

ROLE OF WATER COOPERATIVES IN SUSTAINABLE DEVELOPMENT AND GREEN TRANSITION IN FINLAND

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Abstract. The research is a part of the Horizons Europe research project Sustainable Horizons, where each partner in six European countries contributes by own local Sustainability Co-Creation Model to common one. The model development takes place between higher education institutions (HEIs) and their non-academic local partners with the sustainability approach. The local context and of the real-life providers in Finland are water management co-operatives in rural areas, locating in Päijät-Häme region in Southern Finland. The aim of this study is to assess the sustainability challenges facing rural water services in a Finnish region, with a focus on the role of water management in the transition to a green economy. The mixed methodology, where quantitative and qualitative data is combined, was chosen. The data collection from 19 co-operatives took place in spring 2024. The paper explores a water cooperative perspective on the three pillars of the sustainability in the regional context. It assesses co-operatives' ability to implement more advanced forms of environmental management and sustainable development and their role in green transition. The results will contribute to Sustainability Co-Creation Model and will shed light co-operatives' possibilities to contribute for the regional development.

Keywords: co-operatives, green transition, rural area development, sustainable development, water management.

JEL Classification: O1, R1

1. Introduction

The quantity and quality of water have severe health, environmental, and economic impacts, which creates major problems for both individuals and communities in low- and even middle-income economies (Laitinen et al., 2020). The role of water in a green economy is vital because it is linked to many sustainable development goals. We are fortunate in Europe to have, at least relatively speaking, an abundant supply of clean water. Wastewater management is as important as fresh water and to take care of in a sustainable way that we can safeguard the nature, good living, and economic activities.

The global water actors like the World Water Council, UN, and OECD are continuously discussing about the water in the green economy. The argument is that a green economy will help to enable water to be managed sustainably and that water is of economic importance for the green economy. The danger in the discussion is that problems which do not necessarily figure among a green economy's priorities such as major water governance

reforms and rural drinking water supply and sanitation will be neglected (Houdret et al., 2012).

According to Heino et al. (2011) water services are in very good condition in Finland. However, there are several sustainability challenges of high-quality water services now and even more so in the future. In Finland municipalities are responsible for water supply and own most of the utilities, but there are also numerous consumer-managed utilities, mostly co-operatives, especially in the rural areas. Water cooperatives can be connected to the concept of inverse infrastructure, which means miniature infrastructures built and maintained voluntarily by users, producers, or communities. The aim of this study is to assess the sustainability challenges facing rural water services in a Finnish region, with a focus on the role of water management in the transition to a green economy. Specifically, the study seeks to investigate the current state of rural water services in Finland, considering consumer-managed utilities, and to identify key areas for improvement to ensure the long-term sustainability

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of water resources, in alignment with the principles of green economy and sustainable development goals.

2. Water cooperatives in Finland

2.1. Brief history of water co-operatives

It has been said that Finland is the most co-operative country in the world with 7,5 billion co-operatives' members in the country of 5,5 billion inhabitants. Consumer cooperatives cover more than 45% of daily goods (Pelervo, 2024). The first Cooperative Act came in to force in 1901 (Finlex, 2024).

The brief overview of Heino et al. (2005) mentions that first water co-operatives were established in the beginning of 20th century, over hundred years ago. The first water co-operative located in the city of Tampere and the activity started in 1907. In the beginning the region of Pohjanmaa in the west coast had the biggest amount of water co-operatives. Köppä (2010) characterizes the following development steps by saying that the 1960s was a time of decay of cooperatives in Finland. In the 1990s, the boom in cooperative small entrepreneurship, also known as neo-cooperatives, which received stimulation from many different directions, also activated water co-operatives. Since then, their popularity has strengthened with the renewal of the requirements of the Waste Management Act in sparsely populated areas. In 2004 there were 950 water co-operatives in Finland.

2.2 Background of the emergence of water cooperatives in Finland

The water cooperative is a cooperative water supply facility owned and managed by residents in a sparsely populated area. The need to obtain domestic water and improve wastewater treatment in areas where the municipalities' resources have not been sufficient to expand the water and sewer network has led to the creation of water cooperatives in Finland. The biggest part of the water co-operatives works for the domestic water.

