To cite this Article: Meristö, T. & Laitinen, J. (2017) Sustainable Innovations for the Blue Economy. In the Proceedings of the XXVII ISPIM Conference: Vienna, Austria. Composing the Innovation Symphony.

Laurea University of Applied Sciences
Ratatie 22, 01300 Vantaa, Finland
Phone +358 (0)9 8868 7150
Fax +358 (0)9 8868 7200
firstname.surname@laurea.fi
www.laurea.fi
Business ID 1046216-1
Domicile Vantaa

This paper was presented at The XXVIII ISPIM Innovation Conference – Composing the Innovation Symphony, Austria, Vienna on 18-21 June 2017. The publication is available to ISPIM members at www.ispim.org.

Sustainable Innovations for the Blue Economy

Tarja Meristö*

Laurea University of Applied Sciences
c/o ElektroCity, Tykistökatu 4 B, 20520 Turku, Finland
E-mail: tarja.meristo@laurea.fi

Jukka Laitinen

Laurea University of Applied Sciences
c/o ElektroCity, Tykistökatu 4 B, 20520 Turku, Finland
E-mail: jukka.laitinen @laurea.fi

Abstract: Nature needs constantly water for living but the global water resources are limited and unevenly distributed. At the continental level, America has the largest share of the world's total freshwater resources followed by Asia Europe and Africa. Our aim is to present a conceptual framework for innovations concerning water management and water-related business opportunities. Based on that, our submission´s goal is to generate visionary concepts for different actors in water ecosystem. The framework for the study consists of futures research paradigm, network research in ecosystems, conditions of sustainability and new business opportunities in blue economy. This paper will give answers to the questions concerning the megatrends and their impacts on water use in long run, the main actors in water ecosystem context and finally concerning innovations can be developed for this purpose based on process, product, system or legislative and social innovations influencing on consumer behaviour?

Keywords: Future; sustainable innovation; water; ecosystem; innovation management; visionary concept; trend; megatrend; wild card.

1 Introduction

Water reserves in the globe are huge, still limited and unevenly distributed. The total water resources in the world are estimated to be 43 750 km3/year (FAO 2003). At the continental level, America has the largest share of the world's total freshwater resources with 45 percent, followed by Asia with 28 percent, Europe with 15.5 percent and Africa with 9 percent. Nature needs constantly water for living. Human beings have both over-used and polluted water reserves since industrialization. In global context e.g. Lake Aral has been totally destroyed and many areas in Africa and Asia suffer from lack of pure water. In this paper we will focus on innovations on one hand to reduce the use of water in industrial and community infrastructure processes, on the other hand to develop new approaches to collect and re-use nutrients and energy from water as well as recycle used water, too.

Continuous demand for efficiency in production processes in industry, agriculture and community services has caused overwhelming negative impacts on the state of the seas,

lakes and rivers as well as on the groundwater. On industrial side e.g. closed processes have been developed, whereas in the agriculture organic cultivation methods are in use. Still, these are in minor role in global scale and actors in this field do not apply shared principles. Also, legislation in different parts of the world varies. People at grass-root level meet the consequences of these problems in everyday life.

2 The aim and research questions

Our aim is to present a conceptual framework for innovations concerning water management and water-related business opportunities. Based on that, our submission´s goal is to generate visionary concepts and concrete suggestions for different actors in water ecosystem.

Research questions are as follows:

1. What are the megatrends and their impacts on water use in long run in different sectors?
2. Who are the main actors in water ecosystem context and what is their role and significance in this "save the water" project?
3. What kind of innovations can be developed for this purpose based on e.g. process innovations, product innovations, system innovations, legislative innovations influencing on consumer behavior or social innovations?

3 Research design

The state of the art concerning water ecosystems and water reserves and their conditions based on existing research results is the starting point for the CIRCLE, which is an ongoing joint project of Aalto University, Häme University of Applied Sciences (UAS), SYKLI Environmental School of Finland, The Association for Water and Environment of Western Uusimaa and Laurea UAS, financed by ERDF (European Regional Development Fund), from September 2016 to August 2018. The CIRCLE project will focus on opportunities for energy recycling, nutrients re-use, water reserves recycling and reducing of water use as well as opportunities for technology development (see Katko, T. (2016). In this context also financial mechanisms, legislation, educational needs and ecosystem actors with best practices will be analyzed. Laurea research group has got support and contribution in data collection and analysis from two students´ groups from Laurea UAS, namely business students from Hyvinkää campus and MBA students in futures research field from Tikkurila campus in spring 2017.

