

## **LIVEABLE LANDSCAPES: A key value for sustainable territorial development**

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### **Abstract**

The development of territorial cohesion policies in EU has become a very powerful tool for the implementation of European political guidelines. Besides, with regional policies in EU increasingly focused on harmonious territorial development towards sustainability, highly inspired by the European Landscape Convention (ELC, 2003), the elaboration of landscape plans and calling for its integration within spatial planning has become a potential asset in regional development towards sustainability.

Within this context the landscape has become a key territorial value where analyses and assessments could become important elements which could enrich and improve integrated spatial planning and urbanism in different ways, and be seen and used as an asset for economic and territorial development. But with the European Union characterised by varying, historically developed governing and planning systems in relation to both landscape and spatial planning, the process of reaching such a goal is not a simple task. The differences in land use decision processes due to different patterns of legal, constitutional and administrative frameworks have obvious impacts on the concept of landscape and practices in relation to landscape management and planning. It seems clear that the linkage between territorial development strategies and landscape planning is a political priority.

The paper presents the LIVELAND project, an ESPON 2013 targeted analysis running from March 2012 until April 2013, which focuses on policy making for liveable landscapes. In particular it aims to explore practices of landscape planning and regional territorial strategies. By means of policy analysis and exchanging experience, among landscape planners and policy advisers, comparisons are drawn on the content, methodologies, processes and procedures of policy making for landscape. The identification of successful approaches in combining landscape management and socio-economic development will constitute a basis of this comparison, and based on evidence, advices will be made on 'planning for liveable landscapes' in the form of guidelines and policy recommendations. In the proposed LIVELAND project these objectives and aims are addressed by including six case examples studies across Europe, each representing a different planning culture and different levels of competences and territorial scales of landscape policy making.

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These 6 cases serve as examples to: get an insight of the current practice of landscape policy making, and of implementing European landscape policy in particular (without pretending a complete overview of European practice, because this targeted analysis is a bottom-up initiative); it is expected that common denominators will be identified such as terms, concepts and practice that are shared among the landscape policy makers who are included in this project. The participant regions and cities are: The Basque Country (Spain), The City of Ljubljana (Slovenia), Midden-Delfland (The Netherlands), Navarra (Spain), Thy National Park (Denmark) and the city of Offenburg (Germany).

Key words: Landscape, Spatial Planning, benchmarking, policy making, territorial cohesion.

## **1. Introduction**

Competitiveness and attractiveness of regions have become important aims of regional, territorial and environmental policies of the European Union, particularly as contributing to harmonious territorial development.

The European Landscape Convention states that landscape “*constitutes a resource favorable to economic activity*” and responds “*to the public’s wish to enjoy high quality landscapes and to play an active part in their development*” (Council of Europe, 2003).

### **1.1 Concepts and approaches**

It is embedded in European concepts of landscape that, as people, we do not simply live in a physical reality of ‘areas’ or ‘territory’ but mainly in our perception of such areas: in landscapes (Moore & Whelan 2007). ‘Landscape’ includes the physical and the mental, the natural and the cultural (COST, 2010). Landscape is a common good that visibly and invisibly frames everyday lives.

In recognition of a multifaceted aspects of landscapes, the European Landscape Convention (Council of Europe, 2003) recognizes landscape as having “...an important public interest role in the cultural, ecological, environmental and social fields”. Consequently, improving the understanding of the outcomes of landscape planning decisions is of high political priority (European Union, 1998), a conclusion which is followed up in the European Landscape Convention (ELC) stressing the importance of stimulating the elaboration of landscape plans for the considering of landscape as a key territorial value (Council of Europe, 2000). The Convention recognizes landscape as having “...an important public interest role in the cultural, ecological, environmental and social fields, and constitutes a resource favourable to economic activity and whose protection, management and planning can contribute to job creation”.

This need of developing a definition of landscape as an asset in regional development towards sustainability is fully recognized by ESPON, emphasizing among other things the need for a: “Balance between landscape protection and social welfare and economic development” through an “Improvement of governance and participation of key actors and stakeholders in the planning process”, and furthermore “Assess, evidence based, how to consider landscape planning in the framework of territorial cohesion policies”.

Within the LIVELAND project:

- Landscape is recognized as “whatever part of the **territory as conceived by the population**, which character results from the action and interaction of natural and human factors”.
- Landscape is also recognized as an essential element in the quality of life, expressing a common natural and cultural heritage, and contributing to the configuration of the territorial identity.
- It is also a dynamic element which reflects the relationship between the population and its territory along time, and therefore, its conservation should focus on maintaining and improving its quality and diversity, integrating new elements and uses.
- Land use strategies increasingly emphasise multifunctionality. The landscapes of the future will have to serve, simultaneously and in integrated ways, a number of different functions (Haber, 1977). These functions are employed for analysis and policy proposals in this project:
  - ecological (as an area for living organisms and natural environments), (Daily, 1997)
  - economic (as an area for production and reproduction),
  - socio-cultural (as an area for cultural actions and identification),
  - historical (as an area for settlement, memory and identity),
  - and aesthetic (as an area for shaping and experiencing).
- “Multifunctional landscapes” refers to areas serving different functions and combining a variety of qualities, i.e. that different material, mental, and social processes in nature and society take place simultaneously in any given landscape and interact accordingly. Multifunctionality in landscape, therefore, means the co-existence of ecological, economic, cultural, historical, and aesthetic function. (Zebisch et al, 2004).
- Balance between landscape protection and social welfare & economic development is possible and wanted.
- Landscape approach (evaluation and planning) could enrich and improve integrated spatial planning and urbanism

