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Municipal Green Space Management in Saint-Petersburg: Introducing a New Outlook on the Basis of European Experience

Working paper de l'IDHEAP 16/2014
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Municipal Green Space Management in Saint-Petersburg: Introducing a New Outlook on the Basis of European Experience

By

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A Master dissertation submitted in partial fulfilment of the Requirements for the Award of the Degree of International Master of Public Administration (iMPA)

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ABSTRACT

The housing environments in the central districts of Saint-Petersburg (SPb) are lacking many characteristics needed for comfortable living conditions. It is primarily linked to the Green Plantations' (GP') deficit which derives from the fact that historical centre of SPb is built in a special way. The buildings form courtyards with specific enclosed architectural shape with almost no place for GP. This makes traditional greening impossible in this area. As a result, the residents of such courtyards are exposed to the lack of GP coming together with the high levels of road traffic noise, air pollution etc. Since greening of the courtyard territories falls under municipal responsibility, municipal Green Space Management (GSM) is in the centre of the author's attention in the present paper.

The problem in question was approached from the administrative science perspective on the basis of integration of the ideas into a single strategy as opposed to the natural science perspective. For the purpose of the present research, data-source triangulation method together with comparative policy analysis were chosen. These methods consisted in collecting the data on the problem from the 3 sources – semi-structured interviews, questionnaires, and documentary analysis, and analyzing it on the basis of theoretical paradigm on the policy analysis developed by Peter Knoepfel.

In order to build a picture of the current situation in the problem sphere, to identify the problem, and to find the proper solution, the following research questions were posed:

1. What is the urban greening status quo in SPb?
2. What is the way GSM is organized on the municipal level?
3. What is the way to resolve or mitigate the problems in the sphere of municipal GSM?

As a result of testing the main hypotheses, the author came to a number of findings:

1. Poor condition of the courtyard GP was proved to be an evidence of a number of factors lying much deeper than on the level of local self-governance. Plenty of legislative gaps, financial limitations and informational deficit along with the managerial problems (partly caused by the factors above) lead to the inadequate condition of the courtyard GP. The possible solutions to these problems are seen by the author in the 2 spheres: legislative improvement, and budget increase.
2. The level of detail and diversity of GSM techniques and works was proved to be not enough for increasing the quantity and quality of courtyard GP. The comparative policy analysis revealed 3 decisive variables determining the indicator on green space provision per capita in a given municipality: GSM budget; the number of courtyards within a municipality involved in GSM; volume (scale) of GSM works.
3. Alternative greening techniques (such as green roofs and green walls) can become a solution of one of the problems of courtyard GP management within the historical part of SPb. In this light, the author developed a 7-phase course of action on the way to the "Green roofs and walls" municipal policy for the city of SPb based on the European experience. It is supposed to serve as a "recipe" for the successful development of green roofs and walls policy for those municipalities which will be willing to try to realize these alternative greening techniques. The roadmap includes a toolbox based on the regulations, incentives, and public relations "ingredients".

As the famous saying goes: "Forewarned is forearmed". In this light, given the results of the present research, SPb municipalities may view existing problems in a more explicit way, as well as take example from the successful in the sphere of GSM municipalities, and try to introduce an innovative GSM public policy based on the strategy proposed in the present paper.

Keywords: urban greening; sustainable urban development; courtyard Green Plantations (GP); municipal Green Space Management (GSM); green roof policies; green wall policies

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CHAPTER I. INTRODUCTION

This green is a lung for a city,
This green is a place to walk and think,
And sit and listen to the poets being witty
Because poetry in Dublin flows like drink

And this green is a poem in an urban setting,
This green is a poem that scans and rhymes
Where you talk about remembering and forgetting
And you sit and sing about bygone times

Because every city needs a green like this
To pause for a moment in the city's throng
This garden is a smile and this green is a kiss
And Dublin is the city where St. Stephen's Green belongs...

Sarah Chaplin, „Places" Space Place Life, 2011

For thousands of years people have been learning the way to manage their relationship with nature. In our fast-changing world, every generation creates a new set of circumstances as population and economy grow, and as impacts on the natural environment increase. And every generation must find its specific way to adapt to these new circumstances. Constantly evolving social and political system has enhanced people's ability to make collective decisions on the management of the natural environment and on the way to adapt to it. However, there are still plenty of problems in the sphere of environmental management.

SPb is a megalopolis, the second largest city of Russia with 5.131.900 million population (Federal Service of State Statistics, 2014). Nowadays due to the fast economic development SPb is facing more and more environmental problems. First, it is air pollution. 96% of the citizens live under the conditions of high level of air pollution (Golubev, D., Sorokin, N., 2013). It is connected with the growing number of motor transport and transport problem as a whole (traffic jams, overloaded public transport, lack of parking places etc.). Secondly, it is noise pollution. Around 1 million people live in the high level of noise mostly due to the close location of apartment blocks to the transport highways and also due to the growing number of transport (Golubev, D., Sorokin, N., 2013). Thirdly, it is chemical and radioactive soil pollution. 50% of soil tests do not comply with the existing standards. There are 17 radioactive polluted locations in the city. In this situation the city urgently needs some actions against the growing pollution (Golubev, D., Sorokin, N., 2013). And one of the most important action is to develop green infrastructure of the city, increasing the amount of green spaces and abolishing any construction in the city's green areas. This measure will contribute to resolving the problems of air, noise, soil, and, partly, water pollution. In other words, green infrastructure development would be the step towards the resolution of "the green cities conflict" (Godshalk, D., 2004)[1].

Taking everything into account, one can state that the growing city of SPb lacks a big number of sustainable urban development measures and is beset by green space deficit. Solving the problem of balancing and harmonizing natural and man-made frames in the space of the city would be possible by applying innovative public policies and greening technologies. It demands considerable effort and taking into consideration foreign experience in the field.

Among all the green infrastructure development, residential environment green infrastructure is especially important. "For most people, the home is a place for rest and relaxation and where relief from stress and demands of everyday life is sought" (Environ J., 2010). It is therefore highly important to design the housing environment which will be supporting this restoration process. However, the housing environments in the central districts of SPb are lacking many characteristics needed for creating comfortable living conditions. It is linked to the fact that historical centre of SPb is built in a

[1] According to the David Godshalk's Community sustainability prism (2004), this conflict is described as a tension between livability and ecology, between the primacy of natural factors and the primacy of built environment design in determining urban form.

special way, namely, there are courtyards with almost no place for GP what makes traditional greening impossible in this area. The residents are exposed to high levels of road traffic noise, air pollution, and lack of GP around their homes. These may cause adverse health effects, such as sleep disturbances, general annoyance, stress-related symptoms etc.

Looking for the new models of sustainable urbanization in order to improve the residential environment, it is reasonable to examine European cities which represent powerful sources of potential ideas, innovative tools, strategies and inspiring practices on the green urban development and policies. Europe is considered to be a pioneer in the area of sustainable cities which convincingly demonstrate that ecological and urban can go together. And also as soon as SPb was founded as the "window to Europe", now it seems reasonable to search for the new models of sustainable urbanization in Europe. In this light, looking at the European experience can bring a solution. In Europe there are so called alternative ways of greening, namely, vertical greening, green roofs, etc.

In order to guide the research on the way to discover the details of the present situation in the sphere of courtyard green space management (GSM), as well as to find possible solutions in the European experience, the author stated 3 main research questions and presumed hypotheses described in the Table below:

Table I Research Questions and Hypotheses

Research Question	Hypothesis
1. What is the urban greening status quo in SPb? ✓ What kind of legislation and public policies are currently being applied to design sustainable urban greening? ✓ What are the problems in GSM? ✓ What is the structure of GSM? ✓ What part of GSM falls under municipal responsibility? **See Chapter** "SPb Green Space Legislation and Policies"	No hypothesis, descriptive chapter.
2. What is the way GSM is organized on the municipal level? ✓ What are the activities performed and policies adopted by the different municipalities in the sphere of greening? Are they efficient or not? ✓ What is the legislative base for the municipal actions in the sphere of greening? ✓ What are the problems in the sphere of greening on the municipal level? **See Chapters: "**Courtyards' Greening in the city of SPb"; "Comparative Policy Analysis: Vasilievskiy Municipality and Chkalovskoe Municipality"	2.1 Bad condition of the courtyard GP is an evidence of substantial problems in municipal GSM. 2.2 Good indicators on green space provision per capita in a district/municipality is an evidence of existence of a detailed courtyard GSM policy.
3. What is the way to resolve or mitigate the problems in the sphere of municipal GSM? ✓ Which public policies and solutions from the European experience in the field of GSM can be adopted? ✓ How these innovations should be adapted to be implemented in SPb? **See Chapters: "**Alternative Greening Techniques", "Conclusion".	3.1 Such alternative greening techniques as green roofs and green walls can become a solution of the problems of courtyard GP management within the historical part of SPb.

CHAPTER II. LITERATURE REVIEW

II.I. Introduction

The amount of literature about sustainable, green, or ecological city has increased tremendously during the last few years (Leeuwen, Nijkamp, and Vaz, 2010). It clearly shows that the topic of urban greening is becoming more and more important. Leeuwen et al. (2010) found that all the books on this issue contain useful information and ideas following a similar thematic path. Most of these sources describe the urbanization process and its negative environmental impact. Nowadays these aspects became a familiar "territory" almost for every average person. However, in this large amount of literature on the topic in question there is a lack of active linkages between all the aspects. Leeuwen et al. (2010) state that there is no theoretical construct that helps to put the pieces together in broad but synthetic picture. The only exception Leeuwen et al. (2010) identify is Paolo Soleri's "City in the Image of Man".

II.II. Birth of Urban Greening

In the present paper the author investigated available literature from the land-use planning approach perspective. It means that Green Space Management (GSM) or urban green planning was approached as a part of urban land-use planning, since urban green planning is widely considered as one of the key aspects covered by the major urban planning strategies (Eurocities, 2014).

The concept of "planning" and "managing" is not a new one. ***Urban land-use planning*** is defined in most literature as "design and regulation of the uses of space that focus on the physical form, economic functions, and social impacts of the urban environment and on the location of different activities within it" (Fainstain, S., 2005; Berke, P., et al., 2006). Some other authors highlight functional aspect of the urban planning concept, for example, Monclus and Guardia (2006) argue that the term planning and its different adjectives (town planning, urban planning and city planning), in the Anglo-Saxon world, as much as their Latin equivalents (urbanismo, urbanisme, urbanistica) "designate an activity controlling urban development".

The birth of urban green planning is discussed in a large number of books and articles (Fainstein, S., 2005; Harloe, M., 1995; Gutkind, E., 1972; Hall, P., 2002). The "city phenomenon" was brought to humanity in Antiquity and since then along with all its advantages led to the certain undesirable aspects, including scarcity of nature that was more and more neglected and degraded as settlements expanded. As some urbanites started to miss the natural environment, they began to create natural enclaves within the city limits, mostly in the form of domestic gardens (Jim, 2012). These gardens were initially private, belonging to nobility and aristocracy, whereas common people did not have access to such natural zones. Nonetheless, people's deprivation prompted them to start striving for accessible green spaces when the Industrial Revolution brought factories and workers into cities, together with poverty and poor environmental conditions. Governments, in their part, satisfied these demands by the establishment of urban parks. It began in 19th century Britain where part of the private green areas was acquired by municipal governments and made accessible to the public. This trend was used by the other countries, and urban parks became an obligatory and universal amenity (Jim, 2012). Another watershed in urbanization history came in 2010, when the cities' population reached the amount of half of the 7 billion. It must be mentioned that the growth in population and large cities in recent decades occurred mainly in less-developed areas (Crossette, 2011). It resulted in the fact that in less-developed countries there is a deficiency in public open spaces (Jim, 2012). Being built fast, newly developed urban areas, towns, and urban redevelopments were most of the time built with almost no regard to environmental quality (Olembo, R., Rham, P., 1987). Opportunities to improve the situation for millions of urbanites could be found in the spirit of sustainable urban development and smart growth (Jim, 2012). Taking into account increasing concerns about climate change, urban heat island phenomenon, urban greening provides for a way to climate proof cities. Most of the cities in developed economies have found the effective way of urban sustainable development.

