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MOR€CO – Mobility and Residential Costs: Improving the Settlement Development in the Transnational Alpine Space Region

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1 ABSTRACT

Overriding trends like globalization, differentiation of life-styles and an increasing personal mobility lead to rapid growth of central located cities and shrinkage of remote areas with no significant economy. The Transnational Alpine Space Region includes large cities like Grenoble, Lyon, Munich and Salzburg as well as small villages. Consequently there are many different settlement structures ranging from low to high density. Planners are confronted with the challenge of offering equivalent living conditions for all inhabitants including those located high within the Alps. The limited space for qualitative settlement development and the different demographic dynamics intensify these trends. In the end this development leads to high residential prices in city centres with good infrastructure and to lower prices in suburban and rural areas. Hence, people move to the countryside where they can rent or buy cheaper real estates, without reflecting on the resulting induced costs for longer travel distances. The site decision has significant impacts on mobility and residential costs which differ greatly because of the dissimilar topography and settlement structure of the Alps. The results are not only raising costs for mobility but also other negative consequences like high energy demand, emissions, air pollution, time costs, reduced quality of life and others.

All these parameters influencing the amount of these costs have to be taken into account for a long term sustainable development. The "MOR€CO" project is trying to achieve transferable strategies to tackle these issues.

The EU co-funded Alpine Space project "MOR€CO – Mobility and Residential Costs" is a cooperation of 10 project partners located in Austria, France, Germany, Italy and Slovenia. MOR€CO started in July 2011 and runs until July 2014. The general aim of the project is to force good governance for a sustainable regional settlement pattern in the pilot sites with respect to mobility and residential cost transparency including a simulation of a potential increase of these costs.

2 CONDITIONS IN THE ALPINE SPACE REGION

The Alpine Space Region extends over nearly 200.000km2 and eight countries. There are big differences in altitude between the valleys and the mountains and various settlement and traffic conditions existing in the area.

One example of extremely changing conditions in the last years is the city and region of Munich. The metropolitan area which is located in the Alpine foothills received a major population growth and a correlated demand for houses. In the Pilot Site "City of Munich and Munich Transport and Tariff Association Area" live more than 2.6 Million people on 5.470km2. This is an average population density of 475 inhabitants per km2. However the situation in the City of Munich is another one: on an area of 310 km2 live nearly 1.4 Million people which generates an average density population of 4500 inhabitants per km2. The major part prefers to live in the city centre and this trend will increase in the future. The real estate prices rise enormously, additionally the most of the people use their car for their daily ways (37% in the City of Munich, see Figure 1). This leads to massive costs for housing and mobility for private households.

In dense areas like the Munich Region it is very important to provide an effective technical infrastructure for reducing long trips, especially when the settlement structure is already strained.

On the other hand there are regions in the Alps like the Val Belluna, a valley for which the population forecasts predicts a shrinking trend till 2029. Here approximately180.500 inhabitants live on 2.454 km2 (see Figure 2) which makes an average population density of approximately 74 people per km2. Even in the City

of Belluno the density is just about 250 people per km2 (Source: www.demostat.it). The problem in areas like this is first of all to maintain the quality of the public infrastructure and also to develop and structure the settlement.