The framework (Figure 1) for the study consists of futures research paradigm, network research in ecosystems, conditions of sustainability and new business opportunities in blue economy. Innovation management (Bessant, J. & Tidd, J. 2015) and disruptive (Christensen et.al. 2006) and even frugal innovations (Mukerjee, K. 2012) are essential part of this framework, when developing visionary concepts based on alternative scenarios, including radical ones according to the basic principles of futures research (Masini 1993). Data collection for the study includes futures workshops with ecosystem

actors to produce visionary knowledge, web-surveys to actors and experts to collect trends and impacts on this field and complementary interviews among key actors from water business and from water research side. Analysis and synthesis of the knowledge collected and created will be processed with help of scenario methodology tool kit.

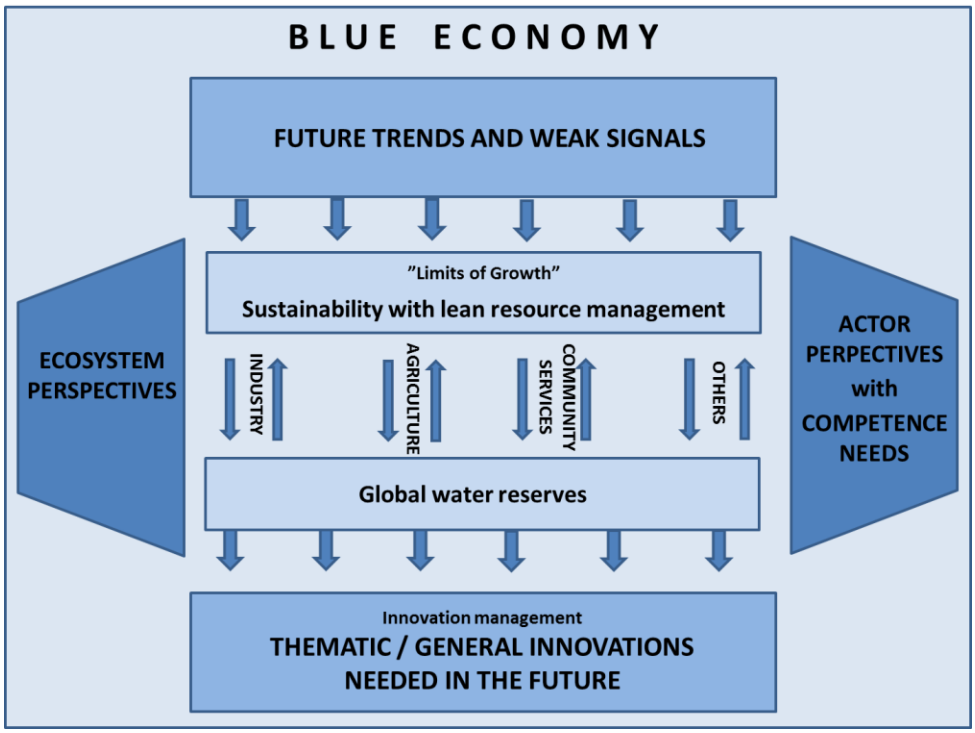

Figure 1: The framework for the blue economy.

The research work timeline runs from September 2016 until now. During the autumn 2016 the global context of the water ecosystem was clarified and basic megatrends concerning water reserves were collected. From the beginning of the year 2017 the student groups started their work to complete the analysis of the actors and factors in the field. Also the media monitoring by both student groups has been a significant part of the work, focusing not only to research data, but also on daily news in different media channels. (Hyvinkää/Media monitoring; Tikkurila/Weak signals/trend cards). Web-survey to the actors in the field consisting e.g. of companies, municipalities, universities and research associations as well as individual experts has been run during March/April 2017 to collect data and estimate the significance of different factors and actors. Some supplemented interviews complete the results, too.

The main method applied in the study in visionary concept design. Visionary concept design is a methodology developed in by FuturesLab CoFi in co-operation with former University of Arts and former University of Technology, both today better known as a part of Aalto University in Finland. Visionary concept design starts from the future and its alternative development paths and focuses on needs and opportunities risen from alternative scenarios. In this paper, we have focused on the themes concerning global

water reserves and ecosystem through the eyes of sustainable water use. Scenarios will serve as wind tunnels to test ideas and concepts, but also as and ideation source to design visionary concepts, i.e. future-oriented concepts that are based on the future needs identified in different scenarios (Kokkonen et al. 2005; Leppimäki et al. 2008; Laitinen & Meristö 2016).

