



PHOTO: THOMAS SICK NIELSEN

Peri-urban transition processes

The increasing variety of urban-rural relationships in peri-urban areas challenges policy makers, who often are not well equipped to deal with this complexity. To improve the ability of policy makers, a fundamentally different perspective is suggested, namely that of change and development within the peri-urban as non-linear transitions.

The PLUREL project provides the opportunity to analyse development processes within different case study regions. Questions can be addressed such as: how do regions deal with transition processes? can general trends of development be identified? and does the combination of a theoretical concept of transition and PLUREL case regions provide new insights which could contrib-

ute to introduction of alternative spatial strategies?

The concept of transition

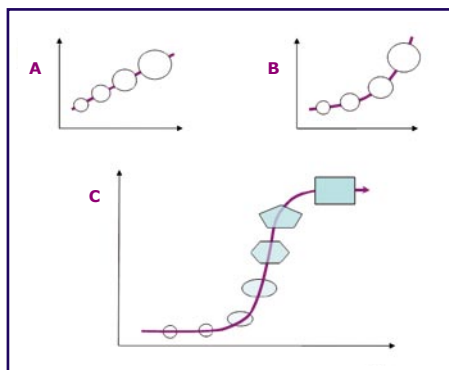
Peri-urban areas are often dynamic zones not yet restrained by sub-urban or inner-city planning and legislation. They comprise an unbalanced mixture of urban and rural functions. Peri-urban areas are multifunctional and interrelated

zones with potential for change. Flows of people, goods and communication in these regions are connected directly with each other, often bypassing the core city. Therefore, we can consider the peri-urban as a complex system, which develops in a non-linear way. The concept of »transition« can help us obtain an enhanced understanding of these non-linear developments. Moreover, it could contribute to a new perspective leading to planning strategies that are able to deal with non-linear processes.

In their article from 2001, Rotmans and colleagues define a transition as a »gradual, continuous process of structural change within a society or culture«. A transition is a change of the »core« of the system and its development can vary in speed, length and scope. Non-linear developments, represented by transitions (see graph c in the figure below), fundamentally change between stages of relative stability. Contrary to linear and exponential developments (visualised in graphs a and b in the same figure), both structure and function can change during a transition, partially induced by a changeable context and causality.

A transition can be characterised as a multidimensional, multilevel, qualitative and irreversible process. A trigger for a transition could for example be a changing role of the state or the dominant ideology which guides state action. Triggers could also be changes in the economic importance of natural resources, the availability of new technology, or a shift in the balance of society. Due to the changeable context and multiple inter-

Visualisations of (a) linear development; (b) exponential development; and (c) non-linear development. Within (c) both structure and function change. (Based on the presentation by De Roo at the PLUREL congress in The Hague, 2008)



related autonomous processes which could be generators for change, various directions for development are possible. Within a transition process several phases can be distinguished, such as pre-development, take-off, tipping period, acceleration and stabilisation. Within these phases a dynamic equilibrium of stable and dynamic elements shifts, resulting in either innovation or decline.

Multilayered perspective

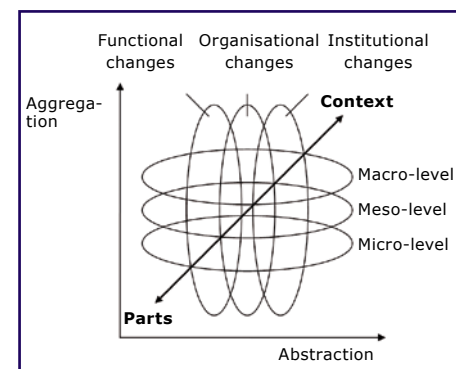
Urban-rural interactions can be considered as multi-level processes. At the micro-level, events can trigger the transition process, connecting with meso-changes influencing the peri-urban area as a whole. Meanwhile, contextual changes occur at macro-level. These contextual changes could very well be regarded as a first call of dawning new spatial concepts. The meso-level will try to connect with these concepts and macro-trends. However, the meso-level can become conservative and rigid. It is hard to stay flexible and renew, while dominant actors in the system try to hold on to power and profits. Meanwhile, developments at micro-level are more likely to link successfully to transition processes. Here, innovations and experiments evolve more easily, as the micro-level is less rigid.

