SUSTAINABILITY AND ADAPTATION IN THE IOT ERA

Mária Szalmáné Csete²⁴⁴

DOI: https://doi.org/10.31410/EMAN.2018.615

Abstract: Social and economic processes have spatial and temporal dimensions, and in the implementation of sustainability in practice, this is compounded by the relationship with the natural environment. Information on the basic characteristics, an understanding of the situation and attitudes is necessary for the stakeholders to recognize synergies, and for the devised coherent strategy to work. The fields of climate change and sustainability in regional development are characterized by their spatial characteristics, a holistic approach, appearance in multiple dimensions (global, regional, local), and the need to account for relationships between the environment, society and the economy. Therefore, adaptation to climate change cannot be done in isolation, but rather in conjunction and harmony with the local initiatives and programs. Local level documents for adaptation, sustainability and strategic planning have numerous synergies and point towards sustainable urban development. In Hungary, the tools that serve the practical implementation of both sustainability and adaptation include the Local Agenda 21 Program, urban climate strategies and the Environmental Protection Program. Present evaluation is mainly focusing on the role of IoT (Internet of Things) solutions related to existing strategies and based on the main findings requires practical recommendations for local decision makers and other stakeholders. Adaptation to climate change is a collaborative undertaking, requiring cooperation on different levels of society, politics and governance. At present, the adaptation strategy is part of the climate strategy, and its objective is to increase resilience to expected impacts, by shifting the emphasis from prevention and control to learning to live with an ever-changing, and sometimes dangerous environment. The impacts of climate change hinder and complicate the transition toward sustainability in the preparation for expected impacts (human resources), prevention (increasing the site of green areas, action plans, stockpiling pharmaceuticals, etc.), management and recovery (after the impact has occurred, financial, technical, institutional, etc. conditions). Climate change can also have a fundamental influence on the local quality of life, income, health etc., which make up the basis for a livable settlement. The objective of a local adaptation strategy is to provide the socioeconomic bedrock for a settlement that is livable, prevents risks, minimizes damage and is flexible in reacting to climate change. This is achieved by devising an innovative strategic framework that supports the transition towards sustainability. Nowadays, the different IoT solutions can play a pivotal role supporting sustainability and adaptation processes. Innovating for sustainability has a crucial role not only global but also on local level. There is a special need related to the monitoring of the practical implementation of sustainability especially considering the possible adaptation issues. Moreover to be able to accelerate progress on the UN Sustainable Development Goals it is also important to examine different projects. Those can be references for sustainability and adaptation processes considering IoT issues. This research is supported by the UNKP-17-4-III New National Excellence Program of the Ministry of Human Capacities.

Key words: *sustainability, adaptation potential, IoT (Internet of Things), SDGs (Sustainable Development Goals)*

²⁴⁴ Budapest University of Technology and Economics, Department of Environmental Economics, 1111-Hungary Budapest Muegyetem Rkp 3

1. INTRODUCTION

Nowadays, there are several crucial problems and challenges global, regional and local level as well that needs to be solved in short term. However, the effective solution can not be grasped easily but different ideas, concepts can be seen related to these symptoms of recent economic and social systems. To be able to foster the practical implementation of sustainable development its complexity also needs to be highlighted according to holistic approach. The environmental, social and economic processes can show diverse picture due to their spatial characteristics, exposure and vulnerability. Related to climatic parameters and the possible effects of climate change several international treaties, accords and increasing number of actors in science, research and technology are calling attention to the need of potential and effective solutions. The expected impacts of climate change can not be forecast easily, creating challenges for the analysis of the capacity and willingness to adapt in different social and economic environments. The regional resilience and the development of adaptation capacity can play a crucial role moving toward sustainability. Adaptation and sustainability strategies and processes are closely interconnected and reinforce each other. Innovating for sustainability has a crucial role on global and local level as well. Currently the examination of different IoT solutions, products and services can play a pivotal role supporting regional sustainability and adaptation processes.

