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Assessment of knowledge sharing processes between academicians and decision makers toward the sustainable development of green infrastructure based on the example of environmental governance in Akershus and Oslo

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Declaration

I, Olena A. Yemets, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature.....

Date.....…

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Finally, I desire to devote this work to my beloved mother, who passed away one year ago, and who is always will be my guiding star and example in the science devotion.

Abstract

It has been a rapid growth of interest to the potential benefits of green infrastructure in the environmental governance along with the balancing densification and greening processes for the sustainable development. In that case an efficient interplay between science and policy, "co-production of science and policy", becomes enormously important. Therefore, aim of this thesis is to gain a deeper understanding of the current level of science–policy interface, especially in the area of knowledge management processes that surround the both groups of actors.

Data for the mixed analysis was collected by using semi-structured face to face interviews from 63 participants who were involved into environmental governance in Akershus and Oslo. Analyzed units were separated into the two major groups. The Theory of Planned Behavior (TPB) was used to explore the behavioral response of actors towards the knowledge management processes.

Qualitative data analysis showed that groups of actors have as convergence or divergence points that can directly influence on their mismatch or similarity in interests close cooperation in the areas on environmental area. In particular, finding indicated that stumbling blocks of knowledge sharing among the decision maker's group were associated with knowledge networking, lack or insufficient amount of knowledge, problem with knowledge source selection and knowledge use, effectiveness of knowledge transferring into policy, and communication barrier. While, among the academician's group revealed knowledge networking barriers, effectiveness of knowledge sharing, political interference into process, motivation and willingness barriers, and lack of understanding policy process. Quantitative analysis showed a direct and indirect significant positive associations of the behavioral actor's Intention with the several variables that describe the knowledge sharing processes of the actors, along with an extended model variables.

Findings, that revealed challenges and capacity gaps in relationships between scientists and decision-makers and can be the serious constrains toward the sustainable development of environment in the area, gave the possibilities to make conclusions and propose the future recommendations for the sustainable development of environment in the area.

Key words: science-policy interface, knowledge networks, knowledge sharing, evidence based decision, green infrastructure, sustainable development, behavioral intention

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Abbreviations

SPI	Science-policy interface
ES	Ecosystem service
SES	Social-ecological system
GI	Green infrastructure
EBDM	Evidence-based decision making
TPB	The Theory of Planned Behavior
BI	Behavioral intention

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"Science–policy interfaces seem to have become both a fashionable and an unavoidable topic"
(*Sybille van den Hove*)

"No matter how different, but science and politics serve the same societal functions, and therefore should fight against the cult of chaos to bring social well being and collective actions"

(Robert Hoppe)

1 INTRODUCTION

1.1 Establishment of the topic and goal of the research

The global expansion of intensification and densification processes constantly raises interest to the combined benefits from the mixed land use. Major findings indicate that green infrastructure can provides the multiple benefit services (Lundholm, 2015; Borelli, Conigliaro & Pineda, 2018). Along with that was determined the lack of a common consensus within the science-policy interface can lead to the crisis in public trust to scientific advice and political representation (Pouliot & Godbout, 2014), while the limited sharing of sustainability information and knowledge can dismiss an evidence-based decision-making in environmental governance (Cvitanovic et al. 2015; Cvitanovic, McDonald & Hobday, 2016).

The challenge for the sustainable development demands to reduce the gap between science and practice in the green infrastructure governance (Sitas et al., 2014), where the transfer a scientific knowledge and collaboration between stakeholders are still incomplete or lacking direction (Kabisch, Qureshi & Haase, 2015). Also was highlighted that further research and policy should focus on the multi-level governance approach (Baró Porras, 2016), and how the green infrastructure concept can be incorporated into the strategic planning for compact cities (Artmann, Bastian & Grunewald, 2017).

In order to harmonize the relationship and improve knowledge sharing processes between scientists and decision makers, there is a need to examine how science is used in policy making processes and how it could be successfully implemented in policy development towards the sustainable development and management of natural resources. Therefore, the main goal of this work is to acquire knowledge about the relationships between scientists and decision-makers on examples of the green infrastructure governance in Akershus county and Oslo municipality area.

1.2 Objectives and research questions

The first objective is on the base of empirical evidences to study how the knowledge management processes between academicians and decision makers are established and supported in the environmental governance. The second objective is develop a theoretical and conceptual frameworks based on the above mentioned assessment to guide two groups of actors in their integration efforts. Based on the results will form recommendations towards effective knowledge management strategies and approaches that can be attributed to the sustainable governance by green infrastructure.

This study aims to answer the three main research questions that divided on the sub-questions:

1. How do actors involve in knowledge networking and knowledge sharing?

- to explore the characteristics of knowledge networking process;
- to analyze what knowledge dissemination strategies are common among scientists and what knowledge related sources are background for the for decision makers when they formulate decisions;
- to determine what factors alter the ability of actors improve knowledge networking and knowledge sharing.

2. To what degree exist cohesion and matched values between actors in the area of interest?

- to identify factors that have an impact on believes, values and attitudes of among participants;
- to explore differences and similarities between actors toward the enhancing environmental governance for the sustainable green infrastructure development;
- to reveal major motivations and willingness of actors to participate in the knowledge sharing process.

3. How is the knowledge sharing process influences on the evidence based decision making, and links science to policy?

- to determine the current integration capacity of science to policy, efficiency and frequency of transferring knowledge into action or policy;
- to reveal factors that facilitate or barrier the integration capacity of the actors;
- to test effect of variables on the actors behavioral intentions: intention to knowledge sharing or evidence based decision making.

2 LITTERATUR REVIEW

2.1 Theoretical exploration of the science–policy interface

The historical over-view shows a quite comprehensive amount of studies describing co-evolution between science and policy making towards environmental governance and management issues. According to the long term observation the linkage between the science and policy realms has been significantly increased due to the presence of argent environmental issues of the policy agenda (Jäger, 1998). In his overview Hoppe (1999) mentioned that increasing the scientification of politics in turn did lead to the politicisation of science. Majority of scientific findings indicate the important role of scientific and policy making interactions due to the common work under the sustainable development in the area of environment. Thus, linking of them are necessary to provide sustainable economy, environmental security, and human well-being (Watson, 2005), where interacting of two converging intersecting spheres of human activity...allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making (Van den Hove, 2007, p. 824), that gives the transformative possibilities for...improving global equity and boosting global governance capacities to cope with global problems (Tàbara et al., 2018, p. 10).

It was a big interest to the discussion about the nature of science–policy-interface (SPI). In this work I will focus on the two sided relationship, although exist opinion that such interface should be considered as a triangular interaction between scientists, policy-makers and citizens (Bäckstrand, 2003). In the literature possibly to find a several descriptions about types or approaches for their linking. For instance, relationship between science and politics can be called technocratic when science dominates over politics, pragmatic if politics and science is in a power of equilibrium, and decisionist relationship when political power is dominating (Habermas & Habermas 1971). In turn, work of Hoppe (2005) describes the relationship as the three cliché images: (1) the story where politics is safely on top while experts are still on tap; (2) the story told by scientists where power-less scholars speak only the truth to the power; and (3) the story where scientific advisers following their own interests, unless they are not better paid by the others, e.g. politicians. Several of scholars describe the SPI relationship as non-linear, such conclusion was based on inter- and transdisciplinary approaches of environmental issues, and for this need to consider a different knowledge types, values, and interests of variety stakeholders (Görg et al., 2016). The complexity of linking research to policy has been illustrated visually (Boswell & Smith, 2017, p. 2) as four

different approaches to the relationship: (1) knowledge shapes policy; (2) politics shapes knowledge; (3) co-integration; and (4) two autonomous systems that operate though boundary signals (look at the Figure 1 below).

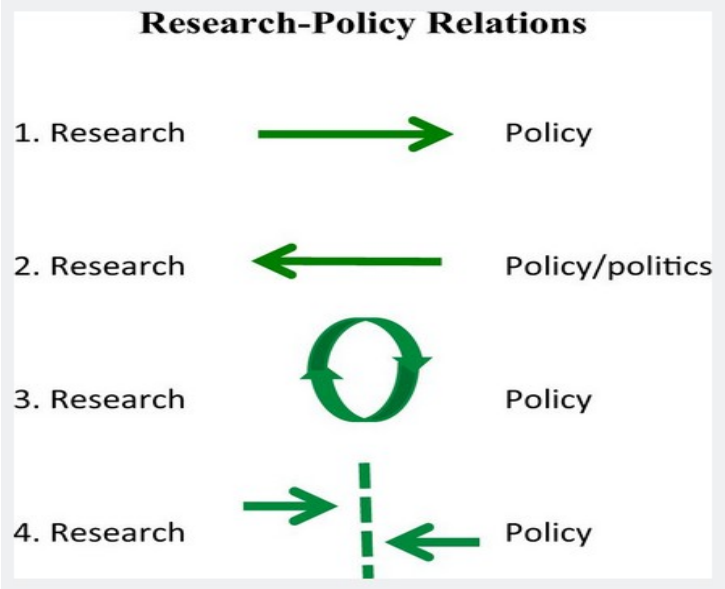

Figure 1: Different interactions that can happen between research and policy

Similarly, was mentioned that science–policy interactions are neither linear nor single-directional and not fixed, that make complicated to separate one that is available or desirable, and very often two approaches work simultaneously (Sundqvist et al., 2018). Naturally, appears the question about an authority in the relationship. Considered, the role of scientists as effective contributors to the policy decision and development in environmental sphere is a critical (Scott, Rachlow & Lackey, 2008), while, from the other side, some factors decrease their authority, like uncertainty of knowledge or absence of straight policy position (Gavrieli et al., 2009; Wesselink & Hoppe, 2011). In order to avoid conflict situation and successful navigate the authority paradox in the environmental science-policy interface was suggested to apply a competent design and adaptation to different meanings of objectivity (Kunseler & Tuinstra, 2017).

Available findings indicate number of reasons why interaction between science and decision making can be unproductive or not effective in a term of the sustainable governance. For instance, has been shown the common barriers between actors were absence of personal contact, lack of

timely relevance of research, and mutual mistrust (Choi et al. 2005). Along with that, mentioned that science does not act in an isolation and constantly is under different pressures as social, cultural and political. Thus, actor's personality can be a serious internal factor which also can influence the interaction, as own attitude, ideology, interests, beliefs, values, and culture, that might contradict their neutrality towards the interaction (Van den Hove, 2007; Suhay & Druckman, 2015). Knowledge management and issues that close to it related also were indicated as the most common barriers in a case of science-policy interaction. The lack of scientific education with environmental context among policy- and decision-makers, and unwillingness of them to welcome scientific prognoses that do not suit their expectations can form psychological barriers (Gavrieli et al., 2009). Found the knowledge systems between knowledge producers and users can be significantly influenced by functional, structural, and social barriers, and that is why a conflict focus between different values, interests and attributes should be relocated to the contextual issues (Weichselgartner & Kasperson, 2010). Along with that, a big question and responsibility of the both actors what knowledge should be appropriate for the decision making (Lalor & Hickey, 2014). Thus, a misfit between demand and supply of knowledge can be a reason that barriers access of policy-makers to the pool of knowledge, while insufficient information can negatively influence the basis of policy-decisions (Van Enst, Driessen & Runhaar, 2014). Formalization and separation as a main features that reveal mismatches between science and policy purposes were discussed on the example of climate policy formulation (Sundqvist et al., 2015).

2.2 ROLES OF KNOWLEDGE MANAGEMENT PROCESSES IN SD ORGANIZATIONS

2.2.1 Knowledge sharing as main agenda for environmental management

Knowledge sharing is one of the most essential and urgent part of the successful knowledge management process. Review shows that knowledge exchange is a key factor that facilitates social, environmental and economic impacts of the research, and therefore interest to it is growing, e.g. the number of publications about the topic increased during 10 years (2002-2012) from 800 to 7000 items for different sectors, while still limited for environmental issues (Cvitanovic et al., 2015, p. 27). The Figure 2 bellow shows the changes.

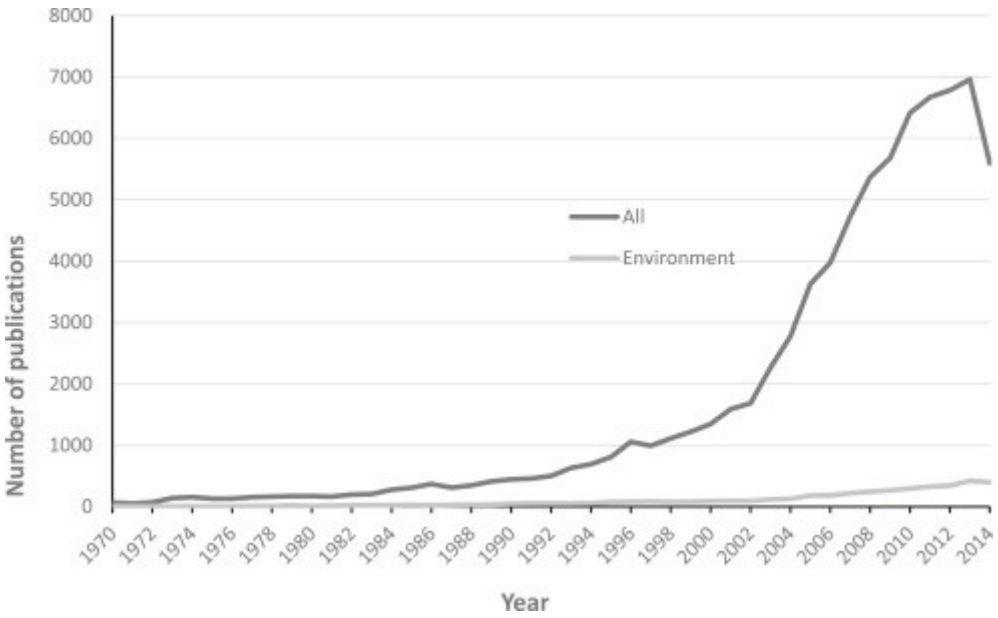

Figure 2: Amount of scientific papers that related to the knowledge exchange topic

Literature also indicates on the variety of advantages that come with an effective knowledge sharing along with some gaps in the process that demand attention and management changes. For instance, knowledge sharing has been mentioned as important tool to bridge the gap between research and policy by reducing the production or service costs that helps in decreasing the mistakes and promotes the scientific evidence usage in a practice (Tsui, Chapman & Stewart, 2006). Additionally highlighted that knowledge sharing increases the innovative capacity of organizations (Iqbal et al., 2011). Environmental governance is a special arena where interest to the knowledge sharing only will extending. It connects with an idea that building up understanding of knowledge sharing processes between environmental researchers and decision makers will increase the success of many research projects and programmes (Fazey et al., 2013). Along with that, uptake and utilization of scientific knowledge will stimulate and open more “policy windows” that strengthen the link (Rose et al., 2017).

The basic roles of scientists and decision makers in the process of knowledge sharing can be described as knowledge providers and knowledge users. While this process is more complicated, not linear, and the co-creation of knowledge might happen. For instance, evidence-based practice in the decision making very often happen when actions are grounded on...an integrated body of evidence that includes all of the forms of evidence (Tsui, L., Chapman, S.A. and Stewart, S., 2006, p. 11). That is why appeared a lot of attention to "co-production of knowledge" model and it use as

a new tool for the governance (Cvitanovic, McDonald & Hobday, 2016; Sorrentino, Sicilia & Howlett, 2018). Another work suggests that decision making should be grounded and will be better understood when it keeps the balance between all processes that include knowledge production, knowledge use and knowledge sharing (Haines-Young & Potschin, 2014). Along with that, mentioned the majority of environmental scientists do not making appropriate data sharing with society that is even ethically obligatory (Soranno et al., 2014). In turn, others stay at the topic, and call for knowledge holders and decision-makers to share their knowledge mutually in a trustworthy, relevant and legitimate way (Cvitanovic, McDonald & Hobday, 2016).

One of the key question in the knowledge management is to reveal factors that influence the knowledge sharing process. Research findings indicate on the high availability of information about issues that might limit the procedure how knowledge are passed between academics and practitioners. Found that cognitive capacity of policy makers, behavioral biases, variety of preferences and distribution of decision-making among different actors are equally important in parallel to the provision of rational information for the successful knowledge transfer (Kørnøv & Thissen, 2000). Among the most common factors that can inhibit the knowledge sharing process also were mentioned lack of time and resources in order to be engage into the process (Tsui, Chapman & Stewart, 2006). In turn, work of Hughes (2008) divides factors that influence knowledge exchange and it transfer into the four groups: individual; institutional; content; and process factors. Along with, some results showed that knowledge sharing effectiveness was significantly impacted by the three factors as organizational strategy of knowledge transfer, structured learning strategy, and an organizational culture (Rhodes et al., 2008). The range of barriers that prevent an effective knowledge exchange between scientists and decision-makers such as cultural differences, institutional barriers, lack of information or poor adjustment between research design and practical knowledge needs also were identified (Cvitanovic, McDonald & Hobday, 2016). Along with that different interests of knowledge holder groups can provide a contradictory scientific evidence, especially towards controversial issues that can negatively influence on the sharing process (Nesshöver et al., 2016). The majority of further works highlighted that organizational structure and organizational culture are among the most important factors that affected effectiveness of knowledge management processes (Magnier-Watanabe & Senoo, 2010; Susanty, Handayani & Henrawan, 2012; Pandey & Dutta, 2013).

Less research has been published regarding the field of knowledge management where factors that influence knowledge sharing become a really serious barriers to the knowledge sharing efforts.

Several papers indicate that organizational settings, and specifically different types of motivations can facilitate knowledge sharing, e.g. authority mechanisms (extrinsic reward) or individual's willingness (intrinsic reward) can be the ways to overcome the barrier. According to the finding, profit organizations should focus on the extrinsic motivation usage (Osterloh & Frey, 2000), in turn, knowledge sharing in non-profit organizations can be improved via intrinsic motivation, and difficulties in the transfer can be eliminated by transformation of tacit knowledge into explicit knowledge (Cruz, Pérez & Cantero, 2009). An explanation of the phenomenon is lying in the overcoming the misfit barrier between the willingness and ability to share knowledge, and in increasing the self-interest toward willingness to share knowledge (Christensen, 2005). By developing this approach, motivational model was built that combines psychological and organizational processes in order to assess the motivation in knowledge sharing (Andriessen, 2006). Further works only support previous findings about the role of motivation practices and individuals willingness among the factors which did affect the knowledge sharing (Lin 2007; Galia, 2007; Erikson & Börjesson, 2014). Results also have shown that motivation, in a case of explaining knowledge sharing behavior among academicians, was attached to personal, environmental, cultural, and the support factors (Mansor, Mustaffa & Salleh, 2015). Highlighted, that power can be a factor that could change behavior of others, e.g. regulate decision towards willingness to share knowledge (Razak, Ahmad & Rahman, 2018).

2.2.2 Characteristics and performance of knowledge networking

Increasing interest to how effectively manage by the knowledge across different fields, at the individual and organization levels, and in that cause, the knowledge networking became a very essential topic. Determined, knowledge networks can effect knowledge sharing, e.g. by building a wider networks for the process of knowledge sharing **(**Hansen, 2002). The next review discussed a number of studies that describe knowledge or knowledge networking processes have been significantly grown during 1970–2009 years, and the Figure 3 below illustrate this (Heidl & Wadhwa, 2012, p. 1116)

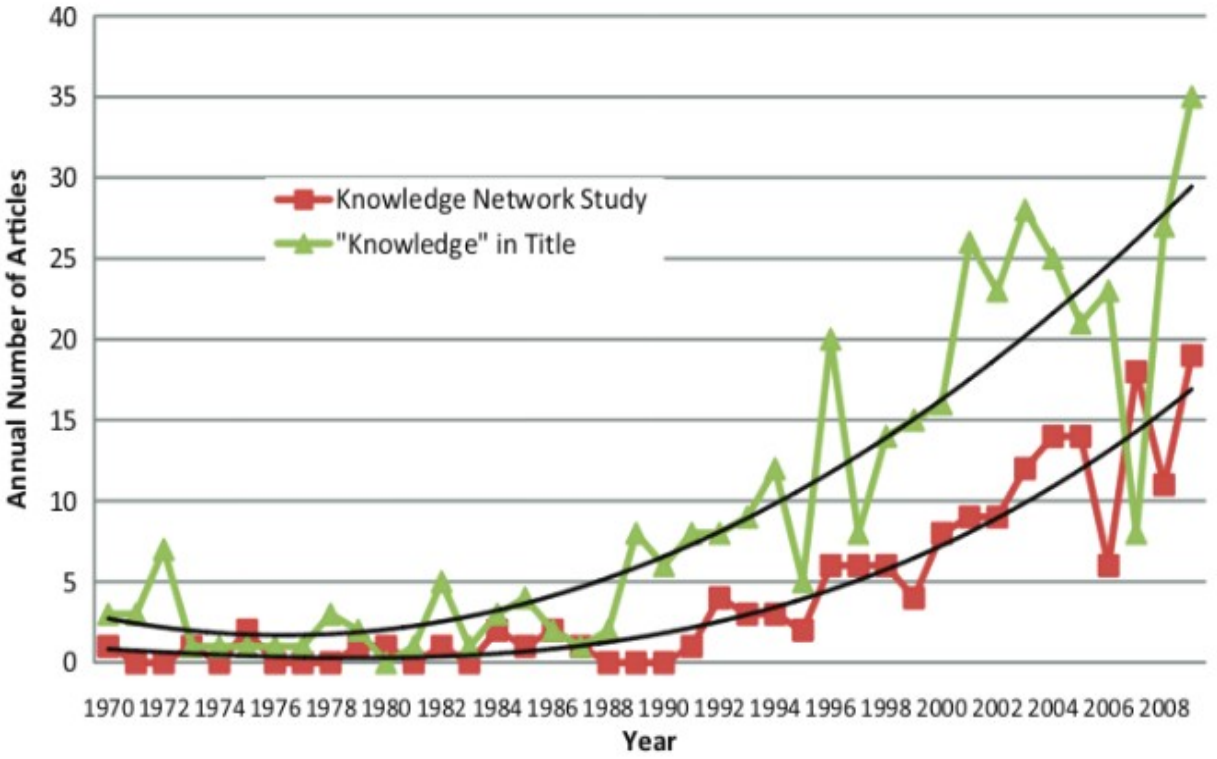

Figure 3: Increase of studies towards Knowledge and Knowledge Networks

The main attribute of knowledge network participation has been seen as an ability to aggregate an information, therefore networking process looks as a summation of separate parts, e.g. for the decision making process knowledge networks will...identify, link, and engage decision-makers more directly… moving the network's knowledge into policy and practice (Creech & Willard, 2001, p. 2). Another important feature that has been mentioned towards the networking process is involvement of the variety of knowledge frameworks and knowledge regimes that allows to generate and integrate knowledge, make them more heterogeneous (Bruun, Langlais & Janasik, 2005). Along with that, knowledge network can be seen as a powerful tool in the distribution of innovative ideas among institutions (Jucevicius & Kinduris, 2011), or in a possibility for an individual learning (Phelps, Heidl & Wadhwa, 2012). Regarding to the last finding, "administered knowledge networks" is a value concentration of knowledge sources, which include different actors, that can be represented as "brokers in knowledge networks", and a vital for the functioning of learning systems (Sanz-Ibáñez, Lozano & Clavé, 2019).

In the literature possibly to find a several factors that can limit efficient functioning of knowledge networks. For instance was pointed, that power, proximity of networking contacts, networking absorptive and exchange abilities, could negativelly influence on the knowledge sharing process

(Cross & Cummings, 2004). The density of network has been revealed as a factor that reduces the "knowledge-creating benefits" among the inter-organizational (Jones & Macpherson, 2006) as well intra-organizational relationships (Bridle et al., 2013). Along with that, technological, policy and legal obstacles (Zhang & Dawes, 2006), lack of organizational support (Verburg & Andriessen, 2011), or geographic distance between network members (Glückler, J., 2013) are found negatively related with individual networking success that can reduce the knowledge outcomes. Among the gaps in the knowledge affiliated networking studies were also mentioned that less attention has been paid to intra-organizational knowledge network research compare to it micro and macro levels (Phelps, Heidl & Wadhwa, 2012), and towards sharing and protection of knowledge within teamworks (lvonen & Vuori, 2013).

2.3 Green infrastructure: exploring gaps for sustainable development

Rapidly growing interest in the green infrastructure (GI) issues from the side of the different disciplines of science. For instance, urban green habitats were mentioned as the refuges for biodiversity (Kantsa et al., 2013), green spaces also were discussed due to their important roles for the social dimensions like improving air quality, lowering noise, increasing mental health and reducing stress (Tzoulas et al., 2007; Azkorra et. al., 2015; Braubach et al. 2017; Honold, Beyer & van der Meer, 2015). Along with the scientific expertise side, there is a growing interest to the GI development from the policy side. For instance, growing the political concern about how to manage the development process that avoid conflicts due to nature conservation efforts (Kowarik 2011; Hosaka & Numata 2016), how to support an environmental justice (Jennings et al., 2012), and how to include the greenbelt policies into the urban development control plans (Siedentop, Fina & Krehl, 2016). Additionally, urbanization and densification bring comprehensive challenges due to disproportional land use and land cover, therefore environmental quality of well being is decreasing (Jennings et al., 2012).

Multifunctionality has been recognized as a main principle that promotes emerging concept of GI, and helps to proceed environmental, social, cultural and economic benefits (Madureira & Andresen, 2014). Thus, case study shows that enhanced multifunctionality in green infrastructure helps connect stakeholders, promote decentralized network with a co-evolving decision-making that increases that resilience in urban systems at multiple scales (Schifman, et al., 2017). In turn, some works indicate that multi-functionality, as a general tool in planning, is not a simple solution and demands critical and diversified approach. In particular, the GI concept will not come with benefits

and will not deliver multiple services without a long term investment and multiple compromising toward land use conflicting values, that in turn demands it implementation as integral parts of the urban landscape, as an entire system of connected spaces within an area or a region with a long term management (Sjödahl, 2016; Lindholm, 2017).

Scientists trying to find additional ways that bridge gaps between science-practice and policy to help the concept of green infrastructure work for the sustainability purposes. In particular, a major way has been seen in the application of ecosystem service concept into decision-making policies and practices that can enhance holistic understanding the decision-making processes complexity across different institutions involved in the managing of ecosystems and social–ecological systems (Derkzen, van Teeffelen & Verburg 2015; Alves et al. 2018). Therefore, a further challenge of GI planning has been seen in the movement from multifunctionality to multiple ecosystem services that requires knowledge from different disciplines, like systemic thinking and cross-disciplinary cooperation (Hansen & Pauleit, 2014). Additionally, has been highlighted the use of ecosystem knowledge will benefit by adding value to the decision making process, because "ecosystems thinking" will involve a variety of strategies of environmental decision makings and contexts (Haines-Young & Potschin, 2014). Despite the many advantages the ecosystem service approuch also has some limitations, e.g. difficulties for practical implementation that reduces it potential (Bennett & Chaplin-Kramer, 2016). Developing this topic further, has been indicated the insurance value of ecosystems, from the view of ecosystem services supply sequrity, can helps to cope with a multifaced disturbances and changes, and makes urban populations are less vulnerable (Green et al., 2016), and it can be achieved by keeping the management balance between supply and demand GI's ecosystem services from regional to urban level (Wang, Shen & Xiang, 2018). In contrust, some of studies did not prove that ecosystem service assessments contribute to a better decision-making, e.g. none of the case studies confirmed that use of ecosysten service knowledge was the main issue between policy options, while was admitted their influence on closer interaction between stakeholders (Dick at al., 2018).

2.4 Review on theories that investigate behavioral output and evidence-based decision making

Topic about individual issues that shape behaviors, intentions, attitudes and beliefs in the knowledge sharing is not well explored, however, there are a several major theories which can be used for this purpose.

The theory of Planned Behavior (TPB) was mentioned as one from the mostly used in the research related to knowledge sharing behavior (Matayong & Kamil Mahmood, 2013). The TPB is grounded on the three kinds of salient beliefs that named as TPB constructs: attitudes, subjective norms, and control beliefs. According to the theory (Ajzen, 1991; 2002), the more will be complementary Attitude and Subjective norms towards the Behavior, and the greater influence of the Perceived behavioral control toward the Behavior, individual's intention to perform a certain behavior will be stronger. In particular, this theory shows a good applicability in a different fields of social studies like environmental psychology. It is well recognized that actions that are environmentally friendly carry a positive normative belief, and by other words: sustainable behavior promoted as a positive behavior. For instance, the TPB used to assess knowledge–behavior relationship (Carmi, Arnon & Orion, 2015), pro-environmental behavior (Greaves, Zibarras & Stride, 2013; Ham, Jeger & Frajman Ivković, 2015) and sustainability (Schultz, 2002; Tommasetti et al., 2018). Along with that was admitted the theory also has some limitations. For instance, behavior is a result of a not linear decision-making process, and can change over time; along with that many other external factors like environmental or economic may influence a person's intention to perform a behavior (Sniehotta, Presseau & Araújo-Soares, 2014). The second popular theory that has been actively used as a research framework in the knowledge sharing process was the Self-Determination Theory (SDT). This theory relates personality, human motivation, and optimal functioning (Deci & Ryan, 2000). Thus, has been shown that values of people are different, therefore, motives and drivers to transfer knowledge are different (Gagné & Deci, 2005)**.** Along with that, if consider that intrinsic motivation to share knowledge becomes more important, this theory can help to explain the influence of different motivational factors on quantity and quality of knowledge that was shared (Yoon & Rolland, 2012). Other explanation of usefulness this theory grounds on the knowledge as a form of power, and therefore willingness to share information can be connected with motivation or cooperation to work. According to Muskat & Mair (2017), self-determination theory can explain three categories of motivation to transfer knowledge (amotivation, extrinsic and intrinsic motivations), and among the key barriers of knowledge sharing was mentioned a personal importance of knowledge sharing. Some of scholars even combined these two theories. For instance, a model of knowledge-sharing motivation has been based on a combination of the TPB and the SDT in order to suggest for future research and methodologies to study knowledge-sharing behavior (Gagné, 2009).