In order to understand potential for change in the peri-urban, in a forthcoming

paper Hudalah & De Roo suggest to consider rural-urban transition as a multi-layered process with three dimensions: functional, organisational and institutional at the macro-, meso- and micro-level.

Functional changes are ranging from physical changes (such as land use and infrastructural changes) and urban and regional dynamics (for example, population, economy and employment changes), to catastrophic events (such as war and disasters). Organisational changes concern changes of actions, cooperation and coordination influencing stakeholders/actors. They consist of economic actors (including real estate developers), political actors and governments, and non-

Multilayered changes in rural-urban transitions.



governmental actors such as environmental organisations. Finally, institutional changes comprise altering frameworks of meaning and rules of conduct. They consist of shifts in cultural values, formal and informal rules (including new legislations and policy frameworks), and ideological forces.

The Montpellier region as example

Since the start of the PLUREL project, various urban regions – Haaglanden, Leipzig, Warsaw, etc. – have been analysed. These cases provide insight into non-linear transitions within the peri-urban. Here we present the peri-urban area of Montpellier, France, in order to elaborate upon the concept of transition as providing a useful perspective to our understanding of peri-urban developments.

Since the 1960s, the peri-urban area of Montpellier has been changing towards a multifunctional area with integrated urban-rural relationships. Economic and demographic changes are dominant in the area's transition processes. Five phases can be distinguished in the development of the Montpellier region. In the pre-development phase (1945-1962), the mono-economy of the wine industry declined. Meanwhile, technological innovation and tourism were generators of economical development elsewhere in Europe. These emerging autonomous and contextual macro-processes could be considered as possible future drivers for a transition.

The wine crisis and the strong demographic growth of the region in the 1960s resulted in a take-off (1962-1977) of a transition of the peri-urban. Due to urban expansion and the introduction of new economical sectors, urban and rural development strategies came under pressure to adapt. The institutional framework was not suitable to deal with upcoming spatial trends. Consequently, urban expansion in the peri-urban zone was not embedded in spatial strategies. Besides, old structures came under pressure, such as the wine industry, and new forerunners appeared, for example the settlement of computer giant IBM.

This adaptation occurred during the tipping period (1977-1982) with the installation of a new city council and decentralisation of spatial policy. The development of the urban fringe became demand-oriented. Public actors ac-



PHOTO: MARC BEETINK

knowledgeled the drivers of a fundamental change and started to accommodate new peri-urban developments, resulting in the acceleration phase (1982-2001) of peri-urban transition. The service sector, the high-tech industry and the leisure economy experienced a strong development and urban extension occurred due to the increasing attractiveness of living in the peri-urban. Recently, a period of stabilisation has emerged. Institutional and organisational dimensions of spatial development are adapting to the integrated urban-rural relationships they face. The establishment of the Montpellier agglomeration, the regional tramlines and the introduction of a regional spatial development strategy provide examples of this adaptation process and the striving for a more coherent development.

Implication for spatial strategies

Within the development of the peri-urban area of Montpellier, which has had different dynamics over time, non-linearity is an important characteristic. Therefore, controlling spatial developments might be unrealistic. Instead, transition processes take place in a dynamic period and are driven by interlinked (partly autonomous) processes of which some might extend beyond the scope of management. Consequently, transitions cannot be managed solely through traditional planning strategies. From a transition perspective,

peri-urban areas should have an adaptive capacity, a »readiness for change«. This could increase the systems probability of making advantage of transition processes. Therefore, functional, organisational and institutional factors should be multifunctional and flexible. Also, a sustainable spatial structure is needed to reinforce the base for future development. »The fitness of the system« to adapt to, and to accommodate change in, a sustainable way are considered to be equally important. Therefore, balancing dynamic and robust elements of the system will be required. Cohesion and compatibility could be considered as conditional for a sustainable spatial structure with synergy and a coherent identity.

Although some general and rather abstract key aspects of transition management are mentioned here, the scenario and modelling approaches within PLUREL could be essential for identifying new pathways of development. Furthermore, alternative approaches to deal with non-linear processes at local and regional scale will be presented during months to come.

