four branches of the region's economy that offer some lasting growth potential, among others because of the innovative capacity of the individual companies that belong to those branches. These four branches include renewable energies, the health sector, tourism and the metal processing sector. Key infrastructure investments have been made especially to provide the basis for future growth of the tourism sector. Funds have been spent, for instance, on the revitalisation of the Finow Canal which is Germany's oldest man-made waterway still in use, and the development of an old rail line that connects Berlin with some areas of the county of outstanding natural and landscape aesthetics.

In addition to the aforementioned development concepts the county also produced a "tourism marketing concept" and an "integrated rural development concept". The former contains three main elements: it specifies the main themes that the tourism marketing should focus on, the responsibilities of the various actors in that marketing arena, as well as a list of important marketing activities for the immediate and mid-term future. The latter became necessary when Brandenburg's state government, encouraged by respective EU-programmes for the development of rural regions, began to make the availability of rural development funds dependent on the existence of such regional development concepts.

The concentration on the growth sectors of the regional economy made necessary a different focus of the work of the county's economic development corporation. While its work was hitherto characterized by providing services for all the companies already located within the county borders, the formation of business networks exclusively in those branches with growth potential has since become a very important field of activity for the corporation.

In general, the development policy approach adopted by Barnim County may be characterized by the following:

- formulating development strategies within the formal policy-making structures, typically supported by a vote of the county parliament;
- utilizing informal institutions for the implementation process (where appropriate) in addition to its own administrative/institutional resources;
- focussing on a project-based approach to regional development; and

- pooling the county's own financial resources with funds available from state, federal and EU sources.

Finally within this action-led research process an integrative solution will be developed by investigations in the fields water and matter fluxes, land use, and economics/institutions/governance. It aims at an system's solution for sustainable land use in the region as a whole. The process will result into a combined management of water and matter fluxes. Central elements are the (re-)use of only partly treated waste water in combination with the recycling of nutrients out of the waste water. Embedding these activities into an inter- and transdisciplinary research design combined with methods of knowledge integration will be guaranteeing the application of the results.

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Regional and regionalised approaches to changing ruralities – Orkney Islands and Scottish Borders

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Abstract

This case study explores the concepts, practices and implications of a "regionalisation" of rural futures, through examining development policies operating in Scottish Borders and Orkney Islands, Scotland. Trends including urbanisation (as communications routes improve), land and community abandonment (as clusters or centres of population grow, and services and livelihoods decline in remoter areas), plus the need for affordable rural housing, all have landscape implications.

Described are methodological approaches and three priority areas for future investigation: (i) the "fit" of regional and regionalised development policies to address these trend and impacts; (ii) the extent to which such approaches can deliver to a national strategy; and (iii) "capacities within the regional system", from within communities and within the four sectors of the Quadruple Helix (public, private, research and third/voluntary sector).

1 An evolving policy context in Scotland

In Scotland, there are recently two major shifts in national and regional policy which mean that it is a rapidly-evolving landscape at the time of writing. These changes sit alongside two other policies – Community Planning (launched in 2003) and Scotland's Rural Development Programme 2007–2013 (SRDP). These policies are now briefly outlined.

1.1 Scotland's National Performance Framework

In 2007, the Scottish Government introduced a National Performance Framework for all Government Directorates (Scottish Government 2007). This Framework builds towards a single Purpose, as follows:

H. Wiggering et al. (eds.), *Innovations in European Rural Landscapes*,
DOI 10.1007/978-3-642-04172-3_9,

> "To focus government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth".

Underpinning this single Purpose are five Strategic Objectives: Wealthier and Fairer, Smarter, Healthier, Safer and Stronger and Greener. In turn, underpinning these are fifteen National Outcomes and 45 National Indicators and Targets. Three Outcomes which have particular relevance to the InnoLand Project are:

1. There are strong, resilient and supportive communities where people take responsibility for their own actions and how they affect others;
2. People value and enjoy the built and natural environment and protect it and enhance it for future generations;
3. People live in sell-designed sustainable places with access to the amenities and services needed.

The most relevant Target for the InnoLand Project is: *Increase the percentage of adults who rate their neighbourhood as a good place to live*. There are other targets relating to Scotland's ecological footprint, use of renewable resources, number of visits to the outdoors to be increased etc.