Currently, there are approximately 1500 water service providers in Finland of which municipalities own and manage 400 of and they distribute 90% of the total quantity of domestic water. 1100 user-owned water co-operatives supply the remaining 10% of the domestic water sold to approximately 13% of the population (Luukkonen, 2013). According to the data of the Village Waters project (2019) the percentage of population, not connected to urban wastewater collection and treatment systems is 19% (900 000 inhabitants). To consider, every real estate must have approved wastewater treatment also in the countryside, but the solution can also be real-estate specific, depending on the municipality and its requirements towards inhabitants and residents. It is estimated that the share of wastewater operations, covered by the water co-operatives, is less than domestic water supply meaning, that all water co-operatives don't have waste water service (Finnish Association of Municipalities, 2014).

The water cooperative is owned and controlled by its members. It can be defined as a village level water supplier. Activities are regulated by several laws and regulations. The proper management of a water utility requires professionalism, but the establishment is a root level initiative and not necessarily based on the know-how or any experience of the water supply. The water cooperative is responsible for the construction of the network, supply of domestic water that meets the quality requirements, appropriate management and treatment of wastewater, and financial operation of the facility.

2.3. Overall picture of current water cooperatives and their sustainability

The Finnish Association of Municipalities (2014) states that water cooperatives are a motley group of different types of actors and the number of cooperative members varies from a few to more to a thousand. The most common water cooperative has from 5–10 to hundreds of members. The smallest water cooperatives have mostly built a common management from the trunk pipe, but the largest ones operate like municipalities water supply companies. Operating methods vary even for the same size between water cooperatives.

The same obligations arising from legislation apply to most of the water cooperatives as large municipal water supply companies. In legislation the water supply facility is defined that it serves 50 customers or delivers more 10 m³ of water per day. It is estimated that 2/3 of the water cooperatives is classified as a water supply facility. Obligations related to water quality come from the health protection legislation and it also concerns smaller players among water co-operatives (Luukkonen, 2014). Still, the interesting fact is that of those who responded to the survey of Tuorila & Saastamoinen (2022), 11.9%, 62 water cooperatives out of 459, stated that their area of operation has not been defined. Whether the operating area is defined, instead, affects the rights and obligations of consumers as customers of the water supply company (Kuulas et al., 2020). This duty to define operational area, can be regarded as a sustainability responsibility, belongs to the municipality where the water cooperative locates.

The academic evidence (Beishenaly & Eum, 2021) suggests that many cooperatives do not produce sustainability reports; however, sustainable practices and contributions to UN's Sustainable Development Goals (SDGs) are embedded in the purpose of cooperative businesses. Furthermore, the staff amount is tiny in Finnish water co-operatives, in many of them no staff at all, and that is why that the Corporate Sustainability Reporting Directive (CSRD) will not concern them as the staff amount should be 250 or more (European Commission, 2022).

2.4 Slight fluctuation in number of water co-operatives

In the past 10 years, the number of water co-operatives has been relatively steady. In the research (Luukkonen,

2013) the number of water co-operatives was 1100 and it was foreseen that water service areas are expanding in Finland, which has not happened.

Table 1. Sector statistics: Code 36, Water collection, treatment and supply, co-operative societies (StatFin, 2024)

Year	2018	2019	2020	2021	2022
Number of water co-operatives	1071	1073	1056	1051	1049

The number of water cooperative societies appears to have fluctuated only slightly over the five-year period but remained relatively stable. There's a slight decrease from 2018 to 2022 (Table 1). In 2013, there were 1100 societies, and by 2018, this number had decreased to 1071. Anyhow, the numbers of water cooperative societies don't show any significant upward or downward trend. This suggests a certain level of stability in the sector during the given period. Various factors could contribute to these fluctuations, including changes in regulations, economic conditions, technological advancements affecting the efficiency of water management, and the mergers between municipal water management companies and water co-operatives.

2.5 Merger of municipal water companies and water co-operatives

The merger is usually favourable for both sides because municipal water company gets the ready infrastructure and water co-operative relieves from the heavy management and maintenance obligations.

