Food-Energy-Water (FEW) Nexus as a Human Security Issue of Modern Cities

Keywords

Food-Energy-Water nexus, human security, urban areas, cities.

Introduction

According to the United Nations, 4.1 billion people or 55% of the world population lives in urban areas. This tendency is expecting to increase during the further decades, especially in developing states. The growing urbanization trends lead to a spatial centralization of global production and consumption. An interesting fact is that cities occupy only 3% of the total Earth surface, but they are responsible for 80% of global GDP, two-thirds of global energy consumption, 70% of global waste and 75% of global GHG emissions. Nowadays, around 75% of the European Union residents lives in cities and towns. The level of European urbanization is expected to increase to about 83.7% in 2050. In its turn, the level of urbanization in the Baltic Sea Region is extremely varying between 60% and 90%.

Cities play a special role for sustainable development as they currently constitute the center of the Food-Energy-Water nexus (FEW nexus) processes. The tight interconnections between these resources, especially in cities, require a high level of integration among relevant sectors. This statement became the main issue of the Bonn 2011 Nexus Conference, which aimed to improve food, energy and water security through an integrated management between these areas. The governance of the FEW nexus in cities has a direct impact on human security of urban residents, which will explain in the further research.

Research question

This paper aims to explain how the FEW nexus is reflected through the concept of human security in urban areas. The main research question set in this paper is the following: What is the role of FEW nexus for human security in cities and towns?

Main method

Methodology of this paper is based on desk review of a range of topic relevant books and scientific articles. Chosen scientific literature includes both theoretical background of the topic and empirical material. The research was complemented by the actual data received from the newest reports and official websites.

FEW nexus

Starting from the Oil Crisis in the 1970s, scientists have focused on the interconnections between food, energy and water. An incredibly important milestone for the FEW nexus was the conference in Bonn (2011) entitled "The Water, Energy, and Food Security Nexus – Solutions for the Green Economy", which widely presented this concept to the international society. Global population is expected to increase from the present 7.8 billion to 9.5 billion by 2050. Nevertheless, already 1.1 billion people in the world lacks an access to electricity, while another 2.9 billion is forced to use wood or other biomass for heating and cooking. As the result, many people are suffering from air pollution, which causes around 4.3 million deaths annually. Around 1.8 billion people use fecal contaminated water as the only source of drinking water. More than 795 million people are experiencing malnutrition.

Interlinks between food, energy and water are reflecting on their prices. For example, prices on food can be determined by price on crude oil, because energy is needed to fertilize and distribute production. When resources are accessible and affordable, these interconnections are less important. The need to address interlinks between food, energy and water is driven by the rapidly growing population and natural resources depletion. According FAO, the need for food, energy and water will increase at least in two times by 2050. To meet this enormous increase in resource demands, there is required a high level of inter-sectoral coordination to secure availability, affordability and quality of essential resources over a long time. Picture 1 illustrates FEW nexus in the understanding of the Bonn 2011 Conference.

Illustration 1: The FEW nexus
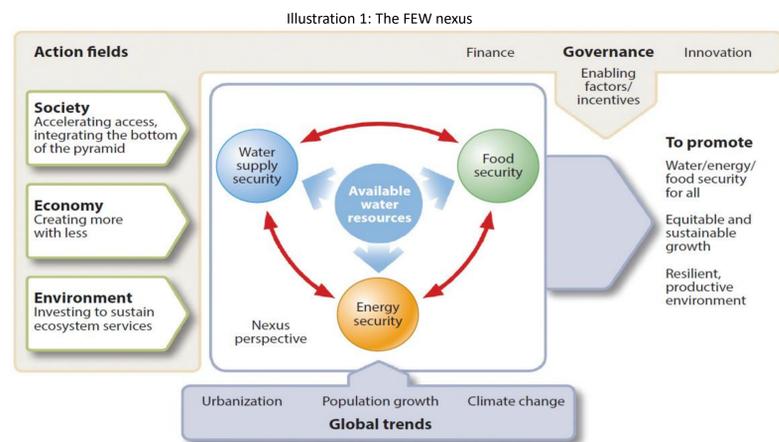
Resource: Hoff H. 2011. *Understanding the Nexus. Background Paper for the Bonn2011 Conference,* Stockholm Environ. Inst.