The Framework, with its supporting Outcomes, Indicators and Targets, appears to be more than simply rhetoric. The Framework is being applied across all Government Directorates (for example, Agriculture, Health, Education, Transport, Justice) and all Directorates are tasked with demonstrating how they are achieving outcomes rather than outputs; this is felt to be a paradigm shift in central and regional government. All endeavours, from commissioning research, to implementing specific policies affecting rural Scotland, must demonstrate ways in which they are linked to fulfilling the single Purpose of Scottish Government.

1.2 Single outcome agreements for local government

In parallel with the Scottish Government's single Purpose and Framework, the second major shift in Government policy and practice came about in April 2008, with the implementation of the Single Outcome Agreement. There are 32 regional authorities (called Local Authorities [LAs]) in Scotland. Each Local Authority (LA) make an annual agreement with central Government which focuses on delivering a Single Outcome, and describes how LA processes, actions, priorities and decision-making are going to address and reach that Outcome. The LA also has to develop a set of Indicators which are then used for assessing the extent to which they are reaching the Single Outcome (see Orkney Islands Council 2008; Scottish Borders Council 2008).

Previously, central Government decided the budget for Local Authorities, and also decided each of the budget streams. Now, Local Authorities are guided in their overall budget and then have to determine how those funds will be allocated, and how that allocation will lead (directly and indirectly) to delivering the Single Outcome. Each region thus has greater flexibility in determining that Outcome (which has to sit clearly within the National Performance Framework) and how to reach it. This newly-established process is called a "partnership approach" between central and regional Government, and has been received positively overall.

Single Outcome Agreements (SOAs) have funding implications for activities and components which were previously "ring-fenced" and safe (that is, their funding was guaranteed year-on-year); under the new system, the rationale for all funding allocations has to be more clearly defined. Further, partnership-working with multiple stakeholders is considered essential to the delivery of the Single Outcomes, and new partnerships are being formed as a result.

Regional and regionalised policies (designed and implemented by Local Authorities) ideally have within them, therefore, a recognition of the importance of locality and place, as well of the specific characteristics, capacities and potential of such places. Contrasting with a "one size fits all" approach, a regionalised set of rural priorities has the potential to identify and respond to local and regional assets and capacities, as well as to the challenges. This therefore makes it a ripe area for us to investigate through InnoLand, in relation to demographic changes and pressures and the associated landscape change.

1.3 Community planning

Slightly pre-dating the above developments, the Local Government in Scotland Act 2003 (HMSO 2003; OPSI 2003) ushered in Community Planning in Scotland, defined as a process which is: "a framework for making public services responsive to, and organised around, the needs of communities". The two main aims of Community Planning are described as:

1. Making sure people and communities are genuinely engaged in the decisions made on public services which affect them; allied to
2. A commitment from organisations to work together, not apart, in providing better public services.

In addition to these two aims, there are a further two key principles:

1. Community Planning as the key over-arching partnership framework helping to coordinate other initiatives and partnerships and where necessary acting to rationalise and simplify a cluttered landscape; and

2. The ability of Community Planning to improve the connection between national priorities and those at regional, local and neighbourhood levels.

Figure 1 used in the Statutory Guidance illustrates how two way communication is supposed to be enabled by the Community Planning process:

Fig. 1. Communication channels enabled by the Community Planning process (The Local Government in Scotland Act 2003: 2).

In the 2003 Act, all 32 of Scotland's Local Authorities (LAs) became duty bound to "initiate and facilitate Community Planning in their area" (See The Local Government in Scotland Act 2003, Section 15), by establishing a Community Planning Partnership (CPP) for their area, comprising all relevant public, private, voluntary and community bodies. Although performance has been extremely varied across Scotland, with some CPPs being exemplary and others less so, the potential for involvement of diverse stakeholders and perspectives, at a regional level, is being realised in certain parts of rural Scotland.

1.4 Scotland's Rural Development Programme 2007–2013 (SRDP)

The preceding examples are implemented across Scotland as a whole, and thus include rural Scotland within their remit. This final example of a policy arena comprises one exclusively designed for rural Scotland.

Along with all European Member States, Scotland has recently begun implementing its national Rural Development Programme. The SRDP addresses five key outcomes: (i) improved business viability; (ii) enhanced biodiversity and landscape; (iii) improved water quality; (iv) tackling climate change; and (v) thriving rural communities.

