

From Sustainable Cities to Sustainable People – Making Behaviour Change towards Sustainability a Priority in Urban Planning Processes

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1 ABSTRACT

For many years, cities across the globe have developed sustainability strategies, trying to combat environmental pollution and its effects on climate change, health, and quality of life. Even though most of them are following similar strategies, not every city is successful. The discussion about urban sustainability mainly focuses on technical solutions such as public transportation systems, green buildings, and the use of renewable energy. However, most cities don't take into consideration that the main factors that make a city sustainable are the people who live in it. Sustainability is not just about using new technologies to make cities and their systems more sustainable by addressing the technical causes of inefficiencies. Sustainability is about changing behavior of people by addressing the root causes of unsustainable behavior. Building public transportation systems and bike lanes doesn't guarantee that people will use them and drive less. To create a sustainable city, planners have to address the factors that encourage people to choose the sustainable option over the unsustainable one. Hence, urban planning must be about creating an environment that allows and motivates sustainable behavior.

The main findings of this work are five factors that can make a change towards sustainable behavior possible when incorporated into the planning process: availability, accessibility, affordability, attractiveness, and awareness of sustainable options (the five A Planning Approach).

This paper outlines these five factors and explain how they can be integrated in urban planning processes in order to enable long-term behavior change towards sustainability.

Keywords: sustainable urban planning, environmental psychology, sustainable cities, behaviour change, urban sustainability

2 INTRODUCTION

With the adoption of the New Urban Agenda during the UN-Habitat III conference in Quito, Ecuador in 2016, national and subnational governments across the globe committed to “a new global standard for sustainable urban development” that “provides guidance for achieving the Sustainable Development Goals and provides the underpinning for actions to address climate change.”¹

Throughout the last decades, more and more cities around the world joined the movement towards sustainable places, developing climate action agendas and sustainability strategies in order to combat environmental pollution, minimize GHG emissions, and conserve natural resources. Urban planners, architects, engineers and urban designers have been pushing the envelope to make cities and the built environment more resource-efficient. “Planning serves as a tool for translating political purposes into specific policies, programs, and projects” (Hoch 2011), however, strategies such as the implementation of public transit systems in the transportation sector or the construction of green buildings in the building sector are not always successful. Building public transit systems doesn't guarantee that people really use them and drive less (Stieninger Hurtado 2018). Building energy-efficient buildings doesn't guarantee that the occupants use less energy than in a conventional building (Turner & Frankel 2008). The technical solution alone doesn't necessarily solve the problem. What planners design on paper doesn't necessarily work out in reality.

Conventional planning approaches focus too much on the technical causes of unsustainable developments and ignore the root causes of unsustainable user behaviour. The “success of an urban sustainability project doesn't only depend on its technical design and its technical feasibility; it mainly depends on the preferences, needs, and behavior of its users.” (Stieninger Hurtado 2018)

This paper looks at this missing link between plans and reality and the human factor of urban sustainability. It will elaborate urban sustainability from a user's perspective, trying to answer the following questions:

¹ <http://www.un.org/sustainabledevelopment/blog/2016/10/newurbanagenda/>

Why are some sustainability projects successful and others are not, even though they are following similar strategies and objectives? What is missing in current planning approaches?

Additionally, the necessity of making behavior change towards sustainability a priority in urban planning processes will be explained. A planning approach that integrates the factors that can make urban sustainability projects work out successfully, not only from a technical perspective, but also from a user behavior perspective, will furthermore be provided.

3 METHODOLOGY

This project started in 2009 as part of a dissertation project, trying to find solutions for energy efficiency in cities with a focus on the transportation and residential buildings sectors. Between 2009 and 2013, field investigations were carried out in select cities in Europe and North America (Europe: Vienna, Linz, Stockholm, Madrid, Hamburg; North America: Chicago, New York, Los Angeles, San Francisco, Phoenix, Seattle, Vancouver, Montreal), including expert interviews with city planners, planning consultants, and academics as well as an evaluation of current urban development plans, sustainability plans, and climate action programs. In addition, statistical data on energy consumption in different sectors, mode share, greenhouse gas emissions, and other energy consumption-related issues was analyzed and compared between the select cities.

The results of these investigations, evaluations, and analyses were clustered into categories of influencing factors and compared with the results from the field investigations. The comparison resulted in five factors that were varying between the different cities and appeared to have a significant influence on the success of energy efficiency strategies: the availability, attractiveness, accessibility, affordability, and awareness of energy-efficient options. These results were published in a monograph (Stieninger 2013). It describes a new planning approach that incorporates these five factors in order to create new energy efficiency strategies by focusing on people's behavior (the Five A Planning Approach).