A big amount of literature has emerged around the issues about evidence-based decision making. Thus, known that evidence for policy development or practice of evidence based not only on the scientific research, while should be combined with other forms of information (Juntti, Russel & Turnpenny, 2009). Highlighted, the relationship between science and policy is not always results in the evidence-based decision making, it has a complicated nature and shaped by different actors or factors, along with that it plays an important role in three stages in the policymaking process like: policy agenda setting, formulation and implementation **(**Strydom et al., 2010). Problem with including scientific evidences, so-called as "uncomfortable" knowledge, into environmental policy decision making process has been highlighted in many scientific findings. For instance was mentioned that "uncomfortable" knowledge should not be excluded from policy debates, especially when dealing with "wicked problems" (Rayner, 2012), and as alternative has been suggested application of a qualitative analysis in the evidence based policy (Saltelli & Giampietro, 2017). In turn, scientists are also responsible for the successful incorporating of evidences into the policy decision making process. For instance, exist problem with scientific evidence like uncertainty, therefore scientists can not be very effective in dissemination of own findings (Horton & Brown, 2018). Along with that, many of other circumstances can also influence on the evaluation of scientific evidence, like political, cultural and social factors. According to the work of Baba & HakemZadeh (2012, p. 848), evidence-based decision making is a multi-level phenomenon expressed at the individual level, and it has been proposed that evidence assessed on the five dimensions: methodological fit, contextualization, replicability, transparency, and scientists and experts' unity.

3 THEORETICAL FRAMEWORKS AND CONCEPTS

3.1 Science policy interface from the conceptual view

The collaboration between scientists and policymakers is often referred to as the science policy interface (SPI). Science–policy interface was defined as social process which encompasses the relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making (Van den Hove, 2007, p. 807). The assumption of satisfactory functioning the SPI results in a beneficial implementation of scientific information into policy (Zulian et al., 2018).

As an example of theoretical framework for the science-policy interface possibly to consider the framework that was built in order to analyse of the sustainable water resource management (Morgan, 2014, p. 47). Due to that, a possibly to define different factors which influence the science within this network interactions with policy, and therefore understand and choose appropriate strategies for the interaction corrections (look at the Figure 4 below).

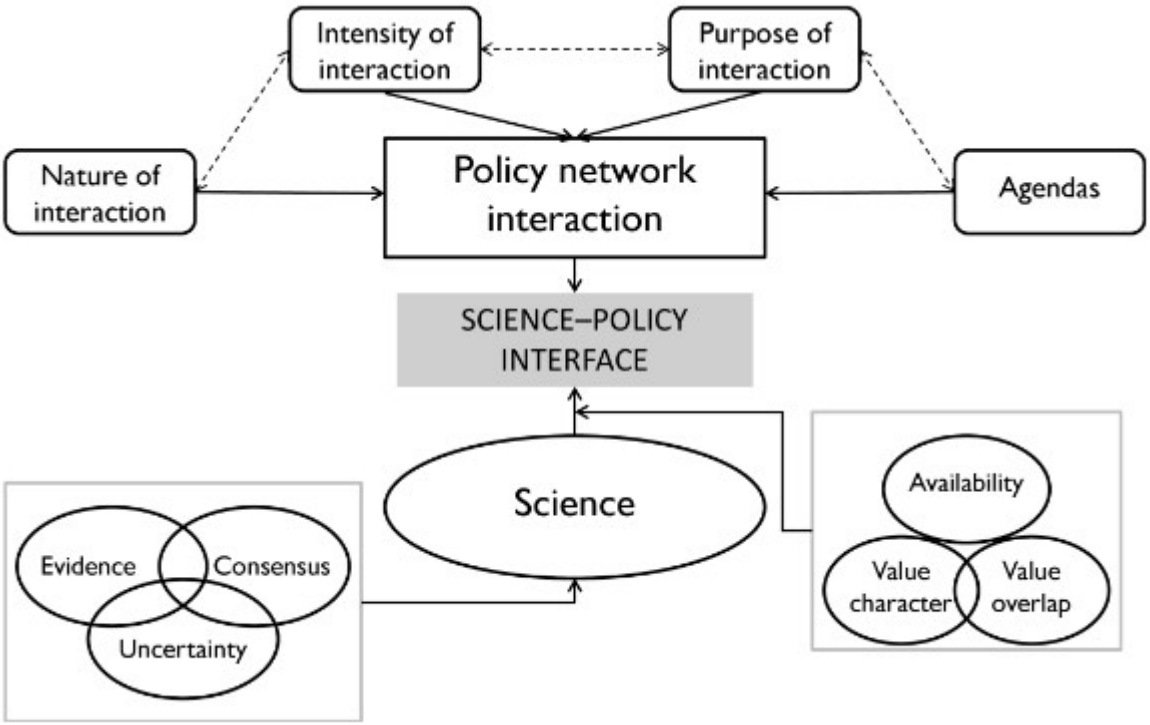

Figure 4: Theoretical framework for understanding the science-policy interface

3.2 Basic concepts of Knowledge management

Knowledge a major tool for the human civilization development , and was determined as "information in action" (O'Dell et al., 1998). Knowledge is a mix of evidence-based (scientific and technical) understanding and meanings-based understanding (experiential), that constructs a part of constructed knowledge systems in the decision-making process (Stoutenborough & Vedlitz, 2014). The Knowledge Management (KM) is a quite recent concept, elaborated and discussed intensively from the 1990s. It can be described as a process that promotes the flow of knowledge among individuals and groups within organization that combines several steps obtaining, storage, distribution and use of knowledge (Argote, McEvily & Reagans, 2003), or as a process of systematic organizing and managing knowledge processes, that include identification of knowledge gaps, acquiring and developing knowledge, storing, distributing, sharing and applying knowledge (Verburg & Andriessen, 2011), or by latest definition it is creation, transfer, and exchange of organizational knowledge to achieve a [competitive] advantage (Girard & Girard, 2015).

The basic feature of the knowledge management framework is the production of knowledge, while the success of KM program ultimately depends on the sharing of knowledge (Mårtensson, 2000), that indicates on the high importance of the knowledge sharing (Serban & Luan, 2002). In the literature can be find many terms are used to describe the process of knowledge sharing, e.g. dissemination, knowledge transfer, knowledge exchange, knowledge mobilisation or research utilisation. The term "knowledge sharing" is activity that include transferring and dissemination of knowledge, information and data at individual or organizational levels (Bartol & Srivastava, 2002), or it can be defined as a process by exchanging experience, understanding and skills among the stakeholders (Tsui, Chapman & Stewart, 2006). The knowledge sharing process is going the both directions, from the knowledge producers to it users and opposite, where...the main purpose is analyze a new knowledge or usage existing knowledge (Christensen, 2005, p. 4).

My study adopted and mixed a two conceptual frameworks toward access of the knowledge sharing process. The first was based on the understanding that knowledge transfer is not a linear or a cyclical process, and therefore it was presented as multi-directional model, where was identified five interactive components: Knowledge Research, Problem, Utilization, Interventions, and Context (Ward, House & Hamer, 2009). The second was grounded on the similar theoretical approach (Hart, 2013, p. 21), while it did not shows interrelations between components, and a model includes six aspects which should be considered for the study of the knowledge sharing process (look at Figure 5 below).

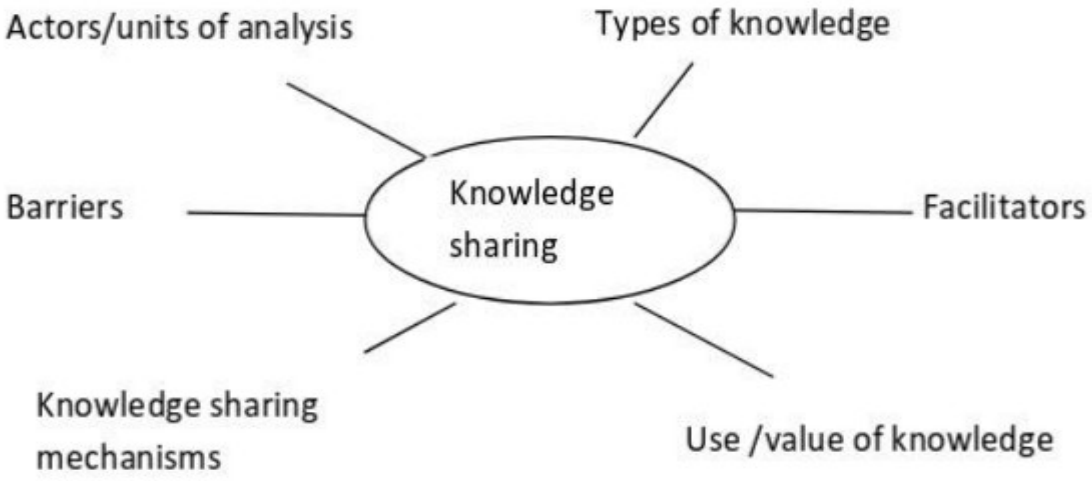

Figure 5: Knowledge sharing context and influences

The concept of knowledge networking emerges from the domain of knowledge management, and has become a very visible reality (Verburg & Andriessen, 2011). In the literature sources possible to be reveal a several definitions that give it a clear explanation. For instance, knowledge networking was described as studying and knowledge production activity which engage different "knowledge agents" (Bruun, Langlais & Janasik, 2005), or as a complicated "dynamic phenomenon" where knowledge are disseminated, created and produced (Skyrme, 2007). A considerable body of research can be found that describes conceptual frameworks and practical guides for assessing the knowledge network organization, like usage of a certain aspects of knowledge network properties, levels of the analysis or knowledge outcomes (Phelps, Heidl & Wadhwa, 2012, p. 1120). From this work I adopted and made some changes to the knowledge networking framework, a working version is presented in the Figure 6. Opinion about the major types of knowledge networks is varying. In particular, has been proposed to divide knowledge networks into a vertical production network, a horizontal learning network, and an innovation network (Pöyhönen & Smedlund, 2004). In turn other source recommends separate knowledge networks into strategic, informal, question and answer, and on-line strategic networks (Verburg & Andriessen, 2011). Additionally, were identified different forms of knowledge networking, like modular, translational and pioneer (Bruun, Langlais & Janasik, 2005), and formal vs informal knowledge networking opportunities (Allen, James & Gamlen, 2007).

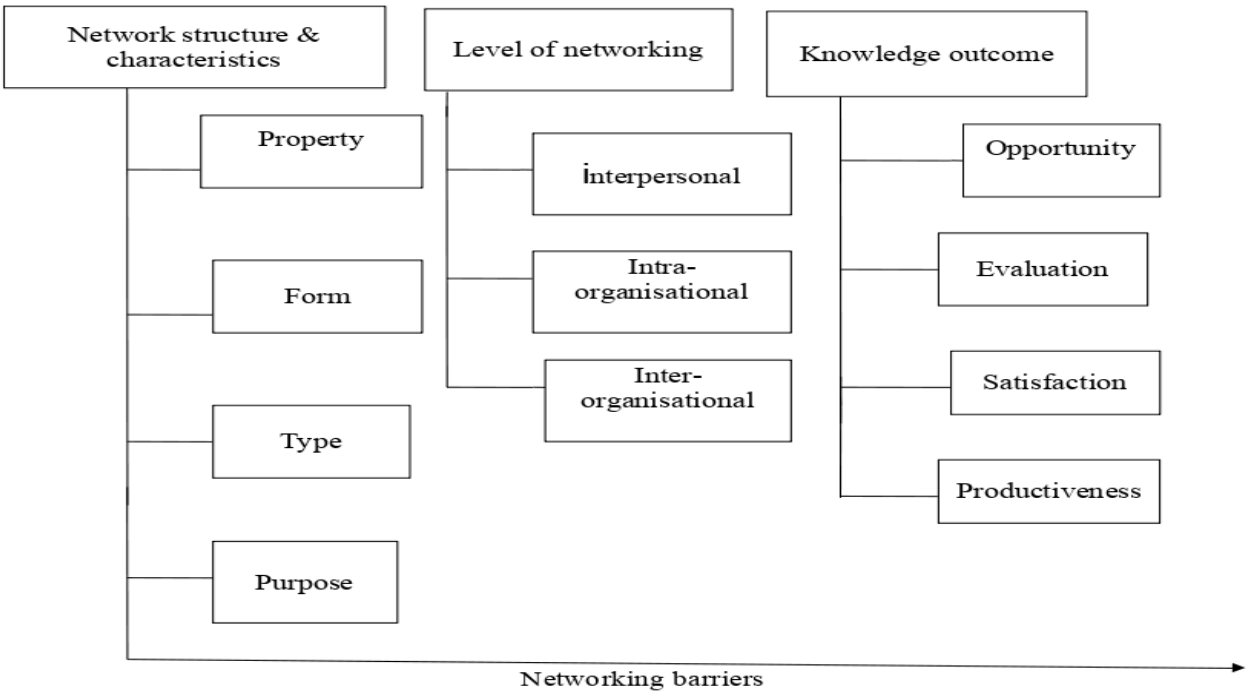

Figure 6: Organizing Framework for Knowledge Networks Research

3.3 A conceptual framework for assessing sustainable green infrastructure development

Definition of the green infrastructure varied over time, that can be explained by slightly different conceptualization because of it interdisciplinary background and by changes in perception that happen during moving humankind towards the sustainable development and quality of life. To give an example of concept evolution: “Green Infrastructure is an interconnected network of green spaces that conserves natural ecosystems values and functions and provides associated benefits to human populations...it is the ecological framework needed for environmental, social and economic sustainability” (Benedict & McMahon, 2002, p. 12). While over ten years later it sounds as: “Green Infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal, urban and rural settings) and marine areas” (European Commission, 2013). Along with that, Green infrastructure concept oriented on the sustainable and resource efficient development process that includes it operation at different scales, from local, metropolitan, regional, and national levels (Mell, 2010, p. 239). Author made a conclusion that without

application of such hierarchical planning system will be difficult reconsidering an evidence-based policy that reside decision-making processes (look at Figure 7 below).

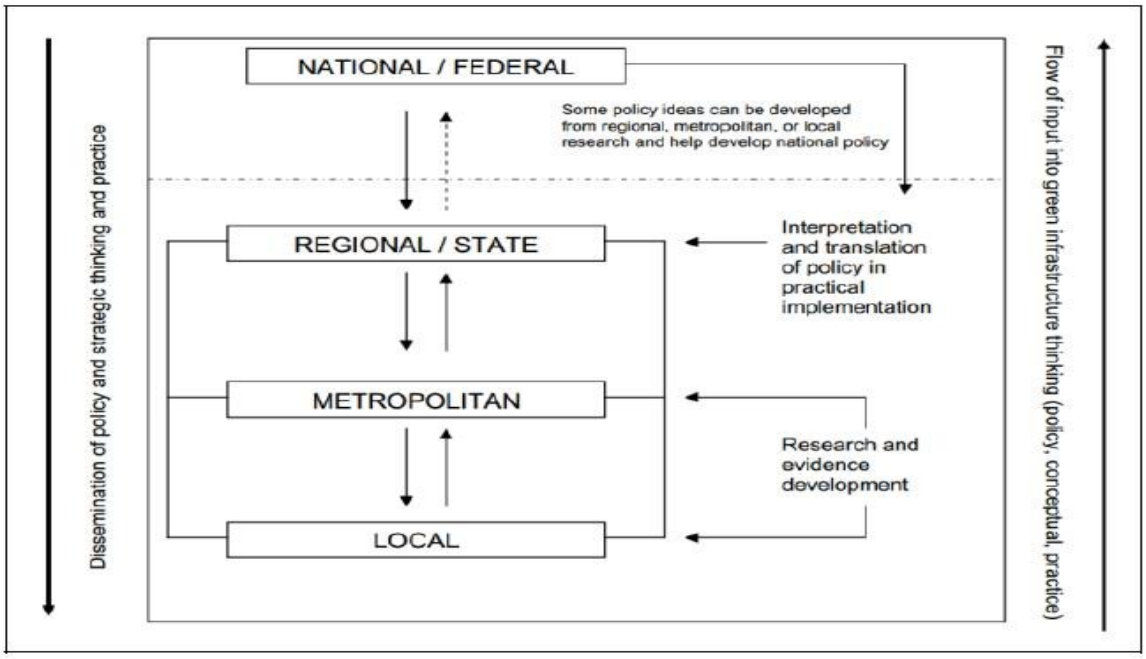

Figure 7: The desired structure of green infrastructure development

Interconnection network of green infrastructure at different scales demonstrates that rural areas have already become important providers of socio-cultural services for an increasing urban population (Bijker et al., 2014), and it allows take a holistic view at the concept (Zaręba, et al. 2016). Along with that, some of scholars making focus on the potential for small scale green infrastructure sites that attributed to the municipal level. Thus, a new concept of community-scale green infrastructure was introduced and described as a network for delivering relevant functions and benefits to the local level (Jerome, 2017). Other work advises to bridge the urban/rural dichotomy that capture the green infrastructure value more completely (Gren & Andersson, 2018).

The Convention on Biological Diversity (CBD) defines an Ecosystem Service concept as a "strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" Convention on Biological Diversity (2000). According to this, Green Infrastructure Framework has been proposed, that concludes five major blocks: ecosystem service, biodiversity, social and territorial cohesion, sustainable development, and human well-being (Lafortezza et al., 2013, p. 105). In particular, Figure 8 shows that each block

is directly or indirectly related to the others, by showing the interrelation between different functions and benefits.

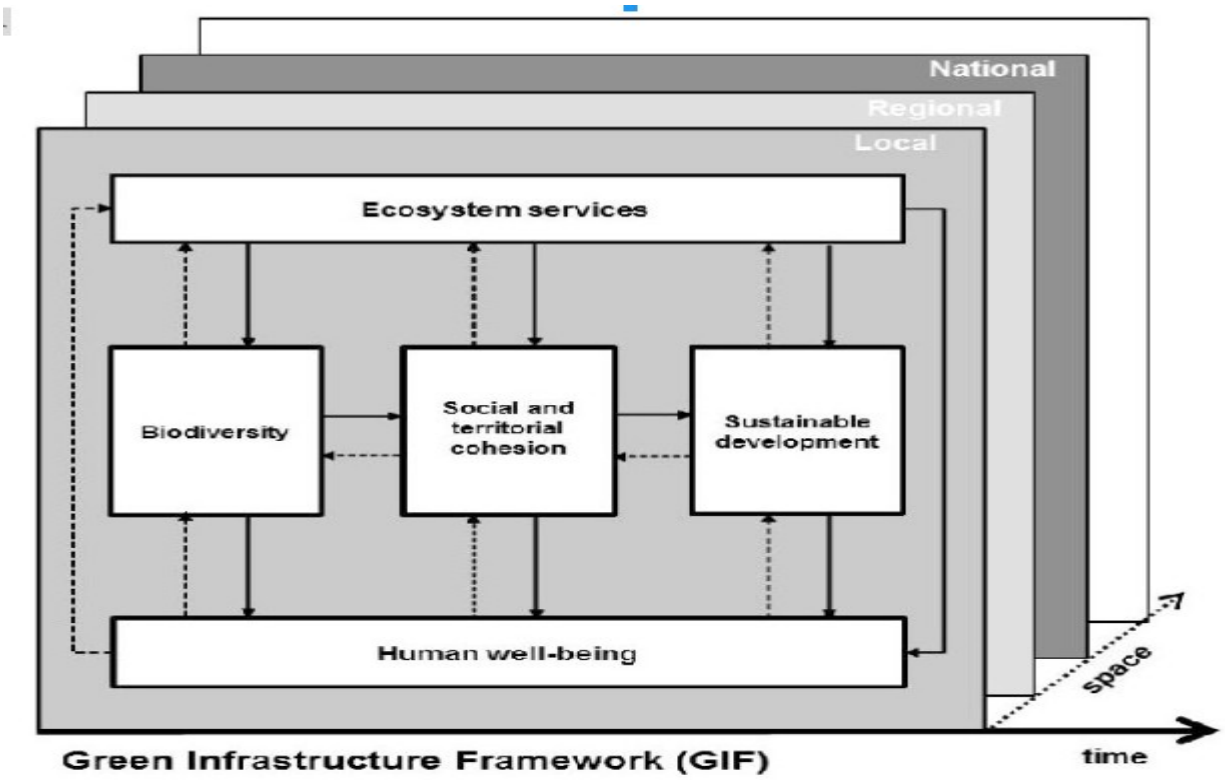

Figure 8: Modern view on the Green Infrastructure Framework

3.4 Conceptual framework of the Theory of Planned Behavior

The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), which explains the relationship between attitudes and behaviors within human action, with a time has been developed into The Theory of Planned Behavior (TPB) (Ajzen, 1991). The key component of the model is the behavioral intent, that influenced by three constructs as the attitude towards behavior, the subjective norm, and the perceived behavioral control. The last core construct of the theory has also indirect influence on the behavioral outcome, while behavioral intention has directly influence on it (Ajzen, 1991, p. 182). Along with that, all core constructs are interrelated. For each case core variables, as attitudes, subjective norms and perceived behavioral controls can be accompanied by a second set antecedent variables that get a better explanation of the theory on a practice.

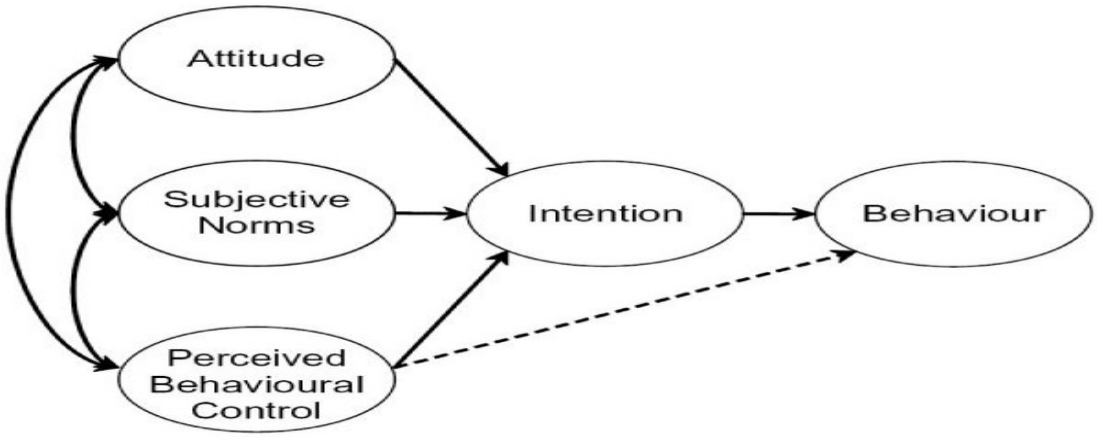

Figure 9: The Theory of Planned Behavior

Attitude itself can be described as a set of beliefs, feelings, values toward a certain object, person or event (Voas, 2014). Also, attitude determined as a result of experience, and therefore can has a strong relation to the behavior (Fazio & Zanna, 1981). Similarly, has been mentioned that comprehensive understanding of how personality and values impact motivation might lead to a greater understanding of the behavior as well (Parks & Guay, 2009). Subjective norm refers to an individual's perception of social pressures to perform or not perform the behavior (Ajzen, 1991). For instance, individuals concerned with what other people think and how other people behave, and due to that they may use such information in the deciding how to behave themselves (Rivis & Sheeran, 2003). Subjective norms can include two types of norms: social norms and descriptive. Social norms describe codes of behavior in a group of people, in turn descriptive norms are more connected with an individual willingness (Ham, Jeger & Frajman Ivković, 2015). Perceived behavioral control (PBS) is determined by the set of controls, the presence of factors that may facilitate or brake the behavioral performance (Ajzen, 1991), and it can varies depending upon situation or action (Wallston, 2001). Additionally, was mentioned that increasing knowledge alone does not help to change the behavioral outcomes in education very much, therefore appropriate management that directed to the several constructs (attributes, perceived norms and control) will be much effective (Ajzen et al., 2011). Behavioral intention refers to the motivational factors that influence the behavior, e.g. the stronger the intention to perform the behavior, the more likely the behavior will be performed (Ajzen, 2006).

3.5 Conceptual framework for the decision making

In the scientific community is a debate about the role of scientific knowledge for the policy making process. From the one side of view, knowledge plays an important role in the decision making theory, that grounds on beliefs and values. And, instead of looking at each of two cognitions separately, study of Marsh & Wallace, (2005) recommend focus on their inter-relatedness. The later work showed the relation between scientific knowledge and values was much weaker compare to the relation between scientific knowledge and beliefs, therefore linking science and decision making demands an additional effort...effort requires an understanding of the information need of the decision makers (von Winterfeldt, 2013, p. 7).

In the next work, values, rules and knowledge were described as interconnected systems that determine a decision process in environmental management systems (Gorddard et al., 2016). From the other side of view, no correlation found between the quality of science and the policy obtained from it (Choi et al. 2005). A little research has been conducted about the role of scientific expertise in policy-making where mentioned the differences between views of the participants, that gives possibility to generate a model between experts and policymakers (Hoppe 2009). Similarly to previous studies, work of Rose et al. (2017) indicates that scientific knowledge is only one factor from many others in the whole policy-making process. In a sum, a two models were elaborated for environmental science–policy interactions: (1) the traditional deficit-linear model, and (2) the round-table model (Soranno et al. 2014). The last model is becoming more popular because it is the most effective way to help scientists think outside the “deficit model box” and engage them into debating of the subject process (Pouliot & Godbout, 2014).

A 4S framework was presented (Dicks, Walsh & Sutherland, 2014, p. 608) that describes the relation between different means of presenting science for use in environmental decisions, and illustration of it has been shown below (Figure 10).

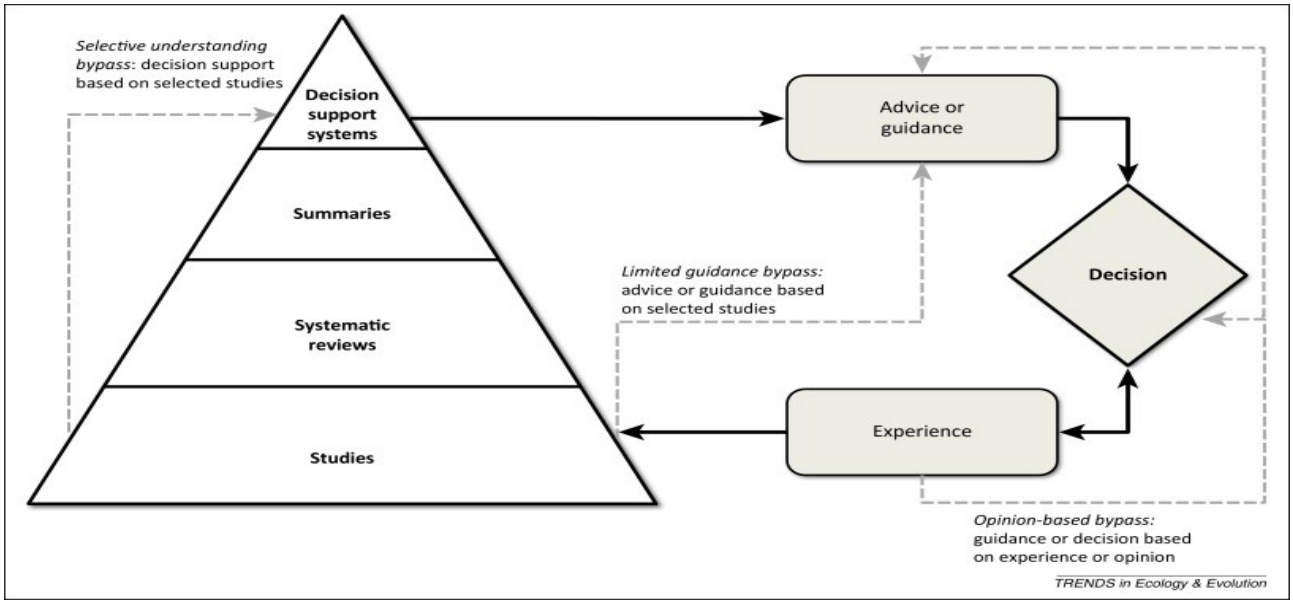

Figure 10: Schematic on how scientific information could feed into environmental decisions

It demonstrates how available science used in environmental policy and practice. Thus, triangle shows the number of items at each level that could feed into a given decision: started from primary studies, systematic review, summaries, and up to decision support systems that place the evidence into a decision-making context. This framework points that with each stage movement, primary scientific information becomes more reachable to decision-makers. Along with that, experience, advice, and external factors also influence the decision outcome.

4 STUDY AREA AND METHODS

4.1 *Description of the study area and delineating the major challenges*

The study area includes Akershus county and Oslo city, where the major interest focused on Bærum and Frogn, and Oslo municipalities. It is a central region of Norway, where urbanisation rate is increasing, while it is still rich by green areas, and therefore it is a major science-policy interface discussion zone towards developing and conservation issues. Three municipalities are differ by natural resources, density of population, and development, while they are separated by not a long distances, therefore possibly to conclude that will be influenced by similar processes of the developmental pressure with a variability level.

Akershus

Akershus county municilality (Akershus fylkeskommune) is a green belt that surrounds the capital of Norway, Oslo, that located in the East of Norway. The administrative center is located in Oslo, a municipality that is not part of Akershus. Oslo and Akershus make up one contiguous metropolitan area with 25 % of Norway's population. Large parts of Akershus are effectively suburbs for Oslo and also home to an important industrial and business districts (Wikipedia, 01.2018., para 1-3). Map illustrates Akershus location in Norway, and locations of municipalities within the county (Fig. 11)

Figure 11: Akershus county and its municipalities (Illustration: Stina Aasen Lødemel)

It is a known fact that Oslo and Akershus is characterized as an area with a very big diversity in wildlife and a part of the country with a number of rare species. Along with that, area under the big anthropogenic pressure due to urbanization processes and high physical intervention. In such situation green infrastructure should be considered as an important component for that supports diversity, mitigate climate change effects, and outdoor life in such metropolitan area. Along with that, a number of appropriate documents and plans were adopted in the area, where land use and planning strategies for municipalities are described with a long term perspective. In this work I will focus only on several of them.

The main objective of The Regional plan for areal og transport i Oslo og Akershus (2015) is to promote growth, competitiveness and sustainable development the Oslo region. The regional plan is

a management tool to promote territorial and economic integration in the Oslo region, that based on national sustainability objectives and negotiation process between the municipalities. Along with that, plan is binning up the complex questions, even some of conflicting topics for policy, governance and planning at various levels, e.g. how do municipalities of the region will combine different governance and plan strategies in the response to complex challenges that cross sectors, actors and levels?

