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From passive house to active neighborhood

- widening the scope and scale of sustainability assessments -

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ABSTRACT

The paper provide an insight into the research conducted by the Faculty of Architecture (University of Ljubljana), and the Urban institute of Slovenia committed to the assessment of the efficiency related to the management of local resources at the level of neighborhoods. The reduction of energy consumption and energy efficient built environments are key objectives of many sustainability agendas which is followed by suitable assessment methods in urban analytics. However, there are two important hesitations occurring: first, traditional assessment methods that focus solely on the energy reduction and efficiency are often too narrow in their analysis and limited in their scope of impact. According to the recent advances in research worldwide, efforts solely related to reduction of energy consumption will unlikely lead to more responsive environments or rise the living quality. Thus, more comprehensive methodologies for assessing and monitoring the change and transformation in built environments shall be sought for to reach long-term sustainability. Second, to date, the majority of the evaluation methods - whether focusing to energy consumption or broader sustainability issues – are building- or household- oriented, thus systematically examining separate spatial and social entities, but neglecting the spaces between (connecting infrastructure and services, mobility, public and inter spaces, and urban design solutions etc.), the holistic aspect and the community aspect. The research develops structured evaluation model, this is, neighborhood sustainability performance index which provides the foundation for targeted actions. To establish the described assessment model two main research pillars are addressed: 1) the development of the structured and modular system of indicators; and 2) the development of the methodology to interpret the resulting values. The paper presents first two stages of the research process and subjects the outcomes to the debate.

PROBLEM & OBJECTIVES

The main problem embraces the lack of assessing methods and applicable metrics, adapted to Slovene environments and specifics, for a more complex and holistic "sustainability performance index" of settlements (on the level of enclosed units such as neighborhoods, villages or parts of a cities on the basis of which we could design a modular series of actions and measures for energy efficiency improvement, reduction of emissions, improved spatial planning (rational use of space), well-thought mobility and infrastructure, raised public awareness and general quality of the dwelling

The purpose of the project is to establish a data-based system to support decisions in modular urban renewal of Slovene settlements at the level of neighbourhoods from the perspective of higher balance between energy efficiency and sensible management of local resources (social, spatial, natural, energy, human, etc.). The primary objective is the development of a structured and modular system of indicators accompanied with a related method of interpretation of values leading towards sustainability performance assessment of neighbourhoods/smaller settlements. This system would serve as a reliable support in the decision making processes in gradual/modular retrofitting of neighbourhoods and streamlining actions in these settlements enhance policy making processes and smart investment planning.

The designed instrument pinpoints potential weaknesses and low performance segments on the basis of quantitative and qualitative items of sustainable efficiency and determines the necessity for appropriate actions.

The objectives are reflected in more detail in four sub-objectives:

1) **the development of methodological model of performance assessment which assesses and compares the neighbourhood's level of efficiency in the light of sensible management of local resources: spatial, natural, energy, economic, social and human; through three major strategic areas: A) building, B) public city area and infrastructure, C) traffic, means of transport, transport infrastructure;**

2) **the selection of six pilot neighbourhoods that shall serve as a »research ground« for the design of a system of indicators, assessment of usefulness, functionality and reliability of the instrument.**

3) **the design of a flexible and hierarchical system of indicators which entirely captures »sustainability performance index« of an individual neighbourhood; modular structure which enable assessment of partial sections (if all data is not available or a certain category and subcategory are irrelevant)**

4) **the development of a decision support system for urban renewal at the level of neighbourhoods, which is based on the above mentioned methodology and allows gradual implementation or retrofitting of individual segments and includes the basis for high-tech measures i.e. smart cities principles, as well as for low-tech solutions; such as the use of algae technologies for the needs of water treatment or biomass production.**

The research is simultaneously followed by two horizontal objectives that refer to:

- **examination of accessibility, availability of the existing indicators/data and the possibility of using ICT-solutions for the purpose of gathering information from the neighbourhoods' inhabitants – e.g. crowdsourcing;**
- **the potential adjustment of the system of indicators for the purpose of activating/ informing/ educating a group and individuals about the efficiency of their neighbourhoods, key assessment parameters and courses of actions.**

INTRODUCTION/RATIONALE

The reason for addressing the issue at hand is a significant lack of instruments to collect and assess overall efficiency and rational use of resources in settlements and their parts (units, neighbourhoods) in a consistent and comparable manner through a unique frame of key criteria and indicators, which provide foundation for targeted actions. The complexity of the issue, although at a world and European scale frequently discussed, is on the other hand distinctly scattered among various research disciplines, which results in diverse research objectives, the use of various working methods and incomparable methodologies and conditions in a sense of geo-spatial and cultural context as well as the variety in scale of built environments researched.