Until the 19th century, natural areas within cities were rarely considered as a resource (McDonnell, M., Hahs, A., Breuste, J., 2009). Natural surroundings were remaining left over from the process of planning, such as areas unacceptable to be easily developed. The first attempts to preserve existing natural vegetation for all types of development areas on the basis of their own intrinsic value were done in Sweden in the early 1900's. Natural vegetation preservation being a trend in Sweden in the early 20th century influenced architecture and town and city planning. Some decades later this planning approach appeared in other Scandinavian countries, such as Norway and Finland. After the

Second World War, the concept “woodland city” became an important planning term in Finland (McDonnell, M., Hahs, A., Breuste, J., 2009). At the same time, in 1950’s the approach of utilizing existing vegetation arose in Australia. Since the 1970’s the interest in preservation and research on this item has increased in many countries all over the world.

II.III. Modern Notion of Urban Greening

The way to use land, as one of the most limited natural resources in urban regions, in an efficient manner is of great significance (Intelligent cities, 2014). Many authors point out the process of degradation as “a human-activity process of decreasing natural vertical structure, horizontal pattern, and/or flows in a natural area. Habitat perforation, dissection, fragmentation, and isolation, as well as familiar processes such as polluting and overgrazing, cause habitat degradation” (Forman, R., 2008). In this light, the concept of urban greening becomes especially important.

There are two main approaches among different scientists to define the concept of urban greening. The first way is definition through the functions of urban greening. For instance, Bowler, Buyung-Ali, Knight, and Pullin (2010) describe ***urban greening*** as a strategy to reduce urban air temperatures. As it is known increasing temperatures in urban areas lead to a serious public health concern. Bowler et al. (2010) examined the studies devoted to the green space impact on city’s temperatures and presented evidence that urban greening acts as a natural “cooler” for the environment, at least at a local level. However, since this evidence is based only on observation, it should be tested in a more profound manner. Jim (2012) states that urban greening contributes to the quality of life and ecosystem services in cities, and public and private sectors should cooperate to insert plantable spaces into the urban fabric in order to reduce or remove green space deficit in modern cities (Jim, 2012).

The second approach, which is more widespread, defines urban greening through its characteristics. One can find that ***urban greening*** usually includes “creation and maintenance of green space, such as parks, planting and care of trees, and creation of green infrastructure such as rain gardens and green roofs” (City of Pittsburg, 2014).

One may find the most important writers in the field of urban green planning in the new international journal called “Urban Forestry & Urban Greening”. This journal concentrates on all green resources within urban areas (such as woodlands, public and private urban parks and gardens, urban nature areas etc.), as well as policy-making, planning and design related to urban forests and other vegetation.

Nowadays there are more and more state-of-the-art greening projects, international organizations and ideas worldwide: Lausanne-Jardins, GreenInUrbs Organisation, Carrot city, Urban Farmers etc.

Lausanne-Jardins is an event which dates back to 1997 and aims at bringing together the world of plants and flowers and the truly urban environment (Ponceau, C., Rovero, A., 2012). The Lausanne-Jardins association conducts this event annually in order to promote the art of gardening; to develop interest in urban gardening and more generally the relationship between city development and the growth of green spaces; as well as to support events on a gardening theme in the City of Lausanne.

GreenInUrbs Organisation is an international organisation aiming at linking environmental with social aspects in studying and managing urban forests. Its main objectives are to increase the understanding of the role of urban forests in the context of green infrastructure from a scientific and a socio-economic perspective, in terms of the ecosystem services provided to people and to the urban environment, as well as to provide indicators and/or thresholds to be included by policy makers in local, national or international regulations about green infrastructure and urban forests (GreenInUrbs, 2013).

“Carrot City, Designing for Urban Agriculture” is an exhibition that ran at the Toronto Design Exchange throughout 2009 curated by June Komisar, Mark Gorgolewski and Joe Nasr of Ryerson University (Lee-Smith, 2009). It is a project promoting a green city in which vegetables are grown and livestock are raised. This exhibition sends a message that urban agriculture creates new professions, reinforces community cohesion and brings more sustainability to the city. Moreover, the project brought the idea of allotment gardens on the rooftops (Lee-Smith, 2009).

II.IV. The Functions of Green Zones in a City

It should be noted that "urban green zones provide a range of benefits in various forms and offer a variety of opportunities to people" (Leeuwen, Nijkamp, and Vaz, 2010; Jim, 2012).

In international literature, one may find a plenty of classifications of green space functions. Some of them are more detailed, some less. Jim (2012) divides the functions into two categories – economic and ecological-environmental. This classification is the most widespread. Leeuwen, Nijkamp, and Vaz (2010) mention a broader range of functions, namely, social (quality of life, new jobs, enhanced attractiveness of a city for living, working, tourism); agricultural (green space deliver wood, fruits, compost and energy); ecological (absorbing pollutants and releasing oxygen, moderate changes in temperature etc.). Even more detailed classification can be found in the work of Baycan-Levent et al. (2009), they distinguish ecological, economic, social, planning, and multidimensional (scientific and policy value) functions.

Moreover, in the ecological economics literature, there is a distinction between the "use value" and "non-use value" of green zones. "Use value" refers to the economic functions of space (growing vegetables, etc.), while "non-use value" refers to intangible functions of space (aesthetic pleasure, psychological well-being, social interaction, etc.) (Leeuwen, Nijkamp, and Vaz, 2010; Jim, 2012).

In Russian literature most of the authors emphasize the same functions of urban green zones as in the other international sources, namely, ecological, social, economic, city-planning (Stepanov, S., 2013; Kapustin, A., Khvatov, V., 2008; Lojechko, V., Esina, E., Merkushev, I., 2013; Denisov, V., Luckmanov, U., 2006). However, one may also find such green zones' functions as cultural and historical which are not typical for most international sources (Stepanov, S., 2013).

II.V. Green Space Management (GSM)

Since urban GSM (or Urban Greenery Management) is considered to be a part of environmental management, it is important to define the way government performs environmental management. Randolph (2012) mentions that government plays a crucial role, using its "police power" to protect public health and welfare, as well as to regulate private activity that makes its impact on the environment. Randolph (2012) points out that government uses three main branches in the environmental management – executive, legislative, and judicial. The legislature enacts normative acts, while the executive agencies develop plans and administer programmes (Randolph, 2012). Randolph (2012) also divides the tools used by government into regulatory (such as zoning, performance standards, urban growth boundaries), and non-regulatory measures (such as location of infrastructure, tax policies, land acquisition, education, environmental design guidelines) in order to influence land use and development practices. Zoning ordinances are of great importance to protect the public's health, safety, morals, and general welfare, since the community can say what land is not to be developed (Whyte, W., 2002)

Looking at the international comprehension of urban GSM, one may state that it is defined in most of the sources as a broad term which encompasses management of the green areas in the urban environment, namely, maintenance of urban green areas (parks or green squares, urban forests and grasslands, flowerbeds etc.) and may also include the maintenance of hard surfaces in urban green areas (Balicka, E., 2012). Moreover, Balicka (2012) states that management contains not only practical activities on maintenance, but also planning and organizing of those activities.

Comparing the definition of GSM with the one accepted in Russian literature, one may see that there is a certain difference. GSM is defined in a more broad way as not only maintenance, but also protection (including preservation, restoration, rational usage, prevention from damage and destruction) of the territories with GP[2].

[2] GP is a set of trees, bushes, herbaceous plants and flower beds on a particular territory. The territories containing GP are called green spaces (Law "On the GP in SPb", 2010). In the international literature one may find a term green space for the territories containing GP, but it has a more broad definition, namely, green spaces (sometimes called open spaces) are defined as "unbuilt areas in an urban region, i.e., areas without continuous closely spaced buildings, which contain and may sustain natural systems where ecological patterns, processes, and changes are in most natural or least-degraded condition" (Forman, R., 2008).

Such concept as "city improvement" is also important, since GSM is a part of city-improvement efforts. City improvement is defined as "the activity aimed at maintaining and improving the quality of city environment" (Art. 2, the Law of SPb "On the administrative offences in the sphere of city-improvement in SPb", 2003).

II.VI. Courtyard Territories

In most of the international literature sources one may find the following classification of the existing forms of green spaces in modern cities (Haughton, G., Hunter, C., 2003; Baycan, Levent et al. 2009):

Table II Forms of Green Space and Their Functions

Form of green space	Function
Limited public green space	Enriches urban ecological quality of life
Open public space	Serve the recreational needs of visitors (through walking, sports activities)
Private gardens attached to the citizen's property meant for private use	Aesthetics etc.
Private green space belonging to corporate organizations	Serve to strengthen the image of openness, nature and health within the city limits

Source: Baycan, Levent et al. 2009

It is noteworthy that one will not find courtyard Green Plantations (GP) among this list. However, territories of courtyard GP are the ones that an average citizen face each day. The concept of courtyard GP would be the key issue in the centre of author's attention in the present paper.

The definition of courtyard (or inner yard) is the same in international and Russian sources. It is defined as a street space (often green) within the complex of buildings (Reynolds, J., 2002; Denisov, V., Luckmanov, U., 2006; Kapustin, A., Khvatov, V., 2008). As for the term defining courtyard territories with GP, one cannot find such a term in the international literature, while in Russian sources they are described as "courtyard territories with GP" are the territories which are located within the borders of blocks[3], contain GP, don't have access to street-road network, and are used mostly by the population of the courtyard for recreation (Law "On the GP in SPb", 2010). Courtyard territories are typical for the old historical building up areas (middle 19th – beginning 20th century) in most big Russian cities. These courtyards have a special enclosed architectural form. The specificity of this form blocks the dispersion of emissions from vehicles, since the building up is dense and the wind cannot freely circulate within the courtyard. Moreover, there are no special models for evaluating the air quality within the courtyards. It is explained by the uniqueness of the problem existing only within the building up of this type. In Europe this problem is solved by announcing these areas as pedestrian (Vasiliev A., Denisov V., Tarhov D., Phedotov V., 2014).

II.VII. Conclusion

This Chapter is designed in order to show the results of review of the literature on the most general concepts of the present paper. Particular concepts are described as they are presented in the existing literature in the respective chapters.

While analysing available literature on the given topic, the author faced a challenge of a difference in understanding of some definitions in international and Russian literature. It was important to identify the difference, in order to avoid further confusion.

Historical development of the concept of urban greening dates back to the 19th century, whereas the activity itself exists since Antiquity. The literature on the topic started to appear in the middle of the 20th century, and reached its peak in the end of 20th- beginning of 21st century. Since environmental

[3] City Block is a part of the city limited by the several crossing streets (Merriam-Webster Dictionary).

problems in the world in general, and in urban environment in particular are predicted to worsen, in the future the amount of literature will most probably increase.

CHAPTER III. METHODOLOGY

III.I. Introduction

The problem in question is approached from the administrative science perspective on the basis of the legal means and integration of the ideas into a single strategy as opposed to the natural science perspective.