- The evaluation of the landscape requires a global vision of the land throughout a multi- scale approach, going beyond the local interest and point of view.
- The identification of landscape objectives can be the support to motivate the improvement and development of poorer or abandoned areas.
- The assessment of the landscape can contribute to the process of making decisions about the most sustainable way to use the land.
- Improvement of governance and participation of key actors and stakeholders in the planning process

## 2. Project objectives and aims

The LIVELAND aims at exploring practices of landscape planning and of regional territorial strategies. By means of policy analysis and exchanging experience, among landscape planners and policy advisers, comparisons are drawn on the content and landscape analysis and evaluation methodologies, processes (public participation / institutional coordination), procedures of policy making for landscape (protection figures, planning instruments) and performance monitoring. The identification of successful approaches in combining landscape management and socio-economic development will constitute a basis of this comparison, and recommendations are made on ‘planning for liveable landscapes’ in the form of guidelines and policy recommendations.

Specific project aims are as follows:

- Developing a **definition of landscape as an asset in regional development towards sustainability**.
- With this project ESPON will have made a first systematic analysis about landscape protection and development in European ‘planning systems’
- **Identifying good and best practices** in the stakeholder regions, with regard to **landscape and spatial planning**, and of their impact on regional development.
- Identifying specific **actions or measures** in the stakeholder regions which have proven to be successful in implementing combined landscape protection and socio-economic development.
- **Benchmarking** of the methodologies for analysis, content and procedures to improve the processes and performances of planning in the involved regions.

- Scientifically assess how landscape approach (analysis and assessment) and landscape planning could enrich and **improve integrated spatial planning and urbanism**
- Defining **criteria for the integrating** of landscape and regional strategies. Assess, evidence based, the consideration of landscape planning within territorial cohesion policies.
- Analyse available **ESPON data and results** from previous and also current projects that could be used to reinforce the consideration of landscape as an asset for territorial development.

### **3. Case studies**

In the LIVELAND project these objectives and aims are addressed by including 6 case examples studies across Europe, each representing a different planning culture and different levels of competences and territorial scales of landscape policy making.

Table 1. Case studies in LIVELAND project

<i>Case study</i>	Overview
<i>The Basque Country</i>	Is revising its Spatial Planning Guidelines and a proposal for a Landscape Law is under development inspired by the ELC with the aims to integrate landscape planning in other planning instruments
<i>The city of Offenburg</i>	Has recently made a landscape plan and seeks to develop and protect landscapes under urban pressure. Offenburg belongs to “Eurodistrict Strasbourg/Ortenau”, so there is already exchange on European scale. A new “Landschaftsplan” is nearly done. Concerning landscape planning, the municipality is interested in improving and learning from the experience of other European regions and municipalities, particularly with reference to successful execution of recommended measures.
<i>Midden-Delfland</i>	Landscape development plan already exists and actions in partnership with the surrounding urbanised municipalities are currently being implemented. From regional perspective, the interest is how to stimulate project development and landscape monitoring. Local and regional governments work close together.
<i>Government of Navarra</i>	Wants to prepare a new landscape plan for the region, based on European experiences. To date, many formal regulations and informal actions exist which now should be articulated and improved by the new plan. The Government of Navarra is especially interested in the specification of the envisaged results concerning the "the guidelines for the elaboration of landscape plans and their implementation". These guidelines will be used for the design of the landscape plan of Navarra.
<i>Thy National Park</i>	Is challenged by the question of enabling a planning process involving all relevant stakeholders in order to obtain a coherent landscape development.
<i>The City of Ljubljana</i>	Is interested in methodologies for the identification of landscape potentials and the development of guidelines, aimed at bringing new arguments in the stakeholders’ dialogue for the development of the Ljubljana and its surroundings. European exchange of experiences is an important motivation.

## 4. Scientific approach and methodology to be applied

A common framework has been established aiming at exploring good practices of landscape planning and regional territorial strategies in the stakeholder regions and to benchmark the content and procedures between regions.

The following sections describe the main issues, from abstract concepts to planning practices, which will be applied as cross-cutting and transversal issues all along the project tasks.

### 4.1 Parameters of analysis

- **Methodologies for the evaluation of landscape**

The project should assess the different methodologies that are being used for the evaluation of landscape: data used, landscape elements and methods of valorization, establishment of objectives and also methodologies for the application of landscape concept into practice: protection, conservation, management.