Due to the Regional plan for innovation and new creation (Regional plan for innovasjon og nyskaping i Oslo og Akershus fram 2015 mot 2025), Oslo and Akershus should be one of the world's most sustainable, smart and innovative regions, which have a common strategic platform. Some of important strategies in the regional plan are: growth should take precedence over the protection of agricultural areas and regional green structure growth areas; protection of green structure and soil ruin areas should be prioritized outside the growth areas; concentration of growth must be developed with multi-functionality. Another important document is Forestry Strategy for Akershus and Oslo 2016-2019 (Skogbruksstrategi for Akershus og Oslo 2016-2019). In it the county has together with the Oslo municipality adopted regional plan for land use in Akershus and Oslo, which is dedicated to densified settlement and reduced use of agricultural area including forest. The strategy assumes the county municipality, as a regional planning authority, should makes a good balance of settlement patterns against the consideration of forest production so that as little as possible high productive forest going to production. Along with that, the county municipality has also initiated work on a regional plan for climate and energy, which is to be done rolling the county 's climate goals, and will helps to ensure that the agreed objectives are achieved (e.g. climate neutrality by 2050).

Oslo

Oslo municipality is municipality located in the inner part of the Oslo fjord. The municipality of Oslo borders the county Akershus, Buskerud and Oppland. The administration center is Oslo, capital of Norway, that has a population of 658,390 inhabitans (1,400 per square kilometer). The population growth of capital is 21% over the past 10 years, therefore it is considered as a one of Europe's fastest growing cities. The city is surrounded by the Marka Forest and the Oslo Fjord

(Wikipedia, 01.2018., para 1-2). Along with that, Oslo won the European Green Capital Award for 2019, and considered as Europe's environmental capital, on a top of the "green cities" list.

A big amount of Plans and Programmes that oriented on the sustainable development of Oslo municipality can be found, while our focus will be only on several. In particular, Oslo is surrounded by a large, mostly forest-covered area called The Marka Forrest. Since 2009, Marka has been safeguarded by the Marka Act (2009) to promote biodiversity conservation and provide many opportunities for recreation. The City of Oslo owns around 10% of the forest in the Marka, by promotion and controlling that it was managed in the sustainable way. For cities with larger green areas in close nearness, protection of Marka can be seen as an example of how cities trying to prevent urban growth, facilitate biodiversity increase, and promote a high standards of quality of life. Although, is difficult to predict and control a future situation, because of growing land use conflicts in near by municipalities, along with wildlife conflicts that have a social context.

Green plan for Oslo Municipality for the blue-green structure in Oslo's construction zone was adopted in 2010 (Grøntplan for Oslo Kommunedelplan for den blågrønne strukturen i Oslos byggesone). The main purpose of this plan was preserve and further develop the city's blue-green structure within the building area. The main background of it was a situation of strong population growth and densification. The plan states to promote a sustainable urban development within the city, help to preserve and contribute to urban development that grounds on the urban ecological principles. Along with that, it includes a several strategies, like utilization of the blue-green structure to gain better resistance to challenges and improve quality of life; application of different types of green areas, and ensure their good coverage and network. City ecological program 2011-2026 (Byøkologisk Progman) was adopted by the City Council in 2011. In that document points that the City of Oslo will focus on environmentally friendly and sustainable urban development with prioritizing the effort in the following focus areas: maintain and strengthen its blue-green structure, will contribute and cooperate for a better environment from regional, national to global scales.

Bærum

Bærum is Norway's fifth most highly-populated municipality that covers 192 km^2, it is Oslo's neighboring municipality in the west Bærum area. The center is located in Sandvika Due to the

Statistics central bureau, population of the area is 127 021 inhabitants (Wikipedia, 01.2018., para 1; SSB, 2019).

Bærum municipality regulate development processes on the base of area plan 2015-2030, that has been nicknamed "Green Urbanization" (Bærums arealplan 2015-2030 har fått tilnavnet "Grønn urbanisering"). The plan promotes population growth in the municipality, and provides guidelines for the sustainable area policy, e.g. restrictive regulations to densification outside the centers; and regulation toward Marka area, sea and green areas between them that protected against degradation. Special attention municipality pays the sustainable use and protection of natural resources. In particular, 15,000 acres of Bærum area are protected, either as landscaping areas or as different types of nature reserves. There are also adopted several important documents which are created and using for this purpose: Overview of nature conservation areas; Biodiversity and habitat types; Status of nature survey in the municipality.

The municipality pays a big attention to the status and development of the blue-green infrastructure of suburban areas. In particular, Bærum has a status of the green lungs in the residential areas, a lot of small horticultural and roof gardens over there, variety of green oriented programs are functioning, like about the protection trees in the municipality. Bærum is a fast growing area due to the population growth, and densification and urbanization processes are taking a power. Therefore, in order to support and continue to follow principles for good quality of life and high environmental standards, appropriate measures and regulation should be prioritized. For instance, Municipal plan 2017-2035 (Bærum, Kommuneplan 2017-2035), highlights that areal strategy is emphasizes on the securing free areas, e.g. a widely available blue-green structure in building zone, along with that, a large parts of the blue-green structure in Bærum are secured as a current area part. The municipality's vision is to create and support sustainability though the long term planning and due to balancing social development and green solutions.
municipality.

Frogn

Municipality of Frogn is a municipality in Akershus county, Norway, has 15 821 inhabitants and covers an area of 85 $km^{2.}$ Frogn is located at the southern part of the peninsula between the main Oslofjord and Bunnefjorden. It borders Nesodden, Ås and Vestby. The administrative center of the municipality is the town of Drøbak (Wikipedia, 01.2018., para 1; SSB, 2019).

According to municipal plan (Kommuneplan 2013-2025), the main priority areas for social development are: climate and energy, quality of life and public health, location development with good location qualities, and business development and value creation. Along with that, was mentioned the municipal development is based on cultural-historical values and green values, where the purpose of green structure is important connecting functions there. In the document also mentioned about conservation and biodiversity preventive strategies and regulations, including water bodies. Another important regulation document for the municipality is the Land use plan, (Tematisk Underlagsnotat Samfunnsdelen 2018-2030, Landbruk). In particular, this document declares Frogn is over 95% of the cultivated land arable area, means that soil is under constant pressure from erosion, water runoff, agricultural pollution. Therefore, its demands appropriate planning of preventive measures, e.g. water management, protection and ecological restoration. Along with that, Frogn has high amount of productive forest area (50%), that also demands regulation for the sustainable forestry from the municipal side.

Identification of governance problems in the area

Norway is among countries where increasing interest and opened discussion about benefits of urban development and regional land use planning, that should include perspective towards the future green infrastructure planning and developing. For instance, study of Falleth, Hanssen & Saglie (2011) describes a wide public discussion concerning physical urban planning, and concludes that direct contact with politicians is an important link through which the community can be involved in the planning process. In other work, on example of Oslo investigated to what extent the protection of urban green infrastructure is considered as an important factor for the urban development (Falleth & Saglie, 2016). Community of scientists also joined to the discussion about problems and advantages that come along with urbanization processes, and what should be recommended toward the sustainable environmental governance in the area. Known that in Norway was a quite long tradition for the low urban density (Næss, 2014), while later density has been incorporated in the

policy as an essential characteristic of the Norwegian sustainable city, by defining that will grant environmental friendly life style and will reduce of the carbon footprint (Hernandez-Palacio, 2015). However, author highlights that increasing density leading to the two risks: decline of urban people's quality of life, and growth of gentrification and social inequalities. In turn, author highlights that increasing density leading to the two risks: decline of urban people's quality of life, and growth of gentrification and social inequalities. Similarly, was mentioned that during long time urban densification will lead to a weakening of sustainability (Næss, Saglie & Richardson, 2019). Other work also agrees with the previous conclusions, by indicating the current policy to increase density even more demands attention and regulation, where the green structure is a value element for the sustainable urban development, and along with that pointing on the importance of densification policy and preservation of green infrastructure outside the urban areas. Authors explain this issue by a weak traditions of green infrastructure planning especially among the small municipalities (Halvorsen Thorén & Inger-Lise Saglie, 2016).

Problems with regional land use planning and regulation also identified in the area. In particular, was mentioned that will be more easier to achieve a balanced development, where the capital city region was accepted as a one region and Akershus county does not lost it regional identity as well (Haga, 2014). Also has been determined a strong connection between urbanization processes and conversion of farmland. For instance, indicated that such areas under significant pressure for continued land taking, and challenges should be focused on the preservation of farmland in land-use planning from the sides of research and policy (Skog & Steinnes, 2016). Further study showed the conversion of farmland to built-up land can discourages future food supply systems and other ecosystem services, therefore recommends use a more restrictive land-use planning along with implementation of agricultural policies and land-use planning linking strategies (Skog, 2018). Another important aspect in environmental governance that get attention of Norwegian scientific community is decentralisation issue, and related to it problems. For instance, based on a legal instrument the local management authority was established for the managing protected areas. However, findings indicate that instead to decrease tensions between property owners and management authorities, this reform revealed a bigger focus of local authorities to fulfill their own needs and interests compare to the achievement of national conservation goals (Falleth & Hovik, 2009). The major weakness of the reform has been seen and in the limitation of regulatory and institutional frameworks between municipal, regional, and up to national levels, that brings the longer-term risks of the reform (Fauchald & Gulbrandsen, 2012). In addition, found that a larger

number of local politicians in Norway are involved into the environmental management issues, and it supported by the decentralization reform as well (Hongslo et al., 2016).

4.2 Research design and strategy

The main purpose of a research design is to apply a variety of methods, strategies and sources to understand of the complex issue through detalization of much smaller components along with their relationships that effectively investigate the research problem (Leedy & Ormrod, 2012). According to many references that were mentioned before, scientific knowledge is considered as an important factor in environmental policy-making. Therefore the goal of this study is to gain knowledge upon science-policy interaction: problems they address, what objectives and strategies are used, what stimulate their mutual work in the light of the knowledge sharing in the area of green infrastructure. The Research design of the study has been shown in Appendix 1. The figure also provides a schematic overview of the methodology employed. Detailed description of certain steps, especially that focused on sampling procedure, collection and analysis will be described further in the text of this chapter. Along with that, Figure 12 presents a conceptual framework, which I used for assessing the SPI relationship with a main focus on the knowledge management processes.

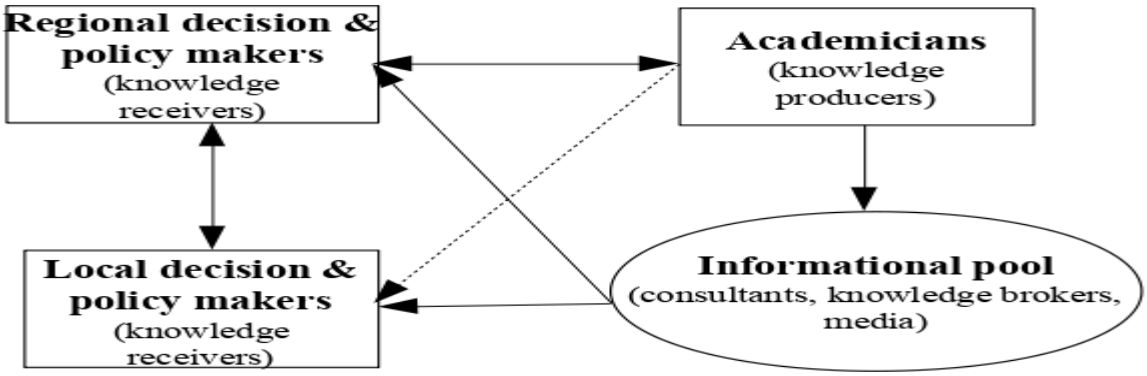

Figure 12: Conceptual framework for the SPI research

Two sub-groups of actors were involved into the study as regional and local decision makers. In turn, academicians were presented by scientists and researches as a one group. On the scheme interactions due to the knowledge sharing process between the actors have been indicated by arrows: mutual, as a two way connection or a particular focus as a one way connection. Additionally, relation between academicians and local decision makers was highlighted by dash

line, that indicate on weak or indirect connection of the passing knowledge sharing process. This scheme was built by author, and was grounded on the personal observation and literature review.

4.3 The major actors and their representatives in a study

Policy making is an area of management that involve formulation, guiding and proceeding managerial decisions, e.g. describes decision making in organizations. In an Encyclopedia (Kaliski, 2009), mentioned that the term of "Policy making" became more broad and now describes the development of organizational policies and at the highest levels policy making is an important element of the organization's strategy, while at lower level it has more operational in nature. In our study this definition was applied for the local (kommune) and regional level policy makers who are dealing with environmental governance and planning. Due to the focus of the study on Oslo and Akershus county, in this category also included the decision makers in the city.

By definition from Çaparlar & Dönmez (2016), the research is "... systematic collection, interpretation and evaluation of data..." where the main objective is contribution to a science. By more general view, scientist/researcher is a person who organises and conducts the research, very often they combine teaching and research activities. Therefore representatives for the study were identified as a one group, academicians, and were collected from the university/college sector, along with the public and private research agencies/foundations that located inside the area of interest. Along with that, for the reserch were engaged representatives of natural and social science backgrounds, because of interdisciplinarity of the topic, and possibility for the different opinions (Persson et al., 2018).

Both groups of actors were chosen for the analysis on the background of their relationship with environmental governance issues or studies that directly or indirectly might influence the green infrastructure management, development and future planning. Along with that, were identified five categories of stakeholders in the area that have been used for the construction of questionarre, like political actors, bureaucratic actors, special interests actors (e.g. developers), general interests actors (e.g. civic) and experts (e.g. scientists) (Armando, Buzzacchi & Morena, 2016).

Summarized data presented as the Lists of science/or research establishments (Appendix 2) and policy/ or decision making establishments (Appendix 3) that were used for sampling in the study.

4.4 Data collection and sampling approach

The non-probability sampling technique was applied for this study, because of limitation in a time and other organisational issues. In order to determine participants were used three sampling techniques: snowball sampling, convenience, and criterion sampling. Initial academicians for this study were identified through a review of published literature. Selection criteria for their identification were: (1) involvement into enviromental governance or green infrastructure research; (2) practice of knowledge networking and sharing; (3) presence of an experience in the field, that gives time to develop characteristics of an expert; (4) variety of seniority and gender (Fazey et al. 2014); (5) having a certain amount of cross-sector experience (science vs policy) (van Enst, Driessen & Runhaar 2017). The major selection criteria for the desicion makers identification were much similar, plus their ability influence on the policy (level of power). In total were sampled 40 academician and 23 desicion maker (15 regional and 8 local).

The empirical data for this thesis has been collected though semi-structured in-depth interviews with participants, and this method was chosen because of the complexity of knowledge sharing processes, and gaining more qualitative information (Richards, 2014**)**. Interviews were conducted face to face, without type or video recording, only with hand-made notations, and lasted from 45 to 60 minutes. Prior to the interviews, all of the interviewees were sent the Request for participation in research project (Master thesis). Appendix 4. All interviews were conducted within two month period: from middle October till middle of December 2018. Before the real interview started, a pilot interview test was conducted. Collected interviews and notations were transcribed into computer software (Word and Excel). After that, data were transcribed and were examined by Qualitative Content Analysis (Mayring, 2014).

Closed-ended and multiple choice questions were selected for an interview. The purpose of them give possibility of respondents select more than one options from a list of answers, that helps to explore in-depth their opinion toward the area of study (Hakim, 1987; McLeod, 2014). The revised research questions were turned into a semi-structured interviews. The Interview guide (see Appendix 1), consists of five sections of questions: (1) Background and personal details; (2) Knowledge networking process; (3) Personal believes, values and attitudes; (4) Knowledge sharing process; and (5) Science-policy interface. Each of section will be discussed firstly as independent area of the research and then, will be discused collectively to show the relationship between them.

Along with that, Interview guides have similar and different questions for respondents, including some particularities for the local decision makers that based on a description of the current green infrastructure status. Samples of questionnaires for academician' group, regional and local decision makers sub-groups presented in the Appendix 5.

4.5 Data analysis

Mixed method research has been applied to the current study, and it has been determined in the accordance to the research questions of the study. A mixed method approach characterizes by the combination of qualitative and quantitative methods, and help overcome some limitations and evaluate maximum perspective at different levels of analysis (Abowitz & Toole, 2009). Along with that, the Concurrent Triangulation Design has been adopted, that gives possibility to collect qualitative and quantitative data concurrently in one phase, and to analyze data separately and after make data comparison or combination (Schoonenboom & Johnson, 2017).

Known that Qualitative methods focus on the explanations of outcomes, processes, or on understanding phenomena and cases (Bryman, 2006), therefore for the study have been applied descriptive and content analyses. Such approaches were used in order to report general background of respondents, and to describe behavioral characteristics of them that help to make judgments of the probability that an observed or provide multiple contexts for understanding the role of actors in SPI. Therefore, descriptive statistics can provide a quite powerful informational summary, along with that gives characteristics for each of the variables in the study. In particular, for continuous variables of the research were reported the measures of central tendency (mean) and measures of variability or spread (standard deviation), while for categorical variables, were reported the number of participants per category and associated with it percentage. The purpose of content analysis is to organize and make data more valid by interpretation by coding the special topics of interest (Elo et al., 2014; Bengtsson, 2016).

The main focus of Quantitative analysis is to increase the validity by statistical patterns, that make quantification and comparisons (Bryman, 2006), and it has been used in the study in order to test applicability of the TPB models. In particular, objective of this research aimed to identify the variables able to guide actors towards the choice of knowledge sharing behavior through the conceptual extension of a theoretical model known as Theory of Planned Behavior (TPB). For this purpose TPB tested in order to predict two behavioral outcomes of actors: (1) knowledge sharing

behavior from the side of academicians and (2) evidence based behavioral practice from the side of decision makers. Data from the Appendix 6 give an overview of the variables which will be used for the further analyses. In order to test theory, core variables with an appropriate antecedent variables inserted into a two models, for two groups of actors, where Dependent variables were Intentions and Predictors were core constructs or antecedent variables of the model. The Spearman correlation coefficients were calculated. For an easier targeting the objective and proceed the whole design, the main hypothesis for testing was divided on smaller tasks: Hypothesis 1-3: the core TPB constructs (attitudes, subjective norms, perceived behavioral control) would significantly predict intentions of to engage in the behavior; Hypothesis 4: the core TPB constructs would significantly interrelated; Hypothesis 1-3 (a, b, c): Antecedent variables affect behavioral intention via associated TPB constructs; and Hypothesis 5: extended variables would have additional effects on the intention to behavior or other core TPB constructs (as shown in Appendixes 7 and 8).

The Behavioral intentions of respondents were assessed by the two variables: Effectiveness of knowledge sharing and Effectiveness of knowledge transfer. The intention was measured by using a 5-point Likert scale ranging from a Very rare till Always. In order to assess a such core construct as Attitude, an overall evaluation of the SPI from was selected. In particular, if the respondents from both groups experienced with the area of a common interest (environmental governance), person's attitude will be considered more beneficial to the particular behavior if person's believes will meet expectations, and therefore the SPI evaluation will lead to positive outcome instead of negative. Specifically, a 5-point Likert scale was used in the questionnaire ranging from 1 (a poor level) to 5 (an excellent level). The Subjective norms, that analyzed from the perspective of expectations whether an individual should or not be engaged in the behavior, were assessed through self motivation factors or descriptive norms. And, accordingly, for the study have been chosen two variables that show how actors perceived descriptive norms, e.g. perceptions about how they willing to behave. In a case of academicians has been picked up Willingness to share own knowledge, that describes willingness or an extent to which an individual is ready to give other individuals access to an own intellectual property. For instance, work of Eriksson & Börjesson (2014) highlights that individuals' willingness to share is the most important and connected with organizational culture. In turn, in a case of the decision makers, has been chosen Willingness to convert scientific evidences into policy. Subjective norms were measured by a 5-point Likert scale from Highly negative to Highly positive. A final core construct for the testing, the Perceived behavioral control, a barrier that can limit ability of respondents to perform the behavior, has been assessed though different variables. In particular, for academicians, which are known by their prominent role as the

knowledge providers, the Amount of publications has been selected. Accordingly, for decision maker's behavioral control and their ability to turn gained knowledge into power, amount of reading has been taken as the Reading capacity. A 5-point Likert scale was used in the questionnaire ranging from 1 (Little) to 5 (Extremely big) level.

Additionally to the core construct variables, antecedent variables for the model testing also have been determined. For instance, in order to assess orientation value for environmental governance, three pairs of items were designed to explore the extent to which an individual holds a particular value oriented attitude towards the GI benefits, like ecological, economic and socio-cultural benefits, which planned to be assessed though measurement by a 5-point Likert scale from Very low to Very high. This choice has been supported by other studies indicated that policy programmers should promote sustainability behavior (Font, Garay & Jones, 2016), and it should be formed on knowledge about social, ecological, economic, and cultural benefits (Tommasetti et al., 2018). Subjective norms that represented by descriptive norms for academicians, will be aseesed through three items as follows: (1) willingness to communicate and collaborate, (2) willingness to gain an additional knowledge, and (3) willingness influence on the decision making. In particular, willingness to communicate was mentioned as the most basic intention toward communication along with a person's willingness to initiate communication (McCroskey, 1992). In turn, Descriptive norms for decision makers will be measured through three items as follows: (1) willingness to communicate and collaborate, (2) willingness to gain an additional knowledge, and (3) willingness to share an experience and information. On practice, respondents from the both groups indicated, by using a 5-point Likert scale (Highly negative to Highly positive), the extent to which they willing to do a certain issues with other actors. The Perceived behavioral control has been assessed though Sharing mechanisms, Productiveness of knowledge networks and Communication capacity for academicians, or through Knowledge related sources, Productiveness of knowledge networks and Communication capacity in a case of decision makers. These variables can be a serious background for assessing effectiveness and efficiency of knowledge sharing or gaining. All variables were measured by a 5-point Likert scale.

Many external and internal factors can facilitate or decrease performance of knowledge sharing or adapting of evidence based decision making. For instance, younger individuals tend to collect more knowledge than they donate, whereas eager people donate and collect in equal degrees (Van den Hooff & Hendrix, 2004). It has been hypothesized that these variables can have relation to mediating or moderating influence on the relationship between the core constructs, and possibly

directly on the behavioral intention. Therefore, an original TPB model has been extended in order to test this hypothesis, and ten additional variables have been tested like Education, Gender, Age, Experience with policy or with science, Work experience, Nationality, Membership, Reward, Density of networks, Familiarity with ES concept and Efficiency in sharing.

4.6 Validation and reliability

Reliability and validity are very well known issues which indicate on the research quality, e.g. reliability indicates on the replicability of results, while validity measures an accuracy of results. These concepts especially were important in the quantitative research (Heale & Twycross, 2015), while they are recognized in the qualitative research as well (Leung, 2015). Also, highlighted that validity and reliability are changing of their meanings through the qualitative perspectives of establishing the truth (Golafshani, 2003).

Validity can be divided to internal and external criteria. Internal validity indicates the degree of trustworthiness in the research. Th current study definitely has some implications towards the overall validity of the results. In particular, among internal validity need to mention about some potentially relevant and important variables towards knowledge sharing that were not used for the study, e.g. complexity of the nature towards knowledge sharing processes possibly is not evaluated from the different angles. The discussion about external validation of the study is much more deeper if look at size of samples and possibility of generalization. For the study has been used non-probability sampling technique, convenience samples, therefore results can have a limited accuracy or sampling error, and difficulties its generalization to a larger population. While some of studies indicate that in a social research should not be a big focus on a problem with non probability sampling technique that does not represent the population well (Luborsky & Rubinstein, 1995). Similarly, was mentioned that due to qualitative approach in the study, generalization to a bigger sample is meaningless, because this approach focuses rather to provide a rich contextual information, e.g. by suing in depth study of particular case (Polit, & Beck, 2010). Additionally, The Central Limit Theorem (CLT) shows that even when a population is non-normally distributed, the distribution of the “sample means” will be normally distributed when the sample size is 30, and it gives us possibility to conclude the sample size for academician group was quite valid (40 respondents), while, for decision makers group was much less and considerably reduces validity of the study (23 respondents).

Reliability is the degree to which possibly to produce the stable or consistent results, therefore can be a major concern in a social study about a behavioral response or as a measure of the response stability (Drost, 2011). In this study the meaning of reliability can be applicable because of research on the behavioral response of individuals, e.g. behavior is not a static process that influences by many internal and external factors, therefore difficult to obtain the same results. But, in the study was applied several approaches or strategies that helped overcome some of barriers. In particular, it was a mixed method research, with in-depth interviews, that gives some flexibility to respondents in a behavior. Along with that, the process of knowledge sharing and adoption as an action of individuals have been conducted in order to develop a better understanding of this process works in real conditions.

4.7 Research ethics

Ethical principles and autonomy are highly important to qualitative social research, such preventive measures avoid causing harm to respondents, along with that allow to develop more trustful relation between respondent and interviewer. In that point will be significant pay attention to reflexivity in the research, e.g. how knowledge is gained and how knowledge is produced (Guillemin & Gillam, 2004). Ethical considerations can be seen as a protection of the privacy of respondents, and as sustaining a certain level of confidentiality of the research data, that include voluntary participation, transparency, and anonymity of respondents (Bell, Bryman, & Harley, 2018).

Prior conducting the research, I applied for an approval towards the NSD office. Additionally, confidentiality was applied throughout the research. In particular, respondent's names were known only to me and my adviser, and were referred to by number codes once the data was systemized into Excel. After the conducting the research, all data plan to be destroyed that dismiss the potential possibility for personal identification. In the thesis the citations of interviews were given a short identification with a number, e.g. A1 (academician, interview 1) or DM2 (decision maker, interview 2).

4.8 Limitations and strengths

Among the methodological limitations of research in literature often have been mentioned the following: cognitive limitations and behavioral biases of respondents, and distribution of respondents (Kørnøv & Thissen, 2000); lack of significant amount of open-ended questions (Saunders et. al., 2001); small sample size and different language (Price & Murnan 2004), along with the researcher's bias (Becker, Bryman & Ferguson, 2012).

There are several strengths and limitations of this study that are important to mention. Firstly, in regards to the sample, the sample size and technique can be be improved. Sample of decision maker group could be more representative, but due to a low response was minimized. Secondly, was limitation in time, therefore was an issue how to balance between time for the research and time for the collection of interviews. Thirdly, questionnaire could be more unstructured towards some issues that include more personal opinions. Along with limitation of the study possibly to mention a loosing some information because of only hand writing notes allowed during interviews. Among the methodical limitations possibly to mention the following. The extension TPB models have limitation for the testing of Subjective norms, e.g. only descriptive norms were introduced, while social norms are missing. Some finding has indicated importance of social and personal norms in explaining intentions (Doran & Larsen, 2016.). The TPB-based model also shows a severe limitation in the intention ability to predict actual evidence based decision making collected from the knowledge produced platform only And this point was supported by other findings indicating that successful practical background for EBDM should be constructed from all forms of evidence that shape knowledge systems in the decision-making process, not only the scientific evidences (Tsui, Chapman & Stewart, 2006; Gorddard et al., 2016). A strength of the study is that the interviews conducted were in-depth and provided extensive data, while mixed method design helps to use triangulation and increase the validity of results. Along with that in the study used different types of questions, like with multiple choice questions and Likert scale questions that enrich the data.

5 RESULTS AND KEY FINDINGS

5.1 Qualitative analysis

In order to report personal characteristics of the two major groups of respondents, along with the processes that surround their interactions, were used elements of descriptive statistics. Because of descriptive statistics describes the basic features of the data, its also can give a behavioral description of the sample data, therefore can helps us to make judgments of the probability that an observed. In summary, descriptive statistics can provide a quite powerful informational summary, along with that gives characteristics for each of the variables in the study. In particular, for continuous variables of the research were reported the measures of central tendency (mean) and measures of variability or spread (standard deviation), while for categorical variables, were reported the number of participants per category and associated with it percentage. The summary of statistical results can be found in the Table from Appendix 9.

5.1.1 Comparison of background and professional characteristics of actors

Academician's group

An average age of the sample was 50.65 years (SD=10.49) with a specter of variation from 34 to 72 year old. More than half (60.00%) of the sample were males and Norwegian. Participants with a highest educational background (PhD) over-represented in this survey sample (92.5%), and a natural science background was a dominant (42.5%) compare to social science (30.0%) and mixed science backgrounds (27.5%). Working position categories of the sample were different, but the majority have had a position as a Professor at university or college level (32.5%). The experience with an advising in environmental governance have had less than half participants (45.0%), and experience with advising was focused on the national and sub-national levels, accordingly 30.0 % and 22.5%.

Analysis of the main characteristics of the respondent's work showed a variety of elements they are working with. In particular, as the major elements were indicated the followings: landscape (75.0%), green spaces (65.0%) and water (35.0%). The main processes in which respondents are involved during the fulfilling the tasks were mentioned the followings: education (60.0%), planning

(40.0%), evaluation and governance (37.5%), management and conservation (35.0% and 25.0%). The main focus of respondents work was described by the certain areas of environmental governance and management like: climate change adaptation (67.5%), quality of life (42.5%), small green spaces with multiple benefits (35.0%), biodiversity (30.0%) and mobility (27.5%). Results of the data indicate that all participants (100%) were involved into the research project activity at different levels but with a predominance of the national level activity (65.0%). Over the half of respondents (65.0%) were experienced with Environmental governance for more than 10 years, while only over quarter (32.5%) were experienced with Green infrastructure, in addition there was a high number with uncertainty answering to the question (27.5%).

Over the half of academicians were members of some an environment friendly organization: 52.5%. Among the most common were mentioned some of Norwegian organizations like Norges Naturvernforbund (Friends of the Earth Norway), Frognmarkas Venner, La Naturen Leve (LNL), Framtiden, Habitat Norge, Grønn Hverdag and The Norwegian Animal Protection Alliance (NAPA), while among the sub-national organizations were mentioned like Greenpeace, World Wildlife Fund (WWF), Wildlife conservation society, The International Water Association, The Intergovernmental Panel on Climate Change (IPCC).

Decision maker's group

An average age of regional decision maker respondent was 49.93 years (SD = 9.11) with a variation from 30 to 64 year old, while for a local decision maker representative was 48.62 years (SD=5.85) with a variation from 41 to 58 years. More than half of the both sub-sample respondents (60.3% and 75.0 %) were females and Norwegian. Participants with a Master degree education over-represented the sample (87.1% and 100 %). Working position categories of the sample were different, for instance, the majority of a regional policy making positions were mentioned as a Senior Adviser and a Senior engineer (40.2%), while over the quarter of local policy making positions were as a Planner (37.5%). The previous experience with science or research have had over the half of regional decision maker representatives (53.6%), and only minority of the local representatives (12.5%).