According to Johnson (2009), the research process was divided into three main phases:

1. Planning

- Determining urban GSM as a research area;
- Determining municipal GSM as a key issue to investigate and formulating research questions with possible hypotheses;
- Selecting qualitative research method based on interviews, questionnaires, and document review for covering the topic;
- Selecting academic dissertation as an appropriate design;
- Developing a data collection strategy and instruments;
- Developing a sampling approach in order to choose the municipalities for the comparative policy analysis;
- Develop a data analysis strategy;
- Reviewing and testing the methodology;
- Preparing a work plan with resource and time requirements (see the Table describing the timetable of the research in Appendices).

2. Doing

- Gathering the data: 2 trips to SPb in order to take face-to-face interviews with the heads of Municipalities and GSM specialists; sending the questionnaires; making inquiries for getting the access to data (documents, programmes etc.); searching for the literature;
- Analysing the data;
- Verifying the accuracy of the data and analysis by comparing the data from different sources;
- Formulating the findings.

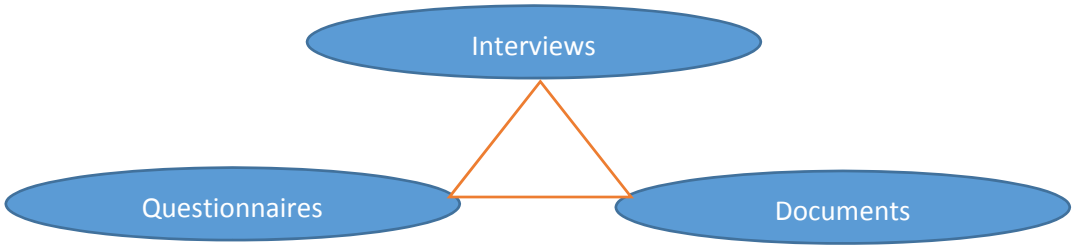
3. Reporting

- Reporting major findings on the status quo of the problem, and the possible solutions;
- Suggesting specific proposal for action: designing a roadmap to the “Green Roofs and Walls” municipal policy (presenting evidence to support recommendations; using tables and figures to communicate the results);
- Giving oral presentation for the thesis defense

III.II. Qualitative Research Method: Data-Source Triangulation

For the purpose of the present research data triangulation method was chosen as the most suitable due to a number of advantages that qualitative research methods can provide. These strengths include understanding the meaning, analyzing the micro-issues, identifying unanticipated phenomena (Aquilina, D., (2013, December). Research Methodology. Lecture conducted from IDHEAP, Lausanne). Data triangulation is considered to be “a process in which the researcher uses multiple sources of data, process similar to that used in some comparative analyses where the same object of study is analysed using a number of different measures and variables” (Aquilina, D., (2013, December). Research Methodology. Lecture conducted from IDHEAP, Lausanne). In order to answer the research questions such three sources as interviews, questionnaires, and documents were chosen.

Figure I Data Triangulation



III.II.I Semi-Structured Interviews

Qualitative interviews were used as a strategy for data collection in conjunction with the questionnaires, and documents. Such a kind as semi-structured interviews was chosen in order to allow for a certain degree of flexibility and for the pursuit of receiving unexpected precious information.

In order to give more credibility to the research, the sample for the interviews was determined to encompass as many people as possible, both in Russia, and in Europe. In order to advice on the literature and access to internal documents of the Committee for Urban Development and Architecture of SPb, the author contacted the Specialist of the permanent Commission for the Urban Development and Land-use, Irina Shkeul, since she is the one who is responsible for public relations. Irina Shkeul has managed to organize a meeting with the Head of Pavlovsk Municipality, Valeriy Zibarev. After sending out the questionnaires to the municipalities in two districts, I have received a message from Valeriy Denisov, a member of International Academy of Ecological Sciences and Life Safety Activities who is interested in my research. After making a first analysis of questionnaire results, I have chosen 4 Municipalities out of which I had to choose 2 for comparative policy analysis. In order to make my choice I took face-to-face interviews with the heads of respective municipalities and specialists for greening or urban development in these municipalities (where it was possible). Valeriy Denisov was the one who helped to organize those interviews, since in Russia it is highly problematic to get access to people working for the Government. After that in order to learn more about the green roof policy international experience, I have contacted for the interview the Director of the International Green Roof Association (IGRA), Wolfgang Ansel. In order to learn about GSM experience, especially, alternative greening techniques application, in Lausanne, I have contacted Pascal Aubert (Delegate for nature in Lausanne) and Roland Schmidt (Delegate for agriculture in Lausanne), whose contacts were given by the author's supervisor, Professor Peter Knoepfel.

The interviews were conducted in accordance with the principle of neutrality vis-à-vis the content of what the interviewees said. All interviews were taped and transcribed in order to capture the raw data as full as possible and analyse it easier. The list of interviews is presented in the Table in Appendices.

III.II.II. Questionnaires

In order to find out the data related to the courtyards' greening status quo it was decided to design a questionnaire and send it out to all the municipalities within 2 districts chosen for the research. The author has distributed the questionnaires containing 9 open questions (see Chapter VI, Paragraph "Questionnaire Analysis") by e-mail to the heads of 11 Municipalities in 2 city districts.

III.II.III. Documents

According to Payne and Payne (2004), the documentary method is a set of "techniques used to categorize, investigate, interpret and identify the limitations of physical sources, most commonly written documents whether in the private or public domain". Documentary analysis was chosen as one of the research methods, since it was necessary to analyse the documents that contain information about: the urban greening status quo in terms of reality and legislation in SPb; the way GSM is organized on the municipal level (including its legislative basis); the activities performed and policies adopted by different municipalities in the sphere of greening.

The author analysed a number of ***primary sources*** such as the Constitution of Russia, SPb legislation and public policies in the sphere of urban development and GSM; documents accessed (through making inquiries) in the Committee for Urban Development and Architecture of SPb, Municipalities,

and the Council of City Municipalities. A number of ***secondary sources*** were also analysed, namely, journal articles and books, encyclopedias and textbooks concerning green roof and wall technologies and policies. Bothe literature search and analysis were based on analogy method, comparison, synthesis and analysis, induction and deduction, abstraction and specification, and opposition methods.

III.III. Research Limitations

III.III.I. Methodological Limitations

Poor accessibility to the region of study – since the author was conducting research in Switzerland, it was difficult to reach people, organisations, and places located in SPb, Russia.

Lack of information on the subject – there is an evident lack of literature on courtyards greening due to the specificity of such an architectural phenomenon.

Absence of prior research on the topic – there is no prior research on the courtyards territories greening in SPb.

Volume restriction of the thesis – volume limitation did not allow the author to include all the data collected during the research in the present paper.

III.III.II. Limitations of the Researcher

Longitudinal effect – the time limitation of 10 months along with the process of studies did not allow to make the research more profound.

Language limitation – absence of fluency in French did not allow the author to include French literature into account.

Access limitation – since the study depends on having access to civil servants, governmental organisations, and documents that are most of the time not accessible to the general public, the research is limited by the documents which were made open to the author, and people who agreed to give an interview. It can be explained by the low degree of openness of civil servants to the public in Russia.

III.IV. Conclusion

Splitting the research into the 3 phases and making a certain timetable in the beginning allowed the author to be consistent and compliant with the deadlines. Data-Source Triangulation Method for the data collection and comparative policy analysis as an analytical tool allowed to draw a relatively objective picture of the present situation in the problem sphere, as well as to analyse the data. However, existing limitations have created a number of obstacles on the way to building a workable solution for the courtyard GSM problem. Nevertheless, since the research in this sphere is the pioneering one, it adds a certain value. Comparative policy analysis was conducted according to the theoretical paradigm on the policy analysis developed by Peter Knoepfel.

CHAPTER IV. SAINT-PETERSBURG (SPB) GREEN SPACE LEGISLATION AND POLICIES

IV.I. Brief history of SPb GSM Development

The history of SPb's parks and gardens dates back to the time of city's foundation. The first garden in SPb, called Summer Garden, was founded by the city's founder, Peter the First, in 1704, one year after the city was founded. Since then a range of regulatory bodies were established. The first body, Garden Bureau, was created in 1710 and counted 3 people. In 5 years this body was employing 400 professionals who were responsible for plants procurement for the city's needs. And it must me also mentioned that from the very beginning the history of city's green space development was closely linked to the work of the European architects and park builders, such as, Karl Rossi, Djakomo Quarenghi, Domenico Tresini, Rastrelli, P. Gonzaga, Brenna, C. Cameron, Montferrand etc. French engineer-topographer, Jean Henri Jaume Saint-Hilaire, developed the first prospective city plan with green space development panorama in 1773. And around 60 years later the city acquired its first GP for common use. It happened when Russian Emperor, Alexander the First, transferred 32 "walk places" from the private to the city's property. At that time all the city greening issues were being discussed in the City's Duma sessions. In the beginning of the 20th century (1907) the first description of city's green spaces was published. Soon after that, in 1933, in order to develop Greening Development Plan a special body was established – city's body for green spaces. This Plan was finally developed in 1940

whilst based on the city's body for green spaces a new body was created – Green Space Department (attached to the Urban Development Administration) (Committee for parks and gardens, 2013).

During the Siege of Leningrad (SPb was called Leningrad from 1924 to 1991) existing nursery-gardens were almost fully destroyed – 135 hectares instead of 294. A lot of greenhouses and hothouses were also destroyed – 2.000 square meters instead of 26.000. Around 100.000 trees and more than 800.000 bushes died, as well as 400 hectares of paths and flower gardens (Committee for parks and gardens, 2013).

During the post Second World War (WW2) period the city saw the creation of several specialized services, such as, district's green space departments, common city's flower nursery gardening, network of forest parks, architecture workshops for gardens and parks planning etc. In 1945 two memorial parks with the square of 300 hectares were established. These are Moscovskiy and Primorskiy parks. During the post-war years green spaces were being restored with the help of citizens and scientific institutions, such as, Botanical Garden, Institute of Plant Cultivation, Institute for Plant Defense etc. At the same time such academic institutions, as Agricultural Institute, Leningrad Engineering and Construction Institute, Leningrad Forestry Engineering Institute, and Leningrad Technical School of Green Construction started to prepare the specialists in the sphere of green space development. As a result of common efforts during the 10 post-war years the square of GP enlarged by 518 hectares, and during the next time – by 1626 hectares. During the second half of the 20th century SPb saw the creation of several parks. Along with the park creation a lot of park reconstruction works were being accomplished (Bekreneva, N., 2004).

In this light, it is worth mentioning that Leningrad was regularly taking the first places among the other USSR cities for its green space development. From that time on Leningrad started to build international connections in the sphere of sharing GSM experience with foreign countries – Bulgaria, Germany, Holland, Finland etc. (Bekreneva, N., 2004).

As for the modern history of GP in SPb, today GP for common use amount to 10413 hectares. Within the city borders one can find 55 parks, 159 gardens, 686 squares (small public gardens), 214 boulevards, 775 greened streets and 9 other objects of greening. The square of forest-park zone is 3.305 hectares (Committee for parks and gardens, 2013).

IV.II. Legislation and Policies Outline

Based on the research of the existing legislative acts and policies which concern GSM, the author has identified a number of them and divided them into 5 categories described in the Table below.

