PLUREL

Land use relationships in rural-urban regions

Module 2

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PERI-URBAN LAND USE RELATIONSHIPS – STRATEGIES AND SUSTAINABILITY ASSESSMENT TOOLS FOR URBAN-RURAL LINKAGES, INTEGRATED PROJECT, CONTRACT NO. 036921

Deliverable Report 1.4.1

Typology of driving forces on generic urban region types

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SIXTH FRAMEWORK PROGRAMME

Contents

Introduction

Land use change and urban-rural relations are central issues within the PLUREL project. Rural-Urban-Regions (RUR) represents the spatial framework to approach them on a European level (Steinnocher et al. 2007). The generic RUR typology at hand are defined by different kinds of morphological settlement pattern of urban regions throughout Europe distinguishing monocentric and polycentric regions as well as regions according to the size of the core city. They allow interpretations regarding quality and extent of peri-urbanisation processes.

For the integration of the Rural-Urban-Regions within the scenario-'cascade' and the interpretation of outputs on regional level a procedure is needed, which builds upon the assumption that the different RUR-types respond differently on driving forces migration, climate change, technological development and planning and governance regimes defined by future scenarios.

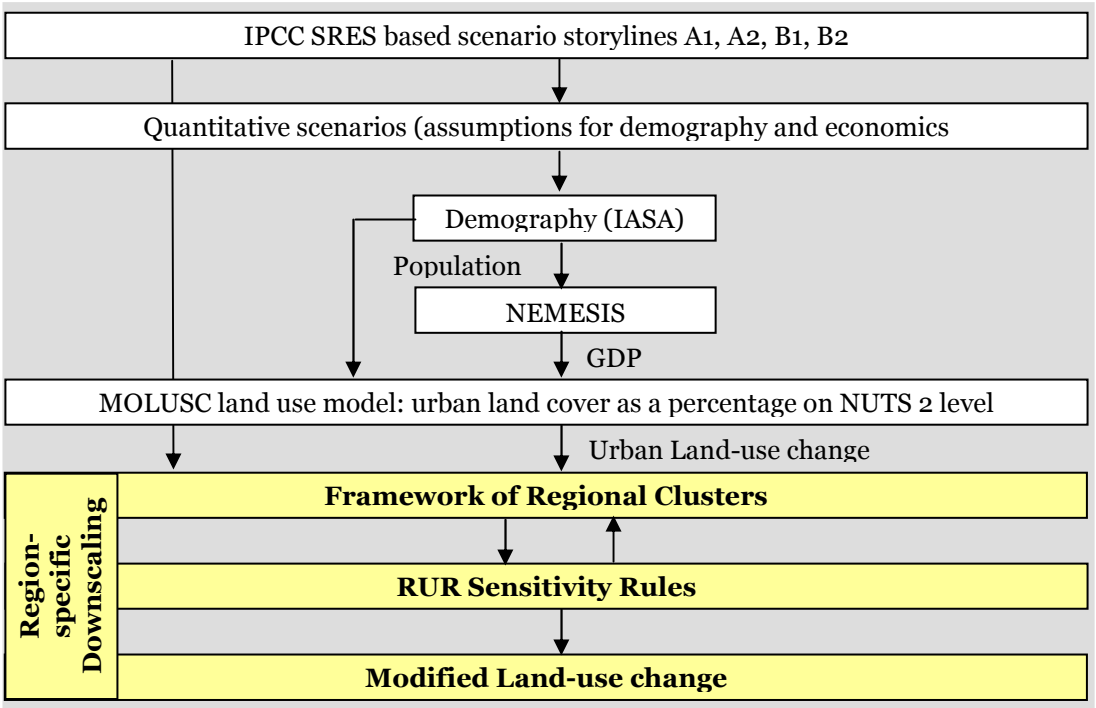
On the one hand those driving forces show macro-regional (national clustering) effects such as migration movement pattern (e.g. from Eastern to Western Europe or from Northern Europe to the Mediterranean), pattern of national administrative and planning systems (Napoleonic vs. Scandinavian) or regions with particular impacts from climate change (e.g. flooding in coastal areas or aridity in Southern Europe). Doing so we avoid establishing European comprehensive scenario frameworks including creating a multitude of regionally specific scenarios. Instead by compiling of regional impact clusters it is focused on regionally relevant aspects of future scenarios.