The Finnish Association of Municipalities (2007) divides the water cooperatives in three types to be established in terms of their life cycle, which can be seen as strategies for the possible future merger. Traditionally, the water cooperative has been established with the intention of remaining independent in water supply as an actor, often with the help of society's grants. The second type is a cooperative that is transferred or wants to be transferred to the responsibility and management of the municipality for a few years after the main part of the investments has been made and the operation is established. Here usually the municipality's water supply company's department takes responsibility for the cooperative's networks, financial ta and debts and the members of the cooperative become customers of the municipality's water supply plant. The third type of water cooperative is a cooperative in the area, which could also be merged to the operation of the municipal water supply plant during its life cycle. By supporting cooperatives to be established, the municipality can to some extent postpone its own investments. Shortly after the actual construction phase, the cooperative is merged to the municipal water management company.

3. Sustainability implementation in water co-operatives in Päijät-Häme region

3.1 Mixed methods research and study features

The mixed methods research is more than simply collecting and analyzing qualitative and quantitative data; it also involves the use of both approaches in tandem so that the overall strength of a study is greater than either qualitative or quantitative research (Creswell & Plano Clark, 2017). To add, the mixed methods research enables for a researcher to bring together both components, qualitative and quantitative to the scientific debate. Al-malki (2016) points out that when the topic has been selected by the researcher, it is also important that s(he) selects a method that will enable researcher to remain motivated.

Based on the literature, the following research questions were formed:

1. How environmental, social, and economic context of water cooperatives impact their ability to implement sustainable practices and navigate the green transition?
2. How do water cooperatives perceive and prioritize environmental sustainability compared to economic and social considerations, and what factors influence these priorities?

The basic data of the water co-operatives of the region was picked up from the open access database YTJ – The Business Information System of Finland, where all registered businesses must keep their financial information annually updated. According to the database, there are 20 not municipally owned water suppliers in the region, of which 19 are registered as cooperative companies and one is registered as an association, and the responsibility to deliver the financial data does not concern associations.

Due to the limited resources of the research to collect qualitative data, it was decided to use an e-questionnaire instead of personal interview, but also to offer to interviewee possibility to meet personally online to get the further information or clarify questions. Four cooperatives preferred the online discussion before filling in the questionnaire. The data was collected in February 2024.

This study's limited scope and focus primarily on a specific region or country's water cooperatives restrict its generalizability and relevance to the broader field of study.

3.2 Economic pillar

Registered financial statement documents are public by law of Finland and they are available at the Finnish Trade Register's web service (PRH, 2024). Cooperatives belong to the group of legal bodies, which must register their financial results after every accounting year. Currently the year 2022 results are available and 16 water co-operatives' results were picked up from the register to assess economic sustainability as the quantitative part of the research. The

financial information of the four water cooperatives was not available in the register. The data of turnover progression and operating profit/loss were investigated.

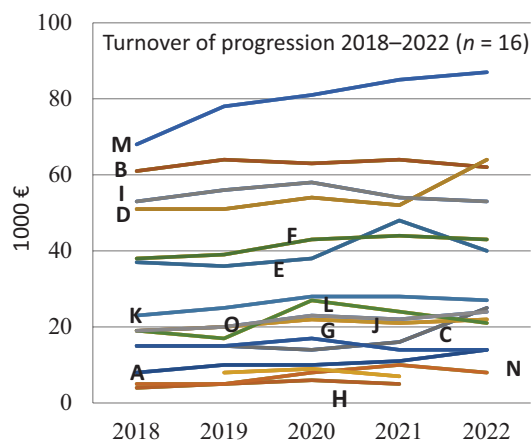


Figure 1. Päijät-Häme region water co-operatives turnover progression in 2018–2022 ($n = 16$)

The observations on 16 cooperatives' (labelled A-O) turnover progress have the following implications. Companies such as A, C, D, F, I, M, J, K, and O demonstrated consistent or intermittent growth in turnover over the years (Fig.1). This suggests effective business strategy, operational expansion, and/or successful service. Co-operative C, in particular, experienced significant growth, with its turnover more than doubling from 2018 to 2022.