Over the past four years this project has been continued and further elaborated with a stronger focus on the psychological part of behavior change in general and the way planning processes are being organized, including additional investigations in cities in the U.S. (Washington D.C.), Europe (Paris), and Colombia (Medellin, Cartagena, Bogota) and the application of the five factors to the broader sustainability topic (resource efficiency and urban climate action). Furthermore, the Five A Planning Approach was discussed with experts from the international planning and sustainability community during various presentations and panel discussions at conferences hosted by the Chicago Architecture Foundation (2014), the U.S. Green Building Council (2015), the American Planning Association (2016 and 2017), the Inter-University Sustainable Development Research Programme (2017), and the Society for the Advancement of Socio-Economics (2017). In addition, input from further literature review on environmental psychology and new findings from field investigations were incorporated in the approach. For this paper, the previously elaborated planning approach was transferred to the broader urban sustainability context.

4 PLAN VERSUS REALITY – THE HUMAN FACTOR OF SUSTAINABILITY

Despite the efforts towards sustainability and resource-efficiency undertaken by urban planners/designers, architects, and engineers when designing green buildings, public transportation or renewable energy systems, the best design doesn't work out if the users don't use the system the way it had been designed to be used. Examples for this phenomenon, such as the Valley Metro light rail in Phoenix, Arizona and the Solar City in Linz, Austria, have been described in previous publications (Stieninger 2013, Stieninger Hurtado 2018) and will here be mentioned only briefly.

The award-winning Solar City in Linz, Austria was meant to be a showcase for sustainable urban development, featuring solar energy systems, low-energy buildings, and a public transit connection to the city center of Linz. However, a post-occupancy evaluation done by the Johannes Kepler University in Linz (Lins 2009), showed that less than 15% of the people who lived in the Solar City used the tramway for their daily commutes and more than 80% were still driving. Furthermore, the lack of knowledge on how to use the building ventilation systems efficiently resulted in an increase of energy consumption. The lack of knowledge on how to use HVAC-systems efficiently in green buildings in order for them to function the way they were designed is one important factor that influences the behavior of occupants. A study on the energy

performance of LEED-certified building by the New Buildings Institute (Turner & Frankel, 2008) confirms this issue.

The Valley Metro light rail in Phoenix was meant to spur urban development along its over 20-mile long corridor. However, due to the financial crisis the expected development didn't take place and only a few people used the light rail for their daily commutes (mainly students and people who couldn't afford a car), as driving remained more attractive than taking the train with plenty of inexpensive parking options and an extensive street network. (Stieninger 2013).

How can planners and designers make the missing link between what is planned and how it is used part of their planning processes? How can they make sure what is being designed is in line with people's needs and at the same time results in more sustainable behavior? How can planners make sure the users behave the way it was expected in the plan?

Looking at the mentioned examples, one major factor that seems to affect user behavior is the design. The way the buildings of the Solar City were designed was not self-explanatory to the end users and therefore they weren't able to use the building systems efficiently. The design failed in that respect; it couldn't meet its purpose. How must planners design the built environment so the desired behavior (intention of the design) takes place? Gibson's concept of affordances (Maier & Fadel & Battisto, 2009) and affordance-based design (Norman) ask for this relationship between the built environment and its users. Any design that doesn't meet its design purpose is considered a failed design.

The post-occupancy study of the Solar City, furthermore, showed that only 25 percent of its occupants moved to the Solar City because of its award-winning, green/sustainable design. The majority, however, moved to the Solar City because of its suburban location outside of the city, offering green space, proximity to the city, and the affordability of big apartments in that area (Lins 2009); factors that support urban sprawl and are therefore considered as unsustainable.

Many barriers have to be overcome in order to make a behavior change in daily activities possible. Humans are creatures of habits and the simple construction of a public transit system or a LEED-certified building won't make that behavior change happen. Those barriers include technical aspects that enable the desired behavior as well as organizational aspects that build the awareness of sustainable options, explain usage to the user, and give them incentives to make the desired changes.

Up until today, cities have been mainly focused on the technical aspects, providing the infrastructure, but missing the question of how convenient or even possible is usage for the actual user. The knowledge and awareness of options and the obvious benefits of using them are being neglected. Planners have to keep in mind that as long as previous, unsustainable affordances of the built environment remain unchanged, the new sustainable options will be very hard to sell. Incentives and positive reinforcement for using sustainable options as well as disadvantages and negative reinforcement for using the usual, unsustainable option, must be clearly communicated in order to make behavior change possible (Skinner, 1971 & 1987).