On the other hand the RUR types *Very large monocentric (1.0), Large monocentric (1.1), Medium monocentric (1.2), Urban polycentric (2), Dispersed polycentric (3)* and *Rural (4)* show distinctive sensitivities to different driving forces under the circumstances of different future scenarios regarding land use change. So we deal with two different regionalising effects of driving forces sensitive to different land-use scenarios:

- Macro-regional pattern of driver appearance
- Region-type pattern of driver sensitivity

This paper outlines a conceptional understanding of how both regionalising effects could by integrated into the scenario-cascade. Starting point for the establishment of the algorithm is the scenario-output modelling at hand, predicting regional urban land-use change as a result of a changing demographic and economic framework on NUTS 2-level and further disaggregation to regional level (NUTS 3) based on storylines (M1, see Carter, J. 2007) and parameterized projections (IASA, NEMESIS) of future European development scenarios.

Table 1: Cascade scheme of scenario output modelling integrating NUTS X Region-specific Downscaling approach



Regional Framework for Scenario-driven land use change

In the following macro-regionally distinguishing parameters are presented, which may alter Europe-wide scenario based outputs of land use change. (1) Governance and planning regimes, (2) migration, (3) environment and climate and (4) technology and transportation need to be integrated into the modelling process of land use change in M1. All four land use parameters are briefly and exemplarily described. However, they need to extended and completed by M1 and M2. The purpose is to integrate knowledge on those framework aspects into the scenario-modelling, to quantify descriptive representation into approximations of impacts of actual land use change.

The most appropriate way is to develop continuums for all issues integrating opposing conditions of frameworks, e.g. different planning regime types on an axis ranging from 'restrictive' to 'laissez fair' and 'translate' them into a discounting factor (105%, 95%) to the MOLUSC land use change output. Conceivable would be results presented as a table, where NUTS 2/3 regions are assigned with characteristics and the 'translated' discounting factors.

Governance and Planning

The European Union is characterised by varying, historically developed governing and planning systems. Those differences in land use decision processes due to different pattern of legal, constitutional and administrative framework have an impact on land use changes itself. Therefore they represent an aspect, which macro-regionally shape European-wide outputs of Development scenarios.

Government and planning structures in Europe can be distinguish regarding sizes of administrative entities, competencies of horizontal administrations (municipalities, counties, regions, nation states), general extent of governing intervention of formal and semi-formal structures (governance). Regarding the planning regimes cornerstones of the classification are the vertical governing approach (bottom-up vs. top-down), the extent of state intervention (restrictive vs. 'laissez fair') as well as degree of communication and co-operation in planning.

Governing and planning systems can be represented by a typology of subtypes. A suggestion encompass the traditional 5 planning system types British, Napoleonic, Germanic, Scandinavian as well as East European, which each characterize a number of nation states. Within a nation state the system is more or less homogenous. Differences occur only in countries with autonomous and federal regions structure like the UK and Germany.

Dealing with future scenarios it needs to be kept in mind that through the European harmonisation process and the general increase of competencies of the supra-national body of the EU will lead also to a harmonisation of national governing and planning regime. Differences between the types are increasingly blurred.

Migration

Throughout Europe a migration pattern consisting of movements of people with different origins and destinations within and from outside the EU, of different social and milieu backgrounds and for different reasons is visible. Focussing on the European scale where gentrification and segregation processes plays a minor role, migration can be divided into working and retirement migration. Migration processes alter population sizes, demo-

graphic and income structures on both ends of the pipe, in countries of origin and destinations.

While due to different wage rates first of all young, mobile, active and educated parts of the population leave countries for working purposes. Those migration pattern can again be deconstructed into migration within the European Union as well as from outside. Both have similar destination countries in common: economically strong countries of Western, South-western and Northern Europe. Since the European unification and integration process with Eastern Europe countries of origin within EU have shifted from Southern to Eastern Europe, to the former communist countries. But nevertheless migration takes place along exiting historic, cultural or language relations: We see for example heavy migration from Poland to the UK, Germany and Scandinavia, from Romania to Italy, Spain and France, from the Baltic countries to Scandinavia and Ireland, from Czech Republic and Hungary to Austria. Concerning the future development those migration patterns can be are temporally limited by changing circumstances either in the country of origin or destinations (e.g. changes of wages).