But still, some of them, B, E, G, H, L, and N, experienced either consistent or sporadic declines in turnover during the period. This could indicate operational inefficiencies. Cooperatives are often characterized by their long-term orientation and commitment to sustainable practices. This may lead to more weak turnover progression over time, as cooperatives prioritize maintaining reliable services and meeting the needs of their members and communities over maximizing short-term profits. In addition, it is worth remembering that co-operatives typically have community-centric approach which may

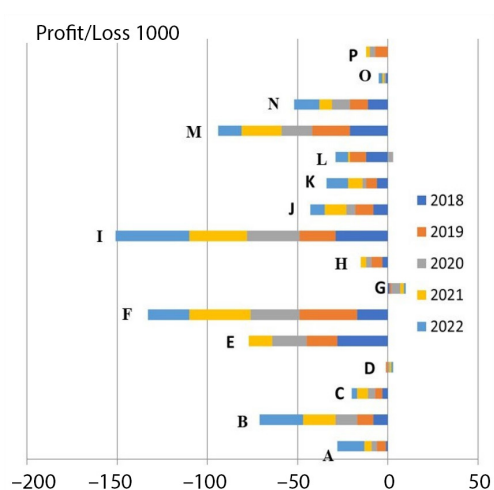


Figure 2. Päijät-Häme region water co-operatives financial results 2018–2022 ($n = 16$)

influence business strategies and investment priorities, potentially impacting turnover progression.

Nearly all (14/16) water cooperatives experienced consistent losses over the years, such as A, B, C, E, F, G, H, I, J, K, L, M, N, O (Fig. 2). This could indicate challenges in managing operational costs or generating sufficient revenue to cover expenses. The price of water supply is usually too low in all kinds of water supply units in Finland.

As cooperatives are owned and operated by their members, profitability may not always be the primary focus. Instead, cooperatives often prioritize serving their members' needs, which may include providing affordable services rather than maximizing profits. Operating losses could reflect investments in infrastructure and their payback as well as bigger maintenance costs, which have not been forecasted.

In several Finnish projects, the minimum number of co-operative members has been five per kilometer, i.e., about 200 meters per property, so that the network would be technically and economically feasible. The minimum number of members is affected by different conditions and cost levels in different parts of Finland (Leka et al., 2015). Only four cooperatives gave the information about the property density per kilometer, so there was not enough data to consider or assess this.

The water cooperative should get money to save about 2% of the turnover every year (Leka et al., 2015). As the overall majority of the studies cooperatives have had losses very long time, this recommendation is not relevant for them and the possibilities the chances of surviving future renovations etc. seem bad, practically impossible.

3.3 Environmental pillar

Ministry of Agriculture and Forestry of Finland (2021) sees the water supply organisations as forerunners of the carbon neutral circular economy. The measures for this are to improve water supply facilities' digitalization readiness and information-based management and promote cooperation between regional water expertise and circular economy clusters. The first measure is critical for most of the water cooperatives because of the limited resources and know-how, the latter might be more realizable if the water cooperative is seen as a collaborator in this context in its region.

Co-operatives are concentrated in renewable-resource-based sectors, so they have a strong link to the environment. It can be said that they routinely integrate multiple economic, social, and ecological objectives (Gertler, 2001). Concerning Finnish water cooperatives, they are also exemplifying how to turn a small environmental investment into an important environmental benefit.

Finnish research underlines that change in the natural environment affect water supply, water availability and quality of water. Climate change in Finland is caused by changes in draw, evaporation, and temperature distribution. Extreme phenomena such as drought, heavy rains and floods increase the willingness in rural areas

to join existing water supply networks, and the eagerness to establish new water companies also increases (Marttila et al., 2005; Sorvala et al., 2006).

On the wastewater side, researchers (Katko & Pietilä, 2017) see that water recycling may have a future. Marttinen et al. (2017) see slow but increasing progress in sewage sludge recycling in soil conditioners.

Summary of the questionnaire answers:

Nature and human health related business, like water supply, is very dependent on the regulation. On the one hand this makes green business quite slowly developing, but on the other hand, this characteristic gives for the business area solid basement and good opportunities to forecast future by directives, laws, and acts.

The use of electricity and limestone were seen as the only ones harmful to the environment. The positive environmental effects were seen as the most significant. Concerning the future perspectives, the use of sewage sludge as soil conditioners or for fertilization in general was regarded almost with horror. The reuse of gray water from laundry and/or showers and/or lavatory sinks was seen as very possible.

When asking which aspect of sustainable development does your water cooperative have the most influence on, the answers show a little surprising, which is seen in the Table 2. One cooperative did not answer to this question.