Table III Legislation and Policies Outline

Category of Legislation	Normative Act
The Constitution and Federal Legislation	Art. 42, 58 of the Constitution
	Art. 2, 6, 61 of the Federal Law "On environmental protection"
	Federal Law №221 "On the state cadastre of real estate"
Basic Laws	Law of SPb "On the green plantations of common use" 19.09.2007
	Law of SPb amending the law "On the green plantations of common use" 30.06.2010
	SPb Law "On the green plantations" 2010
	Long-term Programme for greening the territories of green plantations of SPb for the period 2013-2017
Secondary Laws	Law "On the city improvement of SPb"
	The Decree of the Government of SPb "On the rules of cleaning and order in SPb"
	The Decree of the Government of SPb "On subsidizing in the sphere of city-improvement"
Other Related Legislation	Law "On the general plan of SPb and on the land-use rules and building up"
	Law of SPb of 29th March 2006 "On the ecological monitoring within the territory of SPb"

IV.III. Structure of GSM in SPb (3-level system)

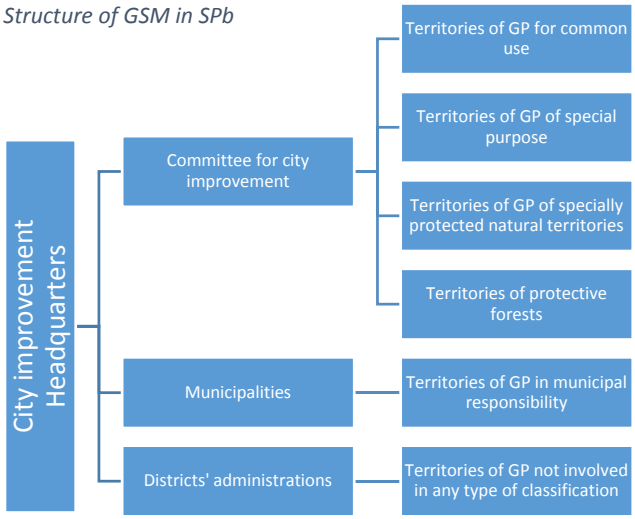
According to the Law of SPb "On the GP" (2010), all the territories with GP are divided into 6 types described in the Table below.

Table IV Types of GP Territories

№	Type	Definition	Responsible Body
1	Territories of GP for common use	Territories for common use which are located in different parts of the city, contain green plantations, and are used ***for recreation by unlimited scope of people***	Committee for city improvement
2	Territories of GP in municipal responsibility (courtyard GP)	Territories which are located within the borders of districts, contain GP, don't have access to street-road network, and are used mostly by the ***population of the municipality for recreation***	Respective municipalities
3	Territories of GP of special purpose	Territories with GP or reserved for planting of greenery which are located in the areas that require establishing of protective planting of greenery (***street greening, territories of protection of drinking water supply sources***)	Committee for city improvement
4	Territories of GP for limited use	Ground areas, located in different zones and containing GP, which belong to SPb's property and access to which is limited by their right holders who are usually some state institutions being in charge of caring about these GP	State institutions (schools, kindergartens) restricting the access to its GP
5	Territories of protective forests	***Urban forests and forest-park zones*** which are located on the territory of SPb	Committee for city improvement
6	Territories of GP of specially protected natural territories	Territories of GP which are located within the borders of ***specially protected territories*** of SPb	Committee for city improvement

If one takes a look at the territory of a particular municipality, one may find almost each type of these territories, and based on the Table above, one can claim that there are 2 political-administrative bodies in charge of them, namely, the Committee for city improvement and respective municipalities. However, there are always some territories that are not included in none of the types listed above, in this case they are taken care of by the Districts' Administrations (Shkeul, I., skype interview, October 25, 2013). Furthermore, there is a City-improvement headquarters which plays a role of a coordinating body between all the actors in charge of GP care and protection. The figure below was designed by the author in order to give an overall picture of the GSM structure.

Figure II 3-level Structure of GSM in SPb



IV.IV. Analysis of the Problems in GSM of SPb

Based on the analysis of the existing policies, legislative acts, citizens' complaints, and interviews, the number of problems in the sphere of GSM was identified:

- Decreasing number of green spaces;
- Building up the territories of parks and gardens;
- Lack of GP in the central districts of the city;
- Absence of available information on GP, including information on dynamics of GP and compliance with the standards;
- Decrease in quality of GP because of sicknesses, bad citizens' attitude, lack of care;
- Problems of availability of GP for the population (time to get to the green space increases);
- Deterioration of environment and citizens' health because of the deterioration of GP' quality and quantity;
- Weak resistance of GP, lack of decorative plantations adapted to the climatic conditions of SPb;
- Lack of nursery-gardens (90% of planting stock is imported from Poland, Germany, Holland);
- **Insufficient budget funding** (inability to fulfill all the planned works according to the existing standards);
- Not involving citizens in consulting and decision making;
- Absence of precise borders of GP due to unfinished inventory leading to overlapping in responsibilities of actors who take care of GP;
- Absence of ecological corridors;
- Harmful influence of motor transport;
- Low indicator of provision of SPb population with GP per capita;
- Incompliance of 40% of GP territories for common use with the existing norms.

IV.V. Conclusion

This Chapter shows that GSM in SPb has a long history and a solid legislative base. The 3-level structure of GSM reveals the types of GP territories and the political-administrative bodies being in charge of them. It also has revealed the most local unit of GSM which can be found on the municipal level and which will be the center of the author's research in present paper.

CHAPTER V. COURTYARDS' GREENING IN THE CITY OF SPb

V.I. Introduction

For the citizens of SPb it is courtyards' land improvement and greening that is one of the most visible and obvious result of municipal work. It can be easily explained by the fact that going out of the doorway or a car, everyone wants to see a beautiful, well-designed courtyard, to walk through the green foot path, to see happy smiling children playing in the well-equipped and safe children's playground, and to enter the clean doorway. In this light, the primary task of the municipal bodies is to provide for comfortable and safe conditions for the life of its inhabitants (Council of SPb municipalities, 2014).

First of all, this chapter is the result of ***research of the responsibilities of SPb municipalities in the sphere of GSM***. Second, this chapter is the result of documentary analysis of the legislation in order to describe the ***legal basis underlying these responsibilities and their fulfilment*** (the laws being a basis for municipality's work in the sphere of greening). And, finally, in this chapter researcher presents ***the results of the investigation in order to test the first hypothesis*** that presumes that bad condition of the courtyard GP is an evidence of substantial problems in municipal GSM.

V.II. Courtyard GSM as a Responsibility of City's Municipalities

V.II.I. Scope of Municipal Authorities' Actions

The city of SPb is divided into 18 administrative and territorial units, or districts, administered by the executive authoritative bodies (district's administrations). Within the territory of each district there are on average 5-6 municipalities. Overall one can enumerate 111 municipalities within the city borders (Law of SPb "On the territorial organization of SPb", 2005). The main goal of each municipality is to ensure efficient execution of state authority on the very local level (Council of SPb municipalities, 2014).

The conceptual framework for local self-governance embodied in SPb municipal structure was being developed during 1993-1996 (Denisov, A., 2001). When in 1998 Russian Federation ratified European

Chart on local self-governance, the municipalities were acknowledged as one of the primary pillars of democratic governance (Federal Law "On the ratification of the European Chart on local self-governance, 1998). Since that time municipalities of SPb passed through the long way of development and gaining authoritative power from the citizens and executive bodies of the city. However, during all the time since municipalities were established, ***land improvement and greening of the courtyard territories*** was their scope of competence in the sphere of city GSM and at the same time their priority field of responsibility (Council of SPb municipalities, 2014). A wide range of objectives in the sphere of municipal land improvement, including GSM activities, as well as their importance for all the citizens, determine the improvement and greening of courtyard territories as the most important, complex, and large-scale municipal responsibility (Belikov, V., Municipal GSM, 2013).

According to the Article 10 of the Law of SPb "On the organisation of self-governance in SPb", each municipality has the following responsibilities in the sphere of courtyard greening:

Directly related responsibilities:

1. Courtyard territories' greening:
    - ✓ ***planting*** of greenery
    - ✓ organisation of the ***compensatory planting*** of greenery;
    - ✓ ***maintenance*** of GP;
    - ✓ ***reparation*** of the objects of GP;
    - ✓ ***protection*** of GP;
2. Conducting sanitary cuttings:
    - ✓ removal of sick trees and bushes
    - ✓ removal of potentially dangerous trees and bushes;
3. Organization of inventory of the GP within the courtyard territories of a municipality

Indirectly related responsibilities, or land improvement-related responsibilities:

1. Undertaking measures for enlarging the territories of courtyards in order to organize additional parking lots;
2. Establishment and maintenance of minor architectural landscape elements and street furniture;
3. Creation of recreation zones (including children playgrounds);
4. Provision of the necessary facilities on the territory of sports grounds;
5. Provision of the necessary facilities for the container areas (waste areas);
6. Reparation of courtyard territory, including driveways and foot-paths;
7. Installation and maintenance of lawns' fences.

In order to find out the data on the way the courtyard territories' borders and their enumerations are to be defined for every municipality and on the results of inventory process, the author made an inquiry to the Committee for Urban Improvement. According to the document received, the inventory process of courtyards within the city municipalities was made in 2012 and the enumerations were sent to the respective municipalities on the 14th of January 2013 for them to be approved. In 4 months, on the 26th of April 2013 only 43 municipalities out of 111 approved the enumerations of courtyard territories to be in the lists under their responsibility, 2 municipalities refused to approve, another 2 – approved the lists only partially, and 59 did not give any answer on the approval of the territories to the Committee (Reference of the Committee on Urban Improvement, 2013). It is worth mentioning that according to the Paragraph 1, Article 16 of the Law of SPb of 28th June 2010 "On the GP in SPb", the enumeration of courtyards within the borders of respective municipalities is approved and corrected by the regulations of municipal bodies of respective municipalities on the basis of their own inventory process results. This law does not presume the possibility of a municipality to refuse approving the enumeration. However, the real situation digresses from the requirements of the Law, and it creates a number of problems concerning the courtyards GSM (See Sub-Chapter "Major problems arising in each area of municipality's responsibility in courtyard greening and possible solutions").

V.II.II. Rules and Procedures

The rules and procedures determining the organisation of work of SPb municipal bodies in the sphere of courtyard GSM can be found in the different documents developed and issued by the Council of

SPb municipalities. The access to these documents was given to the author of current paper by the Assistant of the Executive Director of the Council of SPb municipalities, Julia Slav.

The Council of SPb municipalities was established in 2006 in accordance with the federal law "On the general organizing principles of local self-government in the Russian Federation" as non- government organization which unites municipalities of SPb. The Council unites all 111 municipalities of SPb in order to coordinate their interaction (Federal Law "On the general principles of local self-governance organization in Russian Federation", 2003). This body pursues a number of goals which are of crucial importance for the city's GSM development:

- ✓ Generalization of municipalities' experience in the field of land improvement.
- ✓ Increase in the level of municipality land improvement and greening.
- ✓ Improvement of municipality's work organization.
- ✓ Efficiency increase in municipal budget expenditures.
- ✓ Attraction of investors.
- ✓ Development of municipality inhabitants' initiative for land and balcony improvement within the courtyard.
- ✓ Conduction of annual competition in the sphere of municipal land improvement (awards for the best courtyard within the historical part of the city, for the best courtyard within the newly developed area, for the best children playground, for the best sports ground, for the best object of greening etc.).

Based on the number of documents provided by the Council of SPb municipalities, the author made a list of basic rules and procedures for courtyard greening dividing them into 8 categories.