Less important regarding total European figures but with strong regional impact represents the International Retirement Migration (IRM). Due to warm climate conditions retirees from merely Northern European countries (UK, Germany, Scandinavia, Netherlands) settling down on thin strips of land along the coastline of the Mediterranean in warm climate areas (Portugal, Spain, Italy). E.g. concentrate 80% of the foreign population in Spain in only 6 of 17 regions at the Mediterranean coastline, islands and the capital region of Madrid. (Kreienbrinck 2005)

Environment and Climate

European Regions have different environmental, biophysical preconditions for urban land use change. For instance topographical restrictions such as location in mountainous (e.g. Bilbao), coastal (Stockholm) or river flood (Rotterdam) areas simply limit space for urban expansion and force to increase density.

Also the effects of climate change occur in regionally different. Whereas low precipitation and droughts are expected in the Mediterranean regions, the Alpine regions will face change hydrologic effects due to smelting of snow cover. Other coastal and riverine regions are more often treated by high flood. Those climate change 'hot spots' will have limited opportunities for urban expansion, due to water shortages and landslide risks.

Technology and transportation

European regions show varying pattern of transportation, which have a major impact on urban development. Therefore two main aspects are of importance regarding the issue:

- Regional characteristics concerning modes of transportation
- Regional accessibility and position within the global/continental network

High car ownership, weak regional public transportation system, modal split with dominance of individual traffic are considered as main drivers of urban development beyond the former urban boundaries and a low-density, dispersed urban fabric.

European regions, which are well connected by transportation infrastructure (airport, rail, motorway, port) are accumulating so-called gateway-functions (e.g. regions of the blue banana and European capital regions). Doing so the regional position within the global network is strengthened, which again has an impact on economic performance contributing to urban growth.

Procedure

As mentioned above, the translation of future scenarios into regional land use results on NUTS 2/3 level relies upon a systematic assessment and categorisation of regional specificities: Regions differ regarding their "sensitivity" towards European economic and demographic change regarding their land use development. In DPSIR terms: Their driver-pressure relations show a high degree of variety. For example:

- Regions in countries with a highly restrictive planning system will display lesser sprawl intensities as a consequence of growth (or other kinds of socioeconomic change like shrinking of household sizes) than regions with a laissez faire planning regime. Both formal (government) and informal (governance) aspects play into this relationship.
- Regions with strong migration influx of high income/high potential groups (retirement migration, high skilled labour migration) will show a stronger consumption of land for housing than regions with a weaker in-migration (or even net out-migration) or even regions with equal numbers but other structures (low skilled, low income) of in-migration.
- In some regions the bio-physical conditions (slopes, mountains, water area, flooding or landslide risk, water shortages) inhibit settlement growth. These conditions can change over time due to climate change.
- The availability of certain technologies like transport and communications technology affects the patterns and intensity of urban sprawl/growth, for example by expanding commuting areas.

All these aspects represent either driving forces which are present or absent in individual regions, or inhibiting factors which are also unequally distributed. Planning and governance is somewhat of a hybrid. How do these differentiating factors link into the M1 modelling chain?

In the M1 modelling change, narrative storylines form the starting point for scenario development. Demographic and economic indicators are calculated according to the scenario storylines and fed into the MOLUSC land use change model, which projects the relative change of urbanised area for each NUTS 2 region. The result however, does not take into account the heterogeneous structures of the European territory. In order to qualify and specify the results, but also to lay the basis for following steps of disaggregation and the description of land use change patterns (more compact vs. more disperse), a rule set is needed. In M1 these rules have been labelled "Spatial Allocation Rules". The examples for regional differentiation forces (both 'drivers' in the DPSIR terminology and inhibiting forces) described above relate to individual tasks within M2, most notably WP2.1, 2.2 and 2.3 (typologies, response functions). They need to be integrated into a rule set, which is used to specify, qualify and disaggregate the MOLUSC land use change output. Table 2 and 3 give an overview of a rule set and how it is integrated into the scenario modelling cascade.