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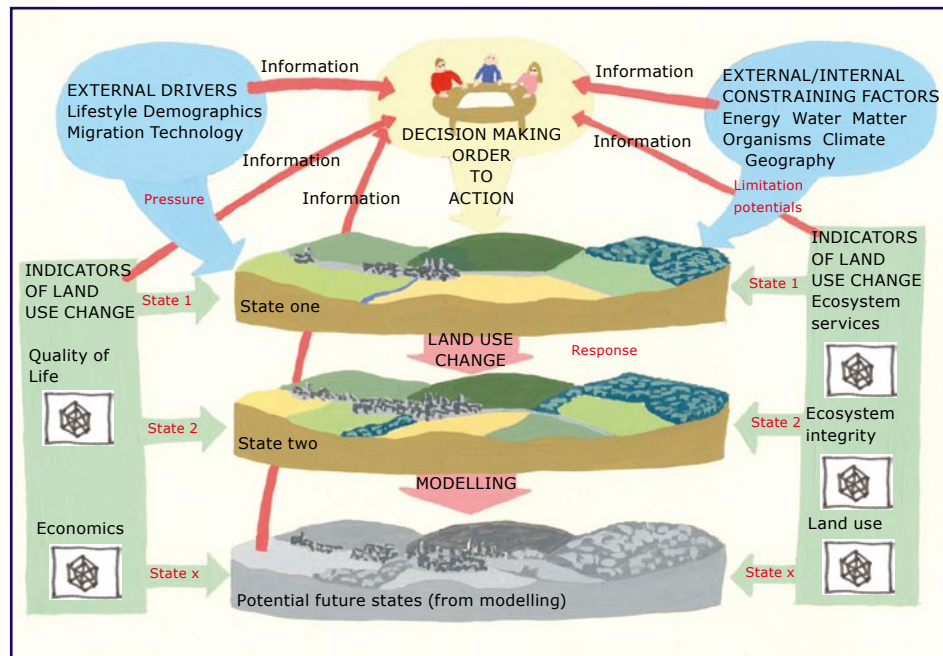
Indicators of land use change over rural-urban gradients

When land uses change, at greater or lesser scales but especially at the interface between the urban and rural, a variety of effects occur which may change a number of environmental, social and economic factors for the better or worse. One way to try to capture these effects, such as the changes in air quality, in commuting patterns, in hydrological function, wildlife habitat quality or the quality of life, is through the use of indicators.

Indicators, as their name suggests, indicate the direction and strength of change in these factors and provide an overall picture of how land use changes affect them over time. In the case of land use change occurring at the scale of a rural urban region, it is helpful to look right across the gradient of land use density from the inner city to the rural hinterland. It is especially important to focus on the urban-rural interface at the urban fringe where land use changes are at their most dynamic. Thus it is necessary to define and describe such gradients. This can be done statistically, looking at a range of factors such as building density which declines outwards from a centre, or population density which shows a similar pattern. Work like this is complicated by the morphology of city regions – large mono-centric cities such as Warsaw show clearer gradients than polycentric metropolitan regions such as Manchester.

The DPSIR model

Central to the concept of indicators is how these are applied in terms of the cycle of land use change cause and effect exemplified by the DPSIR model (Drivers, Pressures, State, Impacts and Responses). Thus, some drivers of change, such as population growth or decline, need indicators developed from demographic trends. However, these are difficult to resolve spatially at the level of districts within a rural-urban region. Pressure indicators can be derived from response functions which translate fac-



tors such as migration – also a cause of population change – to specific areas of a rural urban region or to particular land use changes such as urban densification or rural abandonment. State changes are expressed through indicators representing landscape integrity, such as biodiversity, nutrient and energy flows in ecosystems or landscape heterogeneity. Impact indicators describe the effect of the changes of land use such as soil loss, hydrological changes or accessibility to green space, all of which can be measured using monitoring or other data resolved spatially at greater or lesser degrees of scale. These data can also be shown using graphs and other means which demonstrate the changes across the rural-urban gradient. Response indicators show how municipalities and other agents reacted to the impacts and these feed back into the DPSIR cycle, affecting the drivers once more.