Analysis of the main characteristics of the respondent's work showed the dominance of certain elements was similar within the group: landscape (86.7% and 75.0%), green spaces (66.7% and 62.5%) and water (53.6% and 62.5%) for the regional and local sub-samples, respectively. The main

processes in which respondents were involved during the fulfilling the tasks of work were different. For instanse, planning (73.3%), management and governance (46.7%) were quite high frequencies among the regional sub-sample respondents, while conservation (62.5%), management and planning (50.0%) were more often mentioned among the local ones. Focus of the regional decision maker's work was oriented on the three major areas in the governance: water and storm water management (53.6%), climate change adaptation and small green urban spaces with multiple benefits (33.5% each), in contrast, major focus of the local decision maker's work was on the quality of life (62.5%), biodiversity conservation and mobility (50.0% each). Results of the data demonstrated that regional sub-group was more actively involved into the research project activity at all levels (87.1%), and especially at national and sub-national levels, while only over quarter (37.5%) of the local sub-group was participated in such activity with a predominance of the local level research. Experience with environmental governance among the both tested sub-groups showed the predominance of more than 10 years category (53.6% and 62.5%).
Additionally, less than half (40.2%) of regional respondents have had more than 10 years experience with the green infrastructure, and only over quarter (37.5%) of local sub-group characterized either less than 5 years or more than 10 years experience. Some of the group representatives demonstrated even uncertainty to the answer on these questions as well (up to 20.1%).

The majority of the local decision makers (62.5%) were a member of some environment friendly organization, while only 40.2% of the regional representatives were in the member relationship. Among the most common was declared a membership in majority of national Norwegian or international organizations which were described before, while among an additional possibly to mention such as Jordvern and Oikos.

5.1.2 **How do scientists and decision makers involve in knowledge management processes?**

5.1.2.1 *Assessment of the capability of knowledge networking*

Academician's group

Detailed analysis of the knowledge networking characteristics demonstrated a certain particularities among respondents toward level and density network, form of network and other features that bring actors to the process. In particular, results showed that the majority of tested were involved into intra-regional, inter-regional, national and sub-national knowledge networking (from 95.0 up to 100%). Along with that was found the density of network was different: on average it was the highest for sub-national networking – 35.250 members (SD=28.71), after followed intra-regional and inter-regional networks – 21.925 ± 14.068 and 11.650 ± 10.521, and the lowest national was network density was – 9.150 ± 6.129.

Academician's group possessed different forms of networking, where formal and informal forms were dominated (100% each), while the strategical was mentioned only by over the quarter of respondents (35.0%). Among the most prominent knowledge sharing and networking platforms among academicians can be named the followings: ResearchGate; the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES); The System of Environmental Economic Accounting (SEEA); Networking platform devoted cultivating urban public spaces for human flourishing and sustainability transition in Norwegian cities; Global expertise on green bonds that was established and led by CICERO; The Expert Network on Second Opinions (ENSO); The European Urban Research Association (EURA); and The United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation (or UN-REDD Programme).

The survey also demonstrated the difference of roles which play academicians in the knowledge networking process. In particular, majority of respondents indicated themselfs as a regular network member (80.0%), coordinator (57.5%) or leader (47.5%), while much less was held the role as a facilitator (25.0%). Additionally, sharing information (82.5%), co-production of knowledge (72.5%) and personal learning (65.0%) have been mentioned as the major networking objectives, while collective knowledge adoption was specified among the minority of respondents (10.0%).

The productiveness of knowledge networking for the group on average was 4.22 (SD=0.73), at the 5 point scale. Among the main obstacles for the networking were mentioned organizational (75.0%), physical (30.0%) and interpersonal barriers (20.0%), and among the minor were indicated personal and technological, respectively 10.0% and 7.5%. For instance, words from the respondent's interview: *"In my opinion the main barrier of knowledge networking is communicating in international networks without personal meetings. The technology is not yet sufficiently good to replace physical meetings with virtual meetings. There is a problem communicating virtually when you have different world views" (A7).*

Decision maker's group

Results demonstrated the majority of interviewed decision makers were actively involved into intra-regional, inter-regional knowledge networking (100%), while a high activity at the national level revealed only the regional sub-group (100% against 37.5%). The lowest networking activity at the sub-national level was registered for the both sub-groups. The density of networks has had a similar tendency: on average the highest value was for intra-regional networking – 44.666 (SD=20.04) and 34.375 (SD=13.99), after followed inter-regional (17.866 ± 12.028 and 11.750 ± 8.548), national (10.000 ± 20.959 and 5.000 ± 7.071), and sub-national networks (13.066 ± 11.762 and 0.625 ± 1.767), for regional and local decision makers respectively.

All respondents from the group possess formal and informal forms of networking (100%), while strategical form of networking was much less identified, especially for the local decision makers sub-group (12.5% and 20.1%). Among examples of the strategical knowledge networking that have been in use by decision makers possibly to mention the followings: The Norwegian Association for Green Infrastructure (NFGI); The New Water Ways platform for Oslo municipality; Oslo Water Initiative as a partnership between Norwegian Church Aid (NCA), Global Compact's CEO Water Mandate, Confederation of Norwegian Enterprise (NHO) and Global Compact Nordic Network; The Sustainable Urban Flood management (SURF) networking platform on a base of the Norwegian Meteorological Institute and the City of Oslo Agency for Water and Wastewater services; and Pådriv as a partnership network between public, private and social actors who are working together for the improved sustainable urban development of Hovinbyen in Oslo.

The survey demonstrated the majority of regional sub-group representatives mentioned him/herself as a coordinator (73.7%), a facilitator (53.6%), a regular network member (46.9%) and a leader (40.2%) in the networking process. In turn, among the local sub-group in the networking has been dominated the role of a regular network member (75.0%) and coordinator (50.0%) with the minor role of a leader (37.5%) or facilitator (25.0%). Results showed the major networking objective for the regional decision maker's networking activity were exchange content & valuable information (80.4%), co-production of knowledge (73.7%) and personal learning (60.3%), while in the local decision maker's sub-group was more appreciated an exchange content and valuable information (100.0%), personal learning (87.5%) and co-production of knowledge (75.0%). Such objectives in the networking process as sharing information and foster interaction among users were mentioned by a minority of respondents for the both sub groups (from 0 to 13.4%). Productiveness of knowledge networking for the whole group of decision makers was varied, on average it was calculated as 4.07 (SD=0.79) and 3.62 (SD=0.74), at the 5 point scale, and for regional and local sub-group respectively. Among the major obstacle for the networking process of the whole group was mentioned organizational barrier (100%). Additionally to that were indicated physical barrier (20.1%) for the regional sub-group networking and personal barrier (25.0%) for the local sub-group networking. Plus, have been were reported some of interpersonal and technological barriers as well (6.7-13.4%).

5.1.2.2 Assessment of the main features of knowledge sharing

Academician's group

Analysis of the knowledge sharing process shows that academicians have been used a different disseminating mechanisms, along with a varied frequency of their usage. Thus, the most often among the group were applied publication of knowledge (4.425 ± 0.780) and attendance of conferences (4.200 ± 0.911), after followed a face to face conversations (3.725 ± 1.176) and informal presentations (3.151 ± 0.892), while much less has been used collective actions (2.075 ± 1.118), at the 5 point scale. Visualization of this survey depicted in Figures 13.

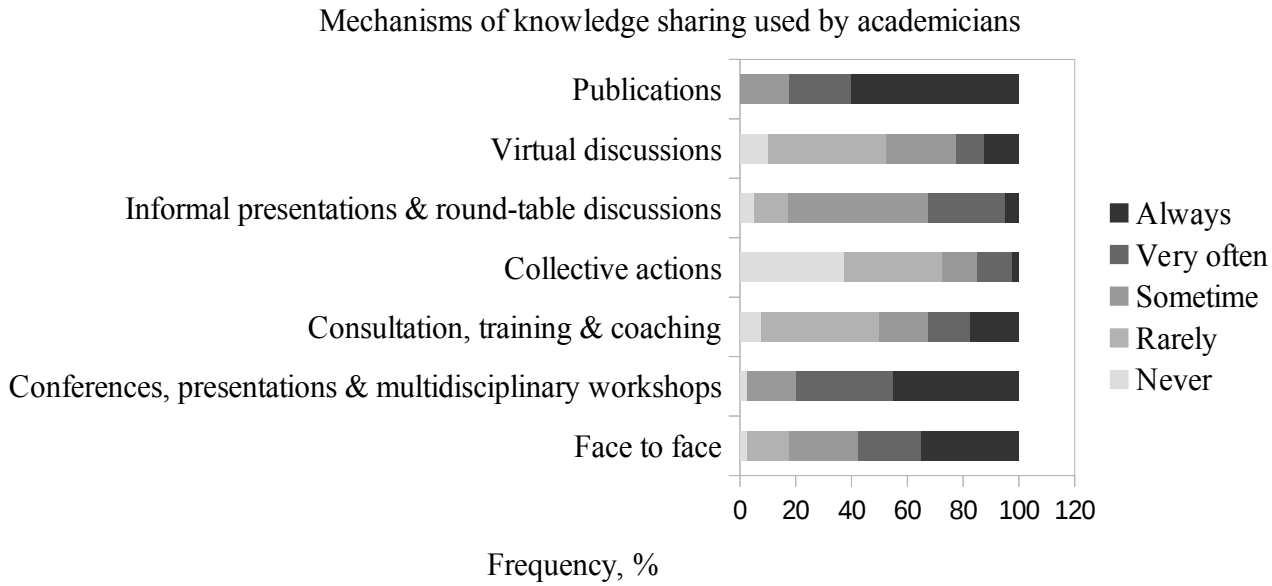

Figure 13: Dissemination knowledge strategies and their frequencies among academicians

Among the categories of shared knowledge were dominated explicit (97.5%) and tacit knowledge (75.0%), in turn embedded knowledge shared only 17.5% of respondents. The dominated type of produced knowledge among the group was knowledge about functioning of SES (75.0%), less amount has been was produced about components and about functioning of SES (65.0% and 67.5%). Results also indicate academicians preferably delivered informative (92.5%) and evaluative (77.5%) writing types, and an average amount was between 50 and 100 pages during the last year (up to 57.5%). Among the major principles of the knowledge sharing design respondents selected the following: impact (57.5%), recognition & representation (42.5%) and reflection & sustaining (30.0%).

Decision maker's group

Analysis of the data showed that decision makers used a variety of different mechanisms to access the knowledge, information and data, that can influence knowledge sharing and obtaining processes. In particular, the most often knowledge and information have been receiving from colleagues or secretariat (4.53 ± 0.74 and 4.50 ± 0.755), from reading (3.86 ± 1.12 and 3.875 ± 0.834) and from seminars (3.66 ± 1.23 and 3.875 ± 00.640), at the 5 point scale, and for regional and local decision makers respectively. Much less have been used by the group such strategies as gaining knowledge though face to face communications, service of knowledge brokers, social and mass media, e.g. less than medium by the scale. Visualization of this survey depicted in Figure 14

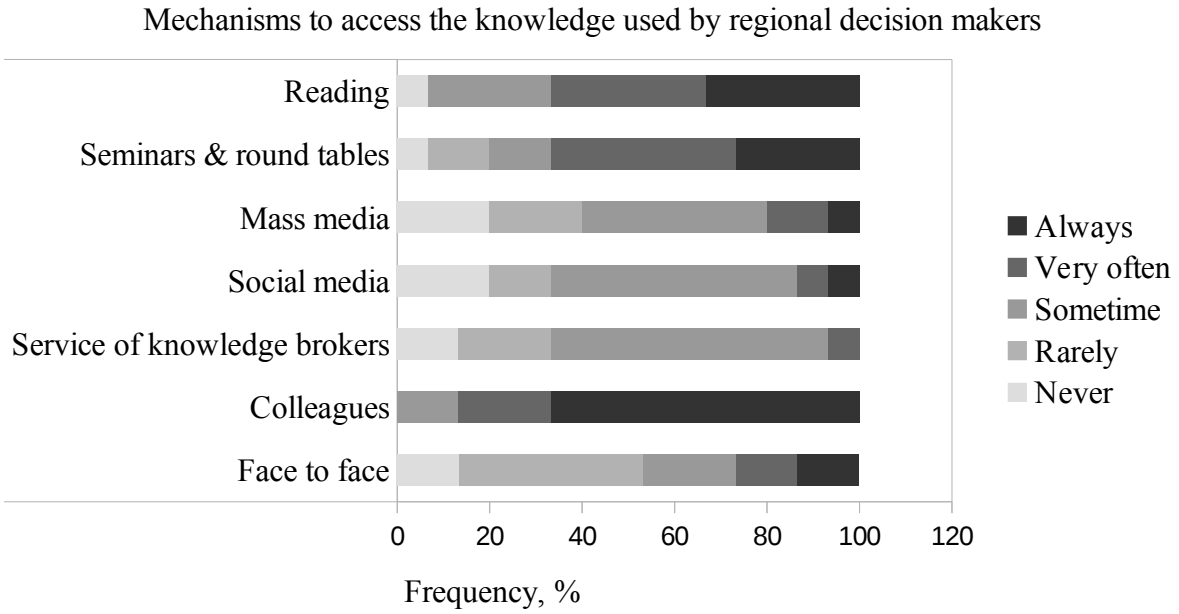

Figure 14: Usage knowledge strategies and their frequencies among decision makers

Among the category of shared knowledge was dominated explicit (87.1%) and embedded knowledge (80.4%) for the regional sub-group, while own experience and embedded knowledge (100% each) were indicated by the local sub-group. Majority of of respondents from the group mentioned that needed more knowledge about implementation for sustainable SES functioning: 66.7% and 87.5%, along with that over half of the local decision makers (62.5%) have been looking for the knowledge about functioning of SES components. Results indicate that respondents prefer to deal with informative and evaluative writing types (75.0 and 87.5%), while over the quarter of regional sub-group representatives (33.5%) have had also a positive attitude to an interactive writing type of communication. Additionally, identified that verbal and written communication are the most valued categories for communication among tested, and they are in an equality of preferences (more than 4 at the 5 point scale). In contrast, non verbal communication was much more rare used on the practice (less than 2 at the 5 point scale).

An average amount of proceeded knowledge, information or data per month among the regional decision maker representatives was varied from extremely big (13.4%) to medium (40.2%) amount, while for the local representatives changed from small (25.0%) to more than medium amount (37.5%). Major principles which have been considered among the regional sub group as the most useful for the knowledge sharing design between stakeholders were engaging into design and linking or feedback and iterative consultation (60.3% each), while the lower interest was to

reflection and sustaining engaging (26.8%). Quite high amount of the both sub-groups respondents (80.4% and 100.0%) mentioned that they have had a concern about the knowledge exchange process. In particular, among the common type of concerns regional representatives mentioned problem with knowledge understanding and problem with knowledge use (40.2% each), lack or insufficient amount of knowledge and unsuccessful knowledge exchange (33.5% each). In turn, local policy makers have had problems with a lack or insufficient amount of knowledge (100%), problem with knowledge source access & selection (75.0%) and problem with the knowledge use (50.0%).

5.1.3 To what degree exist cohesion and matched values between actors in area of interest?

Academician's group

Benefits from the green infrastructure were valued differently by participants from the academicians group. In particular, on average, ecological and socio-cultural benefits were evaluated higher than economic benefit. Statistical test also showed significant differences between these values: ecological toward economic benefit ($V=378$, $p<0.001$), and socio-cultural toward economic benefit ($V=401$, $p<0.001$), while not ecological toward socio-cultural benefit ($V=86$, $p=0.65$). Analysis of personal visions towards the current status and perspectives of development of the environmental governance revealed a varied opinions among the group. In particular, the highest frequency of respondents highlighted importance for the environmental governance to focus attention on such issues as security & climate change (55.0%), sustainable development (52.5%), quality of life (45.0%), education (30.0%) and nature connectedness (20.0%). Also, academicians have had strong personal opinions about what issues should be taken to the account in the area of environmental governance they are dealing with, and these opinions have been separated into four groups: (1) organizational context (regulation and adaptive coordination at different levels of governance; broader networks of user groups like an integration approach; finding of ways to engage people, including an active participation or persuasion); (2) changes of personal values (changes values in people's mind; increase awareness and values; accepting changes and new way of thinking); (3) theoretical and practical tools (holistic approach; focus on interdisciplinary of a field; usage of ES concept in the governance legally; new monitoring tools); (4) openness in discussion (include more NGO and public into decision formation).

Among the most important topics for communication and collaboration with decision makers by academicians were indicated the followings: knowledge management (40.0%), risk & uncertainty (37.5%), resolution of conflict situations, international interplay and boundary organizations (25.0% each). For instance, increasing land use conflicts in a socio-economic and socio-cultural perspective need extensive research and appropriate legislation for a wildlife management: *"Oslo makra already has became a part of Oslo green infrastructure, due to how often people use a forest for recreation activity. Therefore Government has an interest to people attitude in the regulation of human-carnivore conflict that will lead management in a secure way. Role of social scientists in such situation is to link municipality and public interests by blogging with social media that can increase networking and public debate. However, it is quite difficult because of polarity of interests, different level of values among people, and political barriers"* (A8)**.** Additionally, academicians have revealed personal opinions which they think will be important to apply in order to improve communication and collaboration with decision makers within the environmental governance area they are working with, and these opinions were separated into two groups: (1) a special discipline of interest (urban forestry, suburban farming, biodiversity in urban and suburban areas, environmental justice, landscape restoration); and (2) a special controversial area of interest (balance between sustainability and development, densification and quality of life, prioritization of values, risk of power relation toward research prioritization, priorities democracy in environmental policy).

Analysis demonstrated that majority of academicians thinking that environmental governance and management are lacking attention toward the focus on multi benefits and integration of user groups (32.5% each). In addition, the group showed a variety of personal opinions toward the question, therefore their views and attitudes toward recommendations to effective governance were separated into three groups: (1) overcome the lack of practical implementation of integration user groups principles from local to regional level, (2) reduce fragmentation, along with a fragmented thinking, (3) bigger focus on the long term of thinking for sustainability along with a long term problem vision. Future perspectives in the development respondents have been seen from a different angles, while the higher frequency of answers was for the followings: assessment of the utility of green infrastructure in meeting the climate change (35.0%) and developing the techniques to assess the green infrastructure benefits (32.5%). Besides, academicians revealed opinions and attitudes toward the future visions for development in the area of environmental governance they are dealing with, and these visions were separated into four groups: (1) close interaction with politics, (2) involving into design more tools: policy, economic and non-economic instruments, (3) developing of spatial

analysis of landscape architecture, (4) elaboration of mechanisms that can legally control the level of densification and quality of life, e.g. apply principle of environmental compensation in planning, including compensation of environmental degradation.

Calculation of results demonstrated that politicians (65.0%), bureaucrats (57.5%) and common interest actors (50.0%) are considered within the studied group as those who possess the most influence on the current development in the area in which they are working. Results of also showed that on average, sharing and communicating willingness and interest among academicians toward the other stakeholders were the highest, while their desire of personal influence on the shaping policy decisions was the lowest: 4.72 ± 0.5 against 3.90 ± 1.17. This result also was supported by statistical test that indicated on the significant differences between these values ($V=225$, $p=0.0001$). Over half (60.0%) of respondents have been mentioned that knowledge sharing is important for them as an intrinsic reward, over quarter preferred the both types of motivation practices (37.5%), while towards extrinsic reward voted only the minority (2.5%). Figure 15 provides an overview of personal interests and intentions among academicians.

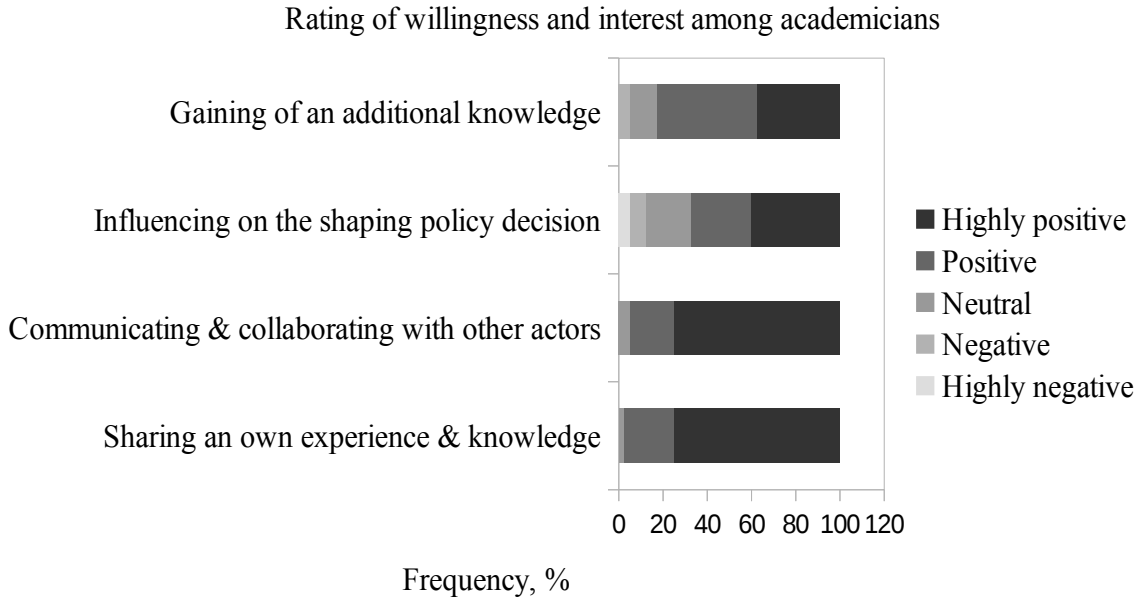

Figure 15: Frequency revealing personal interests and intentions among academicians

Decision maker's group

The two sub-groups of decision makers valued the benefit of GI not equally. On average, ecological and socio-cultural benefits were evaluated by the both sub groups higher compare to an economic benefit (all values higher than 4 from the 5 level scale), while an economic benefit has been received more value among the regional sub group (4.00 ± 0.925 toward 3.25 ± 1.035). Statistical test also showed significant differences between the values mentioned before: ecological toward economic benefit for the regional (V=41.5, p=0.02) and local policy maker's sub-group (V=21, p=0.03), and socio-cultural toward economic benefit (V=0, p=0.03) for the local policy maker's sub-group only.

The analysis of regional policy makers opinions has been shown the following issues are very important in the environmental governance: sustainable development (60.3%), security & climate change (53.6%), quality of life (46.9%), nature connectedness (40.2%), education (26.8%), and own answers (20.1%, e.g. better planning and risk assessment). Among the most important topics for communication and collaboration with academicians were indicated the followings: knowledge management (60.3%), cross institutional changes (26.8%), politics (20.1%), and own answer (26.8%, e.g. practical knowledge, innovative approaches, and multi factorial analysis). The frequencies for the answer opinion among the regional respondents toward the lacking attention principles of GI have been higher for multi functionality (40.2%), integration of user groups (40.2%), and own answer (46.9%). For instance, own answers covered such areas as: (1) low longevity of research projects that gives uncertainty in future forecasting for planning and management; (2) lack of local knowledge usage; (3) lack of interdisciplinary studies with a holistic system view; (4) vary narrow research approach that difficult use on a practice. The future opportunities for the environmental development in the area of their interest were seen differently. In particular, in the regional subgroup was given preference for the developing techniques to assess the green infrastructure benefits (20.1%), while the local subgroup was orientated on the finding ways to satisfy a broader needs of a constantly changing society (37.5%). Along with that both subgroups have had a high percentage of an own vision for the future perspectives (80.4% and 75.0%, respectively). For instance, future development in the area among the regional decision makers was directed to the following changes: (1) improvement of environmental legislation at the local level; (2) involvement more civic actors into the discussion; (3) usage of ecosystem service approach; (4) renew, revision and strengths of nature based solutions across policy and law; (5) increase adaptation to changes by using knowledge as a tool; (6) day-to-day practices

implementation for the long-term benefits; (7) long term strategic planning. In turn, views of the local decision makers have been focused on such future perspectives in the area as: (1) prioritization of conserving the GI in the most densely populated areas; (2) practice of the long term visions with the short term goals; (3) improvement of legislative tools at the local level; (4) mutual focus on the both blue-green components at the same time; (5) application of the different simplified e-learning strategies.

Results demonstrated that bureaucrats (80.4%), special interest actors (46.9%) and common interest actors (40.2%) have been considered among the regional decision makers as those who have the most influence on the current development in the area in which they are working. In turn, respondents from the local subgroup of decision makers have been indicated that academics (100%) and bureaucrats (87.5%) were the most powerful stakeholders in a discussion. The opinion about what factors have been influenced on the value set of the whole group of decision makers during the last 5 years was similar: personal values and believes (87.1% and 75.0%), knowledge and results of education (67.0% and 62.5%), for the regional and the local subgroup respectively. Also has been identified a difference between the subgroups, e.g. organizational directives have been mentioned more often among the regional (53.6%), while frequent globalization influence has been indicated more frequently among the local decision makers (62.5%).

Analysis showed that on average, sharing, communicating willingness and interest in the personal influence in the shaping policy decisions among the regional policy makers toward the other stakeholders have been quite high accordingly to 5 level valuating scale (4.80 ± 0.41, 4.53 ± 0.516 and 4.40 ± 0.828). The results also have been supported by the paired statistical tests that showed a significant differences between these values. Majority of the regional respondents (80.4%) have been mentioned that knowledge sharing was important for them as an intrinsic reward, while much lower amount (20.1%) did expressed their wish for the both of motivation practices. The Figure 16 provides an overview of the personal interests and intentions among decision makers.

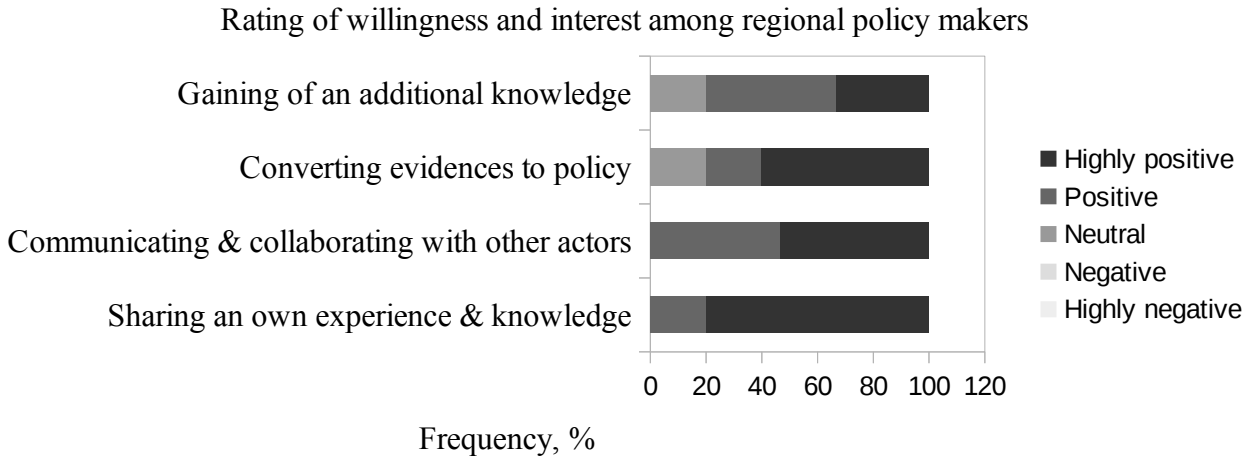

Figure 16: Frequency revealing personal interests and intentions among decision makers

Much more intense investigation about the current status of green infrastructure and its tendencies for the development has been inducted. Thus, by the local decision maker respondents have been mentioned the quantity of GI area in the their local authority during the last 10 years has been decreased (62.5%), and only over quarter (37.5%) declared that its stayed the same. More than five research projects in the last 10 years that connected with the GI development has been mentioned among the majority of respondents (75.0%), and they have been presented as mixed in a duration (62.5%) or as a short term projects (37.5%). Government and public funding (100.0% and 62.5%) have been mentioned as the most often donation funds for such projects, where a big green areas (75.0%), species biodiversity and conservation GI practices have been the most frequent types (62.5% each). Gaps to assess GI benefits in the tested regions were different and included all types of obstacles, moreover among the major common have been mentioned organizational (75.0%). Along with that, the local decision makers subgroup showed an interest in the different forms of scientific support, while preferably it has been practical and theoretical supports (37.5% each).

5.1.4 How knowledge sharing process influences the linking science to policy?

Academician's group

Current level of the science-policy interface (SPI) was evaluated by academicians differently, possibly it was due to the area of interest or due to an own personal attitude and experience. In particular, the larger part of respondents supported a good valuation mark (47.5%), over the quarter

respondents valuated it as a fair (30.0%), and only a minor part (10.0%) voted for a poor or a very good marks of the interface. Among the major criteria for the SPI evaluation has been chosen the followings: openness and cooperation (55.0%), competence (30.0%) and effectiveness (20.0%). Results showed that frequency with which academicians effectively shared an own knowledge with policy was not so high. For instance, the common frequency was mostly occasional (35.0%) or rare (37.5%), a lower than quarter of respondents (20.0%) managed done it frequently, and only minor representatives of the group done it frequently (2.5%).

The analysis towards familiarity of academicians with ecosystem service concept (ES) demonstrated the over half of respondents (60.00%) have been known about the concept, along with that an over quarter were not sure about it (32.5%). The most common frequency of concept usage was rare or occasional (27.5% each), in turn about a very frequent usage of the concept have mentioned only a small amount of respondents (17.5%). Among the issues that by opinion of academicians can help better SPI integration have been mentioned socialization and developing capacity (60.0% each), practical implementation support (47.5%) and conceptualization (40.0%).