There are four SRDP Axes which reflect those of the European Commission: Axis 1 is the principal means for supporting an outcome on *improved business viability*; Axis 2 supports outcomes on *enhanced*

biodiversity and landscape, *improved water quality and tackling climate change*; Axis 3 focuses on supporting the outcome *thriving rural communities* (as is open to rural people *beyond* the land-based sector); Axis 4 has the priority of *increasing the capacity of local community and business networks to build human capital, stimulate innovation and co-operation locally, through LEADER*. LEADER comes under the provision of the SRDP for the first time in the 2007–2013 programming period. Local actions groups (LAGs) have been set up (Article 62, RDR), whose membership includes CPPs and other community groups.

In contrast with previous national Rural Development Programmes in Scotland, the SRDP is being implemented through a regional structure of Regional Project Assessment Committee areas (RPACs). In practice, this means that rural Scotland has been subdivided into eleven RPACs. The rationale behind this is that a "one size fits all" approach is not necessarily appropriate, given the diversity of Scotland's regions, land uses and landscapes. Therefore, when farmers, landowners and rural communities apply for funds from the SRDP, they must bear in mind the Regional Priorities which have been decided, and their applications must reflect not only their local-level activities, but also how this builds towards achieving regional challenges. Further, implementation of the SRDP takes place on a regional basis, and participants and agencies are linked through a National Rural Network (as stipulated under EU Rural Development Regulation (RDR 1698/2005). The formation of Local Action Groups (LAGs) also lends a place-based feel to the implementation, and eligibility, of plans, ideas, projects etc, so this relatively "devolved" approach to a national programme is of significance for InnoLand.

Therefore a comparative analysis of the relative efficacy of national Rural Development Programmes (RDR 1698/2005) within this project is proposed in achieving regional developmental and associated landscape objectives within InnoLand Partner countries, would form an extremely valuable component of a Europe-wide investigation. The fact that Scotland has taken a regionalised (and relatively localised) interpretation of the Programme (setting regional priorities as the core element of its conceptualisation and implementation, and implementing components through LAGs), would form a useful point of comparison, given that InnoLand is seeking to explore, in a critical manner, the ways in which regional policies and approaches can achieve a balance between land use and developmental objectives. Such a comparative analysis of the Programme would also allow for investigation of the extent of "co-construction" of landscape, land-use and socio-economic challenges and associated projects under the RDR.

1.5 Policy context: comment

The National Performance Framework, the Single Outcome Agreement, Community Planning Partnerships and the SRDP and all comprise elements of development policy and practice introduced in recent years. Collectively, such measures effectively give greater priority to regional (and in some cases, local) perspectives, and to the regionalising of approaches to setting targets and allocating resources, as well as forming appropriate regional partnerships for implementation.

This picture of the policy and institutional landscape forms the focus of our chapter, as we seek – through future work in InnoLand – to build on our current understanding of the role and impact of regional and regionalised approaches to rural development, and thus to (managing) land use change.

2 Case study areas: Scottish Borders and Orkney Islands

2.1 Scotland as the wider context

Rural Scotland has a relatively sparse population of 16 inhabitants per km^2, compared to 65 inhabitants per km^2 in Scotland as a whole. In 2001, rural areas of Scotland accounted for 98% of the land mass but only 19% of the population. However, the population has been growing (4.3% between 2001 and 2004), particularly in "accessible" (see below) rural areas, although there are still pockets of population decline. The population of rural areas has an older age profile than elsewhere in Scotland, particularly in remoter areas where the population over 65 years is 3% higher than the rest of Scotland. There has also been a trend of younger people (15–24 years) leaving rural Scotland.

The labour market is relatively strong in rural areas overall compared to the rest of Scotland, although pockets of unemployment exist. Rates of self-employment are higher in rural Scotland, and are particularly high in remote rural areas (22% in 2005). The rural economy comprises a broad range of activities, with diversification away from the primary industries of agriculture, forestry, fishing and energy, and growth in the tertiary (service) sector; 69% of GVA in rural areas (based on NUTS 3 areas that are "predominantly rural") is derived from the tertiary sector and 4% from the primary sector. Small firms are characteristic of rural Scotland, particularly in remote rural areas where they support 84% of employment. Recreation and tourism also play a significant part in the rural economy, through access and recreation, accommodation, and marketing of local products.

