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Ökotopia – Multidimensional Cities need Multidimensional Data

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1 ABSTRACT

The development of a multidimensional criteria catalog brings along data for the evaluation of the actual situation for cities or areas in cities. The criteria are defined in four research groups in the area of social living, building, energy and transport. The criteria are defined by different indicators weighted due to their importance. The indicators themselves are described by values, which depend on the approachableness of sustainability. The data from the criteria catalog is available for specific applications or services for town-planers either from authorities or planning offices or the commercial developers of areas. The main objective is not only to define data, but also use it for the validation of sustainable smart cities.

2 MULTIDIMENSIONAL CITIES

Places where people live together are always multidimensional. Some of these dimensions are the design of buildings to life and work; the quality of the places to move around or to relax; the different modes of energy used; the form of transport that is based on the needs, the availability of attractive public transport and cycle possibilities; the availability of shops and services and the infrastructure and the social dimensions like the availability of places to meet, family and social structures. The dimensions named are not complete to describe the evolution of cities; they just show the complexity of the development of cities. These dimensions are represented by specific data. The relationship between the dimensions is very complex but the violation of the relationships leads to cities with difficulties like crime or dangerous places and in the end separation of people with all its difficulties. As the development of cities is in an on-going process it is necessary to have a tool that supports the town planners and delivers data to the public for services. The mentioned data is long term planning data.

A city of high living quality – a smart (sustainable) city – has to cover many dimensions with high quality, only these cities (or living areas) are successful in business and economics. Sustainable Smart Cities are not only based on short term data, but also on long term multidimensional data to show the development and "smartness" of cities or living areas.

3 ÖKOTOPIA – RESEARCH PROJECT TO RETRIEVE DATA

To research on the coherences of different sciences for sustainable areas a research project was set up. The project Ökotopia was based on the fruitful cooperation between the research institutes Social work; Energy-, Transport- and Environmental Management and Construction Design and Economics of FH JOANNEUM University of Applied Sciences at Graz and Kapfenberg. This combination covers scientific approaches in different fields with their specific methods.

It was one of the results the content of the research project ÖKOTOPIA to develop an evaluation tool for areas in cities covering the specific knowledge of the different fields of research. This evaluation tool can be used for collecting data that can be used to evaluate planned developments, for actual town planning or for the observation of long term processes. This evaluation tool is a catalog of criteria in the four fields of research: building environment, social science, energy and transport.

To develop a standardized catalog seven different living areas in the city of Graz were specified. The definition of the areas was based on three pairs with equal density, building structures and common visual appearance. One living area was additionally selected as it shows a specific high density with large and high structures.

4 SUSTAINABILITY

To study the sustainability the definition of sustainability is necessary. Helms defines the sustainability as shown in the following figure.

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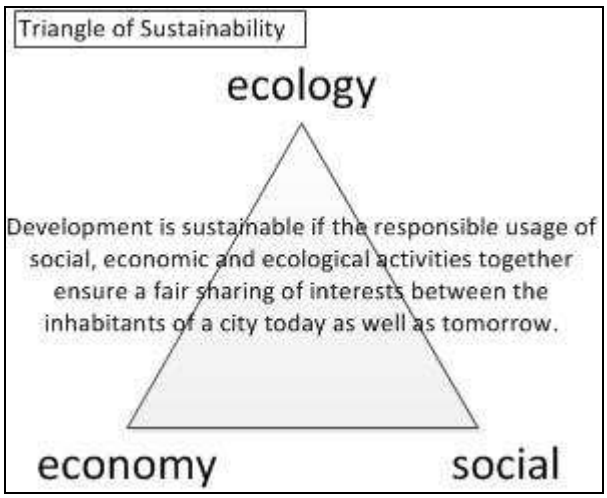

Figure 1: Definition of Sustainability (source: Helms)

To define the level of sustainability in the living areas every research group defined the most sustainable solutions.

5 DATA TO DESCRIBE LIVING AREAS

The specific result of the project Ökotopia is a multidimensional set of criteria, based on specific different data retrieving methods from the research groups. The cooperation of the research groups based on an approach where the combinations, of the sometimes quit different scientific methods, of the participating researching institutes with their specific knowledge is very unique and very fruitful.

The range of methods to retrieve data covers the interpreting of plans, scientific designing of a questionnaire with a survey performed and interpreting the results and the analysis of energy and geological data. The research groups cover specific knowledge and experience in the area of social research, the retrieving and interpretation of geographical data and analysis of energy sources and consumption.

The data is based on criteria defined by the four different fields of research: architecture, social science, energy and mobility. Every area defined criteria, the criteria themselves are compound by indicators, and those indicators have specific values. The values themselves have the range from 0 to 10. The most sustainable solution defines the highest values. The definition of the best values is based in literature or on the knowledge of the researchers. The different indicators were weighted and combined to define the criteria. They were again weighted and combined to show the valuation of the area in form of numerical indices. The final results are four figures for the fields of building environment, social life, energy and mobility that describe the researched area.

This data can not only be used for the analysis of areas at the present, but also for the forecast of developments. If the data is already collected it can be stored and together with the collection of new data in the future it will be used again to look back and analyze the developments.

6 EXAMPLES

This chapters show some examples of criteria in the different research groups.

The research group of mobility values the distance between the areas and the objects of basic functions for living, work and social life. Another figure shows the access to good public transport as it correlates to the number of cars owned by the inhabitants in this area.

Examples for the valuation of the research group of building are the quantity and quality of the surfaces, and the public spaces available.

Energy based data is defined on the kind of energy sources used including their production and its amount of usage in the different households.

Social data concerns for example, the quality of relations to the neighborhood, the identification with the living area and the employment rate.

For the named examples data is collected from different official sources or a specific questionnaire developed for the project. Some of the figures are made up different indicators.

7 CONCLUSION

The project Ökotopia developed a catalogue of criteria that delivers the data that can be used to evaluate a specific area with different scientific approaches from four research groups in the fields of building, social life, energy and mobility. The data can be used to evaluate the present, make forecats or if looked back to show developments. In the actual project the criteria are based on the sustainablity but the adaption towards "smart" is easily possible. The defintion of "smart" itself was not part of the project, it is still open.

The data of this project could be a source to proof if the cities are "smart" or how the development goes on.

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