Table V Basic Rules and Procedures for Municipal Courtyard Greening

Domain	Basic Rules and Procedures
Address Programmes as a basis	▪ Municipal responsibilities in the sphere of courtyard greening are executed on the basis of "address programmes" which define the addresses of courtyards and greening activities to be performed there. ▪ Address programmes must be developed taking into account the opinions, wishes and ideas of the municipality's inhabitants. ▪ Targeted addresses must be defined taking into account the results of the annual monitoring of the courtyard territories' state. ▪ Address programmes must be approved by the deputies of the municipality, district's administration and housing agencies.
Coordination and Accountability	▪ Before starting any kind of activity (including building) within the courtyard zone with GP, municipal bodies must receive a special approval from the Committee for parks and gardens. This Committee must make an inspection of the territory and issue a permit. After receiving the permit in order to go ahead with the project, the full construction plan with indication of engineering networks, zone of construction, and greening plan must be again submitted to the Committee for parks and gardens. In case of any change in general plan, documentation and engineering networks documentation leading to the additional damage or destruction of GP, these documents must be adjusted with the Committee for parks and gardens. The Committee organises a special commission involving members of the Committee itself and a building company. This commission is to define the amount of trees and bushes that will be pulled down or transferred, the amount of lawns, flower gardens, garden paths and squares that will be destroyed. Having finished the inspection, the commission issues an act, as well as defines the replacement cost of GP along with the replacement plan in the builder's estimate. All the necessary sanitary cuttings are also to be done only being approved by the Committee for parks and gardens. ▪ On the way to comprehensive improvement of the courtyards, municipalities work in close cooperation with ***district's administrations*** and ***housing agencies***, which plan and execute the reparation of the houses (facades, roofs)

	within the courtyards. Municipal authorities have to submit the address programmes for their approval. ▪ All the projects for courtyard improvement and greening are to be approved by the ***Committee for Urban Improvement***. ▪ Special equipment for the seasonal and vertical greening (flower bowls, containers etc.) should be created on the basis of existing templates and specific projects being approved by the ***Committee for Urban Development and Architecture***.
General Guidelines	▪ Municipal bodies should perform comprehensive improvement of the territory preserving existing greenery and using intensive greening methods. ▪ Municipal bodies should provide for the maximum preservation of valuable sorts of trees and bushes.
Technical Guidelines	▪ To ensure the vitality of GP planting material should be selected using adapted sorts which are in compliance with the state quality standards 24909-81, 25-769-8, and 26869-86 (Report on the GP by the Council of SPb municipalities, 2013). ▪ Design of greening must be done on the basis of preliminary research on the soil safety. ▪ Reconstruction of existing GP should be done taking into account preserving or restoring the initial project's idea on the interplay between the greening elements and the architecture of the buildings, height of the buildings and GP, insolation of territory and buildings, visibility of road signs, as well as safety of pedestrians and transport. ▪ Before planting any greenery, municipalities must take into account decorative characteristics and peculiarities of different types of trees and bushes - the shape of crown, the colour of the leaves, the change during the year, time and type of flourishing. ▪ Before starting any construction works, municipalities must make sure that all GP are protected with the special temporary fences. ▪ Trees and bushes must be planted according to the existing construction rules and norms. For example, the distance between trees and bushes and building walls is to be respected.
Recommendations	▪ It is recommended to compensate the deficit of trees and bushes within the territory of dense building up in the historical districts of SPb by the ***vertical greening*** and seasonal container greening. For example, on the facades without windows special structures for the vertical greening can be installed. ▪ It is recommended to use the elements of ***decorative greening*** in addition to the standard amount of GP.
Taboos	▪ It is prohibited to plant trees within the territory of underground utilities. Those trees that are growing within this territory are to be cut. The trees that were cut have to be substituted by the bushes that do not have deep roots. ▪ It is abolished to use bushes with thorns or poisonous berries for the green walls within children's playgrounds. ▪ It is abolished to plant greenery that is littering the territory and is provoking mass allergy reactions while flowering.
Compensatory Greening	▪ Pulling down or transferring GP is allowed under the following conditions • Construction and reconstruction of roads, engineering networks, building according to the construction projects. • Reconstruction of GP which were planted violating the construction norms and rules according to the decision of district's, city's bodies responsible for the architecture and urban development, and the bodies for nature protection. • Elimination of the consequences of accidents happened within the engineering networks. ▪ Compensatory planting of greenery is obligatory in all the cases when GP die or are damaged. The volume of compensatory greening depends on the green space provision per capita in this particular municipality.

	1. In case when the amount of green per capita is higher than 6 square meters, compensatory greening is conducted: -in the same amount and with the same sorts (or more valuable sorts) within the territory of this particular municipality; -in the same amount and with the same sorts (or more valuable sorts) within the territory of the neighbouring municipality with the provision of GP lower than 6 square meters per capita. 2. In case when green space provision per capita is lower than 6 square or the availability of GP for the inhabitants of the place with damaged or removed GP is more than 300 meters, compensatory greening is conducted in a double amount using more valuable sorts. 3. In case of illegal destruction or damage of GP, compensatory greening is conducted within the same place using the same sorts. ▪ Compensatory greening is conducted during the nearest season acceptable for planting of greenery, however it should not be conducted after more than 1 year since damage or destruction took place.
Penalty	▪ In case of felling trees without permission, as well as in case of absence of action to prevent trees and bushes from dying, the responsible actor(s) will incur administrative responsibility and pay the replacement cost for the damaged GP.

Source: Document "On the organisation of work of municipal bodies of SPb in the sphere of courtyard greening", Council of SPb municipalities, 2013; Belikov, V., Municipal GSM, 2013; Law "On the GP of SPb", 2010; Denisov, V., Lukmanov, U., Courtyard improvement, 2006.

The rules and procedures can be characterized as being quite vague, since most part of them do not precise the way this or that procedure or rule must be applied in reality. For example, it is stated that address programmes must be developed taking into account the opinions, wishes and ideas of the municipality's inhabitants. However, there is no indication on the way a municipality should find out inhabitants' opinions. Nevertheless, these rules and procedure provide a municipality with a general framework for GSM that gives them a certain degree of autonomy. At the same time one can conclude that the documents outline that courtyard improvement is only possible on the basis of close cooperation between municipalities, as well as between municipalities and the other political-administrative bodies, and with the contribution of creative ideas from the citizens.

V.III. Legislative Basis for the Municipal GSM

Since the time when municipal self-governance was established in SPb, in the end of the 90-s, the legal acts and norms regulating courtyard improvement and GSM have changed several times (Kuznetsova, N., 2008). At the same time in order to perform GSM in compliance with the technical requirements and existing legislative acts, municipalities must have a very clear idea on the list of these acts to be taken into account. Based on existing literature and conducted interviews, the author accumulated a list of relevant legislative acts, norms, and standards pointing out the relevant provisions in which of them. The results of the research are present in the following Table.

Table VI Legislative Basis for the Municipal GSM

Legal Act	Relevant Provisions
Law of SPb of 2nd of July 2014 "On the organization of municipal self-governance in SPb" №420-79	▪ Local self-governance as a basis of constitutional regime of Russian Federation and as a form of exercising power by the citizens of SPb being a means of independent decision-making by the population of the city (Art. 1). ▪ The enumeration of the municipal territories and the description of their borders is determined by the Law of SPb "On the territorial organization of the city" (Art. 7). ▪ Article 10 describes the sphere of responsibility of a municipality (see Paragraph "Scope of actions"). ▪ Municipal bodies can organize public hearings in order to discuss the draft municipal normative acts on the local issues. Public hearings can be initiated by the municipality's inhabitants, municipal council, or the head of municipality. Moreover, it is stated that public hearings are obligatory to discuss the municipality's budget report, municipality's development and improvement projects, and municipality's charter (Art.19). ▪ Citizens' meetings can be another form of discussing local issues and the way to inform the inhabitants on the activities of municipal bodies. Citizens' meetings can be initiated by the citizens, as well as by the council of municipality, or the head of municipality (Art.20). ▪ In order to get the information on the opinion of municipality's inhabitants, surveys can be conducted. A survey can be organized on the whole territory of the municipality or only on one part. The results of surveys play a role of recommendation for the municipal authorities while making their decisions. A survey can be initiated by the municipal council or the head of municipality (Art.22).
The Law of SPb of 28th June 2010 "On the GP in SPb" №396-88	See Chapter 3 "Saint-Petersburg (SPb) Green Space Legislation and Policies".
The Law of SPb of 29th May 2003 "On the administrative offences in the sphere of urban improvement in SPb" №239-29 amended by the Decree of the Government of SPb of 29th March 2005 №399 "On the measures for realisation of the Law of SPb of 15th May 2003 №239-29 "On the administrative offences in the sphere of urban improvement in SPb"	▪ According to the Article 3, courtyards in general, and GP in particular are considered to be the objects of urban improvement. One may find 4 Articles describing administrative offences related to the work of municipalities in the sphere of urban improvement: articles 8, 10, 19, 21. ▪ Article 8 stipulates the consequences in case of violating the procedure for issuing the permit for building, repairing or placing an object of urban improvement. For this kind of violation a municipal body is to pay an administrative fine of 1.000-2.000 Roubles (around 20-40 Euro). For the repetitive offence the administrative fine is twice bigger. ▪ Article 10 describes the redress for the violation of the rules of conducting building and repairing works. In case of violation of these rules, including violation of deadlines, conducting the construction works after the end of the permit, leaving the territory after the construction process without restoring its GP, the municipal body is to pay an administrative fine of 3.000-10.000 Roubles (around 60-200 Euro). For the repetitive offence the fine is 10.000-15.000 Roubles (around 200-300 Euro). ▪ Article 19 stipulates the redress for keeping the object of urban improvement in a bad condition. The administrative fine for this offence equals to 10.000 Roubles (around 200 Euro), while for the repetitive violation it is 20.000 Roubles (around 400 Euro). ▪ Article 21 states that violation of time limits and procedures for cleaning the territory of the objects of urban improvement entails an administrative fine of 10.000 Roubles (around 200 Euro), whereas for the repetitive offence it is 20.000 Roubles (around 400 Euro).

The Decree of the Government of SPb of 17th of November 2005 "On the way of inventory of GP" №1779

№	The name of courtyard territory	Square of the territory with GP, m2	Number of trees	Number of bushes	Number of flowers, perennial plants
1					
2					
3					
	Total №				

- Article 2.1 states that the Summary list of GP in SPb is to be developed and updated by the Committee for Urban Improvement of SPb on the basis of the data provided by districts' administrations and municipal bodies. These actors must submit the list both in written and electronic form which has the following format:

- Article 2.6 describes the responsibilities of municipalities in terms of inventory of GP. The procedure for performing the inventory consists of a number of steps
  - Municipal authorities must input the inventory results data on courtyard GP (number, borders, location) given by the Committee for Urban Improvement into a municipal list of GP.
  - Municipal authorities must examine GP within its courtyard territories in order to correct (in terms of number and type of GP) the lists given by the Committee for Urban Improvement, on the annual basis (before the 31st of December).
  - Annually the municipal authorities examine the courtyards which are less than 15 square meters (in Central, Admiralteiskiy, Petrogradskiy, and Vasileostrovskiy districts) and which are less than 150 square meters (in the rest of the districts) in order to include into the municipal lists of GP actual updated data on the square of GP' territory, number of GP and their types.
  - Municipal list of GP' territories is to be approved not later than on the 1st of March each year and is to be sent to the Committee for Urban Improvement before the 10th of March.

The Decree of the Government of SPb of 22nd of April 2008 "On the way of conducting compensatory greening" №451

- Compensatory greening in case of GP' death, destruction or damage within the courtyard territory is to be done by the municipal bodies (Art. 2.2).
- In case construction project presumes destruction or damage of GP, compensatory greening project (containing the information on address of construction, number of trees and bushes to be cut or replaced, square of lawn to be destroyed, volume, place, and type of compensatory greening to be done) is to be submitted to the municipal bodies (Art. 2.3; 2.4).
- In case of illegal destruction or damage of GP the restoration is to be done at the same place with the same sorts of GP (Art. 2.5).
- The amount of compensatory greening depends on the municipal green space provision per capita (Art. 2.6).
- Compensatory greening is to be done in the nearest season acceptable for planting, not later than in 1 year after the damage or destruction of GP (Art. 2.9).
- Quality control of compensatory greening within the courtyards is performed by the municipal bodies of the respective municipality (Art. 2.10).
- After compensatory greening the change in number of GP must be recorded by the municipal bodies and taken into account when submitting the enumeration to the Committee for Urban improvement (Art. 2.11).