Urban FEW nexus

The literature on the urban FEW nexus is quite limited, and there is no one widely accepted definition of this concept. According to Mohtar and Lawford (2016), FEW nexus "is a connection or link – often causal – between a group or series of objects, ideas, or, in our case, the water, energy, and food sectors that comprise the WEF nexus". Beck and Walker (2013) argue that "Nexus security is a compound mix of ideas: reconciling human needs and wants with access to multiple resources; diversity of access to those resources and services […]". In its turn, ICLEI defined the urban nexus as following: "The Urban Nexus is an approach to the design of sustainable urban development solutions. The approach guides stakeholders to identify and pursue possible synergies between sectors, jurisdictions, and technical domains so as to increase institutional performance, optimize resource management, and services quality […]".
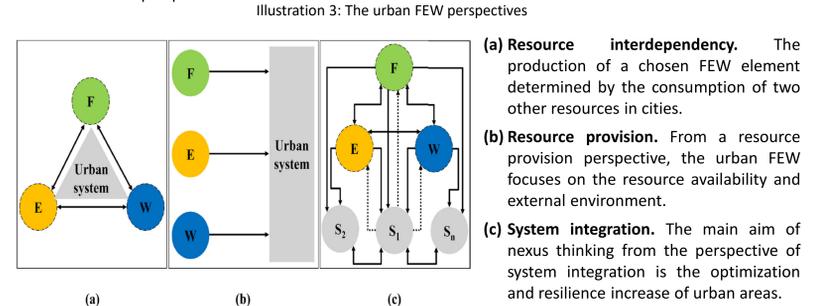
Illustration 2: Intra and Nested Urban Nexus Perspectives
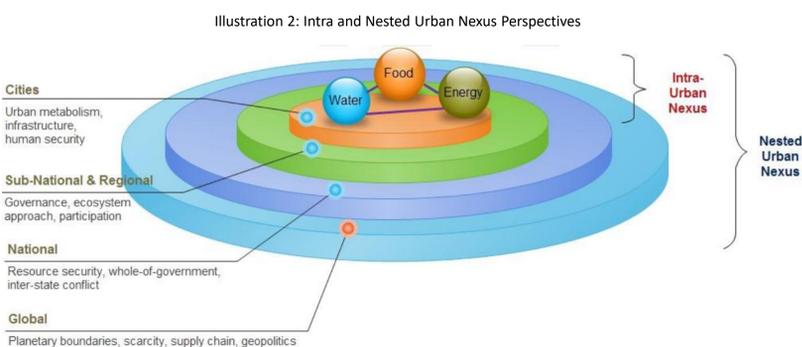
Resource: Hezri A. 2016. *The Urban Nexus,* United Nations Economic and Social Commission for Asia and the Pacific.

Urban FEW nexus

Europe is widely called "Union of cities and towns" as about three-fourth of the total population lives in urban areas. The largest metropolises in the Baltic Sea Region are Saint Petersburg and Berlin with 5.3 million and 3.7 million inhabitants respectively. Other cities with relatively large population are the following: Minsk (1.9 million), Hamburg (1.9 million) and Warsaw (1.7 million). Urban areas are the motors of the European economy, however some disparities in the BSR urbanization are quite visible. Cities located in Germany and Scandinavian states are more well-developed, however the growth of cities and towns in post-communist states are characterized as more intensive.

While cities are the centers of the European economic development and creators of European wealth, they heavily depend on resources from outside of their physical boundaries. The high complexity of urban areas is caused by multi-faceted supply chains of food, energy and water in urban-rural relations and across states or even continents. The innovative concept of urban FEW nexus, presented in this research, is moving beyond cities narrow physical boundaries and emphasis the role of rural areas in the concept. Due to physical and conceptual interlinks of the urban FEW nexus, a three-dimensional framework was proposed for cities, mainly system integration, resource provision and resource interdependency. Illustration 3 shows the abovementioned perspectives.

Illustration 3: The urban FEW perspectives

(a) **Resource interdependency.** The production of a chosen FEW element determined by the consumption of two other resources in cities.

(b) **Resource provision.** From a resource provision perspective, the urban FEW focuses on the resource availability and external environment.

(c) **System integration.** The main aim of nexus thinking from the perspective of system integration is the optimization and resilience increase of urban areas.

Resource: Zhang P. et al. 2019. *The Energy-Food-Water Nexus,* Resources, Conservation and Recycling, vol. 142.