4. Results

The main outcomes can be classified based on research questions presented above. Innovations supporting the sustainable use of water will be described for different purposes, e.g. process innovations, product innovations, system innovations and social innovations among the others. The main actors in water ecosystem context and their role and significance in this field will be clarified. This will be presented in the form of core actors, supporting actors and enablers, which will form a basis for effective water management and enhancing innovation capabilities. Finally, megatrends and their impacts on water use in long run in different sectors will be recognized.

First, **megatrends** and their impacts on water use in long run in different sectors have been listed according to PESTE categories, i.e. political (P), economic (E), social (S), technological (T) and ecological (E) perspectives. Input to this part have been collected during the spring 2017 with the help of two students group from Laurea UAS, namely business students from Hyvinkää campus and MBA students in futures research from Tikkurila campus. The levels for the data collection have been divided according to the geography and the rate of uncertainty. This means data variation from megatrends to wild cards and weak signals as well as from global to local and even to individual perspectives. The summary of the collected data has been presented in the figure 2 in which the general PESTE analysis has been described. The changing factors with the bolded texts represent megatrends.

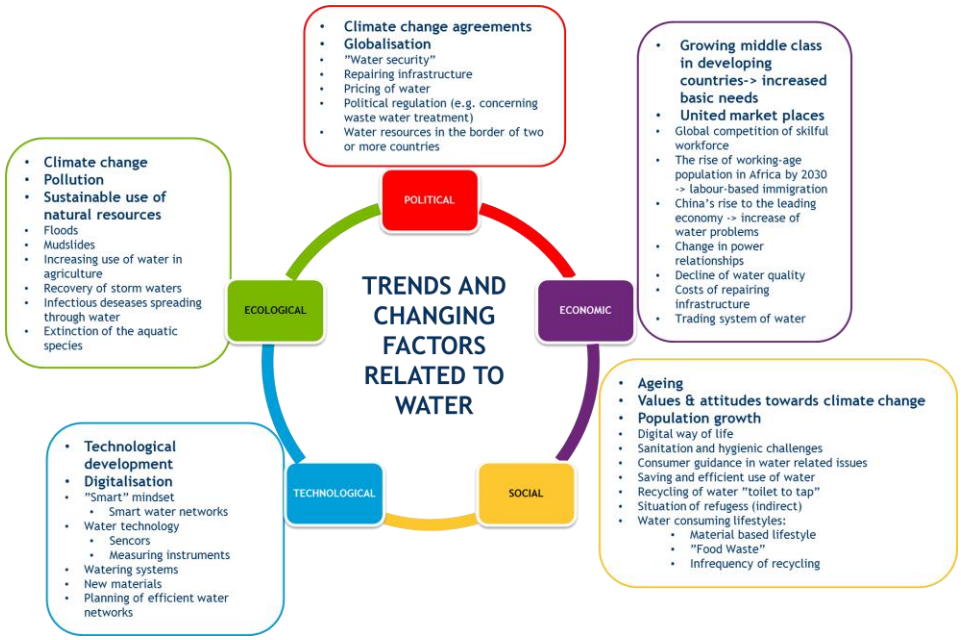

Figure 2. PESTE analysis results concerning water theme (Pursiainen et al. 2017).

The student group of Tikkurila recognized also wild cards (Student reports 2017). Possible wild cards could be e.g. protectionism. restrictions to travelling, redistribution of water resources, water wars, water taxation, collapse of the economy, one common currency, decrease of travelling, social catastrophes, space technology, permanent change of the ecosystem and new energy sources.

The **water ecosystem** consists of key actors in the middle, playing the main role in the field and of related and supporting actors, forming the multidisciplinary service and industry network around the key actors. Furthermore, the main actors in water ecosystem context need also enablers, which usually are actors from public sector, but also from the third sector like different associations and other NGOs as well as from the financing sector. Each actor has its specific role in the ecosystem dynamics and their significance can vary from time to time in the "save the water" project, depending on the conditions in the real world. Water ecosystem description developed in this project includes actors in all these levels, as presented in the figure 3.

Figure 3. Water ecosystem and it´s different actor groups (Pursiainen et al. 2017)

In our web-survey, which was carried during the spring 2017, we received 54 answers concerning the future of water services field. According to the web survey results, the most significant actor group in the field is water and wastewater utilities. Additionally, national level decision makers, companies and authorities were seen important. Instead, resident's associations, agricultural actors, individual active citizens and teaching personnel did not seem to have remarkable role in the water services field. In general, the orchestration of ecosystem as a whole, not only for the most powerful actors of the ecosystem, is a critical issue for the success (Wallin, J. 2006).