V.IV. Major Problems in Each Area of Municipality's Responsibility in Courtyard Greening. Possible Solutions

As it was mentioned above, each municipality has a number of responsibilities in the sphere of courtyard greening. There are 3 directly related spheres of responsibility, namely, planting of greenery, conducting sanitary cuttings, and organising inventory process. At the same time there are plenty of municipalities' responsibilities that are indirectly related to greening activity, namely, creation of recreation zones, establishment and maintenance of minor architectural landscape elements and street furniture, and provision of the necessary facilities on the territory of children's and sports grounds.

In order to test the first hypothesis which presumes that bad condition of courtyard GP is an evidence of existing problems in the sphere of municipal GSM, the author conducted research of the related legislation and documents, a number of interviews, and analysed the results of the questionnaires. The results of this research are presented in the following table. It encompasses the list of identified problems, as well as possible solutions elaborated by the author.

Field of Problem	Problem	Essence of Problem	Proposed Solution
Courtyard greening, including compensatory greening, maintenance of GP within courtyards, reparation of the objects of GP, protection of GP, approval of courtyard territories list	1. GP within the courtyards are the common property in a block of flats. Their borders are determined on the basis of the data from the cadastral enumeration and the other territories within the territory of a municipality. The procedure for GP inventory within the city in general and within courtyards in particular is not set.	Absence of inventory procedure	The Committee for urban development and architecture must develop a detailed procedure for courtyard GP inventory indicating: -time frame -actors -order of actions -accountability
	2. The responsibilities of municipal bodies in relation to GP within the territories of GP for common use are not determined, according to the Law of SPb of 28th June 2010 "On the GP". It is unclear whether the municipal bodies are allowed to pull down or plant GP within these territories using the money from municipal budget.	Municipalities do not understand their responsibilities	To amend the Paragraph 9, Article 10 of the Law of SPb "On the organization of municipal work in SPb" with additional clauses giving municipal bodies the right to conduct greening and sanitary cuts within the courtyard territories that were not categorized into one of the existing categories.
	3. The Law "On the GP" states that there must be cartographical materials on the borders of green courtyard territories. In reality these materials do not exist, therefore the borders of green spaces within the courtyards are vague.	Green space borders are not clear	To discuss the possibility to oblige the Committee for land resources and land use to provide the municipalities with the full enumeration of the courtyard green plantation territories with detailed and clear cartographical schemes depicting the borders of these territories.
	4. GP inventory (in accordance with the Decree of the Committee for land resources and land use "On the way of GP inventory") in some courtyards is still not finished.	GP inventory is not finished	To finish the inventory of courtyard GP in accordance with the Law "On the GP".
	5. Municipalities' budget is not enough for the qualitative maintenance of courtyard GP.	Budget limitation for green space maintenance and improvement	To make the approval of the documentation for land improvement within the courtyards completely free of charge.
	6. In the organization of compensatory greening the opportunity to plant GP outside the courtyards (where there is a demand for that) is not determined.	Municipal competency limitation	To amend the Article 11 of the Law "On the GP" with the provision that will enable municipal bodies to plant greenery outside of the courtyards while conducting compensatory greening.
	7. Municipalities do not have enough staff to introduce a passport system of the courtyard GP. Passports that contain the data on the object of GP (date, number, developer), actual condition	Municipal human resources limitation	To amend the Law ""On the organization of municipal work in SPb" by the provision obliging municipalities to create a new department on GSM. To increase financing of municipalities from the city's budget.

	(quantity and quality of GP, architectural landscape elements) and price is not developed.		
	8. Prices of the state unitary organizations that monitor potentially dangerous trees are too high.	Municipal budget limitation	To enable newly created municipalities' GSM Departments with the responsibility to monitor potentially dangerous GP, avoiding high payments for the external organizations.
	9. According to the Article 2 of the Law "On the GP", all the GP of the city must be classified into one of the existing categories of the GP. According to the Law, initial courtyard GP inventory is done by the Committee for land resources and land use. After that the enumeration of courtyard GP is sent to the municipalities for their approval. However, since the inventory was not done in a proper way, a substantial part of the courtyard GP are not categorized into one of the existing categories. The problem is that the initial inventory is not precise enough - a big number of courtyard green territories are not enumerated and registered, and are left without care. For example, in the municipality Pavlovsk the enumerations received from the Committee after its inventory in 2012 did not involve more than half of existing GP within the courtyards.	Improper inventory	To oblige the municipalities to submit the list of GP territories that were found to be out of any register to the Committee for land resources and land use. To amend the Paragraph 9, Article 10 of the Law of SPb "On the organization of municipal work in SPb" with additional clauses giving municipal bodies the right to conduct greening and sanitary cuts within the courtyard territories that were not categorized into one of the existing categories. To discuss the possibility to oblige the Committee for land resources and land use to do a new inventory according to the newly established inventory procedure, and to provide the municipalities with the full enumeration of the courtyard green plantation territories with detailed and clear cartographical schemes depicting the borders of these territories.
	10. The Committee for parks and gardens does not inform the municipal bodies on its activities of pulling down the trees. It leads to the situation when municipal programs on complex greening are done without taking into account these works.	Lack of coordination	To determine the clear procedure for coordination of actions of the Committee for urban improvement, the Committee for parks and gardens and the municipalities in order to achieve consistent and complex greening.
	11. On the web-sites of districts' administrations and Committee on urban improvement of SPb there is not enough information on the greening activities (pulling down/planting) from the State	Absence of common database	Allocation of permanently updating information on the borders and owners of the GP on the web-site of the Committee for urban improvement.

	Institution of Housing Agency, from the institutions dependent on the Committee on urban development and from the other organisations.		
	13. In the basic definitions in the Law one can find that maintenance and reparation of GP must be done in compliance with the Classifier of tasks on maintenance of GP and with the Classifier of tasks on reparation of GP. However, there is no such normative documents existing in reality.	Declarative nature of the Law	The Committee for urban development and architecture must develop and communicate to the municipal bodies the detailed Classifiers of tasks on maintenance and reparation of GP.
	14. In order to do the enumeration of courtyard GP municipal bodies lack the money resource. For example, after the inventory of courtyard GP municipality Gagarinskoe had to include in the list of courtyard GP additional 71 territory (23,3 ha). Not all of the municipalities approved the exact list of courtyards in their responsibility. In reality the number of courtyards increased, but since municipalities did not submit the new number, they did not get additional budget for the new territories' maintenance.	Lack of money for the inventory and maintenance	To discuss the possibility of providing nonrecurrent subsidies from the city's budget for the municipalities to perform the full inventory of courtyard GP. To develop a procedure for the municipalities to apply for additional financing for the maintenance of additional territories of courtyard GP.
Conducting sanitary cuts, cutting dangerous/sick trees and bushes	Existing procedure for the municipalities to get a permission from the Committee for city improvement for cutting potentially dangerous and sick plants is unacceptable. The registration is only possible each Monday morning via e-mail. Moreover, the time for the appointment is to take place not earlier than in one month.	Inefficient procedure	To simplify the procedure for receiving the "cutting" permission. To enable district's companies dealing with parks and gardens to issue "cutting permits" – it would make the procedure much faster and simple.
	Municipalities are not allowed to cut GP if they are not in the list of courtyard GP.	Lack of municipal responsibility	To enable municipalities to conduct sanitary cuts within their territory.
	From 2012 Committee for city improvement requires municipalities to pay the replacement cost of GP to be pull down (as a payment for the damage to the city's green fund) before cutting.	Budget imbalance	In case when a municipality is planning to conduct courtyard improvement projects and policies, the replacement cost should not be demanded. To diminish the price taken by the SPb state unitary garden organizations for the formulation of examination results for the sick or potentially dangerous trees.

	While having an interview with the head of Pavlovsk Municipality, Valeriy Zibarev , the researcher acquired a very bright illustration of this problem. In the end of 2012 Pavlovsk municipality has finished 5 projects for improving 5 courtyards within its territory using the money from the municipal budget. Committee for city improvement had examined the area of these courtyards and stated that the municipality had to pay replacement cost for the damage to the green fund that equals to 2 million 341 thousand roubles. However, according to the estimate of the Committee for city improvement the revenue to the municipality's budget from the replacement cost will be 16 thousand roubles.		
Creation of recreation zones, including arrangement, maintenance and cleaning the territories of children's playgrounds, sports grounds, architectural landscape elements, street furniture, and service-utility facilities necessary for making the municipality territory comfortable	It is not clear whose responsibility is to clean children's playgrounds and sports grounds. City's budget involves subsidies for the organizations serving the houses to clean the courtyard territory which does not belong to the common property of a block of flats. At the same time, it is stated as a responsibility of a municipality to maintain and clean children's playgrounds and sports grounds. One more problem is that some of the children's playgrounds and sports grounds were included in the enumerations of the territories of GP of common use. However, there are no provisions in the city's or municipalities' budget for their maintenance and reparation.	Overlapping control of green spaces by the different responsible bodies and legislative gap	To exclude children's playgrounds and sports grounds that appeared to be included in the lists of territories of GP of common use from these lists and to include them (along with the other children's and sports grounds) in the lists of responsibility of the municipalities. The other solution might be to include a new provision in the city's budget for the maintenance of children's playgrounds and sports grounds within the territory of GP of common use, while making the municipalities being in charge of cleaning these places.

Table VII Major Problems in Each Area of Municipality's Responsibility in Courtyard Greening

V.V. Conclusion

The analysis of the responsibilities of SPb municipalities in the sphere of GSM, as well as the legal basis for their fulfilment, and the problems existing in this sphere, makes it clear that the first hypothesis only partly proved to be true.

Poor condition of the courtyard GP is an evidence of substantial problems in municipal GSM as a result of a number of other factors. The problems lie much deeper than on the level of local self-governance. The author classified the identified problems according to the source of their existence, namely, legislative, financial, informational, and managerial. It is presented in the Table below.

Table VIII Problems in Municipal GSM and their Sources

Source of Problems	Problems
Legislative	▪ Absence of inventory procedure ▪ Municipal competency limitation ▪ Lack of coordination ▪ Declarative nature of the existing legal acts ▪ Inefficient procedures ▪ Limited nature of municipal sphere of responsibility ▪ Municipal budget imbalance ▪ Overlapping control of green spaces by the different bodies
Financial	▪ Municipal human resources limitation ▪ Municipal budget limitation for GSM (lack of money for fulfilling the inventory process) ▪ Budget imbalance
Informational	▪ Absence of the common database
Managerial	▪ Municipalities don't understand their responsibilities ▪ GP inventory is done in improper manner: green space borders are not clearly defined, GP inventory is not finished yet ▪ Municipal human resources limitation

Plenty of legislative gaps, financial limitations and informational deficit along with the managerial problems (partly caused by the factors above) lead to the inadequate condition of the GP in the city.

It is needed that existing legislation is amended. There is a need in legal acts which will stipulate:

1. the way inventory procedure must be done;
2. enlarged competencies of the municipalities;
3. the way of coordination between the bodies in the sphere of GSM;
4. clear distinction in the spheres of responsibility of the different bodies.

It is also necessary to review the amount of money municipalities get from the city for the GSM needs, in order to hire more people working for green space development and finish the process of inventory in a proper way.