5 THE FIVE A PLANNING APPROACH TOWARDS SUSTAINABLE CITIES

Obviously, the main problem of urban sustainability projects are the missing drivers for behavior change, the factors that can overcome the above mentioned barriers. The remaining question is what do planners / designers have to do to not just offer the hardware and software for a more sustainable life, but to also make people want to use it.

The evaluation of sustainability projects resulted in five factors that are essential and have to be integrated in sustainability projects in order to make a behavior change more likely:

“It is essential that sustainable options are (1) available, (2) accessible, (3) affordable, and (4) attractive, and people have to be (5) aware of them - the five A Planning Approach (Stieninger 2013). In addition, it must be obvious that the benefits of the sustainable options exceed those of the unsustainable options. According to Skinner (1987), people are more likely to change their behavior if there is an obvious consequence for choosing the unsustainable option. The consequence must therefore be an obvious disadvantage for choosing the unsustainable option over the sustainable one. The unsustainable options should be less attractive and more expensive than the sustainable options, with limited availability and accessibility, and people should be aware of these disadvantages.” (Stieninger Hurtado, 2018), see also figure 1.

Availability:

First of all, sustainable options have to be available in order to make behavior change possible. Without a public transit system or bike lanes, people won't be able to give up driving. This is what many cities have been working on for the last decades, making sustainable options such as public transportation systems, bike lanes, green buildings, and renewable energy systems available. The next step, however, would be to make unsustainable options unavailable. As the example of Phoenix showed, as long as parking and four lane streets are still available, the existence of a public transit system alone may not be enough reason for people to change their behavior.

Accessability:

Sustainable options have to be physically and legally accessible. That is, for the case of public transit, it has to be accessible from every place in the city, not just in downtown. In order for people to be able to take the train to work, they have to have access to a station from their home and their work place. At the same time, when it comes to the urban fabric and the problem of urban sprawl, physical and legal accessibility of suburban, sprawling areas through highways and zoning maps that allow sprawl to happen have to be changed. As long as people are able to physically access sprawled areas outside the city in their cars and they are legally allowed to build their single-family houses in the middle of nowhere, they will keep doing it. Therefore, unsustainable options should not be accessible.

Affordability:

Sustainable options have to be more affordable than unsustainable options. When it comes to green buildings or public transit use, prices are generally perceived as higher than the unsustainable options of conventional buildings and driving. This is not true though. Studies have proved that green buildings don't have to be more expensive than conventional buildings and, with the right use, a payback through energy and water savings adds additional value (Stieninger Hurtado 2018). Furthermore, prices are wrongly perceived when it comes to transportation. Every transit trip starts with either paying for it or validating a transit card that reminds people of the price they paid for it. On the other hand when driving a car, people are usually not aware of the total costs including the gas, the cost of new tires, insurance, tolls, and the cost of buying a car in the first place. The perception of prices has to be corrected in many cases. However, in many places, the use of public transit is still very high (e.g. a single ride ticket in Washington D.C. costs up to five U.S.-Dollars (depending on the length of travel) compared to only one Euro for an entire day of transit use in Vienna when purchasing an annual ticket). Germany will soon be piloting the possibility of offering free public transit.²

Attractiveness:

Sustainable options have to be attractive. The term attractiveness is meant as in beautiful design, safe, and comfortable. Obviously, beauty is very subjective. However, so called "secondary times of transit use" such as waiting times and time needed for the first and last mile can be the main decision factor for people to choose between taking transit or driving (Grohmann 2006). A cut of these secondary times can be as essential as the design and operation of the places where these secondary times take place. A run-down, dirty train station with no benches to sit down, no heating or cooling, known as a place where crimes take place, will definitely attract less people than a new, modern station that offers ample space to sit down, heating in the winter and cooling in the summer, maybe a coffee shop and free wifi, known as a place to meet friends or coworkers on the way to work.

Awareness:

Probably the most important factor is awareness. People have to be aware not just of the availability, affordability, accessibility, and attractiveness of sustainable options, they also have to be aware of the advantages of using them over the unsustainable options. If there is no awareness of the sustainable and the unsustainable options, their advantages and disadvantages, the greenest building and the best public transit system won't be able to make behavior change happen.