Table 2. Water cooperatives assessment of their main sustainability concept

Focus role of sustainability in water cooperatives	<i>n</i>	%
Economic issues	0	0
Environmental issues	5	26
Social issues	0	0
All three sustainability pillars	4	21
Economic an environmental together	10	53
Economic and social issues together	0	0
Environmental and social issues together	0	0

26% of the responses highlight environmental issues as a significant focus area. This suggests a moderate emphasis on environmental sustainability within water cooperatives, indicating recognition of the importance of preserving natural resources and ecosystems. 21% of the responses indicate a consideration of all three sustainability pillars. This suggests that a subset of water cooperatives recognizes the interconnectedness of these pillars and strives to address them collectively in their operations and decision-making processes. Most responses (53%) focus on the intersection of economic and environmental issues. This indicates a strong emphasis on balancing economic viability with environmental sustainability within water cooperatives, suggesting a recognition of the need to manage resources efficiently while also minimizing environmental impact.

3.4 Social pillar

Water services have many stakeholders with different interests, which makes the projects challenging and they may fail. Furthermore, water services are a multi-level system – from on-site to cooperatives, municipal utilities, and various types of supra-municipal arrangements. The academic debate too often concentrates just on one level ignoring the others and their inter-relationships (Katko & Hukka, 2015).

Although there are different types of cooperatives, a cooperative definitely has characteristics of social enterprise and offers considerable potential as a tool for regional economic development. Throughout its long history the co-operative has played a significant role in helping to fill gaps caused by market failure or absence of government intervention (Malindretos et al., 2013).

Summary of the questionnaire answers:

As Table 4 above indicates that none of the responses specifically mention social issues as a primary focus area for sustainability within water cooperatives. And none of the respondents highlights the combined consideration of economic and social issues or environmental and social issues. This suggests a potential gap in addressing social aspects alongside economic and environmental concerns within the context of water cooperatives, based on the provided data. Four cooperatives selected all three pillars equally important, including social pillar.

To be successful in the long run, any business must have a track-record of responsiveness to community needs. Ensuring safe and clean drinking water is indeed a critical social aspect of water cooperatives managing home water and sewage water in Finland. Nevertheless, what the results in Table 4 show, it seems that the social understanding is quite strong among respondents, because several answers repeated phrases like “our village’s water supply” and “we take care of the well-being of the village and our area of operation”. Could it be, that cooperative itself is a kind of social mission, and the members do not see need any separate need for focusing of social action.

However, there are also social aspects that these cooperatives considered to be successful in the long run. Equity and accessibility are one of these aspects. It’s essential for water cooperatives to ensure that all members of the community have equitable access to clean water and sanitation services. This was clearly seen as a matter of honor.

Water cooperatives also underlined that they must ensure that drinking water meets legal and regulatory standards, meaning that water cooperatives must also prioritize public health and safety in all aspects of their operations. This includes maintaining infrastructure integrity, responding effectively to emergencies or outbreaks, and implementing measures to protect against waterborne diseases.

4. Green transition of water co-operatives

Antikainen et al. (2013) set preconditions for the transition towards sustainability. First, it can happen in stages. Second, green transition or sustainable operations must be able to be carried out in such a way that the economic profitability is possible. And third, at the same time, it must be ensured that people's well-being and social justice compromised. Hukka & Nyangeri (2014) underline that transition to the green economy is not possible without ensuring everyone has access to basic water and sanitation services.

The other precondition is that water cooperatives have to be notified as the municipalities' vitality factor. They have a role in the municipality's service production. However, the high-quality operation of water cooperatives is a prerequisite for their positive effect (Luukkonen, 2014).

Summary of the questionnaire answers:

In general, the development of own operations is seen as a step-by-step process, e.g., the forthcoming times for repair investments was seen crucial, the next big challenge after the establishment phase. The provided open answers highlight especially the importance of water cooperatives' centralized wastewater treatment operations for environmental preservation and future planning. By directing wastewater from the co-operative's sewer to the city's waste treatment plant instead of local lakes, nature is protected, and opportunities for future development are enhanced. The location in the Lake-Finland area underscores the significance of maintaining environmental quality for the green transition.

Additionally, a decrease in livestock farms and water consumption is a shift, which poses challenges, particularly in managing water turnover within the network and maintaining water quality standards. Overall, while there are promising prospects for environmental conservation and sustainability, there are also complexities and obstacles that require attention and proactive management. A few water cooperatives were of the opinion that they have been left to operate alone, their operation is not appreciated. In these cases, the vitality factor is not included in the municipality's views.