METHODS

To accomplish the above mentioned we proceed by addressing two main research pillars:

- **development of the structured and modular system of indicators**
- **development of the methodology to interpret the data (from the first phase) and to interrelate it with the actions required to improve the performance of a neighbourhood (efficiency, ability and productivity on different levels of human activity)**

The theoretical part of the research focus on the interrelations of selected elements/phenomena of/in built environment and their impact on the selected segments of neighbourhood efficiency. In the initial phases we conducted a meta-analysis of the existing, more or less established parameters that affect individual segments of efficiency. The following examination covers a set of potential indicators for measurements in partial segments. On the basis of the analysis carried out, a hierarchically and modularly set system of indicators shall be developed, where qualitative and quantitative datasets can be combined and then appropriately numerically revalued/modelled. The combination of theoretic and mathematically-numerical methods shall be applied in the process of designing the new methodology for interpreting the data and weighting their meaning for partial and final values of the index.

EMPIRICAL ANALYSIS - PILOTING

For the purpose of the research 6 Slovene pilot neighbourhoods have been systematically selected to assist as a "research testing ground" for:

- **validation of theoretical knowledge,**
- **the identification of differences in respect to local specifics of the selected neighbourhoods and consequently identification of reservations regarding the application of the existing evaluation methods;**
- **the examination of theoretically less supported correlations and impacts among individual features of neighbourhoods (built structure, natural conditions, economic sustainability, population demographics, habits etc.) and their sustainable efficiency (according to adopted categories);**
- **the examination of indicators' acceptability, data access, datasets frequency, geographic data resolution etc. Our experience shall be used efficiently to design and overview indicators system which will be able to resolve data deficits also with its modularity;**
- **testing the developed instruments for performance assessment of individual segments of neighbourhood sustainability efficiency;**
- **the examination of neighbourhoods' community and its potential with regard to crowd-sourcing (the use of smart phones, cooperation through sourcing and forwarding the data and indicators appropriate for this kind of sourcing).**

RESULTS AND DISCUSSION

The proposed research provides original contribution and results in several aspects. In relation to the existing cases of similar practices, we are advancing in terms of holistic (not solely energy-driven) and through experience gained dimension of built space on the level of neighborhoods as the one that actually affects the perception of its inhabitants. We are focusing on the features of Slovene neighborhoods with local specifics. The final metric system is to be derived from spatial elements (as the factors of impact or indicator) which can most easily be connected with positive and negative effects on the quality of dwelling (directly and indirectly).

Two of the most important potentials of the research are modularity and flexibility of the system of indicators in a manner that enables assessment and comparison of various neighborhood types with locally specific features and at the same time preserves a sufficient degree of universality for assessment and measurement in a manner that allows for comparison, repetition and control. Secondly, modularity in assessment enables modularity in actions which provides the opportunity for gradual retrofitting and improvement in sustainability of neighborhood, starting with those actions which are assessed to be the most urgent/economically justified/feasible/adapted to the environment specifics.

Innovation of the contribution in the research-methodological field is demonstrated by combining quantitative and qualitative approach to description and evaluation of space or neighborhoods. Quantified form is supported by a strong qualitative meaning of individual included sub-indicators. An index designed in this manner does not answer only the question of how much, but also why that much, which places the proposed instrument also into the awareness raising/education field. With this we are addressing one of the main objectives of our previous work – the development of methods and tools that would enable transfer of spatial information in user-friendly and visually-supported form.

CONCLUSIONS

Assigning neighbourhoods the role of a carrier in sustainable development in the field of dwelling culture presents a factor of immediate social relevance, essential in committing to reduced energy use, reduced emissions and the use of alternative resources, as to preserving place-based identities, cultural-historic heritage, fostering liveability of the open spaces and transferring the social values by activating the communities
Modern technology at disposal (GPS technology, geo-located services, geo-referential data, e- and m- services etc.) provides various possibilities for mass crowdsourcing, which can represent a valuable source of time-spatial data and details, comprising various aspects of our everyday, our habits, views, observations, conduct and preferences. By combining official records and from users obtained data (»collective sensing« concept) of quantitative and qualitative nature, a bigger geographic data resolution, a wider time interval of crowdsourcing and increased type and data form diversity are enabled.
This allows for engaging people more firmly into the process of decision-making as well as provokes public spatial literacy, this is, fostering public ability to recognize the potentials, weaknesses and qualities in living environments to consequently act sustainably and make prudent/smart interventions. It is also an opportunity to encourage direct engagement with the inhabitants or the community to better understand their interests, concerns and priorities in their neighbourhoods.