Alternative scenarios based on key drivers selected among megatrends and other factors were constructed by using scenario axes methodology. Student groups had alternative themes and viewpoints to the water field were selected as follows: local water, water business in airline company, rain management, recreational use of water, water purification in traveling and ecological tourism. As an example, the scenarios and innovations based on visionary concept design created in the theme groups will enlighten broadly opportunities and new solutions based on e.g. process innovations, product innovations, system innovations, social innovations or even legislative innovations influencing on consumer behaviour (see Table 1).

Table 1. Visionary concepts and innovations (Student reports 2017).

Theme	**Visionary concepts (examples)**
Local water (company perspective)	Business unit for humanitarian aid A cleaning pill Utilizing water received from snow Filtered water for new markets
Water business in airline company	Zip water Cloud catcher / Water hoover Speculative trading with water resources Cooperation with charities
Rain management	Weather manipulation Cooperation with insurance companies Transferring rains Brand: "More sun"
Recreational use of water	Water park at home Spiritual water retreats Natural water parks Branded organic water
Water purification in traveling	Utilizing nanotechnology in packaging Possibility to manipulate the taste of water Purifying packages
Ecological tourism	Virtual lake tourism Importing water from space Green card lotteries to Finland to find pure water experiences

In our web-survey, we also asked what kind of innovation water business cluster would need in the future. Most of the respondents saw that the technological innovations are the most needed ones. More specifically, technological innovations could be related e.g. to IoT-based solutions, real-time monitoring systems and automation. However, quite many of the respondents saw that also business and social innovations are needed. Business innovations could relate e.g. to financing models, co-operation models and procurement processes whereas social innovations could relate to financial solutions in poor countries.

5 Conclusions and practical implications

This paper brings to the innovation management community concrete examples of sustainable innovations, where economic performance, grass-root level wellbeing and environmental improvement integrate to win-win-win solutions in practice. It walso opens the importance of water reserves and their state of the art not only in the present but especially for the future. Water issues are at the same time global and local problems needed new perspectives and innovations from the whole innovation community.

Different actors in the water ecosystem will get advantage from these results. Decision-makers at local, regional, national and international/global level will have a holistic view to the water field issues based on the framework and the ecosystem description with

different actors and roles. Companies can exploit the innovation concepts developed here and commercialize them to various market needs. Business actors can also find new network opportunities from ecosystem partners and establish to new market areas internationally. Ordinary people will find cleaner environment with fresh water. New business opportunities will also mean new jobs for people.

As a summary the core competence tree describing the Finnish water cluster will be presented (Figure 4). The cluster parts in the tree are branches, the trunk demonstrates the core competences needed for success and the roots are not only skills and competences, but also values and attitudes as well as networks and contacts to guarantee the excellence for the future, too.

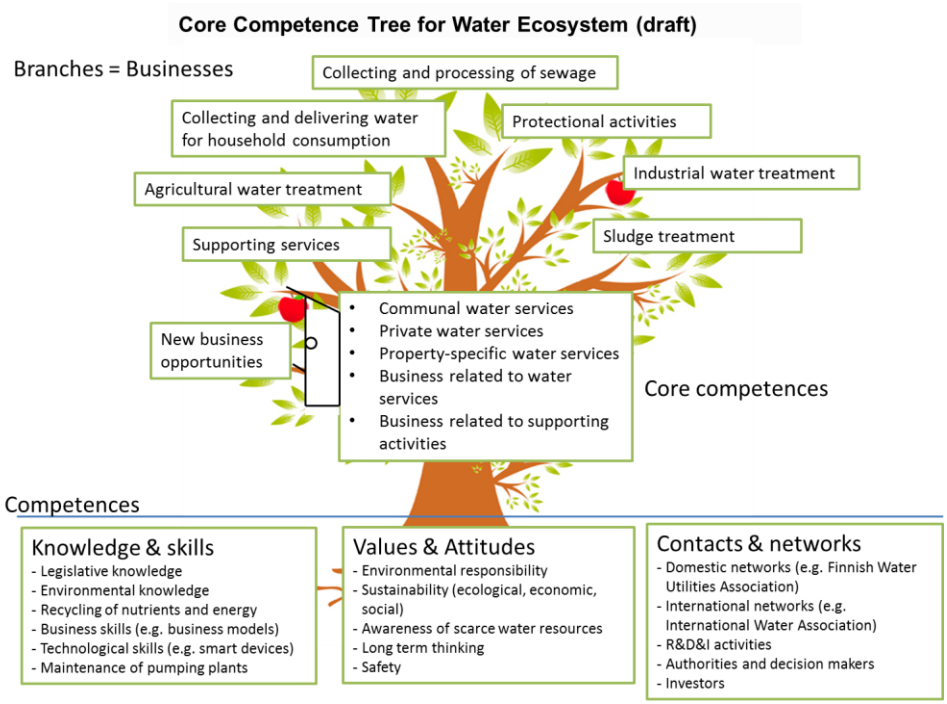

Figure 4. Core competence tree: an example developed for the water ecosystem in the project (adapted version from Pursiainen et al. 2017)