Indicators in scenario development and modelling

Past and present data can be used to calibrate the indicator sets and to show how past land use changes leading up to the present have affected ecosystem services or quality of life. These can then be

applied with some confidence to possible future scenarios of land use change. Scenarios are possible futures derived from analysis of different trends affecting societies and may include accelerating or decelerating rates of urban change. Another approach is to undertake some modelling using rule sets derived from a number of driving forces and then to model future land use patterns produced stochastically as land use types switch from one to another according to these rules. Agriculture can e.g. switch to urban or forest, while urban tends not to switch to forest. The indicators are then used to explore the impacts of such modelled futures and to help policy makers to decide which strategies for development of a given region are likely to have the least impact in key areas. Indicators therefore need to be presented in simple graphical ways that are easy to interpret. The use of diagrams such as »spider webs« is one way of doing this, showing the extent to which factors along different axes change to greater or lesser degrees for each potential future scenario.

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MOLAND Model results for the Leipzig region

One of PLUREL's aims is to analyse and understand urban and peri-urban relationships by means of land use scenario simulations to support strategic planning. In PLUREL's Leipzig region case, the MOLAND Model has been combined with local stakeholder knowledge for developing regional development storylines.

The approach used is application of the cellular-automata based MOLAND Model, driven by information derived from the agent-based model RESMOBcity and from the expert-knowledge of local stakeholders. Urban planners, regional policy makers and scientists distilled the main variables for the future development of the region and assembled those to consistent storylines which were then ingested into the modelling framework.

Modelling land use categories

The land use patterns of the Leipzig area were classified in the MOLAND Model into 20 categories. Five of these are active land use functions (continuous

urban fabric, discontinuous urban fabric, industrial and commercial, construction sites, port areas), while eight are vacant land uses where urban expansion actually takes place.

The final seven categories are land use features (airports, mineral extraction, dump sites, road and rail networks, artificial non-agricultural, water bodies) that remain stable during the modelling process. Input variables in the model were: past and actual land use maps, accessibility of transport network, inherent suitability for different land uses, zoning status or institutional suitability and socio-economic characteristics (e.g. population, income, production, employment). The spatial resolution is 100 x 100 meters. Model calibration, performed with historical data sets over the period 1990-2000, provided accuracy values above 90% for most of the active land use classes.

Example of results

As shown in the table, qualitative scenarios were produced for a period of 25

Locally adapted scenarios	No restrictions	Planning instruments implem.	Strong planning
Growth	»Hyper-tech« scattered growth		Smart growth
Baseline		»Business as usual« Baseline	»Eco-environmental« Compact eco
Decline	Give-up shrinkage		Smart decline

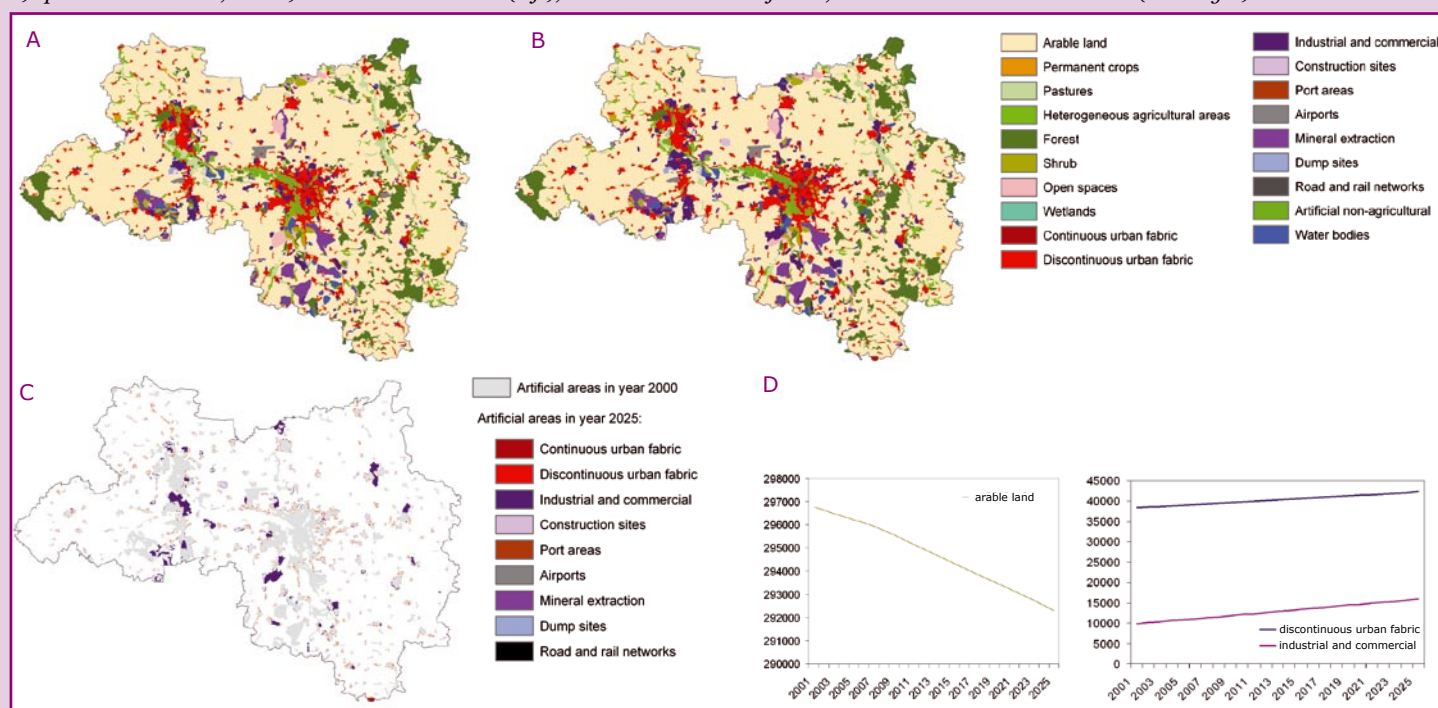
Expert-based future development scenarios for the case study region of Leipzig. The scenarios have been then translated into quantitative drivers for the MOLAND Model.