Much of rural Scotland in characterised by mountainous terrain and harsh climatic conditions. Agriculture covers 6.12 million hectares or almost 80% of Scotland (2005 figures) but difficult physical and climatic conditions limit the uses to which much of this land can be put; 85% is classified as Less Favoured Area. The area of land used for crops, fallow and set-aside represents only about 10% of the total agricultural area. The livestock sector is of particular significance to Scottish agriculture, as shown in the map (see below). Average farm size in 101 hectares, which is large compared to the rest of the UK and the EU. However, a substantial proportion of the holdings are small with 39% of holdings having less than 5 hectares of utilised agricultural land, and 63% of holdings have a farm size of less than two European Size Units. Very large holdings are rare, and only 2% of holdings have a European size unit of over 100. Approximately 10% of the land mass of Scotland us under "crofting" tenure (including in Orkney), which is a system of land tenure which provides grazing rights in an area of common grazing shared with a number of other crofts. In 2005, there were around 14,000 crofters (who are usually tenants). (Extracts from Scottish Executive 2007).

2.2 Rationale for selection of two case study regions

Both the Scottish Borders and the Orkney Islands are defined as "rural", with a combination of "accessible" and "remote" rural within their regions, based on the Scottish Executive Urban-Rural Classification (Scottish Executive 2006) which sub-divides rural and urban Scotland using six categories; at its core, the classification of rural is: settlements of 3000 people or less. The classification is shown in Table 1.

Table 1. The Scottish Executive six-fold urban-rural classification table (Scottish Executive 2006: 1).

1 Large urban areas	Settlements of over 125,000 people
2 Other urban areas	Settlements of 10,000–125,000 people
3 Accessible small towns	Settlements of between 3,000 and 10,000 people and within 30 minutes drive of a settlement of 10,000 or more
4 Remote small towns	Settlements of between 3,000 and 10,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more
5 Accessible rural	Settlements of less than 3,000 people and within 30 minutes drive of a settlement of 10,000 or more
6 Remote rural	Settlements of less than 3,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more

Based on this classification, the two selected Local Authority (LA) areas of the Orkney Islands and Scottish Borders illustrate two contrasting types of rurality (Table 2).

Table 2. Selected Local Authority (LA) areas of the Orkney Islands and Scottish Borders according to the Scottish Executive six-fold urban-rural classification table.

LA	Large urban areas	Urban areas	Accessible small towns	Remote small towns	Accessible rural	Remote rural
Orkney islands	0.0	0.0	0.0	32.2	0.0	67.8
Scottish borders	0.0	26.8	19.9	4.9	37.5	10.8

Further, there is a differential range of increasing pressures on the rural landscapes in these two areas. In the Scottish Borders, where a third of the area is "accessible rural", trends in increasing urbanisation can be observed as communications routes improve. In the Orkney Islands, in contrast, there are issues of land and community abandonment, as clusters or centres of population grow, and services and livelihoods decline in remoter areas. There is migration from remoter islands, dependent on ferries, to the central Orkney islands, or "mainland Orkney". In both LA areas, the ongoing and real pressure of affordable rural housing for the next generation of rural people persists, and this in turn has implications for land use.

It is important to examine how these two trends (urbanisation and abandonment) are described, observed and being addressed in a regional way, and to explore the scenarios which are seen as likely to unfold. Through data-gathering in the two LA areas that has taken place in exploratory phases of the research, issues of regional "rural-proofing" (Scottish Borders) and "island-proofing" (Orkney Islands)[1] are seen as important, as are issues relating to the "regional capacity" – institutionally and within communities – to address regional issues such as urbanisation and abandonment in a sustainable manner. Given that these issues are of interest and concern to the LAs, the research to be pursued through InnoLand will be of practical use to the LAs and will also generate further LA buy-in to the research process.

[1] Rural proofing is a commitment by Government in England and Wales to ensure domestic policies take account of rural circumstances and needs. It is a mandatory part of the policy process, which means as policies are developed, policy makers should: (i) consider whether their policy is likely to have a different impact in rural areas, because of particular circumstances or needs; (ii) make proper assessment of those impacts, if they're likely to be significant; and (iii) adjust the policy where appropriate, with solutions to meet rural needs and circumstances (CRC 2009).

3 Methodologies for investigating the regional challenges, policies and practices

The research to be pursued through InnoLand will build on ongoing research that is currently in its earliest stages within both of the Local Authority areas. This research, broadly, addresses the efficacy of a "regionalised" approach to rural development, and the capacities (such as institutional and community) associated with this. Thus the InnoLand research would both benefit from, and complement, existing research activity.