CHAPTER VI. COMPARATIVE POLICY ANALYSIS: VASILIEVSKIY MUNICIPALITY AND CHKALOVSKOE MUNICIPALITY

VI.I. Introduction

Each Municipality in SPb elaborates its own courtyard improvement and greening policy. Since the competencies of municipal authorities are defined by the same law, the policies are similar in their content. However, if one looks at the green space provision per capita in the municipalities citywide, one can see the striking difference. In order to find out what is the reason of this difference between the similar municipalities, the author will perform the comparative policy analysis, making a hypothesis that good indicators on green space provision per capita in a district/municipality is an evidence of existence of a detailed courtyard GSM policy. In order to perform a reasonable

comparison, the author had to perform a preliminary selection procedure. The goal was to choose two similar districts (and two municipalities within them) with the opposite efficiency indicators, and to compare their policies.

VI.II. Sample Choice

VI.II.I. Choice of the Districts

The most severe ecological problems, including green space deficit, take place in the districts with existing building up where it is nearly impossible to resolve these problems without complex reconstruction of a block by transforming old over-built up territory into a modern comfortable block (Denisov, V., 2013). This situation is typical for the historical centre of SPb which is constituted by so called "Museum-Nucleus" of the city. This region comprises 4 districts, namely, Admiralteiskiy, Zentralniy, Vasileostrovskiy, and Petrogradskiy.

For the present analysis only two out of four districts which constitute the historical part of the city were chosen. The choice was determined on the basis of comparison of a number of parameters (See the Table). These two districts are similar in terms of district's total area and have approximately equal population, however they are highly different in terms of GP' area and actual GP provision per capita. GP' area takes 5, 5% of total area in Vasileostrovskiy district, whereas it takes almost 4 times bigger territory of total area, namely 20, 6%, in Petrogradskiy district (Government of SPb, 2014).

According to the Law of SPb "On the GP" (2010), the standard GP provision per capita is different for different districts. For Vasileostrovskiy and Petrogradskiy districts being located in the centre this indicator is the smallest – 6 square meters. Nevertheless, the actual GP provision per capita is different. It is counted for each district as a ratio of total area of GP to the number of people registered in the district (Long-term Programme for greening the territories of GP of SPb for the period 2013-2017, 2013). The actual GP provision per capita is 7 square meters in Vasileostrovskiy district, and 5 times more, namely 35 square meters, in Petrogradskiy district. It is evident that these districts have similar conditions but totally different efficiency. This determined the choice of these two districts to be analyzed, namely, to analyze Vasileostrovskiy district as an example of inefficient GSM, and Petrogradskiy District as a contrary example of efficient GSM.

Table IX Districts' Comparison

Comparative measurements	Vasileostrovskiy District	Petrogradskiy District
Number of municipalities	5	6
Population	210.249	136.606
District's area	2146,88 ha	2400 ha
GP' area	118 ha (5,5% of total area)	494,8 ha (20,6% of total area)
Standard GP provision per capita	6 sq. m	6 sq. m
Actual GP provision per capita	7 sq. m	35 sq. m

Sources: Government of SPb, 2014; Law of SPb "On the GP", 2010

VI.II.II. Questionnaire Analysis

Following the choice of the districts representing relatively good and bad GSM performance, the author has chosen two municipalities – one from each district. The choice of the municipalities to be focused on was determined to the biggest extent by the questionnaire analysis. Out of eleven questionnaire inquiries sent to all the municipalities within two districts, the author received only five answers: from one municipality in Petrogradskiy district (Chkalovskoe Municipality), and three municipalities in Vasileostrovskiy district (Vasilievskiy, Gavan, and Morskoy). Two other questionnaire forms were fulfilled by the author during the interviews with the heads of respective municipalities (Municipality №7 and Posadskiy Municipality).

District	Municipality	Status quo in the sphere of greening (existing policies)	GP provi-sion per capita	Air pollution indica-tors (NOx; PM 2,5)	Kinds of GP surfaces within a municipality	Number of new territories of GP done during the last 10 years	Normative base for the land use within a municipality 1.1[4] 1.2[5] 1.3[6]	Evolution of GSM during the last 10 years	Plans for the future (activities/ policies); GSM innovations that are known/used	Problems in municipal GSM
Vasileostrovskiy District	Vasilievskiy	-Programmes on: felling potentially dangerous/sick trees, compensatory greening, planned planting of trees/bushes/perennials/annuals (taking into account courtyard inhabitants' wishes), restoring of lawns (bringing soil, sowing of grass) -The choice of company that will implement a programme is determined during the open auction.	2,5 sq. m	No data	-Public gardens -Sports grounds	0	1.1 It is not municipal responsibility. We only rely on the Law of SPb "On the organization of municipal self-governance in SPb" (2014). 1.2 It is not in our responsibility. 1.3 40%of municipal budget used for courtyard improvement, including greening.	No change	There is only one address where vertical greening was implemented Sometimes inhabitants use some elements of vertical greening on their balconies.	-Plants die due to salinization (salt used for ice-covered ground). -Vandalism (citizens damage/steal GP). -Courtyard inhabitants plant the trees without permission. -Courtyard inhabitants oppose to plantings, since they want the place for parking lots. -There is no budget for the activities which are not in the annual programme's plan (for example, there are no resources for liquidation of natural disaster consequences (felled trees).

[4] What are the legal norms/acts/decrees concerning the territory to be built up and territory where building up is abolished within a municipality?
[5] What are the legal instruments contributing to the preservation of green spaces within a municipality?
[6] What are the acts regulating budget expenditures for the GSM? What are the average expenditures for these purposes?

	Gavan	Satisfactory situation. There are annual programmes on courtyard improvement, including courtyard greening.	6,9 sq. m	No data	- Territories of GP for common use - Territories of courtyard GP - Territories of GP of special purpose - Territories of GP for limited use	0	1.1 It is abolished to construct anything within the territories of GP of common use. 1.2 Municipal bodies cannot intervene in construction projects, but we take part in public hearings on construction projects. 1.3 Address programme is a basis for GSM budget. 15% of budget for courtyard improvement goes for greening.	Territories of GP decreased	Vertical greening is known and is planned to be implemented in the future.	-Plants die due to salinization (salt used for ice-covered ground). -Increasing number of cars.
	Morskoy	"On a regular basis we plant the trees, conduct sanitary fellings, sward, vertical greening according to the annual programmes".	3,43 sq. m	No data	-Squares -Boulevards -Street greening -Sports grounds	0	No response	No change	Vertical greening is known and is planned to be implemented in the future.	No response

	Municipality №7	-The situation is going into a progressive direction. -Annual targeted municipal programme “Green Courtyard”: planting trees, pruning, installing flower beds.	7,7 sq. m	No data – last examination was done 10 years ago (presumably the level of air pollution is growing due to the growing number of cars)	-Federal -Regional -Municipal -Private	0	1.1 The enumerations of courtyard GP were legally approved – within these territories any construction without municipality’s approval is prohibited. “We are responsible to approve the issue of building permit for the construction within our territory”. On the city level we rely on the Law “On the general plan of SPb” (2005) and the Law “On the urban planning in SPb” (2009). And we also take part in all public hearings on construction projects, and there was not a time when GP were removed without our permission”. 1.2 “We are doing annual inventory of courtyard GP in order to prevent them”. 1.3 2-3 mln. of municipal budget is for the implementation of the annual programme “Green Courtyard”.	Positive evolution, because since 2013 municipalities got the courtyard GP territories as their field of responsibility. It gave a chance to make real steps for courtyard improvement.	Vertical greening is known and is planned to be implemented in the future.	-Our only problem is the lack of budget. -During the post-war years courtyard inhabitants were planting trees without prior planning. It lead to many problems with engineering networks being destroyed by the tree roots. -New engineering networks are installed in a 1 meter proximity to the tree roots violating 2-meter protective zone.

Petrogradskiy	**Chkalovskoe**	A number of annual address programmes exist which include such activities as: -Rejuvenation of trees; -Planting of trees/bushes; -Reparation/ maintenance of lawns; -Pruning; -Planting of flowers.	106,4 sq. m	No data	-Public parks -Public gardens (of federal heritage) -Territories of courtyard GP	-No new GP territories were done -7,2 ha of courtyard GP were restored due to address programmes	1.1 There is no legislation on this matters on the local level. On the city level we rely on the Law “On the general plan of SPb” (2005) and the Law “On the urban planning in SPb” (2009). 1.2 The Law “On the GP in SPb” (2010) and the Law “On the territories of GP of common use” (2007). 1.3 Courtyard greening is financed from the municipality’ budget – 10 mln. Roubles annually.	No change in quantity, but substantial improvement of quality.	Vertical greening is known and is planned to be implemented in the future.	There are no problems.
	Posadskiy	Satisfactory situation. GSM activities are being performed if necessary, and on the request of the citizens.	6,7 sq.m	No data	No response	0	1.1 No response 1.2 No response 1.3 About 30.000 Roubles spent for greening annually.	No change	Vertical greening is known and is planned to be implemented in the future.	-Lack of budget is the source of the most other problems. -Vandalism (citizens damage/steal GP).

Table X Results of the Questionnaire Analysis

Based on the data received from the municipalities' answers to the questionnaires, the researcher conducted comparative analysis of GSM parameters in the municipalities which are being analysed. The goal is to see the similarities, differences, as well as existing problems in the sphere of municipal GSM.

Table XI Comparison of GSM parameters in Analysed Municipalities

Parameter	Comparative Statement
Status quo in the sphere of greening (existing policies)	In 5 municipalities out of 6 there are annual address programmes on courtyard improvement, including courtyard greening which presume planting the trees, conducting sanitary felling, swarding etc. These programmes vary in the degree of their detail- some of them are quite concise, whereas some of them contain much longer list of greening activities.
GP provision per capita	GP provision per capita is up to 8 square meters in 5 municipalities out of 6, while in one it is much higher – 106,4 square meters.
Air pollution indicators (NOx; PM 2,5)	None of municipalities has the data on air pollution indicators. The author found out the data making a request to the Committee on nature management, and environmental protection in SPb. It provides the data for the districts' air pollution indicators from 22 stations of measurement across the city. According to the Report on the ecological situation in SPb 2013, at the station in Vasileostrovskiy District the highest daily concentration of NOx was 0,3 mg/m3, and the highest annual concentration of pm 2,5 mg/m3 was 0,9 mg/m3 (Serebritskiy, 2014). In Petrogradskiy District these parameters are different: the highest daily concentration of NOx was almost the same, namely, 0, 4 mg/m3, while the highest annual concentration of pm 2, 5 mg/m3 was a bit lower, namely, 0,5 mg/m3. Furthermore, there is data on the monthly air pollution level in each district. In Vasileostrovskiy District such pollutants as CO, NO, NO2, SO2, PM-10 are measured. The level of air pollution is mostly low during the month, while during 3 days there is medium level of pollution (Committee on nature management, and environmental protection, May 2014). In Petrogradskiy District measuring the same parameters (CO, NO, NO2, SO2, PM-10) the level of air pollution is marked as being mostly low, 5 days with high level, and 2 with medium level (Committee on nature management, and environmental protection, May 2014).
Kinds of GP surfaces within a municipality	There is no common understanding of what are the kinds of GP surfaces within a municipality. From 6 municipalities there are 6 totally different answers to this question. Some of them gave a classification of GP according to the city Law on GP, some of them enumerated territories of GP of common use within municipal GP' kinds.
Number of new territories of GP done during the last 10 years	During the last 10 years none of examined municipalities extended their GP territories.