Table 2: Integration of Framework of Regional Cluster into the Scenario Modelling Cascade

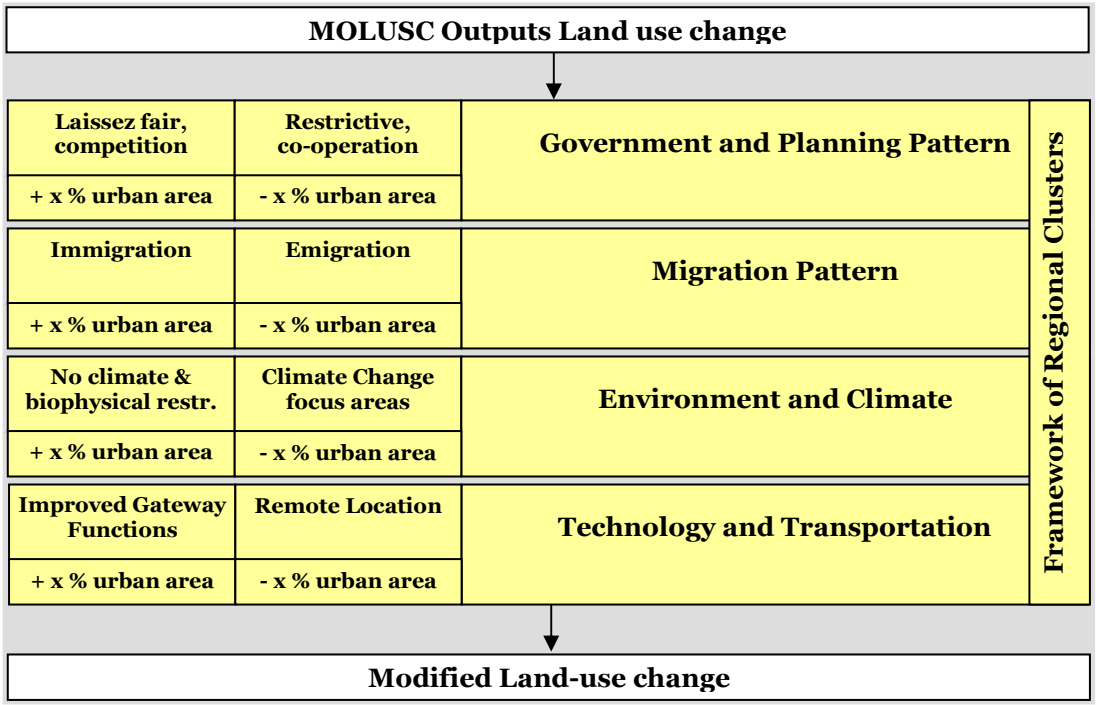


Table 3: NUTS X Output table for with particular land use changes due to regional framework

NUTS X Region	Additional Land-use change			
	Governance and Planning	Migration	Environment and Climate	Technology and Transportation
Region 1	+ 10 %	+20 %	0 %	0 %
Region 2	- 10 %	0 %	0 %	+20 %
Region 3	-10 %	0 %	-20 %	+10 %
Region 4	0 %	-10 %	-10 %	-10 %
…	…	…	…	…

Impacts of driving forces on Rural-Urban-Region-Types

RUR regions are characterised by specific population sizes, morphological settlement structures and the degree of urbanisation. Furthermore it contains implication to certain urban-rural relationships. These circumstances result in differences regarding a regional land-use change elasticity to respond on global driving forces. Elasticity or sensitivity means here that particular regions of different RUR types within the same regional cluster of driving forces show different extents of (urban) land-use change.

To illustrate the consideration an example shout be stressed here taken a specific situation defined by the scenario (A1) the scenario-specific quality and quantity of driving forces and their different appearance at in regions of different RUR types.

According to the storyline the scenario A1 'Hyper Tech' is characterised as following (Carter & Ravetz. 2007):

- Overall population peaks and then declines
- High rates of immigration and social change
- high rates of urbanization, rural restructuring & counter-urbanization.
- New efficient forms of urban transport
- Peri-urban activities & land-uses are market driven at a globalizing scale.
- Fast Development changes
- Low population growth
- Unity in EU
- On the long term low urbanization
- Lack of planning
- Environmental impacts

It is obvious the all those impacts regard neither all components (urban, peri-urban, rural) of RUR regions nor all urban region types the same way. On the one side e.g. environmental impacts such as droughts, water shortage and soil degradation will hit rural areas much stronger than large urban areas. On the other side large metropolitan regions gain economically more from technological development in communication and transportation due to their role as network gateway. Therefore there are also subject to immigration but have an increased demand for governing and planning capacity. Deliverable 1.3.1 (Environmental drivers of change) points out the relevance of particular environmental drivers on urban-rural-linkages, which serves as a prerequisite for assessing their impacts on RUR regions since they are defined different urban-rural-linkages.