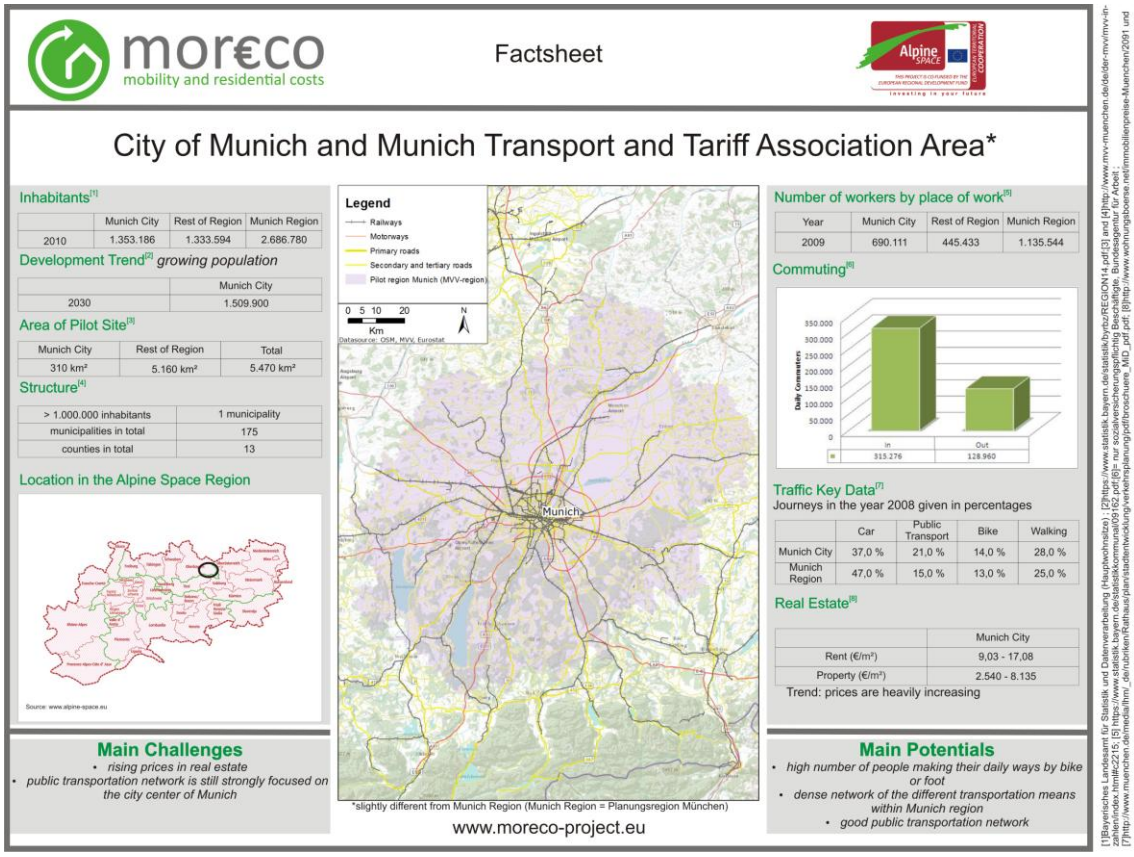

Fig. 1: MOR€CO Factsheet "City of Munich and Munich Transport and Tariff Association Area"