The analysis of the plans will focus on:

1. ***Landscape or spatial structures and appearances:*** This includes areas defined through major environmental features (as natural patterns like rivers), and man-made objects and patterns (such as settlements, power-grid lines etc.) These patterns, in their appearance in maps and plans, are not only defined through their “locus standii”, but also on their coverage and their density within the appropriate area unit.
2. ***Functional features:*** This defined through environmental features such as Biodiversity and Productivity; socially such as Place to live, work, visit temporarily or more frequent through second homes; economically through Production and Reproduction. Identification of functions is important when dealing with general area characteristics, and especially important when dealing with multiple functions/multifunctionality across sectors as a key concept in relation to for instance urban sprawl, homogeneity and heterogeneity of land use.
3. ***Values or qualities:*** the ‘quality’ or ‘value’ of space / landscape is an important issue of planning. Beside the function often the natural, economic, cultural and recreational value is mentioned on maps and plans.
4. ***Future developments and scenarios:*** the future spatial developments (trends and scenarios) are often analysed to develop goals and strategies for also to develop ‘desirable / advisable’ measures for protection, development and management of space and landscape.
5. ***Drivers of change in functions and values:*** For instance socio-economic driving forces such as: Land ownership; Land management practices; Land use patterns; Landscape/Land cover; Aesthetics; Biodiversity; Productivity of

ecosystems; Forestry; Agriculture, or institutional driving forces such as regional, national, or EU regulations.

- **Planning processes & participation**

Process understood as governance and sequence of planning, including formal and informal methods and practices

- Planning and planning processes at different administrative levels (here local and regional authorities with political power to guide developments as well as protection of certain values);
- Planning and planning processes in different sector settings (as nature, recreation, agriculture, urban dwellings, etc.) that can generate developments and investigations;
- Planning and decision taking procedures ('good governance' and participation) in relation to landscape and territories.

- **Planning procedures & decisions**

The procedures, including the administrative requirements to be fulfilled following specific legal frameworks will be other very relevant parameter to be considered in our research.

The local and regional plans for landscape and place are often made with participation of stakeholders. It is important to analyse which procedures of decision taking have been followed: such as hierarchical / bottom up / top down / stakeholder driven / administratively organized etc.

- **Actions and measures of local / regional government**

The analysis should also address which actions and measures have been incorporated, whether it could be formal as part of a regulated procedure, or informal, for landscape management and planning at different levels of competence.

- **Impact measurement: monitoring indicators and systems**

It is important finally to identify which monitoring systems are in place, for measuring the territorial impact of the actions incorporated in the planning instrument with regard to landscape management and planning.

## **4.2 Multilevel/Multisector/Multifunctional approaches**

The project will apply a multiscale and multisector approach in a transversal way all along the project development.

Although the participant stakeholders represent different administrative levels and competences, both local (represented by the cities of Offenbourg, Ludjlbiana and Midden-Defland and Thy National Park cases) and regional (Basque Country, Navarre), the project will look at the coordination of different levels of planning and also the implications of cross-sector planning. With this regard is remarkably important to address the implications that regional landscape planning will have at local level.

As planning and policy making is often done by a variety of different authorities including experts with different backgrounds the impact of local, regional and national differences should be clarified before examples of planning practice are compared. These include state planning agencies, environmental and nature protection agencies, cultural agencies and authorities for monument protection, regional planning offices, nature park administrations, local administrations; private planning consultants may be called in for support. By comparing approaches taken, by different organisations representing different levels in the planning and managing landscapes, a set of common quality standards might emerge.

Another issue appears when looking into the above described approaches, namely that sectoral differences are another important quality that should be reflected and enables consistence when used across different sectors.

The expression multifunctionality, and more specific “multifunctional landscapes” refers to probably the most important contemporary challenge when dealing with the concept of landscape, namely that areas increasingly serves different functions and combines a variety of qualities, i.e. that different material, mental, and social processes in nature and society take place simultaneously in the landscape and interact accordingly. Multifunctionality in landscapes, therefore, means the co-existence of ecological, economic, cultural, historical, and aesthetic functions. Although there are different ways to classify landscape functions, all lead to the same conclusion that landscapes are multifunctional.

As a cornerstone of the project is the comparing of examples from different regions, and therefore with concepts and conceptual frameworks with historical differences in both definitions and practices, the project needs to get an overview of as well the current approaches to practice of landscape policy making, and of the implementation of landscape policy in particular, whereby common denominators such as the identification of terms, concepts and practice shared among the landscape policy makers who are included as stakeholders in this project enables comparability, and at the same time contribute to how landscape approach (analysis and assessment) could enrich and improve integrated spatial planning in different ways and be seen and used as an asset ensuring that assessment of the landscape can contribute to the process of making decisions about the most sustainable way to use the land, improve the governance and participation of key actors and stakeholders in the planning process, and finally contribute to the assessment of how landscape planning can be considered in the framework of territorial cohesion policies.

### 4.3 Stakeholder involvement

As a project within the framework of ESPON Targeted Analysis Based on User Demand, the question of stakeholder involvement is crucial. Practitioners are both contributing to defining the demands that has led to the call, but are also to be integrated throughout the project as suppliers of more detailed information and practical know-how. In that connection they are expected to be critical in the process of outlining new understanding and perspectives in relation to future development opportunities and challenges, but at the same time also active in relation to the outlining of actions and potential new projects. Two groups of contributors are identified: First of all the professionals on space and landscape from the stakeholders, but in addition a group of experts who have been – and are – practitioners in relation to dealing with the problems outlined throughout the project, who, due to communality to the case study practitioners, constitutes a “legitimate peripheral participation” (Wenger et al., 2002) are able to supplement the stakeholder’s involvement with additional input.