Table 4 and 5 give an overview how to interpret the scenario driven factors 'planning & governance', 'migration', 'climate change' and 'technological change' for the exemplary scenarios A1 and B2. They represent the result of an expert estimation of scholars of Module 2 (Vienna, February 4th and 5th 2008).

Table 4: RUR sensitive Scenario interpretation Scenario A1

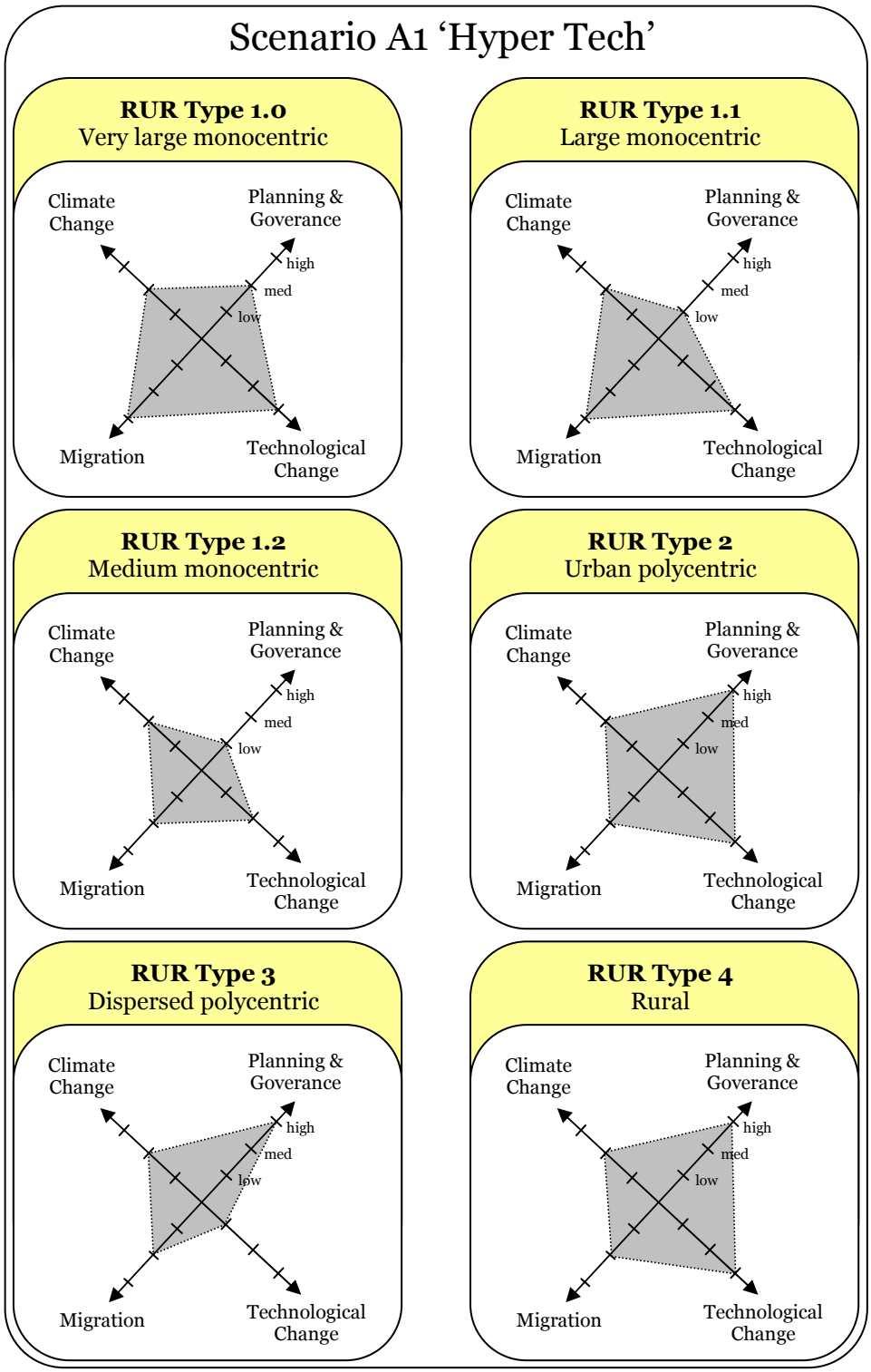


Table 5: RUR sensitive Scenario interpretation Scenario B2