² https://www.theguardian.com/world/2018/feb/14/german-cities-to-trial-free-public-transport-to-cut-pollution?CMP=share_btn_tw

The Five A's	Definition	Examples
Availability	Sustainable options must be available. The availability of unsustainable options has to be limited.	Walkable distance (500m) to at least one bus or train station from any point in the city; limited parking throughout the city; etc.
Accessibility	Sustainable options must be physically and legally accessible. The accessibility of unsustainable options must be limited.	Public transit accessibility of any point in the city; growth boundaries regulated by law to minimize sprawl & optimize transit use; etc.
Attractiveness	Sustainable options must be attractive in terms of beauty, comfort, safety, and quality. Unsustainable options must be less attractive than sustainable options.	Bus/train frequencies <5 min. during the day; lighting in stations and pedestrian areas for safety; pedestrian areas and shared streets; traffic lights in favor of busses; etc.
Affordability	Sustainable options must be affordable and less expensive than unsustainable options.	Road pricing in cities and on highways; attractive transit passes; free transit or incorporation of price in property tax; etc.
Awareness	People must be aware of the availability, the accessibility, the attractiveness, and the affordability of sustainable options as well as the benefits of choosing them over the unsustainable options.	Create awareness of benefits of sustainable options by obvious design (e.g. visible subway stations), laws and regulations, information and education (e.g. car-free day).

Fig. 1: The Five A Factors of Behavior Change (Source: Stieninger Hurtado 2018)

For a successful integration of these drivers for behavior change into planning processes, the following points are essential:

- Sustainable options have to be available, accessible, affordable, and attractive.
- Unsustainable options should not be / be less available, accessible, affordable, and attractive.
- People have to be aware of the advantages and benefits of choosing the sustainable option over the unsustainable one.
- The five A's have to be integrated into a planning process as motivators for sustainable behavior and discouragement from unsustainable behavior.
- All five A's have to be applied. If only one or two A's apply (e.g. the availability of affordable public transit) and the rest of them are ignored (e.g. unsafe and dirty train stations) it will not be enough for people to change their daily habits.
- The interrelations between the five A's are important as well. That is, for example, the awareness of the affordability, the affordability of attractiveness, or the accessibility of affordability.

6 CONCLUSION

Summing up, there are three main reasons for why urban sustainability projects don't always work out successfully:³

- (1) Cities focus too much on the technical problems and their technical solutions.
- (2) Sustainability is about changing behavior of ordinary people who are living their ordinary lives.
- (3) Urban planning should be about creating an environment that allows and motivates sustainable behavior (concept of affordances).

Planners and designers have to integrate drivers towards behavior change into their designs the way they design technical components that help insulate the building, reduce water flow in bathroom fixtures or reduce energy use in LED lighting.

³ Hurtado Stieninger

Furthermore, planners have to be aware that they “can’t expect people to behave sustainably just to behave sustainably” (Stieninger Hurtado 2018). People just want to live their lives and get things done. When planning for sustainability, planners have to consider this and focus on what people really need.

Lastly, taking Gibson’s concept of affordances, an affordance-based design of a sustainable city that automatically affords the possibility of living a sustainable lifestyle without any extra efforts would be the ultimate goal of a new approach for behavior change towards sustainability.

However, these are all very rational considerations. The difficulty for urban planners and city governments in finding successful ways to implement sustainable solutions will always be the fact that human beings are creatures of habits that don’t necessarily base their decisions on rationality or economic models, but rather on emotions. The way the criticism of a lover about one’s bad breath from smoking is more effective than any alert on lung cancer; social pressure and self-identification may be more effective for a behavior change towards sustainability than a piece of infrastructure or a legal regulation.

The American economist Richard H. Thaler received the 2017 Nobel Prize in Economic Sciences for his research on this issue. Limited rationality, social preferences, and a lack of self-control are, according to him, the main factors in decision making processes (Thaler & Sunstein, 2008). When planning for sustainable cities, planners are planning the living environments of an emotions-driven species that is very hard to understand. Even the knowledge about environmental needs does not necessarily result in environmental behavior. Environmental behavior does not correlate with environmental knowledge (Skinner 1987) nor with general environmental beliefs (Corral-Verdugo & Bechtel & Fraijo-Sing 2003). Even if people know it would be better and more sustainable to turn off the light when leaving the house, they don’t always do that for a variety of personal reasons.

The Five A Planning Approach tries to integrate those factors of behavior change into urban planning processes that can be changed and influenced by planners based on the nature of their profession. Factors as discussed by Thaler might never be fully addressed in a planning process, but can be touched by the five A’s. Integrating the five A factors is one way to make the success of urban sustainability projects more likely.

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