years (2000-2025) following the overall PLUREL storylines and with the involvement of local experts. Preliminary results are available for the business-as-usual scenario for 2000-2025 (see figure). According to the simulated projections, the growth of artificial areas is expected to continue in the Leipzig region, regardless of the further decline of population and related ageing. In particular, discontinuous urban fabrics are increasing with 10 % and industrial and commercial areas with over 60 %. These new developments will claim open land in the urban periphery, and particularly arable land, natural succession areas and shrub vegetation, which all are expected to decrease.

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Preliminary results for the business-as-usual scenario for the region of Leipzig. A) landuse for year 2000 (actual), B) land use for 2025 (simulated), C) spatial distribution, and D) trends in arable land (left), discontinuous urban fabric, and industrial and commercial (both right).



Towards sustainable land use planning – the Koper case



PHOTO: HORST THALLER

The municipality of Koper, situated on the Slovenian coast, is one of PLUREL's case studies. A highly diversified peri-urban land use and increasing development pressures call for tools that support sustainable land use planning.

The municipality of Koper lies between Italy and Croatia. Koper is situated in the southwest of the country. Its total area is 311 square km, with 17.6 km of coastline. The municipal territory includes more than one hundred settlements and had a population of 49,303 in 2007. The municipality is characterised by a Mediterranean climate, with long and hot summers, mild winters and occasional strong winds. The administrative centre of the municipality is the town of Koper (about 24,000 inhabitants). Here, most of the administrative, economic and cultural activities are concentrated.

Brief history

Koper's history spans over more than 2,000 years. Initially it was not more than a humble island settlement within city walls, where the vicinity's inhabitants took refuge at the time of the great migrations. In the following centuries, though, Koper flourished, mainly because of its favourable position. Its economic power lasted until the 18th century, when Rieka and Trieste were granted the status of free ports. With the downfall of the Venetian Republic and the completion of the Vienna-Trieste railway, Koper finally lost its important role in the wider region. After the Second World War, Koper flourished once again, becoming the most important economic centre of the Slovenian coast.

With Slovenian independence in 1991, Koper became the only commercial port and an important industrial centre of Slovenia. Today the city is the sixth larg-

est town in Slovenia and second in terms of per capita GDP. The basic advantages of its economy are diversity and versatility. In addition to tourism, crafts, industry, entrepreneurship, transport, trade, business and financial services are the most important activities. The Port of Koper, founded in 1957, continues to be a very important actor, with a major economic and spatial influence on the town and its surroundings, and even on the national economy.

Diversified peri-urban land use

The location of the city on the coast and the medieval city centre provide some limitations for future development. In addition, the Port of Koper occupies a lot of space. Settlement and the development of economic activities are therefore directed even more into the peri-urban area, which also experiences the highest pressure concerning future construction

The aerial photos show Koper in 1911 (left), 1960 (middle) and today (right). Source: Surveying and Mapping Authority of the Republic of Slovenia.



and other interventions. The peri-urban area is characterised by highly diversified land use. It acts as a built-up area for settlement, as well as a green and recreational area. Favourable conditions enable agricultural activities, while new infrastructure and industrial zones are also being constructed there. A major part of the municipality is formed by the rural hinterland, which is sparsely settled but has unique cultural and natural heritage values and a rich biodiversity.