Human security approach

Human security is an emerging approach, which in opposite to the traditional security concepts, argues that mainly a human-being should be a proper referent in security issues. The notion of human security was presented during the 1994 United Nations Development Program (UNDP) "Human Development Report", which is considered as a milestone publication for the human security establishment and development. Human security was defined through the summation of seven specific dimensions of security, which are presented in Table 1.

Table 1: The concept of Human security

Types of Human security	Explanation
Economic security	It requires an assured basic income for individuals or, at least, state-financed social assistance. Persistent poverty and unemployment constitute the main threats to economic security.
Food security	It requires both physical and economic access to basic food. The main insecurities are hunger and famine, especially for the places with poor food distribution.
Health security	It aims to secure a minimum protection for individuals from diseases and unhealthy lifestyles. The main challenges are deadly infectious diseases, lack of basic healthcare, unsafe food and water, malnutrition, etc.
Environmental security	It aims to protect citizens from the short- and long-term devastation of natural environment. The main insecurities are environmental degradation, natural disasters, pollution, resource depletion, etc.
Personal security	It requires a protection of people from physical violence. The main threats to personal security are physical violence, terrorism, crime, child labor and domestic violence.
Community security	It aims to protect inhabitants from the loss of traditional values and relationships. The most important challenges are religious, inter-ethnic and any other identity-based tensions.
Political security	It requires the compliance of the basic human rights. The main challenges are human rights abuses and political repression.

Resource: my own elaboration.

Human security stresses two dimensions of interconnections between both threats and responses to these threats. The first one draws upon the domino effect, when one threat may cause another one and so on. The second dimension emphasizes that threats in the particular area or state can spread on the larger scale, which might cause serious threats for regional and international security. Like in a case of the Coronavirus (COVID-19) pandemic, the global interdependencies enable the spread of the dangerous diseases in short time and on the worldwide scale. Coronavirus caused not only deaths of hundreds of thousands of people, but major economic losses for entrepreneurs, unemployment and great economic instability impacting on individual citizens.

Main results/Main conclusion

Food security. FAO defined food security as the following: "situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". Availability of food is critical for people's well-being, thus the lack of access to food might cause serious human security threats, especially in urban areas. In the case of city residents, the majority do not have possibilities to grow food themselves, thus they rely on food bought in grocery stores. The poor people living in urban slums do not have enough money to afford food. This situation might cause hunger and malnutrition, which lead to serious health problems, especially for children. On the other hand, many people living in cities choose unhealthy food to handle stress caused by intensive urban life. Such unhealthy diet provides to obesity, diabetes and other related diseases.

Energy security. Energy security is heavily depends on energy affordability. The possibilities to install a windmill or a PV system in urban areas are quite limited, thus city residents rely on imported energy. People, who cannot afford to pay electricity bills, are forced to live without possibilities to heat and cool their houses. Moreover, they cannot prepare food, which might lead to malnutrition and in its turn to serious health problems. Transport fuel is also very important for those who need transportation to get to their workplaces or, in a case of emergency, need to reach hospital immediately. The burn of traditional fossil fuels cause enormous CO_2 emissions, which lead to air pollution and in its turn cause serious health and environmental insecurities.

Water security. As in a case of food and energy security, water security heavily depends of individual's possibilities to afford good-quality water to prevent water-related diseases, e.g. cholera or diarrhea. Through many centuries city inhabitants was suffering from sanitation and hygiene problems caused by contamination of water. Individuals' insecurity also might be threatened by floods and droughts, which in its turn impose a negative impact on food and environmental security.

Author

Liliia Hrytsai, M.A., Ph.D. Candidate, Faculty of Political Science and Journalism
Maria Curie-Skłodowska University, Lublin, POLAND. LillaHrytsai@gmail.com

References

- Mohtar R.H, Daher B. *Water, energy, and food: the ultimate nexus.* 2nd ed. Encyclopedia of agricultural, food, and biological engineering; 2012.
- Bonn2011 Conference. *Bonn2011 Conference: the water, energy and food security nexus – solutions for a green economy.* Policy recommendations; 2012.
- Sukhwani V., Shaw R., Mitra B.K., Yan W., *Optimizing Food-Energy-Water (FEW) nexus to foster collective resilience in urban-rural systems,* Progress in Disaster Science 1, 2019.
- United Nations, *The Urban Nexus: Conceptual Framework and Linkages to Global Agendas,* 2016.