3.1 Geographical focus

Figure 2 shows the two selected areas for deeper investigation through InnoLand.

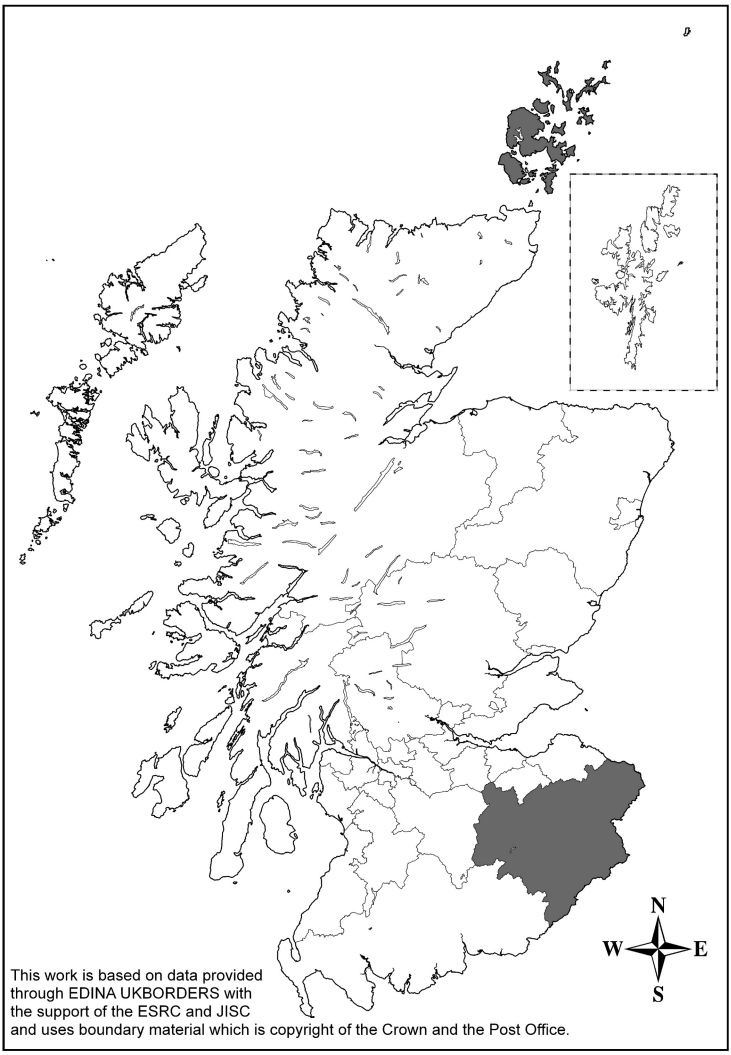

Fig. 2. Map showing the two selected case study Local Authority Regions of Orkney Islands and Scottish Borders.

3.2 Action research orientation

The ongoing investigations will continue to be informed and largely shaped by an "action research" perspective. Reason and Bradbury (2006) state that action research is "not so much a methodology but an *orientation towards* inquiry, and indeed an *orientation of* inquiry that seeks to create a quality of engagement, of curiosity, of question-posing through gathering evidence and testing practices" (p. xxi, emphasis in original); further, that action research is an "inquiry-in-action" that:

- Responds to practical and often pressing issues in the lives of people in organisations and communities;
- Engages with people in collaborative relationships, opening new 'communicative spaces' in which dialogue and development can flourish;
- Draws on many ways of knowing, both in the evidence that is generated and diverse forms of presentation as we speak to wider audiences;
- Is strongly value oriented, seeking to address issues of significance concerning the flourishing of human persons, their communities, and the wider ecology in which we participate;
- Is a living, emergent process which cannot be pre-determined but changes and develops as those engaged deepen their understanding of the issues to be addressed and develop their capacity as co-inquiries both individually and collectively" (Reason and Bradbury 2006: xxii).

This list of components integral to action research are fundamental to the research thus far, and would therefore continue to inform the work carried out through InnoLand. The final point relating to "process" is particularly pertinent, since the details of the research process will be developed with InnoLand partners, and with research partners in Scotland (principally in the two LA regions).

3.3 Phases of the research

Through this approach therefore, and through the multiple phases outlined in the methodology chapter of the InnoLand book (see earlier chapter), the following step-by-step process is envisaged.