5. Conclusions

Certain transitions in society systems are a prerequisite for the full implementation of a green economy and water and wastewater supply is one of them. The water cooperative is a company, so it has all obligations regarding business activities, such as the obligation to take care of the organization of accounting and manage the economy so that the water cooperative fulfills its financial obligations. In addition, the legislation brings obligations through, for example, the Cooperatives Act and the Water Supply Act. By assessed turnover progression and operational profit and loss helps evaluate the economic

sustainability of water cooperatives, offering insights into their financial performance and the factors influencing their economic viability.

Sustainability Practices: The analysis of sustainability practices within water cooperatives indicates a mixed focus on economic, environmental, and social aspects. The cooperatives of the region rather emphasize environmental conservation or a balance between economic and environmental concerns than economic or social concern solely or mixed.

Socioeconomic Factors: Socioeconomic factors, such as community engagement, equity, and accessibility, play a crucial role in the success of water cooperatives. Active involvement with local communities and a commitment to public health and safety are essential for ensuring the long-term sustainability of water services.

Green Transition: Transitioning towards sustainability requires careful consideration of economic viability, social equity, and environmental preservation. Water cooperatives have the potential to contribute significantly to the green economy by adopting sustainable practices and supporting regional development. To note, that water cooperatives play now and in the future an important role in the water supply security of society and rural Finland.

Limitations of this study include the reliance on financial indicators for assessing economic sustainability may overlook non-financial factors that contribute to the overall resilience and effectiveness of water cooperatives. Future research could expand the geographical scope to include a more diverse range of water cooperative models and contexts, allowing for a comparative analysis of sustainability practices. Furthermore, especially the qualitative research could provide deeper insights into the motivations and challenges faced by water cooperatives in their transition towards the green economy.

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References

- Almalki, S. (2016). Integrating quantitative and qualitative data in mixed methods research—challenges and benefits. *Journal of Education and Learning*, 5(3).
<https://doi.org/10.5539/jel.v5n3p288>