In-depth interviewing opened more light on academician's views about the better interface with decision makers. For instance some of the suggestions: *(1) "...the challenge for the policy maker should be to understood why there is a gap between intentions and realization, and to map out the factors that come into play in a decision making process" (A21); (2) "...have a capacity to see 'the broader picture' on a landscape scale, and take informal initiatives that can lead to formal and legal decisions across sectors and administrative boundaries" (A35); (3) "...because of GI is an interdisciplinary field, decision makers should deal with a several areas each with its own challenges, therefore need to learn the possibility to work across disciplines" (A21); (4) "...arrange better cooperation, coordination, and trade-off agreements between Ministry of Climate and Environment and Ministry of Agriculture and Food...that managing by the same natural resources...and disagreements can lead to quite serious problems in the environmental policy application because of their different approaches" (A23), and (5) "...improve conceptual development for a better integration" (A35).*

A quite high percentage of academicians (87.5%) have had a personal contact with a different rank policy makers, and have been mentioned that both sides initiated the contact in an equal proportion (47.5%) or it was done by a decision maker request (27.5%). Among the most common reasons for the contacts between two groups of actors academicians indicated the followings: request for

knowledge, information or data (45.9%), mutual work under the project (35.0%) and request for an advice (32.5%). The frequency of meeting between two groups has been varied, while half of respondents indicated that it was monthly (50.0%), and academicians did prefer to keep the same contact with a person that have dealt before (40.0%), while it is not happen always (35.0%).

Among the major challenges due to contacts were indicated difficulties with a political procedure (15.0%) and difficulties with explanation the complexity of GI issues (10.0%), while some of respondents (20.0%) denied any particular challenge or disagreement. In depth interviews showed a high quota in personal opinions among the group toward that topic (37.5%). For instance, among the challenges with decision makers that academicians faced during the knowledge sharing processes and collaboration under the projects were mentioned the followings: (1) difference of interests, focus and priorities (difference in financial priorities; difference in political orientation, therefore system is complicated due to political context; ignorance of research topic which decision makers consider not enough interesting for the moment); (2) organizational and management problems (lack of time that suits to decision makers; lack of coordination in communication; lack of willingness; difficulties to find a relevant people to talk or discuss the topic; quite instrumental way of planning; do not sealing enough advising information by administration; unwillingness to publish or discuss openly a social issues; problems with the local condition implementation of results); (3) lack of scientific based or educational background (demanding of knowledge simplification; limitation capacity of decision makers in science because of it is not a part of their every day life, unwillingness to understanding information; difficulties with transmitting knowledge, therefore explanation is a time consuming; complexity of issues for understanding; uncertainty in results, therefore a requesting only for yes or no answers; resisting of accepting new knowledge; bureaucracy; political pressure and use natural scientists as a lobby; different vocabulary and different points of views; fragmented thinking; desire to accept knowledge if only it fit their mind set).

Decision maker's group

The current science-policy interface was evaluated by the decision maker's group differently, and variation can be explained by the different professional duties or by the different personal experience with the question. In particular, respondents have been supported the SPI valuation as a fair (53.6% and 26.8%) and as a good (26.8% and 37.5%), for regional and local decision makers accordingly. Besides, some of regional decision makers have been voted for a very good interface

condition (13.4%). The major criteria that has been chosen for the SPI evaluation among the group was openness and cooperation (26.8% and 50.0%). Results also showed the frequency with which decision makers transferred received knowledge into action or policy output was quite high. Thus, the common frequency of transferring process has been indicated as often for regional (60.3%) and local (50.0%) sub-groups.

The analysis about familiarity of decision makers with Ecosystem service concept (ES) demonstrated that over half of regional (53.6 %) and local (50.0%) representatives have been known about the concept, while some of them have been not sure if they familiar with this concept exactly (40.25% and 25.0%). Among the issues that can help better SPI integration the regional sub group have mentioned the followings: developing capacity (67.0%), iteration (53.6%) socialization and practical implementation support (46.9%,). Additionally, has been a survey among the local decision maker's sub group about the factors which by their opinion negatively or positively influence the interface with academicians. Thus, among factors which have been negatively influenced the SPI were the followings: lack of time and lack of contact (75.0%), lack of feeling working for a mutual benefit (62.5%), uncertainty in science (50.05%). In turn, among factors that can positively influence the interface were highlighted the followings: cross institutional cooperation (50.0%), communication & collaboration of stakeholders, and finding the new ways of looking at the problem (37.5%).

A quite high percentage of decision makers have had a personal contact with academicians (62.5% and up to 100%), and in the major cases initiative has been coming from the both sides (66.7% and 50.0%), while the local decision makers particularly initiated the contact first (50.0%). Among the most common reasons for the contact respondents have indicated request for knowledge, information or data, and mutual work under the project (40.2% and 50.0%), for regional and local representatives accordingly. The frequency of meeting with academicians for the regional policy makers sub group has been more often, for instance it was a monthly (40.2%), while for the local sub group it was much often as a several times a year (37.5%). Majority of the regional decision makers prefer to keep contacts with academicians (60.3%), in turn the local representatives have not been shown the continuity of contacts (both options as yes and no have been an equal, 37.5% each). Among the most common challenges due to contact with academicians were indicated difficulties with a political procedure (40.2%) and frustration from the opposite side due to the lack of money for research projects (20.1%). In turn, the local representatives indicated that felt a tension because of the prioritizing priorities that often cause disagreement between stakeholders (25.0%). Also there

has been a high own response among the groups (20.1% and 37.5%) towards the question. Own explanations have been grounded on the several challenges they experienced, for instance: (1) hiding results after the research; (2) frustration from not finished research projects; (3) unwillingness to share own mistakes; (4) wasting time on explanation about a complete decision making process; (5) not familiarity with a political agenda.

5.2 Quantitative analysis

5.2.1 Theory of Planned Behavior: Investigating behavioral intentions of major actors

Academicians

The first testing, TPB-based model, shows that two predictors as Attitude (r_s=0.44**) and Perceived behavior control (r_s=0.59***) significantly associated with the Intention to knowledge sharing behavior among the academicians, however, results of testing do not confirmed that Subjective norm also has a strong association with the Intention to knowledge sharing (Appendix 10). These findings give strong support the Hypotheses 1 and 3. Any significant inter-relationships between the core model variables as Attitude, Subjective norm and Perceived behavior control have not been found, that did not support the Hypothesis 4. Nevertheless, testing showed that some of antecedent variables of these core constructs have had statistically significant associations between itself or have been associated with the core constructs of the model. For instance: Attitude to Ecological GI benefit and Willingness to share were highly associated (r_s=0.57***), that tells about a positive moderation effect between Attitude and Subjective norm. Along with that, Willingness to communicate has been found to be weakly associated with Communication capacity (r_s=0.29*), that indicates on indirect moderation effect via these variables between Subjective norm and Perceived behavior control. Further testing showed that any of three antecedent variables have been statistically significant predictors of an Evaluation the actor interface outcome. The second core construct variable of model, Willingness to share, that substitutes Norms of knowledge sharing, was significantly and positively associated with three antecedent variables: Willingness to gain additional information (r_s=0.34*), Willingness to communicate and collaborate (r_s=0.43**), and Willingness to influence on decision making process (r_s=0.47**). The third core construct variable of the model, Sharing capacity, that substitutes Perceived behavior control over knowledge sharing,

showed association with two antecedent variables like Sharing mechanisms (r_s=0.33*(Cos); r_s=0.40**(CA)) and Productiveness of knowledge networks (r_s=0.38**). These results give only partial support to hypotheses H1-H3 (a, b, c). In addition analysis shows that several extended model variables directly or indirectly have been positively associated with the Intention to knowledge sharing (Appendix 11). In particular, for the direct relationship with the Intention possible indicate on the following variables: Educational background (r_s=0.37*), Age (r_s=0.39**), Experience with policy (r_s=0.44**), Membership (r_s=0.33*) and Density of networks (r_s=0.31*, National), while for indirect: Gender through Cos (r_s=0.40**) and Com (r_s=0.37**). Therefore, testing partly confirmed the Hypothesis *5*. The Figure 17 provides an overview the patch analysis of the study variables in a case of academicians.

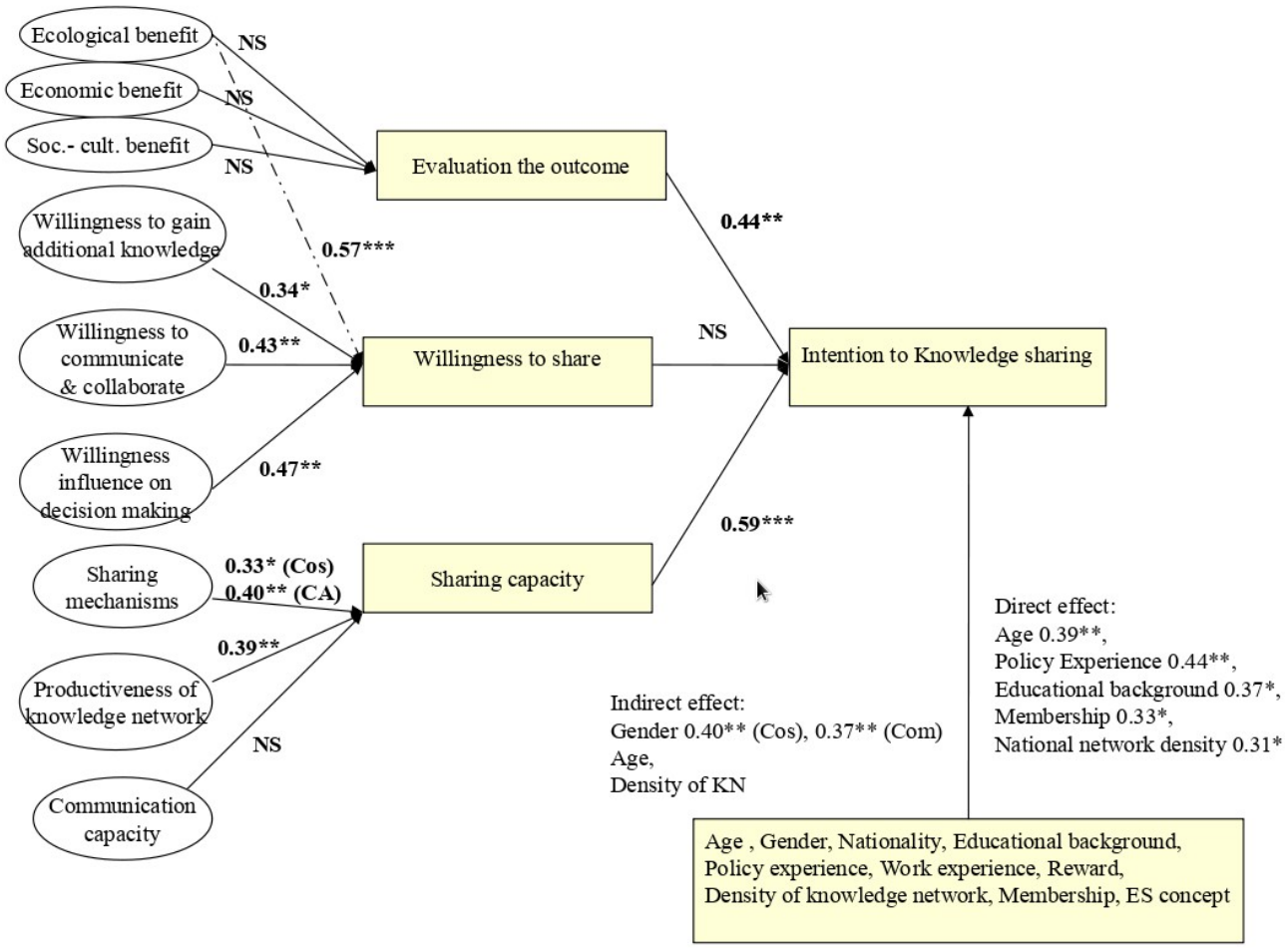

Figure 17: Patch analysis of the study variables in a case of academicians

Decision makers

The second model testing showed that an Intention to turn gained knowledge into power has not been significantly associated with Subjective norms and Perceived behavioral control, while had a weak association with Attitude (Evaluation the SPI outcome) (r_s=0.35*) (Appendix 12). Therefore testing results dis not approved the two main postulates of the theory of planned behavior, and consequently Hypotheses 1 and 2 did not verified, while Hypothesis 1 did verified. Any significant inter-relationships between the core model variables as Attitude, Subjective norm and Perceived behavior control have not been found, that did not support the Hypothesis 4. Moreover, deeper testing showed that variables as Economic benefit of GI and Willingness to share experience and information were positively related, that moderated the relationship between Attitude and Subjective norm (r_s=0.45*). Along with that, Subjective norm and Attitude were moderated through a weak association between such variables as Economic benefit of GI and Reading capacity (r_s=0.36*) and Ecologic benefit of GI and Reading capacity (r_s=0.40*). in turn, Subjective norm and Perceived behavior control were moderated through strong association between such variables as Willingness to gain additional knowledge and Communication activity (r_s=0.55**). These finding have not been included into the summary table, because were not a key results. Further main results confirmed hypotheses about existence different associations between the core constructs and their antecedent variables, in particular: Willingness to gain additional knowledge and Willingness to convert scientific evidences into policy (r_s=0.45*), Knowledge related sources and Reading capacity (r_s=0.34*(Read)), Communication activity and Reading capacity (r_s=0.41*). In addition, was found a strong positive association between Knowledge related sources (antecedent variable) and the Behavioral intention (r_s=0.56** K_Br). All of these findings give a partial support to hypotheses H1-H3 (a, b, c). Final testing demonstrated that core construct as Behavioral intention (Intention to turn gained knowledge to power variable) was significantly directly associated with such extended variables as Education (r_s=0.54**) and Age (r_s=0.39*), while indirect effects via associated TPB constructs have been found through Gender, Science experience, Work experience, Density of knowledge networks, Efficiency of sharing and ES concept (Appendix 15). Therefore, the Hypothesis 5 was partly verified. The Figure 18 provides an overview the patch analysis of the study variables in a case of decision makers. The Summary findings from the both model's located in the Appendix 14.

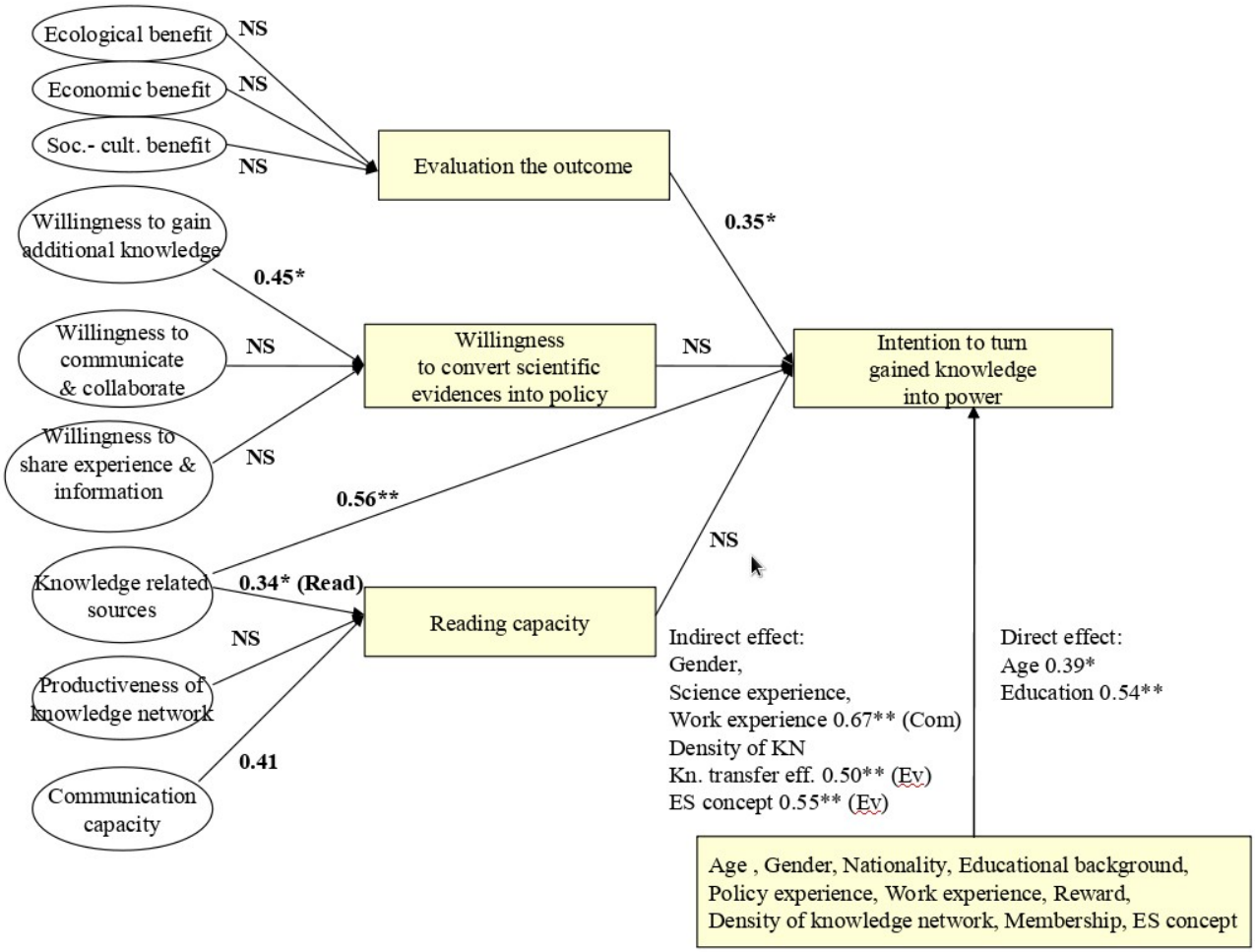

Figure 18: Patch analysis of the study variables in a case of decision makers

6 Discussion and conclusions

Environmental problems and over exploitation of natural resources were continuously accompanying with governments and societies. Tasks in order to overcome the challenge include mobilization of communities, governments, knowledge systems and implementation of different policies that will protect and sustain the environment against degradation. Therefore, acknowledgment of science-policy activities of experts has been seen as a major challenge that must be strengthened (Carmen et al., 2015). The major focus of scientific discussion nowadays devoted the description of examples towards benefits which come with the sustainable development and planning of green infrastructure for urban and sub-urban areas (Stange et al., 2017), and a trade-offs between finding suitable land for urban expansion and preserving land for food production (Gren & Andersson, 2018), that gives a future potential for compromises for land use, opportunities and synergies. In order to harmonize the SPI and improve knowledge sharing processes between scientists and decision makers, need to understand how is science used in policy making processes, what does policy need science for, and how it can be successfully implemented in the policy development towards the sustainable development and management of natural resources. Therefore, the main goal of this work is to acquire knowledge about the relationships between scientists and decision-makers on examples of the green infrastructure governance in Akershus and Oslo area. The main principle of this work is an equality of the two groups of actors in their responsibility for the formulating and implementing policies based on the evidences, along with co-production of knowledge and mutual knowledge sharing.

General short findings

This thesis covers a wide range of theoretical and conceptual issues in the SPI area, grounds on the mixed type of analysis, for which data was collected through semi-structural face to face interviews with 63 respondents (40 academicians and 23 decision makers). The main area of interest is Akershus county and Oslo municipality, from were respondents were collected from 21 different science/research and policy making establishments. Majority of my findings show similar results with the relevant literature, along with that some of them have unanticipated patterns. In general, Qualitative analysis shows a several problems in the area that connected to the environmental governance and management that closely connected with knowledge management processes: intra-organisational, inter-organisational, inter-institutional. Along with that, the major obstacles to the

sustainable development of green infrastructure and gaps in the knowledge management processes between two groups of actors in the area were identified. In turn, results of Quantitative analysis shows relations between described previously variables that characterize the SPI and knowledge sharing processes. In particular, adopted TPB model demonstrates the Intention to knowledge sharing for academicians has a direct positive and significant association with the Evaluation of the SPI outcomes and Sharing capacity through publication of results. In turn, the Intention to turn gained knowledge into power among decision makers shows a direct positive significant association with the Evaluation of the SPI outcomes and with a choice of Knowledge related sources (e.g. service of knowledge brokers), along with several indirect associations with extended factors of the model.

General background and professional characteristics

Scientific findings indicate the linking science and policy in the many cases is considering as a complex with a high polarity of features, and therefore very often our imagination presents the two different worlds that time to time come to the relationship, is that opinion is true? (*Chapter 2.1. Theoretical exploration of science–policy interface)*.The discussion of my results was focused on the finding convergence and divergence points between the major groups of actors toward the different processes that surround them, including the knowledge management. Obtained results show that more homogeneous issues connect these two groups of actors than separate the misfits between them (Appendix 9). In particular, background similarities between academician and decision makers were detected in the following issues: main characteristics of their work (landscape, green spaces and water, up to 86.7%), familiarity with a policy or with a science (over 45% respondents), experience with environmental governance and green infrastructure (up to 65% and 40%), interest to the topic (climate change, up to 87.5%), membership in environmentally friendly organizations (up to 62.5%), participation in the research projects (up to 87.1% of academicians and regional representatives). Along with that were detected some other disparities between the two groups, like a top of activity in the different processes (education/research toward planning/management) and focus on theoretical instead of practical issues.

Characteristics of knowledge networking

The comparison of the knowledge networking processes shows some of similarities between the two groups in a high amount of formal and informal forms of knowledge networking (up to 100%),

a medium evaluation level of the network productiveness, and organizational barrier (up to 100%) as a major obstacle in the process for the networking. Moreover, analysis demonstrated also some of differences between the groups, and between the two sub-group of decision makers. In particular, academicians show a higher amount of the strategic form of networking, and specially againts the local decision makers representatives (35.5% against 20.1% and 12.5%). In addition, academicians have a higher concentration of the sub-national level network density (35 members), while decision makers orientate more on intra-regional network density (up to 44 members). According to a similar research, network with bigger amount of members (nodes) can much faster to gain the knowledge equilibrium (Mu, Tang & MacLachlan, 2010). Results also show a varied orientation of subjects toward a roles and objectives for the networking. For instance, a minor part of respondents from the both groups focuse on the collective knowledge adoption and fostering of interactions (10% up to 20%), and much bigger part concentrated on the sharing or exchange objectives (up to 100%). The majority of academicians (80%) adopt role of a regular network member and only a half were leaders (47.5%), that indicate their passiveness in the networking process. In turn, a higher quota of regional decision makers declare themselves as facilitator or coordinator of networks (53.6% and 73.7%). Such result is in accordance with another findings. For instance, a network "head" plays important role in a network, and a powerful knowledge holder and successful knowledge translator, can successfully reduce mistakes and improve knowledge understanding (Hansen, 2002), especially it is important for explicit and tacit knowledge transfer (Ernst & Kim, 2002).

Personal believes and attitudes

Analysis of personal believes and attitudes revealed a very interesting particularities that were like and not alike among subjacts. For instance, over the half of respondents considered sustainable development and climate change security were the most important issues in the environmental governance. And, only a quarter of them evaluated the green infrastructure benefits in equal proportions, while the majority indicated that ecological and socio-cultural benefits as the most valuable. Such results can be explained by the two guessings. Firstly, over the quarter of tested academicians (30.0%) have a social sciences educational background, and possibly they are lacking a strong knowledge in a natural sciences, and therefore they evaluated a socio-cultutal benefit as a prime type. Secondly, possibly scientists with a natural sciences background just neglected a main point of the sustainability concept. On the similar obstacle towards the promotion of sustainability theoretical principle into the development practice was indicate by several authors, that was

common for the multidisciplinarity that surrounds the green infrastructure management (Naess, 2001; Afgan, 2010). As recommendations to overcome this gap were mentioned the followings: developing a system of indicators to assess the quality of life (Štreimikienė, 2015), integrating of knowledge management processes (Clark et al., 2016; Chang et al., 2018), or strengthening the science–policy–industry interface by a new systems thinking view (Saviano et al., 2019). Returning to the discussion results, convergent opinions of the both groups of actors were directed toward the importance of knowledge management as a major topic for the mutual communication, along with a multi-functionality as a priority principle for the green infrastructure application. Another interesting particularity was revealed in a quite different respondent opinions about who is the major actors in the area of environmental governance which they are dealing with. Thus, academicians mentioned politicians, bureaucrats and common interest actors (over 50% each), while regional decision makers indicated on bureaucrats (up to 80%), and local decision makers showed on academicians and bureaucrats (100% and 87.5%). This finding has an analogy with a question:"Science for science and science for action?", where author points on importance the balancing of own and common interests among scientists, along on their active and open position towards the policy (Van den Hove, 2007, p. 818). However, a lot of external factors make a barrier that science reach the target, and possibly that it why for academicians very difficult to bring knowledge into the policy. For instance, political polarization, politicization and fragmentation can be a serious obstacles for the evidence based decision making process (Suhay & Druckman, 2015). Along with that, my results also show a high mutual willingness of the both groups of actors to share, communicate and gain an additional knowledge in the area of interaction.

Characteristics of knowledge sharing processes

The knowledge sharing processes that surround the groups demonstrate some differences. In particular, academicians distributed their knowledge mainly by use of passive strategies as publication and conferences, and much less by collective actions and virtual discussions. In turn, regional decision makers obtained majority of knowledge and information from colleagues or by reading, and less from social media and face to face conversations. The common categories of knowledge that use academicians were explicit and tacit, while embedded and explicit categories for the regional decision makers, and tacit and embedded categories for the local decision makers. In several publications indicated that practicing "active sharing" technique among scientists can be very useful and productive, like blogging and social networking (Peters, 2013). In turn, ways of obtaining knowledge and information by policy makers can be different and depend on their role in

the interface (Haynes et al., 2012). Highlighted, that tacit knowledge is difficult identify and pass, and in the majority of cases sharing happens through the socialization (Davenport & Prusak, 1998), while embedded knowledge sharing happens through clearly delineated products, like official documents or processes (Serban & Luan, 2002). Returning to the discussion results, academicians produced a variety of knowledge types, but analysis demonstrated that decision makers were lacking of the knowledge about implementation for sustainable social-ecological systems (SES) functioning. A several convergence points were found between the two groups, for instance towards writing and reading preference types, in a medium amount of reading or production, and in the major principles to be involve into the knowledge exchange process (linking and iterative consultation). Along with that, up to 100% of decision makers mentioned the concern in the knowledge exchange process, and among the main causes were indicated lack of information, problem with finding information, difficulties with understanding, selection and use.

Science-policy interface

Analysis shows that majority of academicians (47.5%) evaluated science-policy interface as a good, while the major part of decision makers from two sub-groups mentioned a fair level of interface (53.6% and 62.5%). In turn, only a minor amount of all respondents (up to 13.4%) indicated on a very good level interface.The major criteria for evaluation was similar for the both groups, and it was oneness and cooperation. An effectiveness of knowledge sharing with a policy was rare and occasionally for over 70% of academicians, in turn an effectiveness of gained knowledge transfer was frequent for 50% of regional and 50% of local decision makers. Familiar with the Ecosystem service concept were over the half of all respondents, but only less than a half of academicians mentioned that use this concept rare or occasionally. About this concept and its role to target the sustainable green infrastructure development was mentioned earlier in the text of thesis (*2.4. Green infrastructure: exploring gaps for the sustainable development).* Difficult to explain why the concept that so useful for the sustainable land use planning having a so low practical usage. Among the possible answers can be mentioned a neglection of knowledge, a lack of the true concept understanding, a difficulty in it practical implementation, along with other constrains. I can refer in that case on a lack of interest to it application from a side of policy and decision makers (Guerry et al., 2015), and not full incorporation of concept into EU policies (Schleyer et al., 2015). In turn, in the literature possibly to find ways that will help a practical application of the concept, like: utilization of valuation techniques to assess the economic implications of changes in ecological goods and services (Alcamo, 2003), integrating ecosystem services into the small-scale greening

projects (Lovell & Taylor, 2013), improvement of theoretical conceptualization between SES and ES concepts (Partelow & Winkler, 2016). Returning to the discussion results, socialization considered among academicians as a major way for the SPI integration, while regional policy makers mentioned about importance of iteration and local decision makers gave priority for cross institutional cooperation. Along with that, deficit of personal contact with academicians felt only the local decision makers, along with a lack of feeling of work under the mutual benefit. About a contact with each other mentioned over 90% of respondents, and it was due to their mutual intention. Monthly contact frequency registered among a half of academicians, and less than half of regional decision makers (40.0%), while it was very rare for the local decision makers (12.5%). Therefore, my results concluded any lack of communication from the side of academicians, while indicate on the deficiency of communication for the local decision makers. Among the major challenges due to contact between two groups was mentioned a problem with the policy procedure (up to 40%). Similarly, was mentioned that productive communication between scientists and policymakers promotes the best practice for the science in decision making (Scott, Rachlow & Lackey, 2008). Along with that, a deep context analysis shows an unusual trend between the two groups of actors in their interface. In particular, they blame each other in the similar things, like fragmented thinking, lack of time, narrow approach, prioritization of a certain values, absence of flexibility and see behind the boundaries, lack of multidisciplinary view and absence of the new way of thinking, et cetera. An explanation can be found in the Social psychology. For instance, in order to reduce own responsibility for mistakes, actors that involved in the same process can blame the others, "self-serving bias" phenomenon (Lench et al., 2015).

Investigating behavioral intentions of the major actors

In particular, models for the both groups of actors demonstrate a significant positive relation of the SPI evaluation (Attitude) with the Behavioral intertions (BI): Knowledge sharing for academicians or Intention to turn gained knowledge into power for decision makers. Such results with an accordance to the similar finding, e.g. the level of satisfaction influenced the behavioral output (Baker & Crompton, 2000). Moreover, strength of this association was stronger for the academicians (r_s=0.44**) and weaker for the decision makers (r_s=0.35*), indicating on the different group sensitivity. Results not showed any relations between the Behavioral intention of actors and the Subjective norms. It can be explained by the models limitation, e.g. lack of the social norm describing variables, or influence of other factors that moderate the behavior. For instance, decision makers can be influenced by political, professional directives or knowledge uncertainties. This

finding is in a contrast to the qualitative data, where found the high percentage of personal values and believes influenced on the attitude, opinion and value sets among decision makers (up to 87,1%). Additionally, work of Carmi, Arnon & Orion (2015) claims that behavioral change in a sense of understanding environmental problems an equally important as knowledge about them, and knowledge can has not only direct but only indirect or mediated effects on a behavior. On own willingness of decision makers to convert scientific evidenced into policy also can influence the pressure of social norms or other external factors, e.g. politics or policy recommendations. These conclusions were consistent with the similar results. Thus, subjective norm (SN) was not a strong predictor of a behavioral intention (Guo et al., 2016). Along with that, application of social and descriptive norms together increases the variance explained in an intention (Ham, Jeger & Ivković, 2015). In a case of academicians, absence of the SN and the BI association can be explained by a low level of willingness to influence on policy decisions or by a low capability to consider themselves as major actors in the environmental governance. The Perceived behavioral control showed a high significant positive relation with the Behavioral intention, but only in a case of academicians (rs=0.59***). Therefore I concluded, the bigger oppurtunity among academicians to Sharing knowledge capacity the more positive will be their Intention to the knowledge sharing. In turn, absence of relation between Reading capacity variable (PBC) and the Behavioral intention in the model that describes decision makers behavior, indicate on influence of other factors, like did extended variables of this model. A strong significant and positive relation of the Knowledge broker service variable and the Behavioral intention of decision makers also was identified (rs=0.56 **). Similar results were obtained by other authors, e.g. knowledge brokering bridge or overcome the gap between researchers and decision-makers (Tsui, Chapman & Stewart, S., 2006). However, results of the qualitative study show that opinion about knowledge brokering among academicians varied from negative to positive.