1. Diagnosis

Scottish Borders and Orkney Local Authorities will be engaged with, and discussions will take place concerning approaches to addressing the identified regional challenges of urbanisation (Scottish Borders) and island abandonment (Orkney), through, for example: the National Performance Framework, the regional Single Outcome Agreement as well as the other formal (e.g. SRDP, Community Planning) and non-formal ways in which plans are made and solutions generated.

2. Dialogue and joint action

- Using participatory research methods with LAs,[2] the scientific partners will examine processes and engagement (or "deliberation") strategies of the Local Authorities.
- Case studies will be selected for more in-depth analysis, using both quantitative and qualitative tools: specific aspects of the urbanisation and abandonment trends will be identified for feasible inclusion within the research, and the links between these trends, engagement processes, and impacts on landscapes will be explored.
- Further, since Local Authorities are engaging with a range of stakeholder groups in the delivery of regional policy and practice, scientific partners will also engage with those stakeholders seeking to bring into the research the perspectives of those not currently considered as active stakeholders.[3] A wide range of stakeholders will be identified, since they will be affected by (and engage with) the pressures and changes in different ways, and the research will seek to identify this differences.

3. Exchange and evaluation

- Within the InnoLand work as a whole, options will also be explored for enhanced Knowledge Exchange and capacity-building, both between researchers and LAs, and also within research, LA and voluntary sectors, where feasible and appropriate. This approach aims to develop a legacy beyond the research.
- The perceived efficacy of regional and regionalised policies will then be examined, and – together with InnoLand partners – appropriate "measures" or "indicators" may be developed.
- Included within the focus on efficacy will be an analysis of the capacity of those within the regions (from public, private, and voluntary/third sectors) to conceptualise, implement and assess the efficacy of regional and regionalised development processes, partnerships and policies.
- There will be an emphasis on comparative analysis, such that the findings from the cases in Scotland can be "tested" in other InnoLand partner

2 Recognised are the methodological issues associated with participatory research and with co-construction of "problems" and "solutions" and the maintenance of a reflexive stance on these is seeked through the methodology work package part of InnoLand (Hickey and Mohan 2004).

3 Again, it will be recognised that there may be implications for the status quo in bringing into the research those who are not normally considered as stakeholders, or bringing them to the table in a different way. This is part of the reflexive process associated with action research and will be a deliberate focus within InnoLand.

countries – for example, by examining components of the "institutional landscape" in two Scottish LAs, what might this tell us about similar/different institutional landscapes in other partner countries, and what do these similarities and differences tell about the institutional roles in regional landscape development and management?

4 Implications of the research findings

Clearly, as has been outlined, there is both a rationale for "territorial" or regional development approaches (e.g. OECD 2008), and for policies and practices which are either regional in their construction and implementation, or regionalised versions of national policies and priorities. The aim of this ongoing research is to determine the extent to which regional, or regionalised, development approaches, allow for the more effective management of rural landscape change, due to their sensitivity to place, locations and capacities.

Further, the research will allow to examine how a regional development approach can complement a national strategy effectively, and whether local can realistically sit within regional and national perspectives. The effectiveness of the Quadruple Helix[4] in addressing these regional challenges is thus part of that analysis.

This exploratory research shows that so far, this action research is of particular interest to regional governments, particularly given the context of the National Performance Framework and the Single Outcome Agreement. Further, the aim is that it will assist – through action research – in a reflection on the match (or mismatch) between Outcomes and Indicators, which is a challenge under this new system: that is, how do regional governments know they are reaching their Outcome?
Specifically then, our research will continue to explore three themes:

1. The "fit" of regional, and regionalised, development policies to addressing regional demographies and how they are impacting on landscape and land use change;
2. The extent to which regional, and regionalised, approaches to development can also deliver to a national strategy and objectives; and

[4]A Triple Helix is a partnership between public sector, private sector and research/education. A Quadruple Helix includes the citizen as "third sector" or voluntary sector alongside public, private and research/education.

3. The "capacities in the regional system" for addressing issues on a regional basis – capacities within rural communities, and within the four elements of the Quadruple Helix.

Through the approach as outlined, and the focus on these themes, the research will explore evidence relating to ways in which different levels of development policy are perceived as being effective in addressing and adapting to changing rural demographies and associated pressure on, or abandonment of, landscapes. This will build on other work in territorial (rather than sectoral) development, and also link with OECD's (2008) publication: *OECD Rural Policy Reviews, Scotland, UK* where a territorial, joined-up approach was recommended as a policy priority for Scotland's rural future.