2. SUSTAINABILITY AND ADAPTATION

Different stakeholders can be identified on each spatial level. For instance municipalities, local entrepreneurs, NGOs, local residents etc. on settlement level. More and more stakeholders are dealing with the soultions climate change, mitigation and adaptation or sustainability related solutions. The wide range of different ideas, actions, interventions and case studies can be found all over the world focusing on the main challenges of sustainable development in strong relation to the UN Sustainable Development Goals (SDGs). The UN Sustainable Development Goals are mainly focusing on the 17 most urgent problems and possible solutions to end poverty, protect the planet and ensure prosperity for all as part of the latest sustainable development agenda entitled 'Transforming our world: the 2030 Agenda for Sustainable Development' [1]. According to UN SDGs it is worth highlighting that each goal also has specific targets and KPIs to be achieved in the next 15 years. According to Agenda 2030 the 17 SDG goals are the following [1]:

- 1. "End poverty in all its forms everywhere.
- 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
- 3. Ensure healthy lives and promote well-being for all at all ages.
- 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- 5. Achieve gender equality and empower all women and girls.
- 6. Ensure availability and sustainable management of water and sanitation for all.
- 7. Ensure access to affordable, reliable, sustainable and modern energy for all.
- 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- 10. Reduce inequality within and among countries.
- 11. Make cities and human settlements inclusive, safe, resilient and sustainable.
- 12. Ensure sustainable consumption and production patterns.
- 13. Take urgent action to combat climate change and its impacts.

- 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reserve land degradation and halt biodiversity loss.
- 16. Promote peaceful and inclusive societies for sustainable development, provide access to justices for all and build effective, accountable and inclusive institutions at all levels.
- 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development."

Two researchers of the Stockholm Resilience Center came up with a new aspect according the the SDGs highlighting that how all of them are linked to food [2].



Figure 1: SDG pyramid [2] Illustration: Azote images for Stockholm Resilience Centre

In their work the main focus is on sustainable and healthy food. As Figure 1. shows that all the 17 goals are directly or indirectly related to the examined topic. It also implies that economies and societies are seen as embedded parts of the biosphere that is accordance with the term of strong sustainability. There is an urgent need to move toward a less sectoral approach where environmental, social and ecological development are not handle as separate fields however the holistic aspect can prevail. Related to recent paper it is worth taking into consideration how different IoT solutions, projects and developments can contribute to the fulfilment of SDG goals till 2030.

Considering the possible impacts of climate change both mitigation and adaptation ambitions can be evaluated from spatial and sectoral aspects as well [3] [4] [5] [6] that also underpins the important role of IoT related evaluation in the future of sustainability. Among sustainability and adaptation processes a strong correlation can be found especially on local level that can be an advantage especially from regional resilience and sustainable spatial development perspective. Focusing on these synergies in the phase of strategy development can be quite useful in order to be able to harmonise the diverse approaches of sustainability and climate

processes. 'The EU Strategy on Adaptation to Climate Change' [7] underpins the importance of adaptation on national, regional and local level enhancing strategy and adaptation toolkit development. The document is also highlights the interrelations between sustainability and adaptation. The EU Digital Agenda [8] including IoT related conceptions is a basic element of the Europe 2020 Strategy, thus it is harmonized with the intelligent, sustainable and inclusive growth related achievements. The fourth Industrial Revolution has started and it also can serve environmental monitoring, managing and protection with new solutions as a key element of circular economy.

3. IOT'S ROLE IN ADAPTATION PROCESSES

IoT is a rapidly evolving territory and it has the potential to deliver environmental, social and economic benefits that can play pivotal role in making a sustainable future. Well-founded planning and evaluation is necessary to make clear all the related impacts and issues. Furthermore that those are also addressed and managed such as security and privacy. The wide variety of products and services can affect diverse sectors and transform things in a lot of different way from manufacture to communities. The IoT focus areas are e.g. industry, agriculture, mining, environmental management, energy management, urban management, e-health, entertainment, waste management, tourism, transport and communication etc.