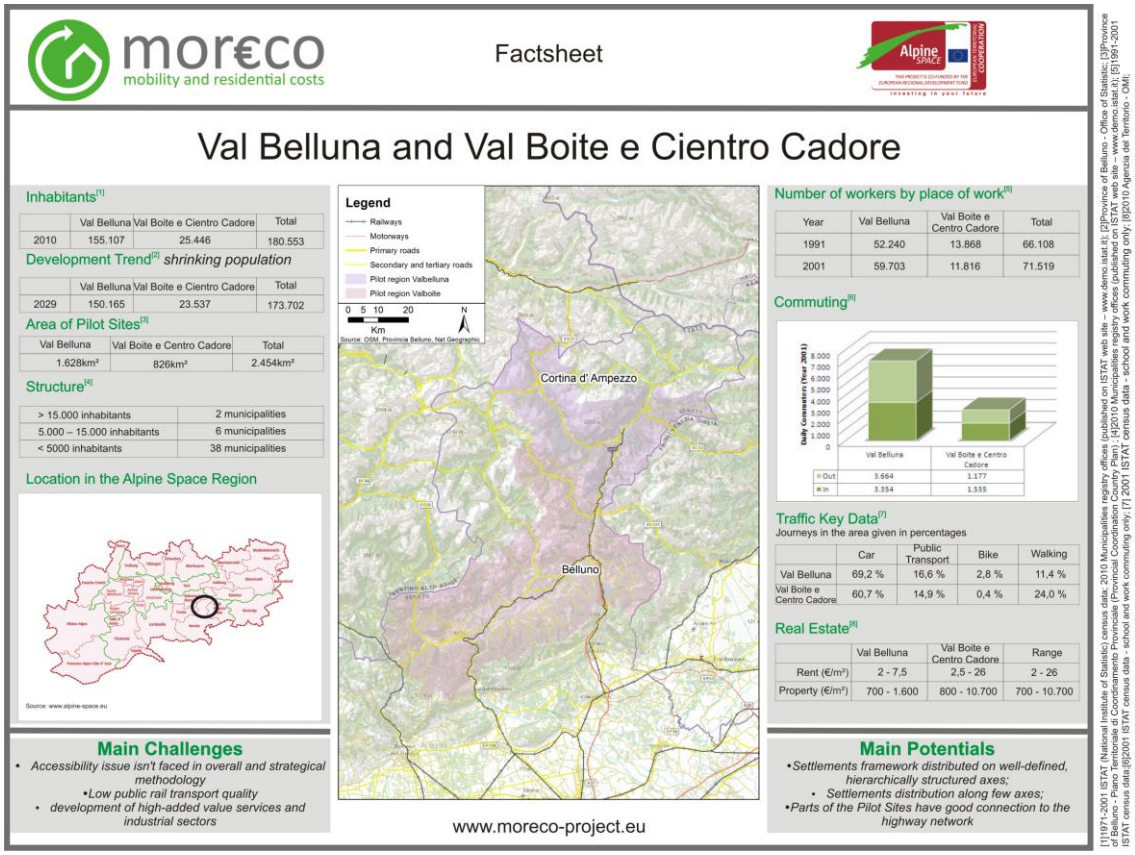

Fig. 2: MOR€CO Factsheet "Val Belluna and Val Boite e Cientro Cadore"

The pressure to tackle these challenges is very urgent in growing areas, but to accomplish equivalent living conditions it is important to serve the needs of all regions in the Alpine Space Region. MOR€CO tries to provide solutions for all kinds of these challenges. This paper is focused on the Munich area because the strategy and further approach is already very advanced.

3 THE INTENDED MOR€CO TOOL KIT

To make the induced long-term costs of site decisions transparent, several tools and strategies will be developed during the MOR€CO project time for special target groups.

Because site decisions are made by different groups of stakeholders, the project will address the following three main target groups:

3.1 Househunting citizens and other private households

When it comes to changing residential location, most people consider first of all the rent or purchase price for real estate. They rarely calculate the mobility costs they will incur by choosing a particular location and especially not the long-term costs. However, the major part of private trips start and stop at home and this implies in most cases:

- The more the residential location lies in the countryside (less costs for real estate), the longer the daily trips are (higher mobility costs)
- The more the residential location lies in a city centre (higher costs for real estate), the shorter the daily trips are (lower mobility costs)

This simple principle works in the major settlement structures but it is not very easy to transfer this to an individual private household, particularly in the Alpine Space Region whit its specific infrastructure. This is the reason why it's essential for citizens to understand the context between residential location decision and induced following costs for mobility.

The general aim of the calculation tool for private households is to give an overview about the mobility and residential costs for an inhabitant of the Alpine Space Region per month based on the individual residential site decision. The tool should help forcing the relation between residential living situations and the induced (long-term) follow-up costs for mobility more transparent.

Fig. 3: User interface of the Munich Residential and Cost Calculator (http://womo.mvv-muenchen.de/)

ISBN: 978-3-9503110-2-0 (CD-ROM); ISBN: 978-3-9503110-3-7 (Print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI

Because the cost calculator should be usable in the whole Alpine Space Area, it needs to be a simple tool free for everybody to download in the internet. The tool follows a similar approach as realized in the Munich Residential and Mobility Cost Calculator (see Figure 3) but transformed into a Windows Excel based Tool which then can be used in the whole Alpine Space Region. There are already several existing tools for this topic, but in the most cases these tools are only partially usable for special regions. The development of the MOR€CO tool will include - where possible – the results and approaches of these existing tools.

3.2 Planners and public transport organisations

The relations between residential location and induced mobility costs are not only important to know for private households but also for spatial and traffic planners, regional developers, public transport organisations and others. These stakeholders should be especially conscious of the consequences of their planning decisions. By knowing the needs of the population and customers the persons responsible for planning could determine more effective and sustainable plans when it comes to questions like mobility behaviour in relation with the settlement structure.