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Epilogue

The InnoLand case studies – first conclusions

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The InnoLand initiative is an extraordinary network for sustainable rural development at landscape level that extends over six countries of the EU-27. In contrast to many research projects, its aim is not only to develop solutions for a sustainable development approach but also to implement, to test and to evaluate these solutions. This ambitious programme has a common conceptual basis and is adjusted to the specifics and requirements of every region. As has been shown throughout the cases in all chapters, all the regions seek to realise an action-research approach that follows a joint procedural course and that is located at a science-practice interface involving regional stakeholders in an ongoing dialogue with the scientists involved.

Because of the individually differing site situations and external frame conditions there is a broad range of what is defined as an innovation. All chosen InnoLand regions are obliged to modify their established land use systems due to changing politics, market situations, demographic changes, climate change etc. Therefore in these regions basically there is a high preparedness to follow innovative opportunities for land use changes.

Thus the innovations and new strategies to be realised differ considerably in correspondence to the regional challenges and problems while the methodology is harmonised. The InnoLand initiative has chosen its cases so as to cover a broad set of different challenges for the rural landscapes' performances. As an example, the socio-economic dynamic of the Portuguese region is opposed to that of the Slovak region: here an extensive agriculture reigns, population density is low and the innovation consists of an appropriate channelling of the demand on landscape amenities of the other societal interest groups. Hence, the competitiveness of this region is still somehow undiscovered. There, in the Trnava district, the urban pressure

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on agricultural and landscape resources is that strong that these interests have to be accommodated with each other rather than given way. Multifunctionality of agriculture and agro-landscapes although widely acknowledged at the European policy level, is a concept that still needs active promotion in this regional context.

Multifunctionality understood as joint production of food and fibre along with benefits such as the rural viability and the cultural and ecological diversity of landscapes caters to this requirement. Systematic decision-making support for the sustainable development of multifunctional landscapes requires a much broader framework, however, in which economic efficiency is just one consideration and agriculture just one sector of economic and social activity.

Another cross-cutting topic is sustainable water management in agriculture, which will obtain even increasing attention due to climate change. And by now the scientific as well as the political discussion no longer will be restricted to mitigation issues. There is a broad acceptance that climate change already has manifested in many ways and that adaptation to the changed situation is necessary. In this context water management strategies are tackled on different spatial and administrative levels in the InnoLand initiative: the German case scrutinises technological aspects at the resource-field interface and embeds the implementation aspects in the overall institutional framework. The Croatian example aims at the linkage between resource protection and agricultural production at field and sector level. And, while the German example has a clear extensification background, the Croatian one heads for intensification. The Slovenian approach to sustainable water management is the broadest approach of these three cases, taking into account not only agricultural and ecological but also socio-economic issues systematically.

Finally, the Scottish example focuses on a further crucial aspect of the rural innovation process – the making of rural development policies. Here, the interests of different rural stakeholders and actor groups and especially the processes of their involvement in the development of rural landscapes are investigated. This perspective will be a complementary one to all other cases because it mirrors the consequences of the InnoLand approach at the science-practice-policy interface. Especially the large water management programme in the Croatian Zadar region but also e.g. the upscaling of the Zero-Emissions Strategy in Brandenburg, Germany will benefit from the cross-regional exchange on and reflection of the innovation processes.

Altogether, the InnoLand programme is – as far as the editors can see – unique for Europe's rural regions. To be clear: its particularity is not seen in the existence of regional initiatives for a sustainable development. Its particularity consists of the joint research and practice approach that relies

on a concerted conceptual understanding among the network partners. On this basis, and presuming that the initiatives in the regions will realise the full programme cycle, an important series of process information will be generated that is likely to capture the complexity of rural regions' change and development processes. Especially for political considerations on the tailoring of site-specifically adjusted and problem-oriented rural development policies the results of the InnoLand initiative will constitute a valuable basis. It is the intention of the editors to continuously document the commenced work and to present not only the regions' results but also cross-regional comparative assessments on both the conceptual and methodological aspects of the programme as well as on the outcomes.

Furtheron, the InnoLand approach already now is an example for a *Joint Programming* all over Europe. The idea behind Joint Programming is that research activities about one specific research topic will be picked up by research institutions all over Europe and in so doing will take place all over Europe, financed by national funds. This already is implemented within the InnoLand project. All the regional projects already have started, funded by national ministries, research foundations and other bodies.

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