Conclusion remarks

Results of the study show a high developmental potential for the SPI toward the sustainable development of green infrastructure on the example of environmental governance in Akershus county and Oslo city. Identified a variety of convergence points between the two groups of actors that related to the common goals in the development and future visions of the progress, along with their desire and willingness to the cooperation. Moreover, results uncovered some of obstacles that related to the knowledge management that surround the both groups of actors, and some of internal

and external causes that can also significantly influence on the direction or focus the knowledge sharing processes. Such misfits and barriers can negatively affect on the SPI in the area, and obstacles in the knowledge management will not add mutual willingness for the common work and increase a trust between the major group of actors.

7 Future outlook and recommendations

Despite growing sustainability awareness, it is still a very limited communication of sustainability issues between science and policy, especially how to manage knowledge in a more efficient way. The ambition of policy to reach sustainability point in the studied area is a very high, in turn requires the significant changes in order to to embody the desired in reality. Many research findings indicate not only on complexity of the SPI itself, but also on complexity of the environmental governance, and the green infrastructure in particular. Situation in the studied area brings to the several challenges that face governance and policy mostly: urban densification versus environmental sustainability, climate change versus adaptation, multi-purpose land use versus land use conflicts. Along with that, it is a quite new area still, where limited communication of sustainability information and knowledge exchange between stakeholders can be the serious issues.

The knowledge infrastructures in the Anthropocene fulfill many functions, e.g. helping to sustain practices aimed at sustainability (Edwards, 2017) or support collective cognitive diversity and transparency (Dixon, 2010). In turn some of findings, argues that the main problem for knowledge utilization located not in the lack of evidence based solutions, but in the competition between "knowledge coalitions" of researchers and decision makers (Buuren & Edelenbos, 2004). Moreover, even though state a fact that knowledge can be seen as steering, learning, and connective elements of the governance, a little attention played for the case where knowledge accepted as an intrinsic element of environmental governance (van der Molen, 2018). Highlighted that to promote ecologically sustainable perspective, environmental governance should be focused on the communicating knowledge that will generate more discussion about values and benefits (Naess, 2001), and on the contextualized knowledge that helps overcome uncertainty in the decision making process (Lalor & Hickey, 2014). The perspective visions and strategies of knowledge sharing were identified as elaboration of communicational dissemination gateways which specifically target the various potential user groups (Van den Hove, 2007) and as availability of communication across science and policy with the help of "skilled" people from the both sides, who act like "knowledge brokers" and therefore foster cohesiveness (McNie, 2007, p. 12).

Traditional research expects only one-to-one relationship between science and policy, while modern complexity of environmental issues demands the new approaches and strategies. In particular, future perspective lies in knowledge aggregation, consolidation, creating knowledge regimes, and knowledge sharing platforms (Koetz, Farrell, Bridgewater, 2012; de Vos et al., 2013). Such type of system involves a set of actors, and this approach especially important for investigating uncertainty of problem, where close cooperation and negotiation provide a great opportunity for the making decision and science-society integration (Campbell & Pedersen, 2015). Along with that, such system helps integrate different evidences and reduce the conflict of interests (Gorddard, et al. 2016), assists to identify gaps in policy and knowledge management that supports the best decision (Nesshöver et al., 2016), decrease fragmentation and increase legitimacy of environmental science (Snoeijs-Leijonmalm et al., 2017). The new role of scientists due to the current problems complexity, demands taking responsibility in order to link the production and use of knowledge. Concerning the issue was discussed a such activity of scientists as knowledge brokering, that can be divided on the three ranges as supplying, bridging and facilitating (Turnhout at al., 2013). In turn, increasing complexity of policy problems, leads to the search of new strategies and assessment tools in order to facilitate more evidence-based policy making. Along with that, governments are not the final institutions nowadays in the decision making, especially towards environmental issues, therefore for the hybrid forms of governance that involve a variety of non-state actors should be open a new perspectives (Armitage, De Loe & Plummer, 2012). In turn, future outlooks for the green infrastructure development lies in the overcoming the communication gap between stakeholders and strengthening the role of scientific research (Ugolini et al., 2015), combining land use strategies on the base of ecosystem services trade-offs in planning and management (Baró Porras, 2016). On the base of earlier proceeded theoretical findings that combine conceptual frameworks of the science-policy interface and knowledge management, I would like to recommend an Integrative design to the sustainable development and planning of the green infrastructure that can be implemented for the studied area. The main pathways of integration depicted at the Figure 19.

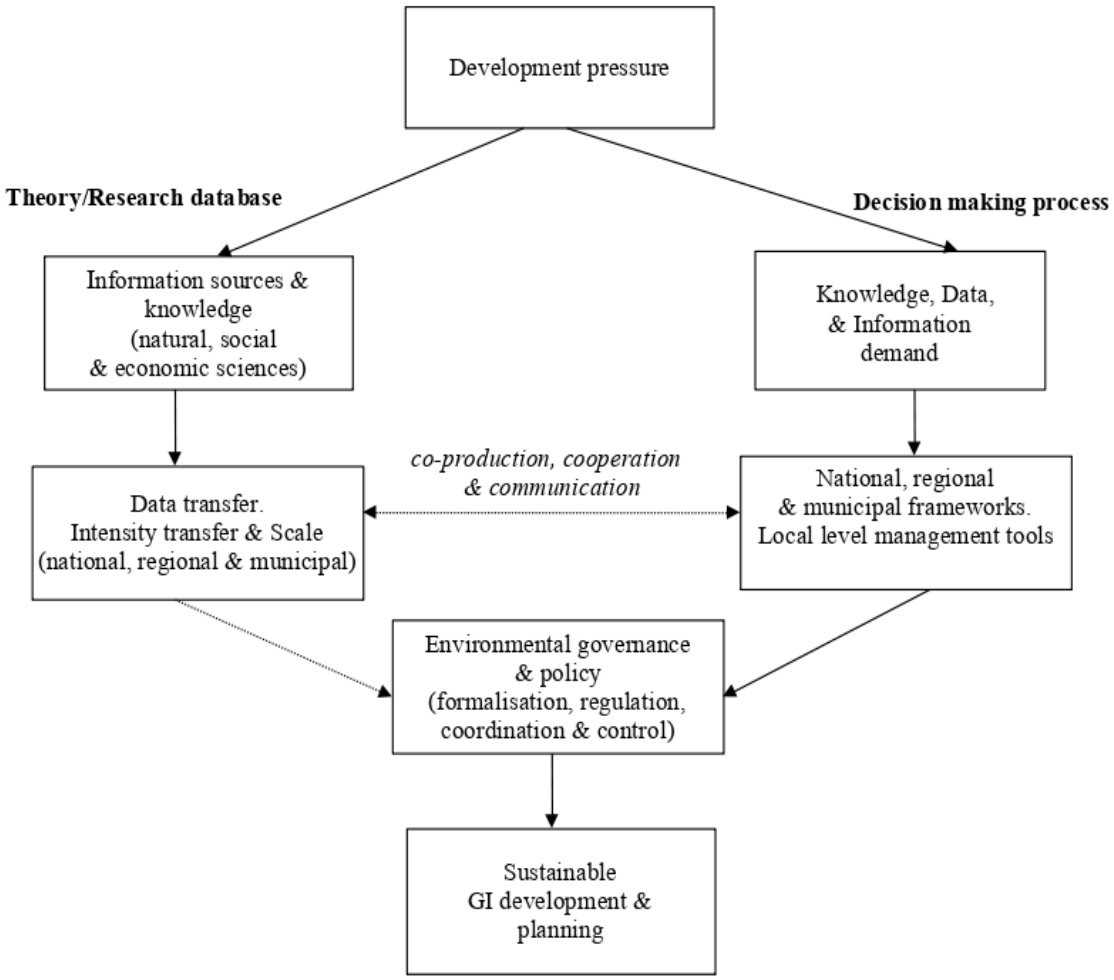

Figure 19: Combined model: Integrative design to the sustainable GI development and planning

Before making the final recommendations, I would like to make a brief stop yet on the several results that closely connected to the place of my research. In particular, the modern research agenda around the municipal environmental governance in Norway focused on the two main issues: (1) lack of administrative capacity at the local level (Aall, 2012), and (2) how to improve transformation of the municipal organizations (Amundsen et al., 2018). The suggestions how to overcome these obstacles were grounded on the followings: enhance institutional capacity to address the challenges of climate change adaptation at the municipal level (Amundsen, Berglund & Westskog, 2010); introduce adaptive co-management between national, regional, and local levels (Westskog, Hovelsrud & Sundqvist, 2017); introduce hybrid solutions that balance local economic interests and national policy concerns (Hovik & Hongslo, 2017); implement a combination of soft and hard policy instruments as the regulatory issues (Kasa, Westskog & Rose, 2018).

By being guided by own results and by results found in the literature I would like suggest the following recommendations to overcome intra- and inter-organizational barriers in the environmental governance in the studied area, and to improve knowledge sharing practices within the science-policy interface at the individual level:

Propositions for the academic community:

- increase quality and durability of designs for the green infrastructure projects inside Oslo city and sub-urban areas (e.g. green roofs, waster water management);
- show openness in the discussions with other stakeholders towards uncertainties in science, and take responsibility in the recognize own mistakes;
- take a leadership towards the knowledge sharing efficiency improvement, along with increase of active knowledge dissemination strategies usage;
- strengthen the link to policy by the simplification of scientific conceptualization, and by using help of the knowledge brokering technique, along with that by production a higher amount of contextual knowledge that appropriate for practical use and relevant for the particular case;
- provide theoretical and practical scientific support for the local decision makers by organizing open discussion about local environmental problems and local sources of knowledge, initiate research projects under the mutual benefit that will elaborate denser knowledge sharing networks.

Propositions for the regional and local decision makers:

- open gateway for the main principle of green infrastructure that based on the holistic view of the whole system functioning, and especially in a case of planning;
- compose and introduce on the net an easy assailable catalog that includes academicians who involve in a particular field of science for the quicker finding a contact (e.g. bee specialist);
- increase monitoring, coordination and cooperation within municipality and between municipalities, which dealing with certain areas of the green infrastructure development, along with updating regional and local legislative bases;
- supply municipalities by specialists with an equal status of natural and social science backgrounds, along with regularity organizing different workshops among the current stuff about how to balance economic and environmental interests at the local level;

- shift focus on the small scale but long term ecological restoration projects that involve green infrastructure elements, and include different stakeholders.

Common propositions for the both groups of actors:

- integrate stakeholders by using different platforms for knowledge sharing that assess the collective knowledge and co-produce knowledge from the several sources (e.g. local adaptation strategies to climate change);
- expand the practical implementation of the concept about ecosystem service due to a strong support of the theoretical base;
- improve and elaborate new mechanisms that promoter the greater degree of sustainability in a case of densification policy. For instance, regulation can be build on social, ecological and economic limits toward the level of development in the area. The main principle of such regulation is multi functionality. Develop appropriate legislative base for such policy and introduce economic instruments to promote it sustainability support, (e.g. financial benefits from the growth should be invested also into the green infrastructure restoration and development projects like riparian vegetation near lakes or shores, conservation of certain areas, bio-retention basins for a water purification).

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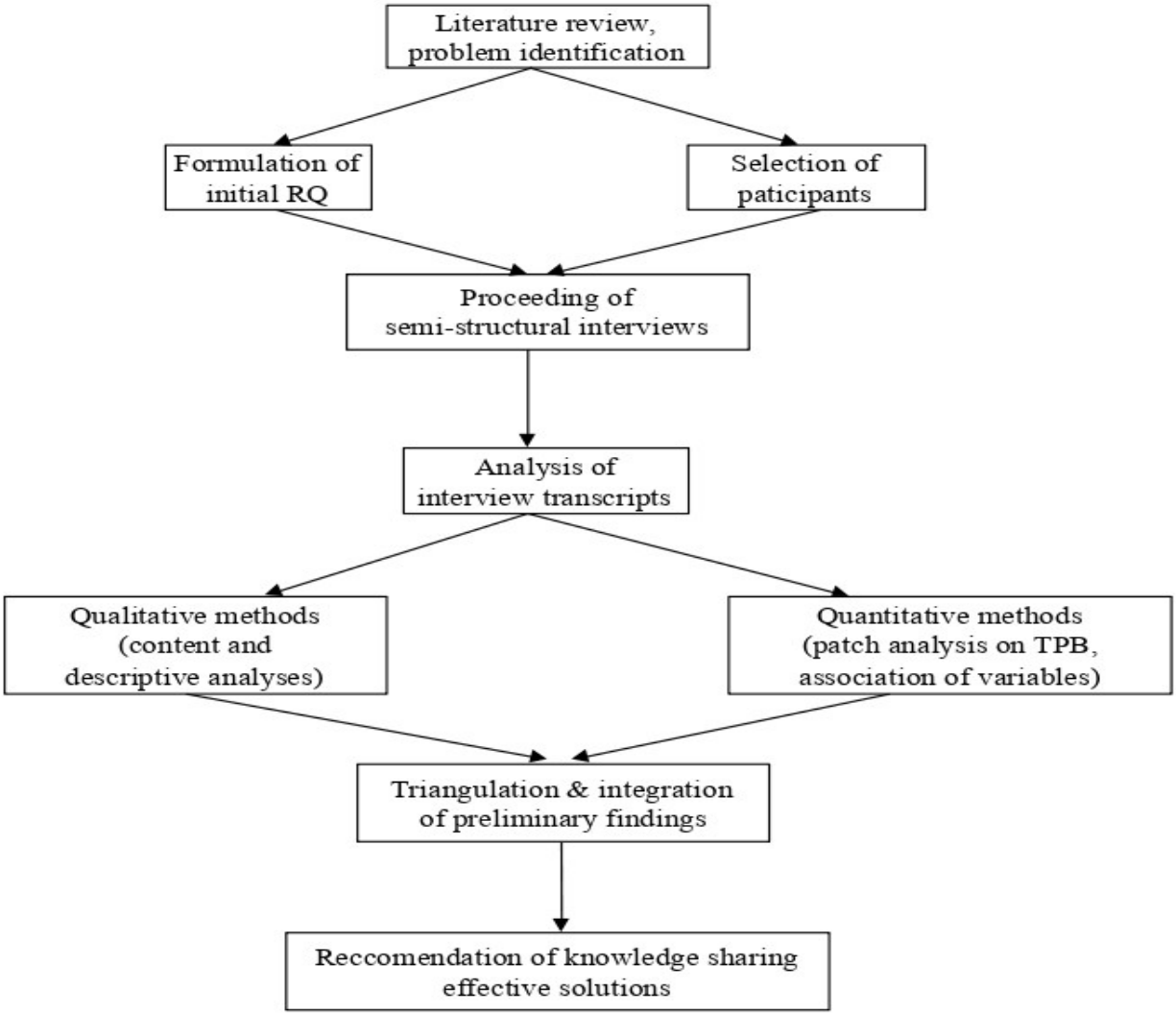
APPENDICES

Appendix 1: A schematic diagram of the research resign of the study



Appendix 2: List of science and research establishments that were used for the study

(*descriptions are taken from the websites of organizations)

Abbreviation (number of interviewees)	Research or academia authority	Short description*
NINA (5)	Independent research organisation	The Norwegian Institute for Nature Research focuses on the nature research and research on the interaction between human society, natural resources and biodiversity
SINTEF (2)	Independent research organisation	The company for Industrial and Technical Research at the Norwegian Technical High School is a broad, multidisciplinary research organisation with international top-level expertise in the fields of technology, the natural sciences, medicine and the social sciences
Høyskolen Kristiania (1)	Private foundation	Kristiania University College offers vocational programmes within the areas of design, communication and technology, contributes research-based knowledge, competence and practical learning for innovation and value creation
OsloMet (HiOA) (3)	State university	Oslo Metropolitan University creates value for society by developing knowledge that contributes to improved welfare. This research will give insights into the activities, frameworks, and conditions of sectors and occupational fields in a society that is continually changing
AHO (1)	Public university college	The Oslo School of Architecture and design offers a unique research-based education with a strong international standing within the fields of architecture, urbanism, design and landscape architecture
CICERO (4)	Independent research organisation	The Centre for International Climate and Environmental Research is an interdisciplinary research centre for climate research and environmental science/environmental studies
NIVA (2)	Private research foundation	The Norwegian Institute for Water Research comprises a wide array of environmental, climatic and resource-related fields. It is combine research, monitoring, evaluation, problem-solving and advisory services at international, national and local levels
NILU (1)	Independent research organisation	Norwegian Institute for Air Research provides knowledge and awareness about causes and consequences associated with pollution and climate change
NMBU (11)	Public university	Research and study programmes of The Norwegian University of Life Sciences are generate innovations in food, health, environmental protection, climate and sustainable use of natural resources
NIBIO (7)	Owned by the Ministry of Agriculture and Food as an administrative agency with special authorization and its own supervisory board	The Norwegian Institute of Bioeconomy Research contributes to food security and safety, sustainable resource management, innovation and value creation through research and knowledge production within food, forestry and other bio-based industries
UIO (3)	Public university	The University of Oslo is a classical university with a broad range of academic disciplines that has top research communities in the most areas with a strategic focus on interdisciplinary research in the life sciences field

Appendix 3: List of policy and decision making establishments that were used for the study

(*descriptions are taken from the websites of organizations)

Abbreviation (number of interviewees)	Authority	Short description*
Fylkesmannen: Miljøvernav delingen, Landbruksav delingen (4)	County Governor of Oslo and Akershus	The Environmental protection department is working on tasks in the planning and nature management area. The Agriculture department goal is a sustainable land use management and planning, safe food production and forestry. Both departments are contributing to municipalities maintaining good governance practices
Miljodirektoratet (1)	The Norwegian Ministry of Climate and environment	The Norwegian Environment Agency's primary tasks are: reduction greenhouse gas emissions, management Norwegian nature and prevention of pollution. It is plays a key role in shaping Norwegian environmental policy
Landbruks direktoratet (1)	The Norwegian Ministry of Agriculture and Food	The Norwegian Agriculture Agency has a national authority in land and forest resources usage, and competence to ensure that all schemes and regulations in agriculture are administered uniformly across the country
Bærum kommune (4)	Akershus County municipality	Berum's local authorities are responsible for green spaces management; sustainable forestry, climate mitigation, land use planning, conservation and biodiversity issues
Frogn kommune (4)	Akershus County municipality	Frogn's local authorities are responsible for green spaces management; sustainable forestry, climate mitigation, land use planning, conservation and biodiversity issues
Vann- og avløpsetaten (VAV) (1)	Agency in the City of Oslo under the Council's Department of Environment and Transport	It is a self-financing company within the municipality of Oslo. The main goal of the Water and Wastewater Administration is to ensure that the inhabitants have sufficient drinking water of high quality and handle the wastewater so that the city's environment, waterways and fjord are well maintained
Statens vegvesen (1)	Subject to the Ministry of Transport and Communications	The Norwegian Public Roads Administration is a government agency that responsible for national and county public roads in Norway, that closely connects to infrastructure developing plants and land usage
Byrådet for bymiljø (1)	Oslo municipality	City environment business unit's objective is to create the synergies that lie in gathering specialist communities and facilitating more efficient administration of public urban space, to establish a more robust operational and investment body and to strengthen the municipality's efforts in the areas of climate change, environment and energy efficiency
Bymiljøetaten (3)	Oslo municipality	Agency for Urban Environment manages common areas such as open spaces and outdoor recreation, including landscape spaces in Oslomarka and inner Oslofjord municipal urban areas (roads, streets, pedestrian streets, sidewalks, squares, parks), also deals with protection of water and soil

Plan- og bygningsetaten (3)	Oslo municipality	Agency for Planning and Building Services is responsible for the municipality's overall land-use planning, planning and building case management, map management and map and sharing operations. The agency is a driving force in Oslo's urban development

Appendix 4: Request for participation in research project (Master thesis)

Are you interested in taking part in the research project: *"Role of the knowledge sharing between scientists and decison makerss in the green infrastructure governance"?*

Background and Purpose

It is a Master thesis work of a student from NMBU, Ås. It is an individual work. The main objective is to uncover if participants reflect their "true" roles and needs in the science-supported policy making process. Survey questions will be oriented that collect data related to gaining knowledge upon science-policy interaction: problems they address, what objectives and strategies are used, what stimulate their mutual work in the light of the knowledge sharing in the area of green infrastructure.

Why are you being asked to participate?

You are being asked to participate because of suitability to criteria: a) involvement into policy/management that connected with the green infrastructure development; b) have a work experience with the green infrastructure projects; c) mix of gender and age; d) location (Akershus country and Oslo city)

What does participation involve for you?

The data collection will consists of individual semi-structured interviews (face-to-face). Prior to the interviews, to all of the interviewees will be send a list of 5-7 questions that would be the main themes for the interview. The duration of interview plan to be 30-45 min. Data will be collected as survey with some of written interview notes, but without of any of audio/video recording

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw

What will happen to the information about you?

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act). All respondents will gain a unique code that will be used throughout data processing and analysis to protect their identities. Interview notes and memos will be imported into ATLAS. Ethical issues during the research were minimized. Anonymity and confidentiality are granted and survey will include only general information about respondent and his/her opinion about the green infrastructure work, any specific information that could be used to identify individual respondent will not be included. All data will be anonymised prior to the analysis and treated confidentially. Access to personal data will have master student and superviser only, and they will be stored at university computer data base. To ensure confidentiality, list of respondent names will be stored separatelly from the other data. Any personal information that support identification of respondent will not be included in the final publication (Master thesis).

Voluntary participation

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw

What will happen to your personal data at the end of the research project?

The project is scheduled to middle of May 2019. All personally identifying information collected about respondent including coding will be destroyed within a specified period after the end of the research project.

If you have any questions concerning the project, please contact:

If you have questions about the project, or want to exercise your rights, contact:

- Espen Olav Sjaastad, supervisor, Professor, NMBU, +4767231332, espen.sjaastad@nmbu.no
- Yemets Olena, MS student, NMBU, +4792477694, olena.yemets@nmbu.no
- Our Data Protection Officer: Jan Olav Aarflot, NMBU, +4767230250, +4790636301, jan.olav.aarflot@nmbu.no
- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Consent for participation in the study may be attained in writing or verbally.

I have received information about the project and am willing to participate

---

(Signed by participant, date)

Appendix 5: Interview guides

(1). *Interview questions for Academicians*

Background and personal details

1. How old are you?_____

2. What is your gender? Male □ Female □

3. What is your nationality? _____

4. What the highest level of education you have completed? High School □ BSc □ MSc □ PhD □

(b) Your scientific background (Social Sc □ Natural Sc □ Mixed Sc)

5. What is your working position? _____

6. Did you ever held an addition position as advisor, consultant for the area of green infrastructure or environmental governance?

(a) Yes □ No □

(b) If Yes, what the type is: Private □ Municipal type □ Mix □ Other □

(c) If Yes, what the level is: Local □ Regional □ National □ Sub-national level □

7. How would you describe elements or processes or topic in the environmental governance that you has been involved in the last years?

(a) What is the main element(s) that you are working with:

water; landscape; green spaces; species; man-made elements; others

(b) What is the main main process(s) that you have been involved during the work:

education; management; planning; evaluation; conservation; governance; design; others

(c) What is the main focus(s) of your work: climate change adaptation; agriculture; urban forest; small green urban spaces with multiple benefits; semi-urban green areas; water and storm water management; soil management; energy savings; biodiversity conservation; food production, air quality; quality of life; mobility; others

8. What is the level of your studies or research projects?

Local □ Regional □ National □ Sub-national □ Variety □

9. For how many years have you been working:

(a) With a field of Environmental Governance?

Less than 5 years □ From 5 till 10 years □ More than 10 years □

(b) With area of Green infrastructure?

Less than 5 years □ From 5 till 10 years □ More than 10 years □

10. Are you a member of any environmental organization or society? Yes □ No □

Part I. Questions related to the knowledge networking process

11. Please, give a brief description of the knowledge networking you are the current member is:

(a) Level of network: Intra-regional □ Inter-regional □ National □ Subnational □

(b) Density of network: Intra-regional □ Inter-regional □ National □ Subnational □

(c) Form of network: formal vertical (organisational) □ informal (horizontal) □ combinatorial □ on-line network □

12. How do you see an own role in the knowledge networking process?
(facilitator; coordinator; regular network member; leader)
13. Please, indicate purpose is and what opportunity(s) the knowledge network(s) offering for you? (personal learning; sharing information; co-production of knowledge; exchange content and valuable information; form of partnerships; foster interaction among users; collective knowledge adoption; others)
14. How would you evaluate the productiveness of your knowledge network(s) by using 5 level scale?
1 □ 2 □ 3 □ 4 □ 5 □
15. Please, describe main barriers in the your knowledge networking: (a) organizational; (b) interpersonal; (c) personal; (d) technological; (e) physical

Part II. Questions related to the personal believes, values and attitudes
16. Where do you see the main benefit of the green infrastructure? (Rate from a Very low to a Very high)
(a) Ecological 1 □ 2 □ 3 □ 4 □ 5 □
(b) Economic 1 □ 2 □ 3 □ 4 □ 5 □
(c) Social & cultural 1 □ 2 □ 3 □ 4 □ 5 □
17. Please, choose up to three answers to the following questions:
(a) What is your opinion, what issue nowadays the most important to take into account in the area that you are dealing with? (security & climate change; sustainable development; low carbon infrastructure; education; mobility; quality of life: health; clean water & air; recreation, design; contentedness with nature; own answer)
(b) Which topics do you think are most important for communication and collaboration with decision makers in the area that you are dealing with? (knowledge management; risk & uncertainty; resolution of conflict situations; legislation; international interplay; politics; cross institutional changes; boundary organizations; own answer)
(c) What is your opinion, which principle(s) in the GI is/are lacking attention from the side of decision makers in the area that you are dealing with? (multi functionality; connectivity; diversification; multi benefits; integration of user groups; own answer)
18. What is your opinion, who are the major actors that influence the environmental development or the green infrastructure branch that you are dealing with? politics; bureaucrats; academicians; special interest; common interest actors
19. Please rate, by using 5 point scale, your willingness & interest in: (Scale from highly negative to highly positive)
(a) Sharing an own experience, information data and knowledge 1 □ 2 □ 3 □ 4 □ 5 □
(b) Communicating & collaborating with other actors 1 □ 2 □ 3 □ 4 □ 5 □
(c) Increase an own influence in the shaping policy decisions 1 □ 2 □ 3 □ 4 □ 5 □
(d) Gaining of an additional knowledge that is not of direct field of expertise 1 □ 2 □ 3 □ 4 □ 5 □
20. Describe what types of motivation practice for the knowledge sharing is important for you?
(intrinsic; extrinsic; both types)
21. What is your opinion, where should be the future opportunities for development in the area of environmental governance that you are dealing with? (conceptually and in planning terms) (assessment of the utility of green infrastructure in meeting the climate change; developing an economic baseline for green infrastructure development; developing the techniques to assess the green infrastructure benefits; role of statutory agencies in the development of green infrastructure; finding ways to satisfy a broader needs of a constantly changing society; own answer)

Part III. Questions related to the knowledge sharing process

22. Please, indicate how often you are employing a certain mechanism(s) for the knowledge sharing (Scale from Newer use to Always use):

(a) Face to face communication, inc. phone conversations 1 □ 2 □ 3 □ 4 □ 5 □

(b) Conferences, presentations & multidisciplinary workshops 1 □ 2 □ 3 □ 4 □ 5 □

(c) Consultation, training & coaching 1 □ 2 □ 3 □ 4 □ 5 □

(d) Collective actions (mass media campaigns) 1 □ 2 □ 3 □ 4 □ 5 □

(e) Informal presentations & round-tables discussions 1 □ 2 □ 3 □ 4 □ 5 □

(f) Virtual discussion (blogs, mass & social media) 1 □ 2 □ 3 □ 4 □ 5 □

(g) Publication 1 □ 2 □ 3 □ 4 □ 5 □

23. Based on your knowledge working activity, please indicate:

(a) What category(s) of knowledge-data-information you are sharing with different actors: (tacit knowledge; embedded knowledge; explicit knowledge)

(b) What type(s) of knowledge within the socio-ecological system you are producing:

(a) about components, functions & processes in the social-ecological system □

(b) about developing goals & pathways for the functioning of social-ecological system □

(c) about ways of the social-ecological system goals implement into the practice □

24. Indicate writing type(s) of data, information or knowledge you delivering:

(a) Informative (report, article, brochure, summary) □

(b) Evaluative (recommendation, advice, feedback, criticism) □

(c) Narrative (descriptive essay, personal observations & feelings) □

(d) Interactive (informal letter, request of information, message, invitation) □

25. What an average amount of data, scientific information, knowledge you has been provided during the last year? (little amount is from1 till 20 pages; medium amount is 20-50 pages; more than medium amount is 51-100 pages; big amount is more than 100 pages; extremely big amount is more than 200 pages) Small amount □ Medium amount □ More than medium amount □ Big amount □ Extremely big amount □

26. Which principles in the knowledge exchange design between different actors you are considering the most useful in the area that you are working with? Choose up to three major

(a) Engaging into design & Linking (bringing more stakeholders together) □ (b) Recognition & Representation (understanding of different motivations) □ (c) Feedback & Iterative consultation □ (d) Impact (working for the mutual benefit) □ (e) Reflection and sustaining (continuity of involvement) □

Part IV. Questions related to the science-policy interface

27. How you can evaluate the current practice in the linking science to policy in the environmental area that you are dealing with? Poor □ Fair □ Good □ Very good □ Excellent □ Difficult to answer □

(b). According to the previous question, what are the major criteria you used for an evaluation of the science-policy interface? (a) Technical coherence □ (b) Competence □ (c) Legitimacy □ (d) Effectiveness □ (e) Efficiency □ (f) Openness & cooperation □ (h)_____(own answer)

28. How often your passive knowledge are being transferred into the actions or policy output? (from Very rare to Always)

1 □ 2 □ 3 □ 4 □ 5 □

29. Do you familiar with scientific conceptualization like Ecosystem service? Yes □ No □ Not sure □

(b) How often ecosystem service concept using in your scientific publications or research projects?)from Never to Very often) 1 □ 2 □ 3 □ 4 □ 5 □

30. What is your opinion, which indicated below issues may help facilitate the further integration of scientific evidences into the policy in the area of your interest: (Choose up to three main issues)

(a) Socialization (focus on the common social understanding & value of knowledge) □

(b) Conceptualization (creating the common theory base) □

(c) Iteration (repeated performance of evidences from bottom to up levels) □

(d) Practical implementation support (helping implement the evidences) □

(e) Developing capacity (helping actors learn from the process) □

31. Have you ever had a personal contact with a policy maker? (a) Yes □ No

(b) If Yes, who was initiated the contact? Me □ A policy maker □ Both in equal proportion □ Other ways □ (c) And what was the reason?_____

(d) How frequently contacts had place? Rare than once a year □ Once a year □ Several times a year □ Monthly □ Weekly □

(e) Do you continue to keep the same contacts? Yes □ No □ Not always □ Difficult to answer □

(f) With what major challenges toward policy makers did you face during knowledge exchange process or collaboration under the projects? (difficulties with a political procedure, topic of green infrastructure is too complex, difficult to communicate with a policymaker, other disagreements; none of them; own answer)

*(2***).** *Interview questions for Regional decision makers*

Questions about background and personal details

1. How old are you?_____

2. What is your gender? Male □ Female □

3. What is your nationality? _____

4. What is the highest level of education you have completed? High School □ BSc □ MSc □ PhD □

5. What is your working position? _____

6. Did you ever held a position as a scientist or researcher the area of environmental governance?

(a) Yes □ No □

7. How would you describe elements or processes or topic in the environmental governance that you has been involved in the last years?