Within the MOR€CO Project a GIS-based tool will be developed to analyze planning decisions concerning future settlement and traffic development. The tool will consist of three main parts:

- Regional Analysis
- Settlement Assessment
- Mobility Planning

These tools will create a combination of maps, diagraphs, interpretation texts and other visualisations. The outputs will help the stakeholders to find qualified settlements for further (re-)developments.

3.3 Politicians, decision makers and municipalities

Politicians, decision makers, municipalities and other authorities at the local level are responsible for zone planning, quantitative targets in settlement development and other formal determinations. They also have to be aware of mobility effects to make sustainable decisions.

Another important group, in addition to the the main target group, includes banks and building societies, housing subsidy institutions, investors and others.

For this target group it is most efficient to develop “soft” tools like

- governance and cooperation strategies
- consulting material
- workshops and seminars

The most important aim for this target group is to provide complicated information in an easily understandable form and to give effective recommendations and instruction for sustainable development.

3.4 Tool practicability and enhancements

By this means private households as well as municipalities/political stakeholders are able to fulfil their current needs. Nevertheless an examination of the current status quo will not solve future issues. Therefore sustainable long-term strategic planning needs to take possible future scenarios into account.

For this reason so-called stress tests will be simulated within the Munich Metropolitan Region combining a mobility cost calculator with a GIS-based accessibility instrument. In the near future sharp increases of mobility costs due to the scarcity of fossil fuels are expected. Therefore simulating drastic future scenarios is a must in order to test the resilience of sub-regions as well as of individuals and households. By means of the vulnerability assessment methodology, several stress tests including different shock scenarios (e. g. triple of gas prices, budget of emission…) will be simulated within the case study.

4 MUNICH CASE STUDY

For the region of Munich the described tools have already been developed and are used in planning practice. Therefore the Munich Region will be highlighted as a case study in the following chapter. The data that will be displayed originated either from the models itself or from the Bavarian statistical database.

4.1 Stress tests on a municipal scale: methodology and first results

To see which region is in danger of increasing mobility costs a so-called vulnerability assessment has been performed for each municipality in the Region Munich.

Kelly and Adger (2000) defined the concept of vulnerability as "the ability or inability of individuals or social groupings to respond to, in the sense of cope with, recover from or adapt to, any external stress placed on their livelihoods and well-being"; while Kasperson et al. (2006) stated that vulnerability refers to "the degree to which a person, system, or unit (such as a human group or place) is likely to experience harm due to exposure to perturbations or stresses".

The vulnerability assessment is divided into the following three dimensions (Kasperson et al. (2006):

- Exposure is the contact between system and stress.
- Sensitivity is the degree to which something/someone is affected by exposure to stress.
- Resilience is the ability of something/someone to absorb perturbations or stresses without changes in its fundamental structure or function that would drive it into different state).

Measuring vulnerability is a crucial issue. As underlined by Leary and Beresford (2007) "… because vulnerability is a complex, multi-dimensional concept that is not directly observable, researchers have experimented with a variety of methods to develop proxy indicators".

The following maps show a selection of key indicators for measuring different levels of exposure, sensitivity and resilience.