Practical implications will vary from case to case. The education in this field has to be adapted to changing world and to multidisciplinary challenges to meet even more in the future. Companies, governments and universities/other research institutes have to co-operate and to build flexible co-creation processes for visionary concept design, service development and customer oriented solutions. From Finnish perspective, the mind set has to be changed towards global view where clean water or scarcity of that will play more important role than in Finland, where nobody has to be afraid of polluted water of lack of water. In global perspective there will be a huge market for different kind of innovations and solutions for water related services and products. Especially, technological innovations would be needed but there is also demand for business model and social innovations.

6 Feedback

The useful feedback to our work in progress would be from the field of questions as follows:

1. Our approach has mainly the basis in futures research and (water) ecosystem theories. We would appreciate your opinion or suggestion on theories from the field of innovation management that could help us to continue our work further? Any references or literature tips?
2. From the international audience, including participants from different parts of the world, we would like to ask you to list the TOP3 trends concerning water reserves and the need for innovations in that field?
3. Whom would you recommend to interview (in your country) for the water management and / or ecosystem description?

References and Notes

Bessant, J. & Tidd, J. (2015) Innovation and Entrepreneurship. Wiley.

Christensen, C.M., Baumann, H., Ruggles, R. and Sadtle, T.M. (2006) Disruptive Innovation for Social Change. Harvard Business Review, December 2006.

FAO (2003) Review of World Water Resources by Country. Water Reports 23. Food and Agriculture Organization of the United Nations.

Katko, T. (2016) Finnish Water Services: Experiences in Global Perspective. Finnish Water Experience Utilities Association.

Kokkonen, V., Kuuva, M., Leppimäki, S,, Lähteinen, V., Meristö, T., Piira, S., Sääskilahti, M. (2005). Visioiva tuotekonseptointi - työkalu tutkimus- ja kehitystoiminnan ohjaamiseen. (Visionary concept design – a tool for steering R&D activities). Technology Industry Association in Finland. (In Finnish).

Laitinen, J. & Meristö, T. (2016) Applying Visionary Concept Design to Energy Efficient Residential Areas, in Proceedings of the METNET Seminar 2016 in Castellon (eds. Kuldeep, Virdi & Tenhunen Lauri). HAMK University of Applied Sciences, Hämeenlinna, Finland.

Leppimäki, S., Laitinen, J., Meristö, T., Tuohimaa, H. (2008) Visionary Concept: Combining Scenario Methodology With Concept Development. In Wagner, C. (ed.) Seeing the Future Through New Eyes. World Future Society.

Masini, E. (1993) Why Futures Studies? Grey Seal, London.

Pursiainen, T., Vehkaoja, J., Heimo, H. & Hiitelä, P. (2017) Laurea University of Applied Sciences, Hyvinkää, Finland (unpublished student report).

Student Reports (2017) for Futurology study module. Laurea University of Applied Sciences, Finland (unpublished student reports).
- Ailamäki, J., Helenius, M., Ilonen, R. & Kangasmetsä, E-R (2017) Local water theme.
- Anttila, J., Koljonen, I., Kovanen-Piippo, K., Laine, E. & Saksala, S-M. (2017) Water business in airline company theme.
- Ehro, J., Ibriqi, P., Kairesalo, M., Moilanen, P. & Nordlund, J. (2017) Rain management theme.
- Jaatinen, S., Laine, E., Perälä, M. & Taponen, L. (2017) Recreational use of water theme
- Kolehmainen, T., Linnanen, J., Paaso, K., Sievänen, T. & Vilén, A. (2017) Water purification in traveling theme.
- Niemi, E., Kallioniemi, E., Timoskainen, T. & Ilola, P. (2017 Ecological tourism theme.

Mukerjee, K. (2012) Frugal Innovation: The Key to Penetrating Emerging Markets. Ivey Business Journal, 2012.

Wallin, J. (2006) Business Orchestration: Strategic Leadership in the Era of Digital Convergence. John Wiley & Sons.