(a. What is the main element(s) that you working with: water; landscape; green spaces; species; man-made elements; others

(b) What is the main main process(s) that you have been involved during the work:: education; management; planning; evaluation; conservation; governance; design; others

(c) What is the main focus(s) of your work: (climate change adaptation; agriculture; urban forest; small green urban spaces with multiple benefits; semi-urban green areas; water and storm

water management,; soil management; energy savings; biodiversity conservation; food production; air quality; quality of life; mobility, others

8. Do you participate in the research activities? Yes □ No □

(a) If Yes, what is the level of your participation? Local □ Regional □ National □ Sub-national □ Variety □

9. For how many years have you been working:

(a) With a field of Environmental Governance?

Less than 5 years □ From 5 till 10 years □ More than 10 years □

(b) With an area of Green infrastructure?

Less than 5 years □ From 5 till 10 years □ More than 10 years □

10. Are you a member of any environmentally friendly organization or society?

Yes □ No □

I. Questions related to the knowledge networking process

11. Please, give a brief description of the knowledge networking you are the current member is:

(a) Level of network: Intra-regional □ Inter-regional □ National □ Subnational □

(b) Density of network: Intra-regional □ Inter-regional □ National □ Subnational □

(c) Form of network: formal vertical (organisational) □ informal (horizontal) □ combinatorial □ on-line network □

12. How do you see an own role in the knowledge networking process?

(facilitator; coordinator; regular network member; leader)

13. Please, indicate purpose is and what opportunity(s) the knowledge network(s) offering for you? (personal learning; sharing information; co-production of knowledge; exchange content and valuable information; form of partnerships; foster interaction among users; collective knowledge adoption; others)

14. How would you evaluate the productiveness of your knowledge network(s) by using 5 level scale?

1 □ 2 □ 3 □ 4 □ 5 □

15. Please, describe main barriers in the your knowledge networking: (a) organizational; (b) interpersonal; (c) personal; (d) technological; (e) physical

II. Questions related to the personal believes values and attitudes

16. Where do you see the main benefit of the green infrastructure? (Rate from a Very low to a Very high)

(a) Ecological 1 □ 2 □ 3 □ 4 □ 5 □

(b) Economic 1 □ 2 □ 3 □ 4 □ 5 □

(c) Social & cultural 1 □ 2 □ 3 □ 4 □ 5 □

17. Which factors influenced your own attitude, opinion and value sets that related to the green infrastructure development during the last 5 years?

(a) Personal values & believes □ (b) Common benefits □ (c) Knowledge & results of education □ (d) Organizational directives □ (e) Globalisation (technology, politics & economy) □

18. Please, choose up to three answers to the following questions:

(a) What is your opinion, what issues the most important take into the account today in the area of environmental governance that you are dealing with? (security & climate change; sustainable development; low carbon infrastructure;

education; mobility; quality of life: health; clean water & air; recreation; design; contentedness with nature, own answer)

(b) Which topics do you think are most important for communication and collaboration with scientists in the area that you are dealing with? (knowledge management; risk & uncertainty; resolution of conflict situations; legislation; international interplay; politics; cross institutional changes; knowledge boundary organizations, own answer)

(c) What is your opinion, which principle(s) in the GI is/are lacking attention from the side of scientists? (multi functionality; connectivity; diversification; multi benefits; integration of user groups; own answer)

19. What is your opinion, who are the major actors that influence the environmental development or the green infrastructure branch that you are dealing with? Like politics; bureaucrats; academicians; special interest; common interest actors

20. Please rate, by using 5 point scale, your willingness & interest in (Scale from Highly negative to Highly positive):

(a) Sharing an own experience & information 1 □ 2 □ 3 □ 4 □ 5 □

(b) Communicating & collaborating with other actors 1 □ 2 □ 3 □ 4 □ 5 □

(c) Convert of scientific evidences into the policy decisions 1 □ 2 □ 3 □ 4 □ 5 □

(d) Gaining of an additional knowledge that is not of direct field of expertise 1 □ 2 □ 3 □ 4 □ 5 □

21. Describe what types of motivation practice for the knowledge sharing is important for you?

(intrinsic; extrinsic; both types)

22. What is your opinion, where should be the future opportunities for the development in the area of environmental governance that you are dealing with (conceptually and in planning terms)? (assessment of the utility of green infrastructure in meeting the climate change; developing an economic baseline for green infrastructure development; developing the techniques to assess the green infrastructure benefits; finding ways to satisfy a broader needs of a constantly changing society, own answer)

III. Questions related to the knowledge sharing process

23. Please, indicate how often you are using the following sources of knowledge-data-information indicated below (Scale from Newer use to Always use)

(a) Face to face communication with scientists1 □ 2 □ 3 □ 4 □ 5 □

(b) Colleagues (adviser & secretariat) 1 □ 2 □ 3 □ 4 □ 5 □

(c) Service of knowledge brokers 1 □ 2 □ 3 □ 4 □ 5 □

(d) Social media (e.g. YouTube, Facebook and Linkedin) 1 □ 2 □ 3 □ 4 □ 5 □

(e) Mass media (e.g. TV, internet, outdoor media, print media) 1 □ 2 □ 3 □ 4 □ 5 □

(f) Reading (e.g. article, book, policy brief) 1 □ 2 □ 3 □ 4 □ 5 □

(g) Seminars or round-tables, including local knowledge source 1 □ 2 □ 3 □ 4 □ 5 □

24. Base on your own knowledge working activity in the area of environmental governance (e.g. green infrastructure) please indicate:

(a). What category(s) of knowledge-data-information you are sharing with different actors: (tacit knowledge; embedded knowledge; explicit knowledge)

(b). According to your practice, what kind of information about the environmental governance (or green infrastructure) could be helpful for you:

(a) About components, functionality & processess in the social-ecological system (SES) □

(b) About developing goals & pathways for sustainable functioning of the SES □

(c) About the ways of the SES goals implementation on the practice □

25. Grade a certain category of communication with other actors according to your own preferences (from Low preference to High):

(a) Verbal communication 1 □ 2 □ 3 □ 4 □ 5 □

(b) Written communication 1 □ 2 □ 3 □ 4 □ 5 □

(c) Non-verbal communication 1 □ 2 □ 3 □ 4 □ 5 □ (body language; physical app.; voice or touch)

26. What type of writing information from scientists you prefer to deal with?

(a) Informative (report, article, brochure, summary) □

(b) Evaluative (recommendation, option, advice, feedback, complain, criticism) □

(c) Narrative (report, descriptive essay, personal observations and feelings) □

(d) Interactive (informal letter, note, request of information, message, invitation) □

27. What an average amount of data, information, knowledge that you are processing per month?

(little amount is from1 till 20 pages; medium amount is 20-50 pages; more than medium amount is 51-100 pages; big amount is more than 100 pages; extremely big amount is more than 200 pages)

Small amount □ Medium amount □ More than medium amount □ Big amount □ Extremely big amount □

28. Which principles in the knowledge exchange design between different actors you are considering the most useful in the area of environmental governance you are working with?

(a) Engaging into design & Linking (bringing more stakeholders together) □

(b) Recognition & Representation (understanding of different motivations) □

(c) Feedback & iterative consultation □

(e) Impact (working for the mutual benefit) □

(f) Reflection and sustaining (continuity of involvement) □

29. From the last experience, do you see some concerns in the knowledge exchange process that might negatively influence on the managing of data, information or knowledge in the area of environmental governance (green infrastructure) that you are dealing with: (a) Yes □ No □ Difficult to identify □

(b). If Yes, please provide a further information which particular concern is:

Lack or insufficient amount of knowledge/information □ Unsuccessful knowledge/information exchange □

Problem with the knowledge source access & selection □ Problem with the knowledge use □ Problem with knowledge understanding □

IV. Questions related to the science-policy interface

30. How you can evaluate the current practice in the linking science to policy in the environmental area you are dealing with?

(a) Poor □ Fair □ Good □ Very good □ Excellent □ Difficult to answer □

(b). According to the previous question, what are the major criteria you used for an evaluation of the science-policy interface?

(a) Technical coherence □ (b) Competence □ (c) Legitimacy □ (d) Effectiveness □ (e) Efficiency □ (f) Openness & cooperation □ (h)_____(own answer)

31. How often information, data or knowledge that you collected were transferred by you into the actions or policy output? (e.g. research project) 1 □ 2 □ 3 □ 4 □ 5 □ (Scale from Very rare till Always)

32. Do you familiar with ecosystem service concept? Yes □ No □ Not sure □

33. What is your opinion, which indicated below issues may help facilitate the further integration of scientific evidences into the policy in the area of of your interest:

(a) Socialization (focus on the common social understanding & value of knowledge) □

(b) Conceptualization (creating the common theory base) □

(c) Iteration (repeated performance of evidences from bottom to up levels) □

(d) Practical implementation support □

(e) Developing capacity (helping actors learn from the process) □

34. Have you ever had a direct contact with a scientist/researcher? (a) Yes □ No □

(b). If yes, who initiated the contact?

Me □ A scientist □ Both in equal proportion □ Other ways □

(c). And what is the reason?_____

(d). How frequently contacts had a place?

Once during a several years □ Once a year □ Several times a year □ Monthly □ Weekly □

(e). Do you still keeping contacts with scientists with whom you have been working before? Yes □ Not always □ No □

(f). What were major challenges or problems that you faced during knowledge exchange network or during collaboration under the projects with scientists? Please, specify a type of problem and how did you handle them (difficulties with understanding of a political procedure, topic of environmental governance is too complex & need to consider a major benefit; lack of time or financial support for the project; different priorities; difficult to communicate with a scientist due to

a complicated terminology; own answer)

*(3***).** *Interview questions for Local decision makers*

Questions about background and personal details

1. How old are you?_____

2. What is your gender? Male □ Female □

3. What is your nationality? _____

4. What is the highest level of education you have completed? High School □ BSc □ MSc □ PhD □

5. What is your working position? _____

6. Did you ever held a position as a scientist or researcher the area of environmental governance?

(a) Yes □ No □

7. How would you describe elements or processes or topic in the environmental governance

that you has been involved in the last years?

(a) What is the main element(s) that you working with: water; landscape; green spaces; species; man-made elements; others

(b) What is the main main process(s) that you have been involved during the work:: education; management; planning; evaluation; conservation; governance; design; others

(c) What is the main focus(s) of your work: (climate change adaptation; agriculture; urban forest; small green urban spaces with multiple benefits; semi-urban green areas; water and storm
water management,; soil management; energy savings; biodiversity conservation; food production; air quality; quality of life; mobility, others

8. Do you participate in the research activities? Yes □ No □

(a) If Yes, what is the level of your participation? Local □ Regional □ National □ Sub-national □ Variety □

9. For how many years have you been working:

(a) With a field of Environmental Governance?

Less than 5 years □ From 5 till 10 years □ More than 10 years □

(b) With an area of Green infrastructure?

Less than 5 years □ From 5 till 10 years □ More than 10 years □

10. Are you a member of any environmentally friendly organization or society?

Yes □ No □

I. Questions related to the knowledge networking process

11. Please, give a brief description of the knowledge networking you are the current member is:

(a) Level of network: Intra-regional □ Inter-regional □ National □ Subnational □

(b) Density of network: Intra-regional □ Inter-regional □ National □ Subnational □

(c) Form of network: formal vertical (organisational) □ informal (horizontal) □ combinatorial □ on-line network □

12. How do you see an own role in the knowledge networking process?

(facilitator; coordinator; regular network member; leader)

13. Please, indicate purpose is and what opportunity(s) the knowledge network(s) offering for you? (personal learning; sharing information; co-production of knowledge; exchange content and valuable information; form of partnerships; foster interaction among users; collective knowledge adoption; others)

14. How would you evaluate the productiveness of your knowledge network(s) by using 5 level scale?

1 □ 2 □ 3 □ 4 □ 5 □

15. Please, describe main barriers in the your knowledge networking: (a) organizational; (b) interpersonal; (c) personal; (d) technological; (e) physical

II. Questions related to the personal believes, values and attitudes

16. Where do you see the main benefit of the green infrastructure?

(Rate from a Very low to a Very high)

(a) Ecological 1 □ 2 □ 3 □ 4 □ 5 □

(b) Economic 1 □ 2 □ 3 □ 4 □ 5 □

(c) Social & cultural 1 □ 2 □ 3 □ 4 □ 5 □

17. Which factors influenced your own attitude, opinion and value sets that related to the green infrastructure development during the last 5 years?

(a) Personal values & believes □ (b) Common benefits □ (c) Knowledge & results of education □ (d) Organizational directives □ (e) Globalisation (technology, politics & economy) □

18. How many do you think the quantity of the green infrastructure has changed in your local authority in the last 10 years? Please give an approximate estimate: Decreased □ Stayed the same □ Increased □ Don't know □

19. How many research projects devoted the green infrastructure running/or did run in your local authority in the last 10 years? (a) From one till three □ From three till five □ More than five □

(b) Was was the duration of these projects?

Long term (more than 3-5 years) □ Short term (up to 3 years) □ Mixed □

(c) What was the type of finding for the projects? Government □ Private □ Public □ International □

(d) What type of stakeholders usually were involved?

(political; bureaucratic; academics; developers; and civil actors)

(e) What types of the green infrastructure practices have already been installed in your locality that you are aware of? (water & storm water management; big green areas (e.g. parks); small green urban spaces with multiple benefits (green roof & riparian buffer); species biodiversity & conservation projects; others (e.g. climate mitigation projects, green mobility or energy saving projects, coastal line))

20. What are the key issues or gaps for assessing green infrastructure in your local authority?

(a) (financial; organisational; public support; scientific support; difficult to answer)

(b) If it is a scientific support, what type of concern: theoretical □ practical □ (c) others □ not sure □

21. What is your opinion, where should be the future opportunities for the green infrastructure development in your locality?

(assessment of the utility of green infrastructure in meeting the climate change; developing an economic baseline for green infrastructure development; developing the techniques to assess the green infrastructure benefits; finding ways to satisfy a broader needs of a constantly changing society; own answer)

III. Questions related to the knowledge sharing process

22. Please, indicate how often you are using the following sources of knowledge-data-information indicated below by using 5 point scale

(Scale from Newer use to Always use)

(a) Face to face from scientists 1 □ 2 □ 3 □ 4 □ 5 □

(b) Colleagues (adviser & secretariat) 1 □ 2 □ 3 □ 4 □ 5 □

(c) Service of knowledge brokers 1 □ 2 □ 3 □ 4 □ 5 □

(d) Social media (e.g. YouTube, Facebook and Linkedin) 1 □ 2 □ 3 □ 4 □ 5 □

(e) Mass media (e.g. TV, internet, outdoor media, print media) 1 □ 2 □ 3 □ 4 □ 5 □

(f) Reading (e.g. article, book, policy brief) 1 □ 2 □ 3 □ 4 □ 5 □

(g) Seminars or round-tables, including local knowledge source1 □ 2 □ 3 □ 4 □ 5 □

23. Base on your own knowledge working activity in the area of environmental governance (green infrastructure) please indicate:

(a). What category(s) of knowledge-data-information you are sharing with different actors: (tacit knowledge; embedded knowledge; explicit knowledge)

(b). According to your practice, what kind of information about the environmental governance (or green infrastructure) could be helpful for you:

(a) About components, functionality & processess in the social-ecological system (SES) □

(b) About developing goals & pathways for sustainable functioning of the SES □

(c) About the ways of the SES goals implementation on the practice □

24. Grade a certain category of communication with other actors according to your own preferences (from Low preference to High):

(a) Verbal communication 1 □ 2 □ 3 □ 4 □ 5 □

(b) Written communication 1 □ 2 □ 3 □ 4 □ 5 □

(c) Non-verbal communication 1 □ 2 □ 3 □ 4 □ 5 □ (body language; physical app.; voice or touch)

25. What type of writing information from scientists you prefer to deal with?

(a) Informative (report, article, brochure, summary) □

(b) Evaluative (recommendation, option, advice, feedback, complain, criticism) □

(c) Narrative (report, descriptive essay, personal observations and feelings) □

(d) Interactive (informal letter, note, request of information, message, invitation) □

26. What an average amount of data, information, knowledge that you are processing per month?

(little amount is from1 till 20 pages; medium amount is 20-50 pages; more than medium amount is 51-100 pages; big amount is more than 100 pages; extremely big amount is more than 200 pages)

Small amount □ Medium amount □ More than medium amount □ Big amount □ Extremely big amount □

27. From the last experience, do you see some concerns in the knowledge sharing process that might negatively influence on the managing of data, information or knowledge in the area of environmental governance (green infrastructure) that you are dealing with:

(a) Yes □ Not sure or difficult to identify □ Not □

(b) If Yes, please provide a further information which particular concern is:

(a) Lack or insufficient amount of knowledge/information □

(b) Unsuccessful knowledge/information exchange □

(c) Problem with the knowledge source access & selection □

(d) Problem with the knowledge use □

(f) Problem with knowledge understanding □

IV. Questions related to the science-policy interface

28. How you can evaluate the current practice in the linking science to policy in the environmental area you are dealing with?

(a) Poor □ Fair □ Good □ Very good □ Excellent □ Difficult to answer □

(b). According to the previous question, what are the major criteria you used for an evaluation of the science-policy interface?

(a) Technical coherence □ (b) Competence □ (c) Legitimacy □ (d) Effectiveness □ (e) Efficiency □ (f) Openness & cooperation □ (h)_____(own answer)

29. How often information, data or knowledge that you collected were transferred by you into the actions or policy output? (e.g. research project) 1 □ 2 □ 3 □ 4 □ 5 □ (Scale from Very rare till Always)

30. Do you familiar with ecosystem service concept? Yes □ No □ Not sure □

31. List factors that may negatively influence the science-policy interface in your local authority

(a) (lack of trust; lack of time uncertainty in science; lack of contact; lack of practical working; lack of the feeling of the mutual benefit; lack of recognition; lack of feedback & iterative consultation; lack of linking)

(b) List factors that may facilitate the science-policy interface in your local authority

(managing of knowledge & information; cross institutional coorepation; socialization; communication & collaboration of stakeholders; technology, politics & economy; legislation; finding the new ways of looking at the problem)

32. Have you ever had a direct contact with a scientist/researcher? (a) Yes □ No □

(b) If yes, who initiated the contact?

Me □ A scientist □ Both in equal proportion □ Other ways □

(c) And what is the reason?_____

(d) How frequently contacts had a place?

Once during a several years □ Once a year □ Several times a year □ Monthly □ Weekly □

(e) Do you still keeping contacts with scientists with whom you have been working before?

Yes □ Not always □ No □

(f) What were major challenges or problems that you faced during knowledge exchange network or during collaboration under the projects with scientists? Please, specify a type of problem and how did you handle them (difficulties with understanding of a political procedure, topic of environmental governance is too complex; lack of financial support for the project; different priorities; difficult to communicate with a scientist due to a complicated terminology; own answer)

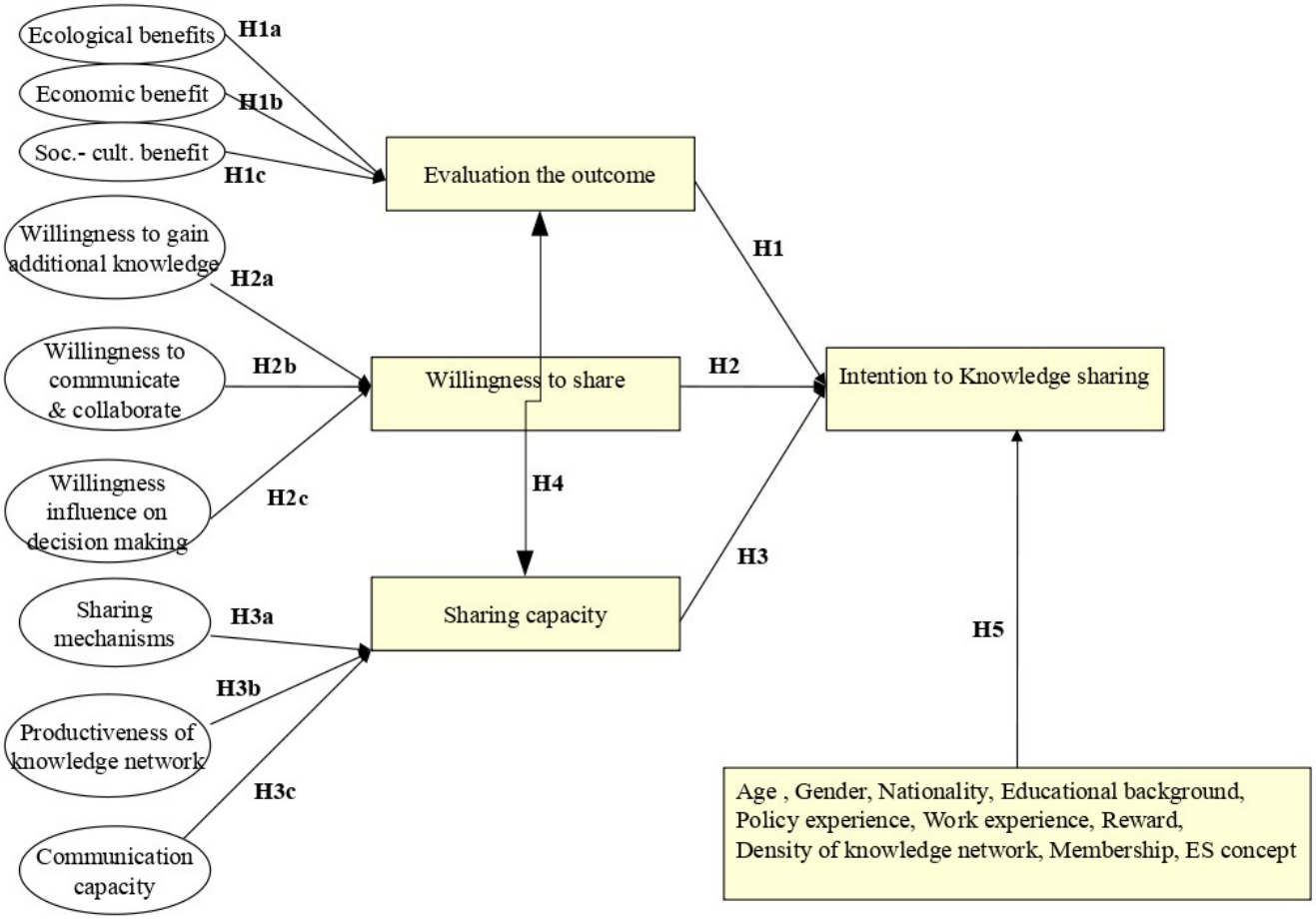
Appendix 6: List of variables that have been used for mixed methods design

Section of survey	Name of variable (survey question number)	Type of variable
Background and professional characteristics	Scientific background (Q1b)[2]	Categorical (dichotomous)
	Age (Q1c)[1,2]	Continuous numerical
	Gender (Q2)[1,2]	Categorical (dichotomous)
	Nationality (Q3)[1,2]	Categorical (nominal)
	Education (Q4)[1,2]	Categorical (ordinal)
	Experience with policy/science (Q6a)1, (Q6)[2]	Categorical (dichotomous)
	Experience with Environmental governance (Q9a)[1,2]	Categorical (ordinal)
	Experience with (green infrastructure (Q9b)[1,2]	Categorical (ordinal)
	Membership (Q10)[1,2]	Categorical (dichotomous)
Knowledge networking	Density of intra-regional network (Q11d)[1,2]	Discrete numerical
	Density of inter-regional network (Q11e)[1,2]	Discrete numerical
	Density of national network (Q11f)[1,2]	Discrete numerical
	Density of sub-national network (Q11g)[1,2]	Discrete numerical
	Productiveness of network (Q14)[1,2]	Categorical (ordinal)
Personal believes, values and attitudes	Ecological benefit of green infrastructure (Q16a)[1,2]	Categorical (ordinal)
	Economic benefit of green infrastructure (Q16b)[1,2]	Categorical (ordinal)
	Soc.-cultural benefit of green infrastructure (Q16c)[1,2]	Categorical (ordinal)
	Willingness share knowledge/info/data (Q19a)[2], (Q20a)[1]	Categorical (ordinal)
	Willingness communicate/collaborate (Q19b),[2] (Q20b)[1]	Categorical (ordinal)
	Willingness covert evidences to policy (Q20c)[1]	Categorical (ordinal)
	Willingness influence policy decisions (Q19c),[2]	Categorical (ordinal)
	Interest in additional knowledge (Q19d)[2], (Q20c)[1]	Categorical (ordinal)
	Motivation in knowledge sharing (Q20)[2], (Q21)[1]	Categorical (dichotomous)
Knowledge sharing process	Face to face communication (Q22a)[2], (Q23a)[1]	Categorical (ordinal)
	Conferences (Q22b)[2]	Categorical (ordinal)
	Consultation (Q22c)[2]	Categorical (ordinal)
	Collective action (Q22d)[2]	Categorical (ordinal)
	Informal presentation (Q22e)[2]	Categorical (ordinal)
	Virtual discussion (Q22f)[2]	Categorical (ordinal)
	Publication (Q22g)[2]	Categorical (ordinal)
	Colleagues (Q23b)[1]	Categorical (ordinal)
	Service of knowledge brokers (Q23c)[1]	Categorical (ordinal)
	Social media (Q23d)[1]	Categorical (ordinal)

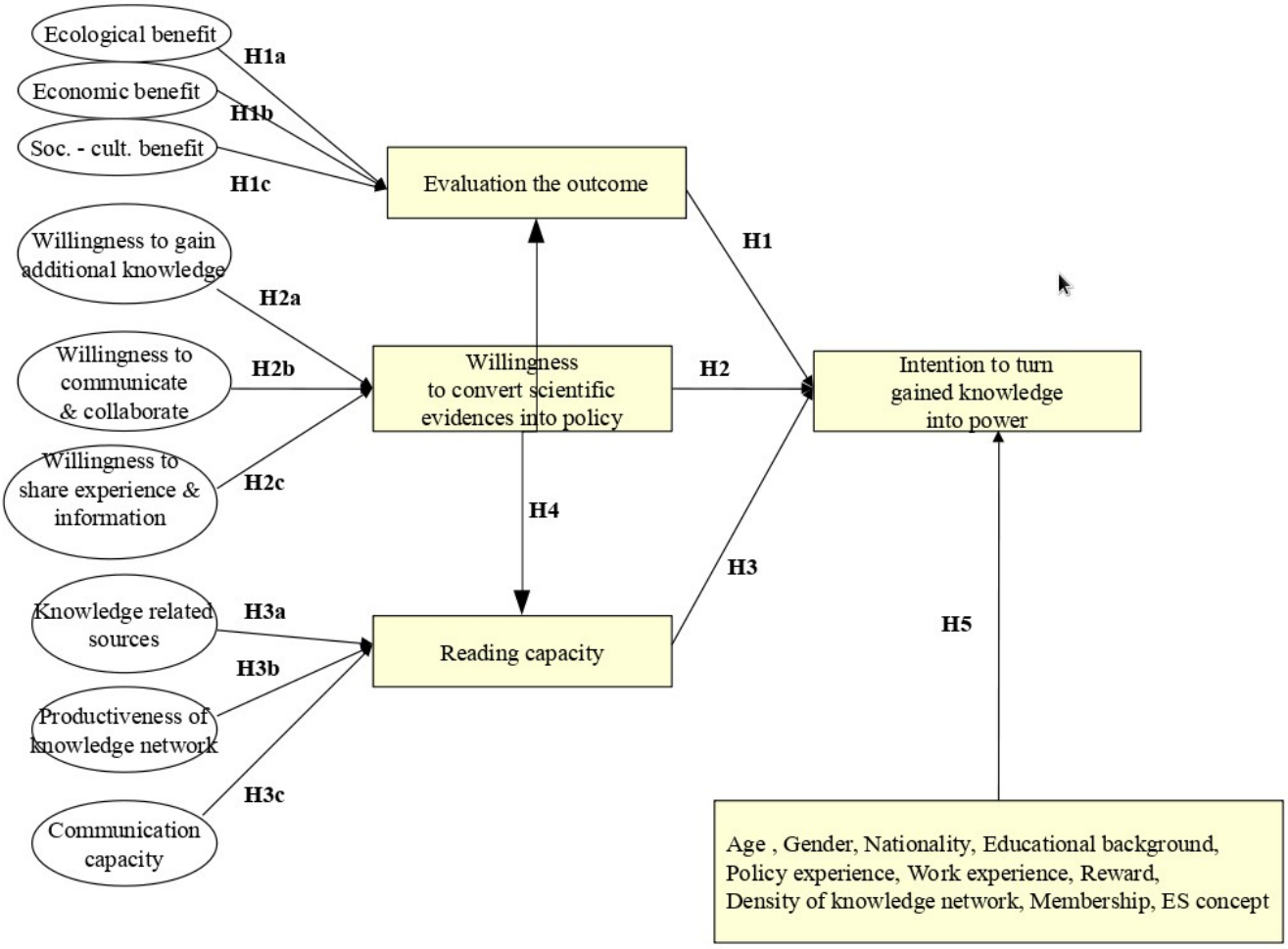
	Mass media (Q23e)[1]	Categorical (ordinal)
	reading (Q23f)[1]	Categorical (ordinal)
	Seminars (Q23g)[1]	Categorical (ordinal)
	Amount of publication/ amount reading (Q25)[2], (Q27)[1]	Categorical (ordinal)
	Knowledge sharing efficiency (Q29a)[1]	Categorical (dichotomous)
Science-policy interface	SPI evaluation (Q27a)[2], (Q30a)[1]	Categorical (ordinal)
	Effectiveness knowledge sharing/transfer (Q28)[2], (Q31)[1]	Categorical (ordinal)
	Familiarity with Ecosystem concept (Q29b)[2], (Q32)[1]	Categorical (ordinal)
	Communication capacity (Q31d)[2], (Q34d)[1]	Categorical (ordinal)