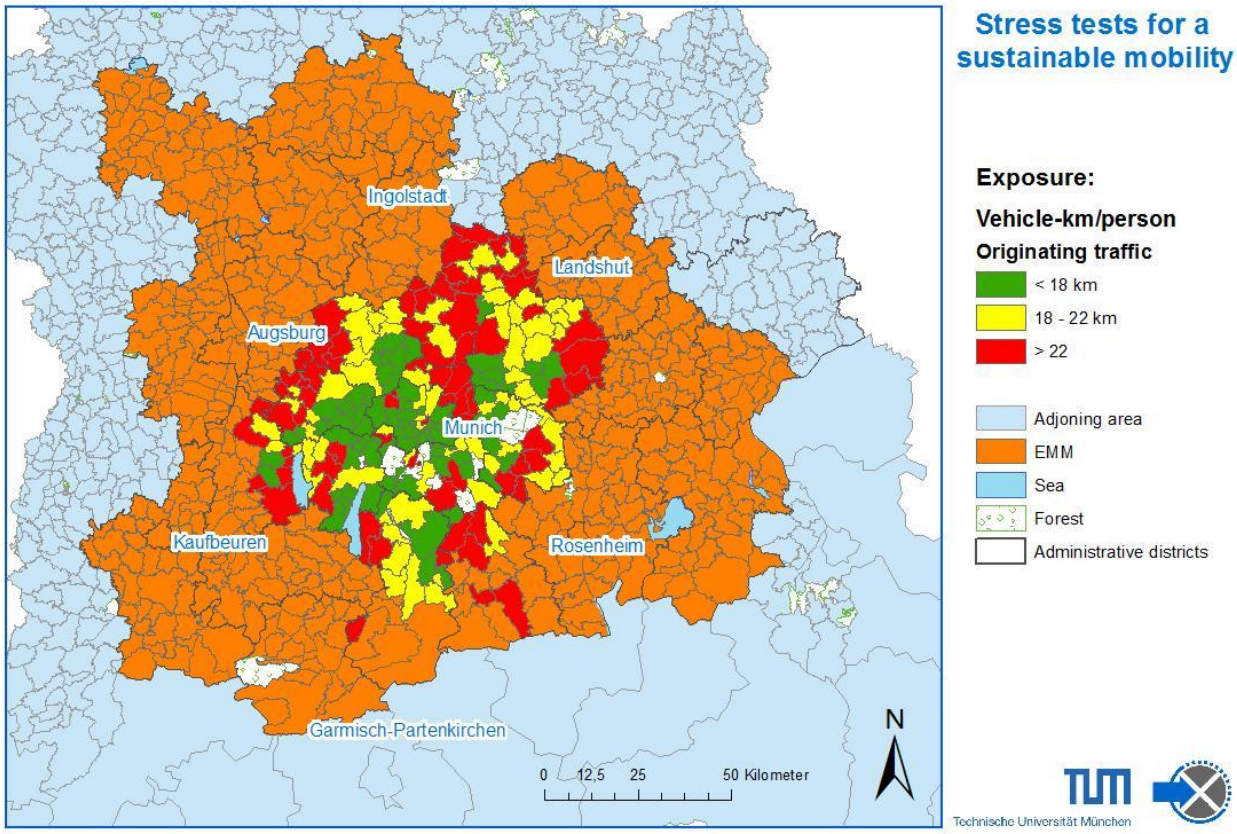

Figure 4: Exposure indicator: Average driven vehicle-km per capita for the municipalities within the Munich Region

The red municipalities have an average driven vehicle-km per capita of more than 22 kilometres daily. Hence these regions are very car dependent and are highly exposed to a sharp increase in fuel costs.

Other possible indicators for exposure are for instance car ownership rate or commuting distance.