- Antikainen, R., Mickwitz, P., & Seppälä, J. (2013). *Opportunities for green growth*. Prime Minister's Office, Helsinki, Finland. <http://vnk.fi/julkaisut/listaus/julkaisu/fi.jsp?oid>
- Beishenaly, N., & Eum, H. (2021). How do cooperatives drive change? SDG Framework for cooperatives. *ICA CCR Conference paper*, Seoul, November.
- Creswell, J. W., & Plano-Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- European Commission. (2022). Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting. <http://data.europa.eu/eli/dir/2022/2464/oj>
- Finlex. (2024). Database of up-to-date legislative and other juridical information of Finland. Finland's Ministry of Justice. <https://www.finlex.fi/en/>
- Finnish Association of Municipalities. (2007). *Municipalities and water supply in the future in Finland*. Statement. Helsinki (in Finnish).
- Finnish Association of Municipalities. (2014). *Organization of water supply municipalities and water cooperatives. Guide for water cooperatives, municipalities water supply facilities and municipalities*. Helsinki (in Finnish).
- Gertler, M. (2001). *Rural Co-operatives and Sustainable Development*. Centre for the Study of Co-operatives. University of Saskatchewan.
- Heino, M., Vanhala, P., Vilonen, K., & Yli-Tolppa, H. (2005). *ABC of the Water Cooperative*. Edita Prima Oy (in Finnish).
- Heino, O. A., & Takala, A. & Katko, T. (2011). Challenges to Finnish water and waste-water services in the next 20-30 years. *E-Water*.
- Houdret, A., Dombrowsky, I., Scheumann, W., & Herrfahrtd-Pähle, E. (2012). *Sustainable water management through green economy? Deutsches Institut für Entwicklungspolitik (DIE)*. Briefing Paper 5/2012.
- Hukka, J. J., & Nyangeri, E. N. (2014). Poor state of water and sanitation services: Why ignorance is reshaping our future? Working Group 6: Invaluable Water Services as a Fueling Agent in Development. *Cooperation Across Borders – Comprehensive Responses to Transecting Global Challenges? November 13, 2014*. FinCEAL, UniPID. Helsinki.
- Katko, T. S., & Hukka, J. J. (2015). Social and Economic Importance of Water Services in the Built Environment: Need for More Structured Thinking. *Procedia Economics and Finance*, 21, 217–223. [https://doi.org/10.1016/S2212-5671\(15\)00170-7](https://doi.org/10.1016/S2212-5671(15)00170-7)
- Katko, T. S., & Pietilä, P. P. (2017). Water Supply in Urbanizing Societies. *Alue ja Ympäristö*, 46(1), 32–39 (in Finnish).
- Kuulas, A., Renko, T., & Kuivamäki, R. (2020). Water supply investment needs until 2040. *Handout series of the Water Supply Association No. 63*. Helsinki.
- Köppä, T. (2010). *Community economy as a growth platform for new forms of entrepreneurship in rural areas*. University of Helsinki, Ruralia Institute. Reports, 69 (in Finnish).
- Laitinen, J., Antikainen, R., Hukka, J. J., & Katko, T. S. (2020). Water supply and sanitation in a green economy society: The case of Finland. *Public Works Management & Policy*, 25(1), 33–50. <https://doi.org/10.1177/1087724X19847211>
- Leka, J., Arvonen, V., & Heikkinen, J. (2015). *Experiences in the operation of wastewater cooperatives "When everything doesn't go in the pipeline"*. Valonia (in Finnish).
- Luukkonen, H. (2013). *Water cooperatives, municipal water supply facilities and municipalities*. Association of Finnish Municipalities (in Finnish). <https://www.kuntaliitto.fi/julkaisut/2013/1572-vesiosuuskunnat-kuntien-vesihuolto-laitokset-ja-kunnat>
- Luukkonen, H. (2014). *Organization of water supply in municipalities and water cooperatives*. Association of Finnish Municipalities (in Finnish). <https://www.kuntaliitto.fi/sites/default/files/media/file/02Vesihuollon%20organisointi%20ja%20vesiosuuskunnat.pdf>
- Malindretos, G., Dimitrios, A., Folinas, D., & Triantafyllou, D. (2013). Holistic value chain and sustainability. The potential role of Co-operatives. *ICA Global Research Conference 'Cooperatives during crisis and post-crisis period- COOPCY'*, 12–15 June, 2013, Nicosia, Cyprus.
- Marttila, V., Granholm, H., Laanikari, J., Yrjölä, T., Aalto, A., Heikinheimo, P., Honkatuki, J., Järvinen, H., Liski, J., Merivirta, R., & Paunio, M. (2005). National climate change adaptation strategy. *Publications of Ministry of Agriculture and Forestry*, 1/2005 (in Finnish).
- Marttinen, S., Venelampi, O., Iho, A., Koikkalainen, K., Lehtonen, E., Luostarinen, S., Rasa, K., Sarvi, M., Tampio, E., Turto, E., Ylivainio, K., Grönroos, J., Kauppila, J., Koskiahio, J., Valve, H., Laine-Ylijoki, J., Lantto, R., Oasmaa, A., & zu Castell-Rüdenhausen, M. (2017). *Kohti ravinteiden kierrätyksen läpimurtoa: Nykytila ja suositukset ohjaiskeinojen kehittämiseksi Suomessa*. Natural Resources Institute Finland. Luonnonvara- ja biotalouden tutkimus, Vol. 45/2017.
- Ministry of Agriculture and Forestry of Finland. (2021). *National water supply reform program*. Publications of the Ministry of Agriculture and Forestry 2021:7 (in Finnish).
- Pellervo. (2024). *Cooperation in Finland*. Pellervo Coop Center. <https://pellervo.fi/en/english/cooperation-finland/>
- PRH. (2024). Limited liability companies and co-operatives: how to file financial statements with the Finnish Trade Register. Finnish Patent and Trade Office. https://www.prh.fi/en/financial_statements/limited_liability_companies_co_operatives_and_other_companies.html
- Sorvala, S., Puumala, M., & Lehto, M. 2006. Sufficiency and quality of drinking water in agriculture in large production units. *Reports of Natural Resources Institute of Finland (MTT) 108* (in Finnish).
- StatFin. (2024). *Structural business and financial statement statistics*. https://stat.fi/tup/tilastotietokannat/index_en.html
- Tuorila, H., & Saastamoinen, A. (2022). Regenerative Water Supply. *Research reports of the Finnish Competition and Consumer Authority 3/2022* (in Finnish).
- Village Waters Project. (2019). Training material. *Part 1: Considering the future of the Baltic Sea*. https://villagewaters.eu/s2/994_671_120_Documentation_of_the_usage_of_the_virtual_platform.pdf?v=26134208