Strategy for sustainable land use

The municipality of Koper is currently preparing new spatial documents. The strategic issues that dominate planning discussions in the municipality are manifold. They include the adjustment of different development needs and assurance of spatial efficiency in the sense of rational space arrangement and protection of natural resources (best agricultural land, forests etc.). Other issues central to the planning discourse are assurance of high quality living conditions (green and recreational areas), efficient public transportation, conditions for economic development (industrial and trade zones), and maintenance of the cultural landscape and natural and cultural heritage in urban and rural parts of the municipality.

PLUREL is contributing to the planning discourse. With the aim of including the issue of sustainable land use in Koper's new municipality spatial plan, an informal »Sustainable Land Use Strategy for the Municipality of Koper« was drafted and accepted at a workshop involving stakeholders and researchers.

The aim of the new strategy is to promote more optimal and more sustainable land use, taking into account the aspects of natural resources (soil quality, environmental important areas, important forest areas, etc.), the initiatives of local people and other actors and future development/spatial needs. Digitalised maps with various contents and a final integrated map, planned to be developed through PLUREL's research activities, will provide a tool to spatial planners. This tool will help planners prepare a proposal for the municipality spatial plan which will be supported by professional arguments and result from an inter-sectoral approach to planning.

Anton Perpar, Andrej Udovč and Marina Pintar, University of Ljubljana

PLUREL People

Interview with Marina Pintar, University of Ljubljana, Slovenia

What is your role in PLUREL?

I am involved in Module 3 as a researcher in the Koper case study, which is one of seven case studies in the PLUREL project. In addition to doing my own research, I coordinate the work of the University of Ljubljana research group involved in PLUREL on the one hand, and the activities of local stakeholders from Koper municipality and local small and medium-sized enterprises on the other.

I closely collaborate with the coordinator of Module 3. This module aims to develop different scenarios for urban development in an inclusive way. Since spring 2008, since the PLUREL meeting in Warsaw, I have also been involved in the project's Indicator Task Force.

How will PLUREL benefit from your specific expertise?

The field of work of the local research group for the Koper case study comprises agronomy and forestry, and specifically agricultural and forest land use, including nature protection areas. In Slovenia, and Koper is not an exception, we have a huge problem with different pressures on agricultural land, and especially with urbanisation.

The old (and still existing) system of protecting agricultural land in Slovenia as one of the natural resources is not efficient. Together with local stakeholders, we have developed a new strategy for agricultural land protection. This strategy could be implemented as part of the planning system. Discussing this 'Sustainable Land Use Strategy' developed for Koper within PLUREL could be of interest to some of the project's other case studies.

What will be PLUREL's most important results?

Due to size of PLUREL and its research team, there will be a wide range of high-value results relevant to research in a broad sense, as well as to practitioners and policy makers. From a more local



point of view, the development of the aforementioned Sustainable Land Use Strategy for Koper will be very important for us. The results of the MOLAND Model will also be of great benefit to Koper municipality. Moreover, the value of the many new relationships and collaborations resulting from the PLUREL project should not be underestimated.

Which challenges can stand in the way of PLUREL's success?

At the beginning of the project, overcoming the boundaries between research disciplines appeared to be a huge challenge. Time was also needed for starting up fruitful communication with stakeholders. Now that we are in the second half of the project, these challenges are behind us and we can be very optimistic about PLUREL's eventual success.

Why should policy-makers be interested in PLUREL?

PLUREL should be of high interest to policy makers primarily as the project deals with planning processes which influence, directly or indirectly, everybody's life. Policy makers are the people who steer these planning processes. Having said this, not only policy-makers should be interested in PLUREL, but also many other actors.

PLUREL



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- Alfred Peter Paysagiste, France
- University of Edinburgh, United Kingdom
- Wageningen UR / Van Hall Larenstein, The Netherlands

Peri-urban Land Use Relationships

Strategies and Sustainability Assessment Tools for Urban-Rural Linkages

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