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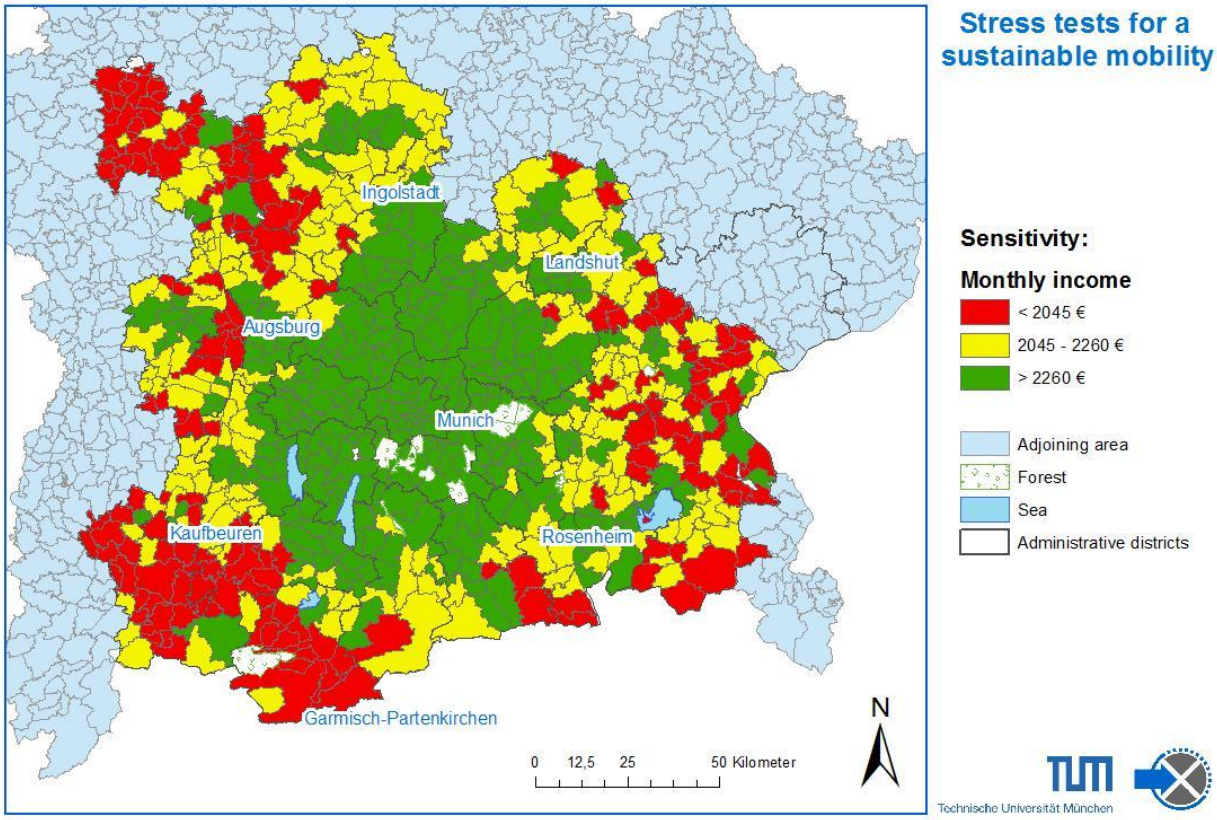

Figure 5: Sensitivity indicator: Monthly average income for each municipality within the Munich Metropolitan Region