With a goal of bringing up the specific approach of landscape and territorial planning of each region through the exchange of experiences and giving feedback to the involved regions, the involvement of the stakeholders include five components:

1. The stakeholder’s involvement is essential throughout the project and starts off with the definition and development of the specific theme for the targeted analysis.
2. The stakeholders will provide input and play an active role by delivering strategies, plans, spatial data, cases and measures and other relevant information about their regions;
3. A comparison between the practices of different administrative territorial entities (planning agencies of the involved local and regional authorities) in order to identify examples of good/best practices will be tested and responded to from both individual stakeholders as through a more general responses from the whole group of stakeholders.
4. A series of workshops will serve as a tool for discussions among the stakeholders and the research group to compare the region’s performance at three levels:
  - a. Internally, aiming at providing a comparison between different practices (methods, operations and procedures) of landscape and territorial planning within one's own organisation;
  - b. Intermediate by evaluating own practices against the other cases and thereby acquire an important contribution to internal knowledge generation;
  - c. Externally through evaluating the potential usability of the best practices for generalizations beyond their own situations.
5. Finally their comments to the generalizing of experiences and best practices of landscape and territorial planning and their impact on

sustainable development in relation to future planning approaches will be important.

The precise involvement of experts has not been decided on at this point of time, but it is expected that the option of involving one or a few experts with both practical as well as more overarching experiences within the integration of landscape and territorial planning would be included in the workshop activities.

#### **4.4 Benchmarking**

The benchmarking is based on the baseline analysis of the regional planning practices and case studies of plans, where the policy contexts (European and national), spatial planning systems, methodologies of analysis and studies, processes, procedures, challenges as well as needs are outlined for each of the regions. Out of this an analytical framework for the benchmarking procedure is generalized. In addition to the case studies “learning cases” will be taken into account which may provide longer traditions of including landscape plans in territorial planning may be included as well. Similarly input from the first stakeholder’s workshop will provide important input to this activity.

A second step in the procedure include the identification of similarities and differences between the planning practices– territorial as well as landscape wise - and thereby enabling a categorization of the case studies according to similarities in planning systems, practices and planning tools. Emphasis will be on local and regional plans, which may provide guidance to future spatial measures of protection, development and management of space and landscape. The comparison will be structured through a set of indicators which enables a comparative presentation of practices and plans. We intent to use the same scheme as in the baseline analysis of cases in stakeholder regions:

- Analysis of space / landscape and future developments
- Problems and challenges
- Objectives and targets
- Actions and measures of government
- System of monitoring
- Impacts.

The results of this comparison will be presented through a draft version of “Guidance in benchmarking best practices”.

A third step will be the second stakeholder’s workshop which is intended to serve as a key meeting place between practitioners, selected experts and the research team. The workshop will be a learning experience between practitioners and experts from the case regions by being a meeting between three different knowledge components: the practical experiences of stakeholders, the input from the group of experts as well as input from the research team.

To guide the learning process and the targeted output from the workshop an agenda will be made aiming at prioritising the discussion items in order to keep a feasible ‘work load’ of a workshop of maximum two days. An important item for the ‘agenda’ will be the question of which practices (kind of spatial problems and type of plans) are comparable, and which kind of learning processes could be promoted. Generally spoken professionals (‘plan makers’) could learn from each if, at one hand:

- Their problem statements and challenges are comparable (like high urban pressure versus ‘shrinking’ depopulating regions; rich versus poor economic performance);
- Their scale of working is comparable (regional, abstract strategies versus local, implementation programmes).

And at the other hand:

- Their methods and cultures of planning are different (e.g. ways to analyse the spatial development, kind of goals and steering strategies; methods of participation). Popular formulated: it is interesting to talk with each other, when we consider having the same problem, but working on different solutions and also in a different way.

Based on the above, two outcomes are target: on one hand a refining of the “Guidance of benchmarking best practices” will take place, which will be presented for the stakeholders at the third stakeholder’s workshop. And on the other hand the overall results of the stakeholder involvement and the benchmarking exercise will provide messages and recommendations on how to integrate ‘landscape’ in European territorial cohesion policies and national spatial strategies. It will further deliver recommendations for future benchmark procedures.

#### **4.5 Policy recommendations**

The diversity of her landscapes is widely appreciated as one of Europe’s major assets. Consequently, the wise management of landscapes and their special character leads to adopting generally accepted ways of landscape policy making. Pertinent recommendations are provided through this LIVELAND project. The first set of recommendations lists strategies that are designed to overcome current policy making challenges. The second set includes ideas for a contingency planning. The overall strategy would be to build up better levels of understanding of regional cultural differences referring to landscape and to concepts of landscape, and to build strength on the basis of the potentials that cultural and landscape diversity offer.