In relation to SDG goals it can be underpin that IoT is one of the concepts that can directly or indirectly related to most of them supporting the practical implementation at the same time. IoT solutions and related developments can foster sustainability and adaptation processes on different spatial levels e.g. global, regional and local level as well. For further development it is necessary to build in IoT aspects into adaptation strategies foster the practical to implementation of sustainability and support the monitoring phase of both processes.

According to adaptation strategies the IoT products and services can help to improve adaptation capacity. For instance in relation of the increasing number of heatwaves and growing average temperature that can have serious effects on especially sensible part of the societies IoT solutions (e.g. e-Health) can lead to decrease vulnerability. There are also several IoT products and services in the field of urban management (e.g. smart city and home) that can improve the adaptation capacity of a community. It can be stated that the effectiveness of IoT solutions, products and services do not depend only on technological parameters however on spatial

Mária Szalmáné Csete, Ph.D. She graduated in and engineering management in 2004 and in spatial and urban development in 2007 from the Budapest University of Technology and Economics. She also holds an MSc in



regional planning, urban management and spatial development from Paris-Sorbonne IV (2007). She earned her Ph.D. in business and management in 2009. As an associate professor, she teaches environmental economics, sustainability management, local climate strategies, spatial development, regional economics. Her main research interests focus on sustainable development policies, adaptation to climate change and spatial planning. Her work has been awarded the Ferenc Deák Award of the Hungarian Ministry of Education and Culture in 2008, János Bolyai Scholarship of the Hungarian Academy of Sciences in 2012-2015 and Program for New National Excellence in 2017.

characteristics. Especially the examination of willingness to pay or willingness to accept can

show the relevance and possible role of IoT products and services depending on the local socioeconomic environment.

ACKNOWLEDGEMENT

This research is supported by the ÚNKP-17-4-III New National Excellence Program of the Ministry of Human Capacities.

REFERENCES

- [1] UN General Assembly (2015) *Transforming our world: the Agenda for Sustainable Development*, p.35 Source: http://www.un.org/ga/search/view doc.asp?symbol=A/RES/70/1&Lang=E
- [2] Rockström, J., Sukhdev, P. (2016) *How food connects all the SDGs*. Source: http://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html
- [3] Csete, M., Buzási, A. (2017) *Climate-oriented assessment of main street design and development in Budapest*. Journal of Environmental Engineering and Landscape Management 24:(4) (pp. 258-268)
- [4] Nagy, Z., Szalmáné Csete, M., Török, Á. (2017) Changing logistic management and the challenges of Industry 4.0. In: Varga B. (szerk.) Logisztikai Évkönyv. 208 p. Budapest: Magyar Logisztikai Egyesület, pp. 196-203.
- [5] Szalmáné Csete, M., Taksz, L. (2016) A klímaváltozáshoz való alkalmazkodás európai és hazai irányzatai In: Pálvölgyi T., Selmeczi P. (szerk.) Tudásmegosztás, alkalmazkodás és éghajlatváltozás. A Magyar Földtani és Geofizikai Intézet kutatási-fejlesztési eredményei a Nemzeti Alkalmazkodási Térinformatikai Rendszer létrehozására. Magyar Földtani és Geofizikai Intézet (pp. 17-25)
- [6] Csete, M., Szécsi, N. (2015) The role of tourism management in adaptation to climate change – a study of a European inland area with a diversified tourism supply. Journal of Sustainable Tourism 23:(3) (pp. 477-496)
- [7] COM (2013) *An EU Strategy on Adaptation to Climate Change*. Communication from the Commission, COM(2013) 216
- [8] EU (2014) Digital agenda for Europe. Rebooting Europe's economy. European Commission. p.8. Source: https://europa.eu/european-union/topics/digital-economy-society_en