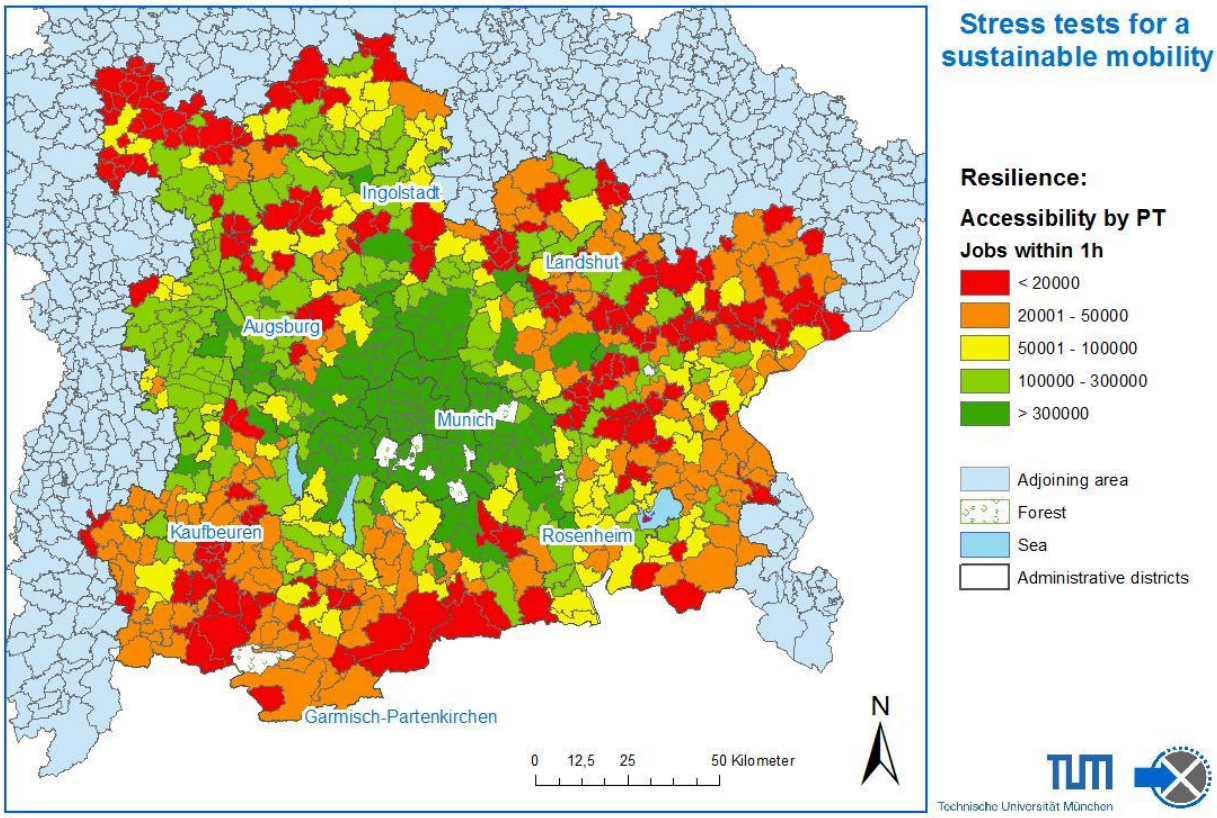

Figure 6: Resilience indicator: Accessibility of the number of jobs by public transportation for each municipality within the Munich Metropolitan Region

The average monthly income is visualized for the Munich Metropolitan Region. In the red municipalities the average income is below 2045 €. Most of them are located in rural locations. The southern regions are close to the Alps and increasing mobility costs will hit the inhabitants in the rural regions very hard; in many cases alternative modes of transport are lacking and therefore their resilience is quite low (see Figure 6).

Other possible indicators for sensitivity are for instance unemployment rate or the share of mobility costs on the household budget.

Figure 1 shows the accessibility of jobs by public transportation for the Munich Metropolitan Region. From the red municipalities less than 20000 jobs can be accessed by public transportation within one hour. Combing accessibility for public transportation with activities (e. g. jobs) will give an idea about need for improvement in the affected regions. Different sorts of accessibility indicators can and should be used for a wide range of thematic analyses.

Other possible indicators for resilience are for instance alternative locations/activities, modes and strategies (e. g. carpooling).

A combination of different indicators for the three dimensions is needed to complete the vulnerability assessment. Nevertheless an examination of the current status quo will not solve future issues. Therefore sustainable long-term strategic planning needs to take possible future scenarios into account. For this reason so-called stress tests will be simulated within the Metropolitan Region Munich combining a mobility cost calculator with a GIS-based accessibility instrument. In the near future sharp increases of mobility costs due to the scarcity of fossil fuels are expected. Therefore simulating drastic future scenarios is a must in order to test resilience of sub-regions as well as of the individuals and households. By the means of the vulnerability assessment methodology several stress tests including different shock scenarios (e. g. triple of gas prices, budget of emission…) will be simulated within the case study.