Since a number of different policy sectors (organisations, government, and non-government) are engaged with or directly/indirectly affect landscape, strategies are developed for these sectors to **engage in communication over landscape and landscape policy**. Suggestions are provided for ‘good communication’ across different sectors, levels of decision making, authorities and NGO, and private consultants. A suitable terminology is needed. Included are common understandings of the ‘concept of landscape’, of shared ideas about ‘liveability of landscapes’,

agreements on definitions of landscape as an asset in regional development, and as an asset that is important to lead the way towards sustainability. Encouragement is also given to allow for a common understanding of landscape that relates to the variety of concepts that exists and yet would connect different disciplines. The overall aim of this strategy is to try and reduce risks of misunderstanding each other (different disciplines, different points of view of different organisations, etc.).

On the foundation of ‘good communication’ strategies are recommended for different policy makers to assume **trans-sectoral perspectives on landscape**; for example, between those in environmentally / ecologically based administrations / professions and those arising from social sciences and the humanities. The overall aim of this strategy is to try and reach a common understanding not only of what landscape is, but also of the services that are expected of landscapes to provide (referring to so called ‘ecosystem services’, ‘cultural services’, and other ‘services’ that are essential for people’s health and wellbeing, including the need for identity, for restorativeness, and many others). The overall aim is for policy makers to start and bridge the gaps that exist due to landscape issues being scattered across different segments of government and administration, and to de-fragmentise landscape policy making activities (including landscape and territorial planning).

Strategies are also needed for **developing pan-European perspectives on landscape**, instead of separating regional / local from European views / scales. Policy makers are advised to try and build on European networks of regions, professionals, etc. The overall aim is for policy makers to take advantage of opportunities that focus on landscape as it is cherished as essential to liveability of every region, and to link liveability to competitiveness and attractiveness of regions. From here, links are to be made to aims of regional / territorial / environmental policies of the European Union, particularly as contributing to harmonious territorial development and towards sustainability. Cultural landscapes, ‘liveability’, ‘regional identity’, human health and well being all refer to important aims of regional / territorial policies at the European level. Policy makers are advised to implement these general policy goals at regional and local levels.

As ‘landscape’ is considered an integrated concept it is also very much suited, in policy making, for achieving sustainable development. Recommendations are given that calls for policy makers to **stimulate knowledge based planning and the elaboration of landscape plans** in particular. Landscape planning, management and protection should be done in integrated ways, referring to indicators and to good and best practice examples (as provided by this project). The elaboration of landscape plans also calls for the integration of their policy output into spatial planning, for policy makers to be considering landscape as a key territorial value.

Recommendations are given for policy makers to agree on management structures for **planning processes that are inclusive and assume an outcome oriented approach** (instead of ‘plans only’), referring to the liveability needs of all who live, work and recreate in a given area, their landscape. Forms of decision making are

advisable that are open to all segments of society and respectful of principles of good governance. By involving all interested parties, and their perceptions and interpretations of landscape, the development of landscape quality objectives is much enriched. The use of public participation in the identification and evaluation of future landscapes is seen as being crucial to informing decision makers. In this context it is important to accurately represent and describe the range of landscapes and landscape types experienced by members of the civil society; these might include cities, peri-urban areas, coastal zones and sites of mobility (some of which might otherwise be neglected if policy advising is done by experts only). It is important to choose approaches that help make policy makers understand what it is in people's surroundings that they cherish, now and in the future.

Furthermore, policy making is advised to consider to what extent landscape-relevant and politically important issues will need to be thought of with reference to the generation-gap (different views and values with every new generation), to demographic change and migration, climate change, lifestyle changes (relating to landscape use and preferences), etc. These are considerations that are referring to the future and thus directly relate to sustainable development. In this context it is also important to make decisions on the involvement of stakeholders, especially on how to include not only persons who have specific rights such as land owners, but also to involve representatives of temporary users such as tourists and second home owners etc., and even future 'claim holders' such as young people and children.