* 1 – Decision makers, 2 – Academician

Appendix 7: The overview of hypotheses to test the behavioral intention in a case of academicians



Appendix 8: The overview of hypotheses to test the behavioral intention of decision makers



Appendix 9: Summary of Findings table

(1) General background and professional characteristics

Describing elements	Academicians (N=40)	Regional decision makers (N=15)	Local decision makers (N=8)
Age (Mean ± SD)	50.650 ± 10.491	49.933 ± 9.11	48.625 ± 5.853
Gender: relative frequency (%)/absolute frequency (n) a) male b) female	 60.0 (24) 40.0 (16)	 40.2 (6) 60.3 (9)	 25.0 (2) 75.0 (6)
Nationality: a) Norwegian b) other	 60.0 (24) 40 (16)	 93.3 (14) 6.7 (1)	 100.0 (8) -
Education 1. Level: a) BSc b) MSc c) PhD 2. Background: a) natural science b) social science c) mixed	 - 7.5 (3) 92.5 (37) 42.5 (17) 30.0 (12) 27.5 (11)	 6.7 (1) 87.1 (13) 6.7 (1) - - -	 - 100.0 (8) - - - -
Working position: a) Assistant Professor b) Professor c) Researcher d) Senior Researcher e) Head of Department f) Senior Adviser g) Adviser h) Senior engineer I) Head of Division j) Director Department k) Project leader l) Planner m) Landscape architect	 10 (4) 32.5 (13) 25.0 (10) 27.5 (11) 5.0 (2) - - - - - - - -	 - - - - - 40.2 (6) 6.7 (1) 40.2 (6) 13.4 (2) 6.7 (1) 6.7 (1) - -	 - - - - - - 12.5 (1) - 25 (2) - 12.5 (1) 37.5 (3) 12.5 (1)
Advising or Research experience 1. Participation: a) yes b) no 2. Level: a) local b) regional c) national d) sub-national	 45.0 (20) 55.0 (22) 12.5 (5) 15.0 (6) 30.0 (12) 22.5 (9)	 53.6 (8) 46.9 9 (7) - - - -	 12.5 (1) 87.5 (7) - - - -
Main characteristics of the work 1. Elements: a) water b) landscape c) green spaces	 35.0 (14) 75.0 (30) 65.0 (26)	 53.6 (8) 86.7 (13) 66.7 (10)	 62.5 (5) 75.0 (6) 62.5 (5)

d) species	20.0 (8)	26.7 (4)	25.0 (2)
e) man-made elements	25.0 (10)	40.2 (6)	37.5 (3)
f) atmosphere	7.5 (3)	-	12.5 (1)
g) social issues	20.0 (8)	6.7 (1)	-
2. Processes:			
a) education	60.0 (24)	20.1 (3)	12.5 (1)
b) management	35.0 (14)	46.7 (7)	50.0 (4)
c) planning	40.0 (16)	73.3 (11)	50.0 (4)
d) evaluation	37.5 (15)	13.4 (2)	25.0 (2)
e) conservation	25.0 (10)	6.7 (1)	62.5 (5)
f) governance	37.50 (15)	46.7 (7)	12.5 (1)
g) design	17.5 (7)	13.4 (2)	-
h) policy	7.5 (3)	-	-
i) modelling	2.5 (1)	-	-
j) coordination	5.0 (2)	-	-
k) monitoring	7.5 (3)	-	-
l) mapping	5.0 (2)	-	-
m) ethics & phylisophy	5.0 (2)	-	-
n) social justice	5.0 (2)	-	-
3. Focus on:			
a) climate change adaptation	67.5 (27)	33.5 (5)	87.5 (7)
b) agriculture	15.0 (6)	20.1 (3)	-
c) urban forest	5.0 (2)	13.4 (2)	12.5 (1)
d) small green urban spaces with multiple benefits	35.0 (14)	33.5 (5)	37.5 (3)
e) semi-urban green areas	22.5 (9)	13.4 (2)	12.5 (1)
f) water and storm water management	22.5 (9)	53.6 (8)	12.5 (1)
g) soil management	17.5 (7)	20.1 (3)	12.5 (1)
h) energy savings	10.0 (4)	6.7 (1)	12.5 (1)
i) biodiversity conservation	30.0 (12)	26.8 (4)	50.0 (4)
j) food production	17.5 (7)	26.6 (4)	-
k) air quality	7.5 (3)	6.7 (1)	12.5 (1)
m) quality of life	42.5 (17)	6.7 (7)	62.5 (5)
l) mobility (public transportation systems)	27.5 (11)	13.4 (2)	50.0 (4)
The research project activity:			
1. Participation:			
a) yes	100 (40)	87.1 (13)	37.5 (3)
b) no	-	13.4 (2)	62.5 (5)
2. Level:			
a) local	57.5 (23)	13.4 (2)	62.5 (5)
b) regional	50.0 (20)	40.2 (6)	25.0 (2)
c) national	65.0 (26)	33.5 (5)	12.5 (1)
d) sub-national	52.5 (21)	53.6 (8)	12.5 (1)
Experience (years):			
a) with Environmental Governance:			
a) less than 5 years	5.0 (2)	26.8 (4)	12.5 (1)
b) from 5 til 10 years	20.0 (8)	20.1 (3)	25.0 (2)
c) more than 10 years	65.0 (26)	53.6 (8)	62.5 (5)
d) difficult to answer	10.0 (4)	-	-
b) Green infrastructure:			
a) less than 5 years	17.5 (7)	33.4 (5)	37.5 (3)
b) from 5 til 10 years	22.5 (9)	6.7 (1)	25.0 (2)
c) more than 10 years	32.5 (13)	40.2 (6)	37.5 (3)
d) difficult to answer	27.5 (11)	20.1 (3)	-

Membership in environment friendly organization: a) yes b) no	 52.5 (21) 47.5 (19)	 40.2 (6) 60.3 (9)	 62.5 (5) 37.5 (3)

(2). Characteristics of knowledge networking

Describing elements	Academicians (N=40)	Regional decision makers (N=15)	Local decision makers (N=8)
Major characteristics of networking: 1. Level and density of network: a) intra-regional b) inter-regional c) national d) sub-national 2. Form of network: a) formal b) informal c) strategical	 21.925 ± 14.068 100.0 (40) 11.650 ± 10.521 95.0 (38) 9.150 ± 6.129 100.0 (40) 35.250 ± 28.710 100.0 (40) 100.0 (40) 100.0 (40) 35.0 (14)	 44.666 ± 20.041 100.0 (15) 17.866 ± 12.028 100.0 (15) 10.000 ± 20.959 100.0 (15) 13.066 ± 11.762 53.6 (8) 100.0 (15) 100.0 (15) 20.1 (3)	 34.375 ± 13.999 100.0 (8) 11.750 ± 8.548 100.0 (8) 5.000 ± 7.071 37.5 (3) 0.625 ± 1.767 12.5 (1) 100.0 (8) 100.0 (8) 12.5 (1)
Role in networking process: a) facilitator b) coordinator c) regular network member d) leader	 25.0 (10) 57.5 (23) 80.0 (32) 47.5 (19)	 53.6 (8) 73.7 (11) 46.9 (7) 40.2 (6)	 25.0 (2) 50.0 (4) 75.0 (6) 37.5 (3)
Networking objective: a) personal learning b) sharing information c) co-production of knowledge d) exchange content & valuable information e) form of partnerships f) foster interaction among users g) collective knowledge adoption	 65.0 (26) 82.5 (33) 72.5 (29) 37.5 (15) 40.0 (16) 20.0 (8) 10.0 (4)	 60.3 (9) 13.4 (2) 73.7 (11) 80.4 (12) 33.5 (5) 13.4 (2) 20.1 (3)	 87.5 (7) - 75.0 (6) 100.0 (8) - - 12.5 (1)
Productiveness of knowledge networking	4.225 ± 0.733	4.066 ± 0.798	3.625 ± 0.744
Networking barrier: a) organizational b) interpersonal c) personal d) technological e) physical f) any of them	 75.0 (30) 20.0 (8) 10.0 (4) 7.5 (3) 30.0 (12) 2.5 (1)	 100.0 (15) 6.7 (1) 13.4 (2) 13.4 (2) 20.1 (3) -	 100.0 (8) - 25.0 (2) 12.5 (1) 12.5 (1) -

(3). Personal believes and attitudes

Describing elements	Academicians	Regional decision makers	Local decision makers

	(N=40)	(N=15)	(N=8)
Benefit of green infrastructure:			
a) ecological	4.575 ± 0.675	4.66 ± 0.487	4.50 ± 0.534
b) economic	3.250 ± 1.103	4.00 ± 0.925	3.25 ± 1.035
d) social & cultural	4.525 ± 0.678	4.26 ± 1.099	4.62 ± 0.517
Most important issues in environmental governance:			
a) security & climate change	55.0 (22)	53.6 (8)	-
b) sustainable development	52.5 (21)	60.3 (9)	-
c) low carbon infrastructure	12.5 (5)	-	-
d) education	30.0 (12)	26.8 (4)	-
e) mobility	2.5 (1)	13.4 (2)	-
f) quality of life	45.0 (18)	46.9 (7)	-
g) recreation	2.5 (1)	-	-
h) design	5.0 (2)	-	-
i) nature connectedness	20.0 (8)	40.2 (6)	-
j) own answer	25.0 (10)	20.1 (3)	-
Most important topics for communication & collaboration:			
a) knowledge management	40.0 (16)	60.3 (9)	-
b) risk & uncertainty	37.5 (15)	13.4 (2)	-
c) resolution of conflict situations	25.0 (10)	-	-
d) legislation	17.5 (7)	13.4 (2)	-
e) international interplay	25.0 (10)	13.4 (2)	-
f) politics	22.5 (9)	20.1 (3)	-
g) cross institutional changes	22.5 (9)	26.8 (4)	-
h) boundary organizations	25.0 (10)	3.4 (2)	-
i) own answer	5.0 (10)	26.8 (4)	-
Principles of the GI that are lacking attention:			
a) multi functionality	30.0 (12)	40.2 (6)	-
b) connectivity	25.0 (10)	6.7 (1)	-
c) diversification	10.0 (4)	6.7 (1)	-
d) multi benefits	32.5 (13)	13.4 (2)	-
e) integration of user groups	32.5 (13)	40.2 (6)	-
f) own answer	35.0 (14)	46.9 (7)	-
Main future opportunities for the development:			
a) assessment of the utility of green infrastructure in meeting the climate change	35.0 (14)	13.4 (2)	12.5 (1)
b) developing an economic baseline for green infrastructure development	12.5 (5)	6.7 (1)	12.5 (1)
c) developing the techniques to assess the green infrastructure benefits	32.5 (13)	20.1 (3)	-
d) role of statutory agencies in the development of green infrastructure	12.5 (5)	-	-
e) finding ways to satisfy a broader needs of a constantly changing society	25.0 (10)	6.7 (1)	37.5 (3)
f) own answer	45.0 (18)	80.4 (12)	75.0 (6)

Major stakeholders: a) political b) bureaucrats c) academicians d) special interest e) common interest	 65.0 (26) 57.5 (23) 30.0 (12) 42.5 (17) 50.0 (20)	 13.4 (2) 80.4 (12) 20.1 (3) 46.9 (7) 40.2 (6)	 62.5 (5) 87.5 (7) 100.0 (8) 62.5 (5) 62.5 (5)
Willingness/interest in: a) sharing b) communicating c) personal influence d) additional knowledge	 4.725 ± 0.505 4.750 ± 0.563 3.900 ± 1.170 4.150 ± 0.833	 4.80 ± 0.41 4.53 ± 0.516 4.40 ± 0.828 4.13 ± 0.743	 - - - -
Motivation: a) extrinsic b) intrinsic c) both	 2.5 (1) 60.0 (24) 37.5 (15)	 - 80.0 (12) 20.0 (3)	 - - -
Factors that influenced own attitude, opinion and value sets that related to the GI during the last 5 years: a) personal values & believes b) common benefits c) knowledge & results of education d) organizational directives e) globalization (technology, politics & economy)	 - - - - -	 87.1 (13) 26.8 (4) 67.0 (10) 53.6 (8) 26.8 (4)	 75.0 (6) 12.5 (1) 62.5 (5) - 62.5 (5)
Changes in the quantity of GI in the local authority during the last 10 years: a) decreased b) stayed the same c) increased d) don't know	 - - - -	 - - - -	 62.5 (5) 37.5 (3) - -
Research projects that devoted to the GI in the last 10 years 1. Amount: a) 1 till 3 b) 3 till 5 c) more than 5 2. Duration: a) long term b) short term c) mixed 3. Type of finding: a) government b) private c) public d) sub-national 3. Stakeholders: a) political b) bureaucratic c) academics d) developers e) civil actors 4. Types of the GI practices: a) water & storm water	 - - - - - - - - - - - - - - - 	 - - - - - - - - - - - - - - 	 - 25.0 (2) 75.0 (6) 12.5 (1) 37.5 (3) 62.5 (5) 100.0 (8) 37.5 (3) 62.5 (5) - 62.5 (5) 87.5 (7) 100.0 (8) 62.5 (5) 62.5 (5)

management b) big green areas c) small green urban spaces with multiple benefits d) species biodiversity & conservation projects e) others (climate mitigation projects, green mobility or energy saving projects, coastal line)	- - - - -	- - - - -	 50.0 (4) 75.0 (6) 37.5 (3) 62.5 (5) 50.0 (4)
Gaps to assess the GI 1. Type: a) financial b) organizational c) public support d) scientific e) political 2. Form of scientific support: a) practical support b) theoretical support c) other (getting a finding or research brokering) d) not sure about	 - - - - - - - - -	 - - - - - - - - -	 12.5 (1) 75.0 (6) 62.5 (5) 62.5 (5) 50.0 (4) 37.5 (3) 37.5 (3) 25.0 (2) 12.5 (1)

(4). Characteristics of knowledge sharing process

Describing elements	Academicians (N=40)	Regional decision makers (N=15)	Local decision makers (N=8)
Sharing/usage of mechanisms: (1-DM, 2-A) a) face to face (1,2) b) colleagues (1) b) conference (2) c) use of kn_brokers (1) c) consultation (2) d) social media (1) d) collective action (2) e) mass media (1) e) inf. presentation (2) g) seminars (1) g) virtual discussion (2) f) reading (1) f) publication (2)	 3.725 ± 1.176 - 4.200 ± 0.911 - 2.925 ± 1.268 - 2.075 ± 1.118 - 3.151 ± 0.892 - 2.725 ± 1.176 - 4.425 ± 0.780	 2.73 ± 1.28 4.53 ± 0.74 - 2.60 ± 0.83 - 2.66 ± 1.11 - 2.67 ± 1.17 - 3.66 ± 1.23 - 3.86 ± 1.12 -	 2.25 ± 0.707 4.50 ± 0.755 - 2.25 ± 1.164 - 2.25 ± 1.488 - 2.75 ± 1.649 3.875 ± 0.640 - 3.875 ± 0.834 -
Category of shared knowledge: a) own experience b) embedded b) explicit	 75.0 (30) 17.5 (7) 97.5 (39)	 66.7 (10) 80.4 (12) 87.1 (13)	 100.0 (8) 100.0 (8) 62.5 (5)
Type of produced/used knowledge or data: a) components of SES b) functioning of SES components c) implementation for	 65.0 (26) 75.0 (30) 67.5 (27)	 46.9 (7) 46.9 (7) 66.7 (10)	 37.5 (3) 62.5 (5) 87.5 (7)

sustainable SES functioning			
Writing/reading preference type: a) informative b) evaluative c) narrative c) interactive	 92.5 (37) 77.5 (31) 20.0 (8) 27.5 (11)	 87.1 (13) 80.4 (12) 20.1 (3) 33.5 (5)	 87.5 (7) 75.0 (6) 12.5 (1) 25.0 (2)
Category for communication: a) verbal b) written c) non verbal	 - - -	 4.50 ± 0.64 4.52 ± 0.65 1.86 ± 1.19	 4.375 ± 0.744 4.375 ±0.517 1.500 ± 0.534
Amount of produced/proceed knowledge: a) small b) medium c) more than medium d) big e) extremely big	 20.0 (8) 30.0 (12) 27.5 (11) 22.5 (9) -	 - 40.2 (6) 13.4 (2) 33.4 (5) 13.4 (2)	 25.0 (2) 25.0 (2) 37.5 (3) 12.5 (1) -
Major principles of the knowledge exchange design: a) engaging into design & linking b) recognition & representation c) feedback & iterative consultation d) impact e) reflection & sustaining	 47.5 (19) 42.5 (17) 52.5 (21) 57.5 (23) 30.0 (12)	 60.3 (9) 40.2 (6) 60.3 (9) 53.6 (8) 26.8 (4)	 - - - - -
Concerns in the knowledge sharing process: 1. Availability: a) yes b) no c) difficult to answer 2. Type of concern: a) lack or insufficient amount of knowledge, information b) unsuccessful knowledge/information exchange c) problem with knowledge source access & selection d) problem with the knowledge use e) problem with knowledge understanding f) not sure	 - - - - - - - -	 80.4 (12) 20.1 (3) - 33.5 (5) 33.5 (5) 13.4 (2) 40.2 (6) 40.2 (6) 20.1 (3)	 100.0 (8) - - 100.0 (8) 25.0 (2) 75.0 (6) 50.0 (4) 25.0 (2) -

(5). Science-policy interface

Describing elements	Academicians (N=40)	Regional decision makers (N=15)	Local decision makers (N=8)
Evaluation the SPI: a) poor b) fair	 10.0 (4) 30.0 (12)	 6.7 (1) 53.6 (8)	 - 62.5 (5)

c) good	47.5 (19)	26.8 (4)	37.5 (3)
d) very good	10.0 (4)	13.4 (2)	-
e) excellent	-	-	-
f) difficult to answer	2.5 (1)	-	-
Major criteria of the SPI evaluation:			
a) technical coherence	5.0 (2)	20.1 (3)	-
b) competence	30.0 (12)	13.4 (2)	37.5 (3)
c) legitimacy	15.0 (6)	13.4 (2)	37.5 (3)
d) effectiveness	20.0 (8)	13.4 (2)	25.0 (2)
e) efficiency	10.0 (4)	13.4 (2)	25.0 (2)
f) openness & cooperation			
g) own answer	55.0 (22)	26.8 (4)	50.0 (4)
	25.0 (10)	33.5 (5)	12.5 (1)
Effectiveness of knowledge sharing/transferring into the action or policy output:			
a) never	2.5 (1)	6.7 (1)	-
b) rarely	37.5 (15)	6.7 (1)	12.5 (1)
c) occasionally	35.0 (14)	20.1 (3)	37.5 (3)
d) frequently	20.0 (8)	60.3 (9)	50.0 (4)
e) very frequently	2.5 (1)	6.7 (1)	-
ES concept			
1. Familiarity with:			
a) yes	60.0 24)	53.6 (8)	50.0 (4)
b) no	7.5 (3)	6.7 (1)	25.0 (2)
c) not sure	32.5 (13)	40.2 (6)	25.0 (2)
2. Usage:			
a) never	15.0 (6)	-	-
b) rarely	27.5 (11)	-	-
c) occasionally	27.5 (11)	-	-
d) frequently	10.0 (4)	-	-
e) very frequently	17.5 (7)	-	-
Issues for better SPI integration:			
a) socialization	60.0 (24)	46.9 (7)	-
b) conceptualization	40.0 (16)	20.1 (3)	
c) iteration	37.5 (15)	53.6 (8)	-
d) practical implementation	47.5 (19)	46.9 (7)	-
support			-
e) developing capacity	60.0 (24)	67.0 (10)	-
Factors that influence on the SPI			
1. Negatively:			
a) lack of trust	-	-	25.0 (2)
b) lack of time	-	-	75.0 (6)
c) uncertainty in science	-	-	50.0 (4)
d) lack of contact	-	-	75.0 (6)
e) lack of practical working	-	-	25.0 (2)
f) lack of the feeling of the mutual benefit	-	-	62.5 (5)
g) lack of recognition	-	-	12.5 (1)
h) lack of feedback &	-	-	12.5 (1)
iterative consultation	-	-	12.5 (1)
i) lack of linking		-	25.0 (2)
2. Positively:			
a) managing of knowledge &			

information	-	-	50.0 (4)
b) cross institutional coorepation	-	-	25.0 (2)
c) socialization	-	-	37.5 (3)
d) communication & collaboration of stakeholders	-	-	12.5 (1)
e) technology	-	-	12.5 (1)
f) politics & economy	-	-	25.0 (2)
g) legislation			
h) finding the new ways of looking at the problem	-	-	37.5 (3)
Personal contact within the SPI			
1. Availability:			
a) yes	87.5 (35)	100.0 (15)	62.5 (5)
b) no	12.5 (5)	6.7 (1)	37.5 (3)
2. Initiating the contact:			
a) me	22.5 (9)	13.4 (2)	50.0 (4)
b) other side	27.5 (11)	13.4 (2)	-
c) both sides	47.5 (19)	66.7 (10)	50.0 (4)
d) other ways	2.5 (1)	6.7 (1)	-
3. Reason of contact:			
a) information	45.0 (18)	40.2 (6)	50.0 (4)
b) evaluation	12.5 (5)	-	-
c) advice	32.5 (13)	-	-
d) project	35.0 (14)	40.2 (6)	50.0 (4)
e) conference	5.0 (2)	13.4 (2)	-
f) finding	2.5 (1)	13.4 (2)	-
4. Frequency:			
a) rare than once a year	17.5 (7)	13.4 (2)	37.5 (3)
b) once a year	10.0 (4)	26.8 (4)	12.5 (1)
c) several times a year	12.5 (5)	13.4 (2)	37.5 (3)
d) monthly	50.0 (20)	40.2 (6)	12.5 (1)
e) weekly	10.0 (4)	6.7 (1)	12.5 (1)
5. Continuity of contact:			
a) yes	40.0 (16)	60.3 (9)	37.5 (3)
b) no	20.0 (8)	13.4 (2)	37.5 (3)
c) not always	35.0 (14)	26.8 (4)	25.0 (2)
d) difficult to answer	5.0 (2)	-	-
6. Major challenges due to contact: (1- DM, 2- A)			
a) problem with a political procedure	15.0 (6)	40.2 (6)	-
b) topic of the GI is too complex	10.0 (4)	6.7 (1)	-
c) difficulties in communication	2.5 (1)	6.7 (1)	-
d) disagreements	2.5 (1)	13.4 (2)	25.0 (2)
e) frustration (1)	-	20.1 (3)	-
e) bureaucracy (2)	12.5 (5)	-	-
f) none of them	20.0 (8)	6.7 (1)	-
g) own answer	37.5 (15)	20.1 (3)	37.5 (3)

Appendix 10: Patch coefficients for indirect and direct effects of TPB constructs and antecedent beliefs on behavioral intentions for the Academician's group, (N=40)

Construct (variable)	Mean and S.D.	Direct effect, Rho coefficient with statistical criteria	Indirect effect via associated TPB construct, Rho coefficient with statistical criteria
Behavioral Intention (Effectiveness of knowledge transfer)	2.82 ± 0.88		
Attitude (SPI evaluation)	2.59 ± 0.82	0.44**	-
Subjective norm (Willingness share knowledge)	4.72 ± 0.50	NS	-
Perceived behavioral control (Amount of publications)	3.52 ± 1.06	0.59***	-
Attitude to Ecological benefit of GI (indirect effect via SN)	4.57 ± 0.67	NS	0.57***
Attitude to Economical benefit of GI (indirect effect via Attitude)	3.25 ± 1.10	NS	NS
Attitude to Socio-cultural benefit of GI (indirect effect via Attitude)	4.52 ± 0.68	NS	NS
Willingness to gain additional knowledge (indirect effect via SN)	4.15 ± 0.83	0.41**	0.34*
Willingness to communicate and collaborate (indirect effect via SN)	4.70 ± 0.56	NS	0.43**
Willingness to influence on decision making (indirect effect via SN)	3.90 ± 1.17	NS	0.47**
Sharing mechanisms (indirect effect via PBC)	*Look at info in Appx. 9 (4)*	0.33* (Cos) 0.40**(CA)	0.38** (CA) 0.42** (Inf)
Productiveness of knowledge networks (indirect effect via PBC)	4.22 ± 0.73	0.38**	0.37**

Communication capacity (indirect effect via PBC)	3.25 ± 1.29	NS	SN

ABV: CA – collective actions; Inf – informal presentations; Cos – consultations

Appendix 11: Patch coefficients for indirect and direct effects of extended TPB constructs for the Academician's group, (N=40)

Extended control variable of the model	Direct effect, Rho coefficient with statistical criteria	Indirect effect via associated TPB construct, Rho coefficient with statistical criteria (via antecedent variables)
Age	0.39**	0.36* (Cos), 0.33* (Conf)
Gender	NS	0.40** (Cos) Com (0.37**)
Nationality	NS	NS
Education	NS	NS
Educational background	0.37*	0.32*(Pub)
Policy experience	0.44**	NS
Work experience	NS	NS
Reward	NS	NS
Membership	0.33*	0.27* (Prod)
Density of knowledge networks	0.31* (N)	IRA: 0.40**, 0.36* (Cos) N: 0.46**(Econ), 0.48** (Conf), 0.50***(Cos), 0.58***(CA) SN: 0.41** (CA), 0.43** (Cos)
ES concept	NS	NS

ABV: IRA, N – networks; prod – productiveness of networks; Conf – conferences; Pub – amount of publications

Appendix 12: Patch coefficients for indirect and direct effects of TPB constructs and antecedent beliefs on behavioral intentions, for the Decision maker's combined group, (N=23)

Construct (variable)	Mean and S.D.	Direct effect, Rho coefficient with statistical criteria	Indirect effect via associated TPB construct, Rho coefficient with statistical criteria
Behavioral Intention (Effectiveness of knowledge transfer)	3.48 ± 0.89		
Attitude (SPI evaluation)	2.30 ± 0.82	0.35*	-
Subjective norm (Willingness covert evidences to policy)	4.26 ± 0.75	NS	-
Perceived behavioral control	2.91 ± 1.16	NS	-
Attitude to Ecological benefit of GI (indirect effect via SN)	4.61 ± 0.49	NS	NS
Attitude to Economical benefit of GI (indirect effect via Attitude)	3.74 ± 1.01	NS	NS
Attitude to Socio-cultural benefit of GI (indirect effect via Attitude)	4.39 ± 0.94	NS	NS
Willingness to gain additional knowledge (indirect effect via SN)	3.95 ± 0.70	NS	0.45*
Willingness to communicate and collaborate (indirect effect via SN)	4.52 ± 0.51	NS	NS
Willingness to share experience & information (indirect effect via SN)	4.70 ± 0.42	NS	NS
Knowledge related sources (indirect effect via PBC)	*Look at info in Appx. 9 (4)*	0.56** (K_Br)	0.34*(Read)
Productiveness of knowledge networks (indirect effect via PBC)	3.91± 0.79	NS	NS
Communication capacity (indirect effect via PBC)	2.74 ± 1.25	NS	0.41*

ABV: K_Br – knowledge brokers; Read – reading

Appendix 13: Patch coefficients for indirect and direct effects of extended TPB constructs for the Decision maker's combined group, (N=23)

Extended control variable of the model	Direct effect, Rho coefficient with statistical criteria	Indirect effect via associated TPB construct, Rho coefficient with statistical criteria (via antecedent variables)
Age	0.39*	0.48*(IRA) 0.38*(Kn)
Gender	NS	0.39*(IER) 0.41* (Read)
Nationality	NS	NS
Education	0.54**	0.36*(Sh)
Science experience	NS	0.82***(SN) 0.43*(Kn)
Work experience	NS	GI: 0.45*(SN) 0.67***(Com)
Reward	NS	NS
Membership	NS	NS
Density of knowledge networks	NS	IRA: 0.52**(Soc) 0.47*(K_Br) 0.55**(Am) IER: 0.49* (Face) 0.46*(K_Br) 0.44* (Com)
Knowledge sharing efficiency	NS	0.50**(Ev)
ES concept	NS	0.55**(Ev)

ABV: Com – communication capacity; Face – face to face; IRA, IER – knowledge networks; Sh – willingness to share; SN, N – networks; Ev – evaluation of the SPI; Am – reading amount; Soc – socio-cultural benefit

Appendix 14: Summary results related to the hypotheses of the model's tested

Hypothesis	Result	
	Academicians	Decision makers
H1: Attitude affects Behavioral intention	Verified	Verified
H2: Subjective norm affects Behavioral intention	Not verified	Not verified
H3: Perceived Behavioral control affects Behavioral intention	Verified	Not verified
H4: Attitude, Subjective norm and Perceived Behavioral control are interrelated	Not verified	Not verified
H1-H3 (a, b, c): Antecedent variables affect behavioral intention via associated TPB constructs (e.g. indirect affect via Attitude, Subjective norm and Perceived Behavioral control)	Partly verified	Partly verified
H5: Extend model variables affect Behavioral intention	Partly verified	Partly verified