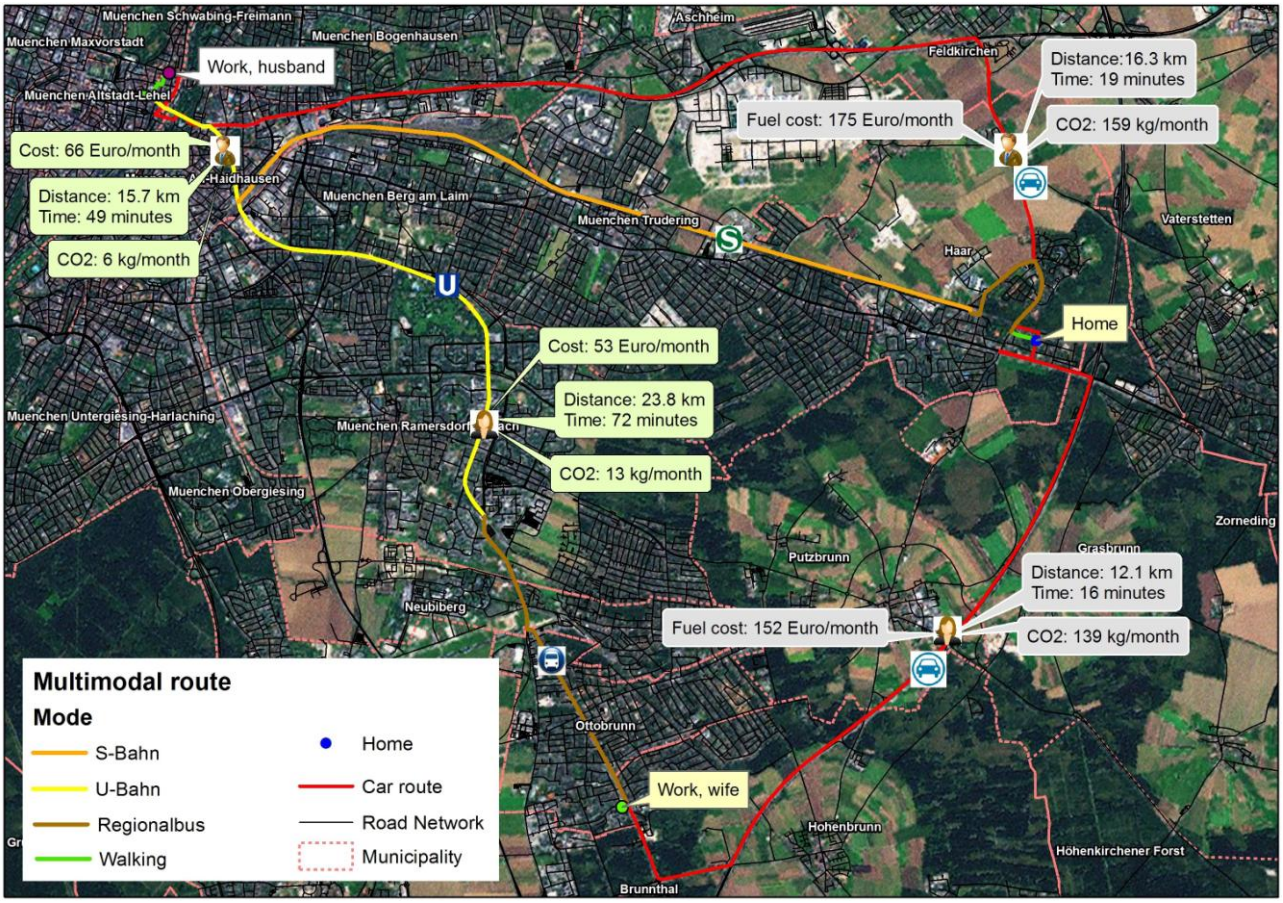

Figure 7: Current mobility costs for trip purpose working in the suburban municipality "Haar" with good access to public transport

4.2 Calculating mobility costs for households

The vulnerability assessment on a regional scale is important to stress test the municipalities regarding the future development. Nevertheless it is of high importance to include site and mobility decisions by

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individuals and households, which cannot be highlighted in average numbers for each municipality. Wilbanks and Kates (1999) state that research on multiple scales (e. g. household and municipality) is needed.

With respect to this matter, fictional yet realistic storylines for synthetic households (based on regional data and survey) have been developed by the means of a residential and mobility cost calculator provided by the Munich Transport and Tariff Association (MVV). For three different settlement structures including a compact urban city, a suburban municipality and a rural municipality the different mobility behaviours have been analysed and the current costs for individuals and households have been calculated.

Figure 4 visualizes the route choices for different modes of transport for the suburban municipality Haar to the place of employment. The exemplary household consists of a wife and a husband; both of them are travelling to work each day. Other household members and activities like a son doing sports and going to school are included. The travel time, mobility costs as well as CO_2 emissions are calculated for each trip. In that way different activities for different members of the household are calculated, visualized and tested for their respective sustainability. Afterwards these numbers are listed and compared, and they provide guidance for improving the mobility behaviour.

5 CONCLUSION AND OUTLOOK

Visualizing the current and the even more important future costs exposes the high importance of the location choice (residential and activity based) and mode choice; this will ultimately help households and decision makers to lead to more sustainable short and long term choices. The MOR€CO tools in combination with stress testing the study regions concerning price shocks will ultimately lead to a more sustainable way of transport and spatial planning in the Alpine Space Area.

If all future project steps will be successfully finished, the project serves the needs from growing and from shrinking structures in the Alpine Space Region as well as support transnational cooperation.

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