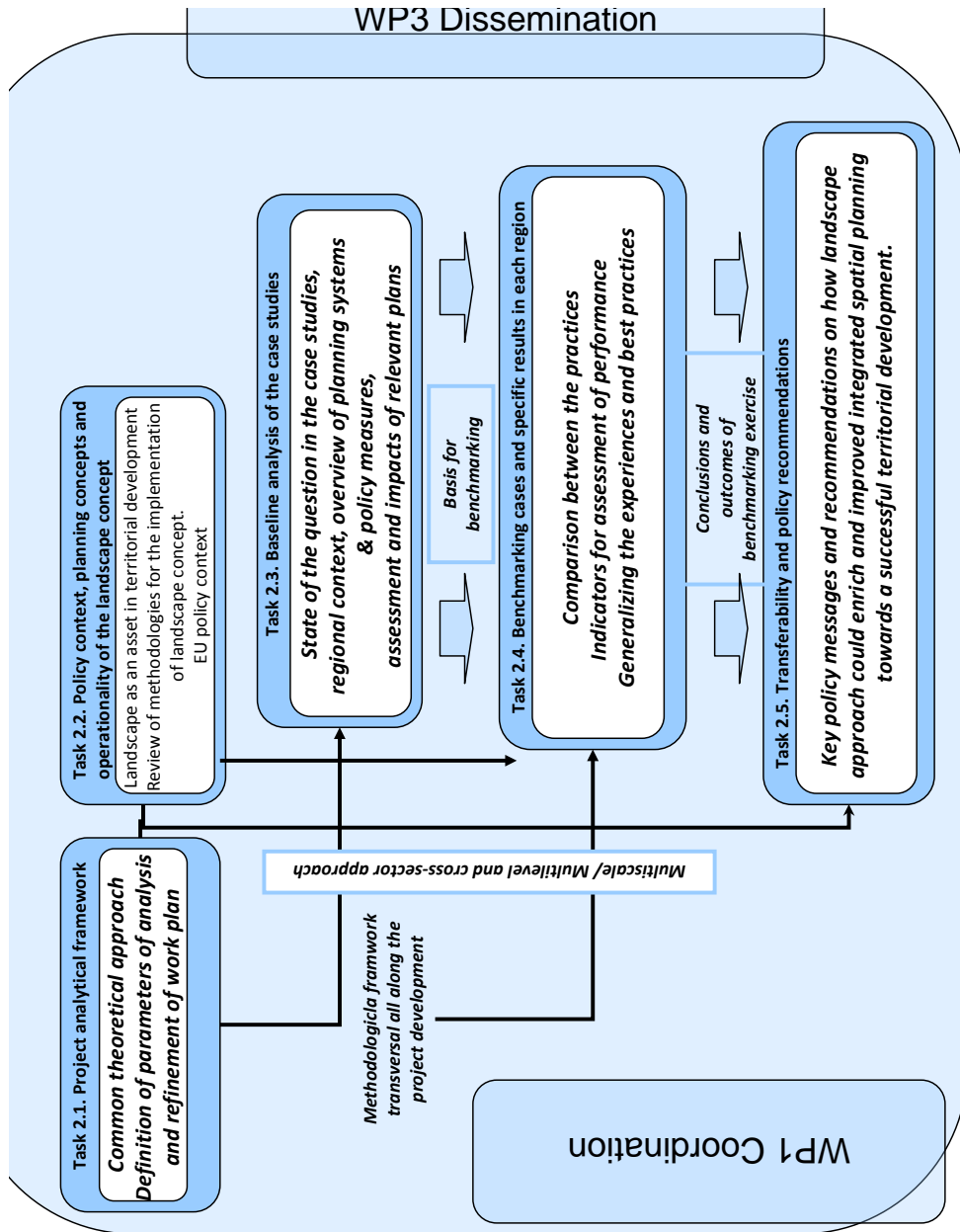


Figure 1. The LIVELAND project work flow.

## 5. Conclusions and expected results

Addressing the objectives and questions described above, the proposed LIVELAND project will strive to answer the following key policy questions

- Developing a definition of landscape as an asset in regional development towards sustainability. With this project ESPON will have made a first systematic analysis about landscape protection and development in European ‘planning systems’.
- Balance between landscape protection and social welfare and economic development.
- How landscape approach (analysis and assessment) and landscape planning could enrich and improve integrated spatial planning and urbanism in different ways:
  - The evaluation of the landscape requires a global vision of the land throughout an multi- scale approach, going beyond the local interest and point of view.
  - The identification of landscape objectives can be the support to motivate the improvement and development of poorer or abandoned areas.
  - The assessment of the landscape can contribute to the process of making decisions about the most sustainable way to use the land.
- Improvement of governance and participation of key actors and stakeholders in the planning process.
- Assess, evidence based, the consideration of landscape planning within territorial cohesion policies.

The project is envisaged to deliver the following results:

- An overview of the EU policy context and the context of relevant national planning systems and traditions for an integration of landscape planning and territorial development
- Insight on the way landscape planning relates to economic development and land use pressure (urbanisation and agricultural intensification) including possible causal relations
- Methodology of analysing ‘good practice examples’ and benchmarking of the content and procedure (governance aspects) of landscape plans and their impact on the sustainable development of the case regions, and

choosing best practice in discussion with professionals and experts of planning from the stakeholder regions

- Examples of ‘good & best practices’ of landscape planning and the way they relate to regional territorial planning in the stakeholder regions
- Recommendations to professionals in the stakeholder regions to improve their processes and performance of landscape and territorial planning
- Policy messages for the relevant European (EC and CoE) and national authorities, to encourage the incorporation of landscape in the territorial cohesion and territorial planning policies
- Assessment on the use of ESPON data, objectives and results from relevant projects and studies. Identification of knowledge gaps to be covered by future ESPON projects

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## INDICATOR ANALYSIS ON THE ISSUE OF TRANSPORT ENERGY CONSUMPTION

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### Abstract

The issue of transport sustainability is drawing more and more attention from related researchers all over the world. In this domain, as one respect, the restriction of energy consumption in transport sector is crucially important to a certain extent. There are many ways for analyzing the factors of the superfluous energy consumption in transport to give reasonable interpretation for the incentives of it. In recent years, factor analysis related method such as decomposition analysis and data envelopment analysis are used in literatures in order to catch the principal factor that leads to the consumption. But it remains a problem that why the very factors are selected for the analysis instead of others, and there is no convincing evidence given by the analyzers. This paper introduces the method of indicator analysis rather than generally used factor analysis to make the analysis afterwards more reasonable. Indicator analysis considers the possible factor to be candidate indicator and evaluate them in advance based on the criteria of indicator selection. The criteria are developed for the application in the transport domain and classified into three categories which named representation, operation and policy application. The scoring standard for evaluation is also given in detail in order to get impartial result. Fuzzy functions are also introduced for joint consideration of indicators.

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## **1. Introduction**

Sustainable development is considered to be a permanent topic around the world in recent years. The basic spirit of sustainability is to meet human being's needs as well as preserving the resources and environment of the world, so that the needs of human can be met not only at the time being, but also in the future for next generations. Sustainable is the systematically combination of environment, economic and social. Based on this spirit, we have to take more consideration on sustainability as well as economic development. Transport activity effects the environment, economic and social very much, therefore it is very important to trace the activity of transport for the research of activity. In this paper, we focus on the domain of the energy consumption in transport factor. It shares about 20% by the transport sector in the total all over the world, and the absolute amount is increasing generally, which is rather a crucial part.

Japan confronted a boom of economic development after the World War II, and is becoming one of the most advanced countries all over the world. At the same time, the consumption of energy in Japan is growing up steadily, which most of the energy consumed is non-renewable resources such as coals and oil. It is not considered sustainable for the ratio to consume so much non-renewable resources especially after the experiences of the oil crisis. And now, the accident of the Fukushima Daiichi Nuclear Plant makes the public uneasy for the safety of nuclear power particularly for the places where suffers from natural disasters easily. Other means of clean energy is restricted by the nature conditions crucially and the cost remains high. Overall, there is a long way for the development of the renewable resources. Therefore, it is more important to reduce the amount of energy consumption particularly in Japan which is not a country abundant in energy (Agency for Natural Resources and Energy, Ministry of Economy, trade and industry. 2008).

There are many ways to analyse the change of the consumption of the energy consumption for further policy suggestion. The most usual one is to analyse the factors which lead to the change of the total amount of consumption. Due to the method of factor analysis, we can find out the importance of each factor and can give corresponding suggestions on improvement. For instance, we can calculate the

proportion of each factor introduces by the method of decomposition analysis (Ang,B.W.,Zhang,F.Q.,2000.). However, the problem is that the selection on the choosing of factors does not have certain criteria at all. It will lead to totally different result of analysing based on different selections of factors. Corresponding references are listed for the issue in detail. Please refer to references C.Bockstaller and P. Girardin, 2003; Peter Hardi and Juanita Ama DeSouza-Huletey, 2000; Todd Litman, 2011 and United States Environmental Protection Agency, 1996.

In this paper, we introduce indicator for the analysis of the energy consumption in transport sector rather than common factor analysis.

## 2. Indicator analysis for the issue of energy consumption

Indicator is defined as a substance used to show visually the condition of solution with respect to the presence of a particular material by the Webster’s dictionary. In the field of abstraction, it would give out invisible implications with the function as a maker or sentinel, indicating the presence or absence, a measurement tool, indicating variations along important dimensions of phenomenon, a decision support tool allowing taking certain action, or the combination of the above.

As indicators have the function to indicate the phenomenon of transport production, on the issue of energy consumption, we should analysis it in order to grasp the nature of the change of energy consumption for policy suggestions. The rest of the issue relies on the selection from factors into indicators.

According to the reference the criteria of indicator selecting can be defined as follows as most researchers agreed. We also believe that the three categories with ten criteria are the most reasonable ones as follows at the moment.

Table 1. Selected list of criteria (Journard and Gudmundsson 2010)

Category	Criteria	Definition
Representation	Validity	Actually measure the issue or factor it is supposed to measure
	Reliability	Give the same value if its measurement were repeated in the same way at almost the

		same time
	Sensitivity	Be able to reveal important changes in the factor of interest
Operation	Measurability	Be straight forward and relatively inexpensive to measure
	Data availability	Based on input data that should be readily available or made available at reasonable cost and time
	Ethical concerns	Comply with fundamental human rights and require only data that are consistent with morals, beliefs or values of the population
Application	Transparency	Feasible to understand and possible to reproduce for intended users
	Interpretability	Allow an intuitive and unambiguous reading
	Target relevance	Measure performance with regard to articulated goals objectives, targets or thresholds
	Action ability	Measure factors that can be changed or influenced directly by management or policy action

In the literature, based on the ten criteria above, the factors which want to be indicator have to be evaluated one by one. The evaluation method used right now is to score the ten criteria from level 1~4, which shows that the indicator candidate satisfies the criterion poorly, limitedly, well and excellently. After that, the score is added together to show which ones are apparently better than others and choose the better ones as indicator.

However, the literature assumes that all the ten criteria are of the same importance as they share the same value, at the same time, the evaluation of each criteria are almost decided subjectively, and the variance of the scores cannot be controlled, too. In fact, these ten criteria may be not of the same importance; therefore, the result of the scoring would not be so precise for us to select. In order to solve this problem, we

introduce the fuzzy functions for the comprehensive evaluation of the candidate indicators.

First, we lay out the candidate indicators that may be the one affects the energy consumption of transport crucially according to Peter W.G Newman, Jeffery R. Kenworthy, 1989. Notice that some factors are applied on the macro analysis all over a region while some factors are only applied on cities. It is important to tell them apart on the choice of factors into candidate indicator.

Passenger trips per person	Employment density
Energy use per passenger km	Average speed of transport system
Length of road per capita	Gasoline price
Vehicles per km of road	Vehicle fuel efficiency
Urban density	Population
Vehicle ownership	Gross domestic product
Model split	Passenger trip per vehicle km of service
Road parking	Lifestyle and tradition/culture
Income	

From the example factors introduced above, we notice that the factors are not all in the same field as every analysis concerns; therefore, we would like to analyze the fitness of factors into indicators by criteria according to the problem we are facing rather than putting all the probable factors into consideration.

Now we introduce the fuzzy functions for the ranking of candidate indicators, generally speaking, fuzzy functions are meant to build a mathematics function to describe the membership of each candidate indicator for the criteria, yet there are several characteristics for each criterion .For instance, some criteria cannot be described into figures so we cannot calculate its membership for that criteria .In this

case, we use relative and are classified as follows (Here we assume  $I_{qc}^t$  is the evaluation of this candidate and  $x_{qc}^t$  is the value of the candidate):

1) Ranking the candidates:

$$I_{qc}^t = \text{Rank}(x_{qc}^t)$$

2) Standardize the candidates:

$$I_{qc}^t = \frac{(x_{qc}^t - \overline{x_{qc}^t})}{x_{qc}^t}$$

3) Categorical scales:

$$I_{qc}^t = \begin{cases} 0.25 & \text{if } I_{qc}^t < p_{0.25} \\ 0.5 & \text{if } p_{0.25} < I_{qc}^t < p_{0.5} \\ 0.75 & \text{if } p_{0.5} < I_{qc}^t < p_{0.75} \\ 1 & \text{if } I_{qc}^t > p_{0.75} \end{cases}$$

4) Distance to a reference:

$$I_{qc}^t = \frac{x_{qc}^t}{x_{qc}^t} \text{ or } 1 - \frac{x_{qc}^t}{x_{qc}^t}$$

5) Percentage of annual differences over consecutive years:

$$I_{qc}^t = \frac{x_{qc}^t - x_{qc}^{t-1}}{x_{qc}^t}$$

6) Some other shape of function  $f(x)$  links from 0 to 1:

$$I_{qc}^t = f(x_{qc}^t) = \begin{cases} \frac{x_{qc}^t - b}{a - b}, & x_{qc}^t \leq a \\ \frac{x_{qc}^t - c}{a - c}, & x_{qc}^t > a \end{cases}$$

Based on these calculations, we can deduce the evaluation of each candidate easily and lead to further results. For example, in order to judge how an indicator candidate satisfies the criterion “data ability”, we can use the ratio that available data accounts for in the number all data required as the one for calculating and use criterion number

1 above to evaluate. The characteristic of the indicator candidate should be taken into consideration on which criterion is used yet the score should be standardized for equality on all candidates.

### **3. Applications and Conclusions**

Based on the fuzzy functions introduced to the evaluation of the candidate indicator, more convincing evidences are shown for the insurance of the indicator selecting. As stated at the beginning, the method of decomposition analysis and the DEA method can be used convincingly to describe the phenomenon. As a result, reasonable result would be got for the policy implication. Here we show the application of indicator analysis on the method of DEA.

Data Envelopment Analysis (DEA for short) is considered to be a useful operational research tool and becoming more and more popular on the field of evaluation analysis. It comes out to be a linear programming methodology to measure the efficiency of multiple decision-making units when the production process presents a structure of multiple inputs and outputs. DEA method is first proposed by Charnes, Cooper & Rhodes at first and developed into some other models with the years went by and is basically used to empirically measure productive efficiency of decision making units. Now it is spread and used widely in many fields for efficiency evaluation. Therefore, it can be also adopted for the evaluation of the efficiency by environmentally sustainable transportation policies.

DEA method focuses on the evaluation given some input variables and output variables. There is no need to set weight on each variable initially which may be difficult to grasp, and only consider the mathematical relationships of the variables. It can be used for both production and cost data. Utilizing the selected variables such as unit cost and output, DEA method searches for the points with the lowest unit cost for any given output, connecting those points to form the efficiency frontier. It is also useful because it takes into consideration returns to scale in calculating efficiency, allowing for the concept of increasing or decreasing efficiency based on size and output levels. A drawback of this technique is that model specification and inclusion/exclusion of variables can affect the results.

In the literature by Yoshino D., Fujiwara in 2010, DEA method was used for the analysis on the environmental efficiency. Population density, road length per capita, private car ownership per capita and public transport serve length per capita are selected as input variables for analysis without further explanation for the reason. And the result will be totally different if other variables are selected. Although the choice in the paper sound reasonable in certain degree and the result is very useful and robust, had the method of indicator analysis been introduced in, the analysis result would be more convincing. We do not know those candidate indicators they initially intended to introduce so we cannot give the table for calculation, yet the method in this paper may be a good approval on the decision.

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