Normative base for the land use within a municipality **1.1 What are the legal norms/acts/decrees concerning the territory to be built up and territory where building up is abolished within a municipality?**	1.1 There is no common understanding on this issue among the municipal authoritative bodies. On the one hand, there are municipalities which state that building up of municipal territory is totally out of their responsibility and there is no legislation on this matter on the local level. The only legislative act they rely on is the Law "On the organization of municipal self-governance in SPb" (2014), and it does not say anything in this respect. On the other hand, there are municipalities which state that within the municipal territory of courtyard GP any construction without municipality's approval is abolished. This position can be proved by the Article 10, Paragraph 10 of the Law "On the organization of municipal self-governance in SPb" (2014). Among the legislation on the city level most of the municipalities rely on the 2 legislative acts, namely, the Law "On the general plan of SPb" (2005) and the Law "On the urban planning in SPb" (2009) which presume participation of municipalities in public hearings on construction projects. The difference in understanding its responsibility in this sphere might come from the fact that some municipalities have already approved the enumerations of courtyard GP and accepted the responsibility of them, and some not.
1.2 What are the legal instruments contributing to the preservation of green spaces within a municipality?	1.2 There is no common understanding on this issue among the municipal authoritative bodies. Half of the analysed municipalities either do not give any response, or point out that it lies beyond their responsibility. The other municipalities note such instruments as public hearings and annual inventory as the ones which contribute to prevent courtyard GP, whereas only one of them indicates 2 legal instruments to be relied on in this matter. These are the Law "On the GP in SPb" (2010) and the Law "On the territories of GP of common use" (2007). As for the existing legislative data, Article 10, Paragraph 16 of the Law "On the organization of municipal self-governance in SPb" (2014), in order to contribute to the preservation of GP within a municipality, municipal bodies should participate in public hearings on formulation of the rules for building up the municipal territory.
1.3 What are the acts regulating budget expenditures for the GSM? What are the average expenditures for these purposes?	1.3 All of the municipalities noted that according to Paragraph 6, Article 16 of the Law "On the GP in SPb" the territories of courtyard GP are financed from the municipal budget. Some of them marked Address Programmes being a basis for GSM financing. The sums of money devoted to GSM differ substantially from one municipality to another. Some of them marked only the percentage of municipal budget that goes for courtyard improvement, including greening – it ranges from 15% to 40% of the municipal budget. Some of the municipalities indicated the exact sums of money, they range from 30,000 Roubles to 10 mln. annually. It might be the factor that influences the GSM efficiency, since the highest expenditure (10 mln. annually) is observed in the Municipality with the highest GP provision per capita.
Evolution of GSM during the last 10 years	Half of examined municipalities marked that there is no change in GSM during the last 10 years. 2 of them marked positive evolution, while one pointed out the decrease in GP territories.
Plans for the future (activities/policies); GSM innovations	There was no information given of the future policies. Vertical greening is known and is planned to be implemented in the future in all the examined municipalities, while it has already started to be implemented as a pilot project in one of them.

that are known/used	
Problems in municipal GSM	Half of analysed municipalities pointed out the problem of lack of budget as crucial one, leading to all the other problems. The common problems for some of them are: -death of GP due to soil salinization; -increasing pressure from car owners for leaving the place for parking lots instead of planting more GP; -planting of trees by courtyard inhabitants without permission; -vandalism (citizens damage/steal GP). It is worth mentioning that the Municipality with the highest GP provision per capita pointed absence of problems.
Additional Comments	About 50% of municipalities (5 out of 11) did not reply to the questionnaires. It shows the low level of openness to research and innovation. Skipping answers to many questions reasserts this tendency.

VI.II.III. Choice of the Municipalities

As it was presumed by the initial hypothesis, the indicator on green space provision per capita was the decisive criteria for the choice of municipalities within already chosen Districts to be analysed.

The municipalities to be examined were chosen based on the data on the GP provision per capita provided by the municipalities in the questionnaire answers. As Vasileostrovskiy District was taken as an inefficient example, among the municipalities of the Vasileostrovskiy district the extreme negative case was identified in the Municipality Vasilievskiy where green space provision per capita equals to 2, 5 square meters. It is 2, 4 times less than the minimal level stated in the Law. Among the municipalities of Petrogradskiy district, which was taken as a positive case, the best positive example is Chkalovskoe Municipality where green space provision per capita is 106, 4 square meters.

Moreover, since the Council of SPb municipalities conducts an annual competition in the sphere of municipal land improvement awarding the reward for the best courtyard within the historical part of the city, the author found it useful to observe the results of this competition in order to ensure the right choice of municipalities to be analysed. Chkalovskoe Municipality took the first place in this nomination in 2013, and second place in 2012 (Council of SPb municipalities, 2013).

VI.III. Comparative Policy Analysis of 2 municipalities' policies in the sphere of greening

VI.III. I. Facts about the Analysed Municipalities

Table XII Comparison of the Analysed Municipalities

Comparative Measurement	*Vasilievskiy Municipality*	*Chkalovskoe Municipality*
Population	33.096	28.729
Total area	241 hectares	291 hectares
Total area of courtyard GP	3,5 hectares	11,96 hectares
GP provision per capita	2,5 square meters	106,4 square meters
Courtyard GP provision per capita	1,06 square meters	4,1 square meters
Number of courtyards	225	250
Additional characteristics	▪ The municipal territory is characterized by the big amount of former industrial enterprises which do not function anymore (1/3 of the total area).	▪ The municipal territory is characterized by the big amount of industrial zones. Nowadays many of them are being transformed into business or living zones. ▪ The municipal territory is being intensively built up by the block of flats on the territory of the former industrial zones and demolished buildings.
	Within the municipal territory there are: -10 functioning industrial enterprises -Smolenskoe cemetery (1/3 of the total area) -Metro station "Vasilievskiy Ostrov"	Within the municipal territory there are: -Central Park of Culture and Recreation (on the Elagin Island) -Primorskiy Park of Victory -Sports stadium "Kirov" -Metro station "Krestovskiy Ostrov" -Hockey stadium -5 schools -14 kindergartens -School of Olympic Reserve -Military-space Academy -2 children's homes -School of sports arts
Socio-economic development	9,56 out of 20 points for the socio-economic development	14,33 out 20 points for the socio-economic development

Sources: Federal Service of State Statistics, 2014; Moskvin, O., e-mail communication, June 17, 2014; Chkalovskoe Municipality, 2014; Council of SPb Municipalities, The results of monitoring of socio-cultural development of Saint-Petersburg municipalities, 2013

VI.III.II. Problem Definition

Since both of the analysed Municipalities are located within the historical part of SPb, their courtyards are lacking GP due to the limited territory and highly specific architectural shape. The courtyards within historical part of the city are called by the citizens in a special way, namely, well-courtyards. It is linked to their shape reminding a well, since the buildings are located next to each other having common walls and forming a closed square or circle.

Typical Well-Courtyard in SPb

The limited territory makes this kind of courtyards uncomfortable for its inhabitants, since there is almost no GP, limited place for children's playgrounds and sports grounds, as well as an urgent lack of parking lots. In the light of this paper, ***GP' deficit*** as a substantial part of courtyard improvement efforts will be in the centre of the authors' attention. Then ***the quantity (green space provision per capita, total area of courtyard GP) of courtyard GP in historical districts of SPb*** will be regarded as the ***dependent variable*** in the policy analysis. As for the independent (explanatory) variables, their choice was determined by the availability of the data. Since the municipal greening policies contain only limited number of parameters, as well as the access to getting information on the additional factors is highly limited (due to the low degree of openness of Russian civil servants), the independent variables will be the following:

- GSM budget;
- performance efficiency in the sphere of GSM (numbers of courtyards involved in GSM;
- variety of GSM works/techniques;
- volume of GSM works.

In order to keep GP in a proper state each municipality has a special local policy. With a view of testing the author's hypothesis which presumes that good indicators on GP provision per capita in a municipality is an evidence of existence of a detailed courtyard GSM policy, a comparative policy analysis was conducted. The municipalities which were chosen for the analysis have the similar conditions, but different GSM efficiency. Comparing their policies in the sphere of courtyard GSM will show if the hypothesis is adequate or not.

Comparative policy analysis will be conducted according to the theoretical paradigm on the policy analysis developed by Peter Knoepfel (Knoepfel et al, 2011).

VI.III.III. Portfolio of the Policies

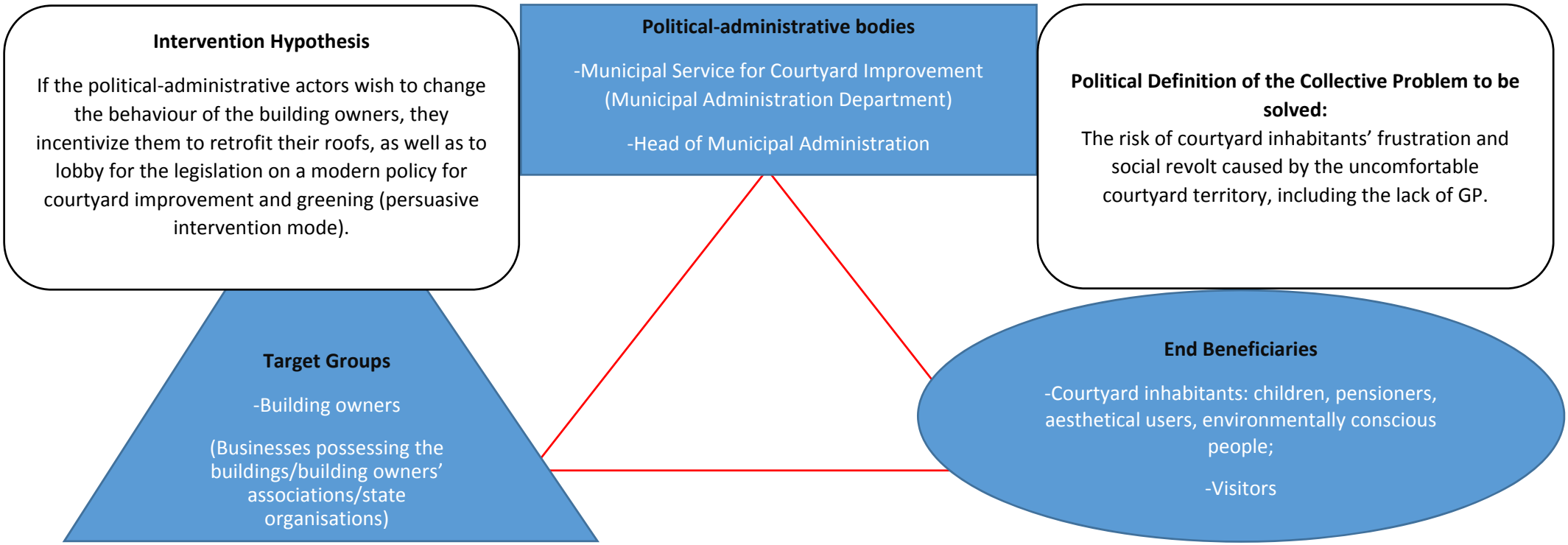
Table XIII Policies' Portfolio

	Parameter	Vasilievskiy Municipality	Chkalovskoe Municipality
1	**Initiator, founder and executive body**	Municipal Service for Courtyard Improvement	Municipal Department for Courtyard Improvement and Ecological Security
2	**Control body**	Administration of Vasileostrovskiy District	Administration of Petrogradskiy District
5	**Period of implementation**	2013	2013
7	**Financing from the municipal budget**	17.173.800 Roubles	24.702.200 Roubles

Sources: Chkalovskoe Municipality, Municipal targeted policy on courtyard improvement and greening, 2013; Vasilievskiy Municipality, Municipal targeted policy on courtyard improvement and greening, 2013

VI.III. IV. Basic Triangle of the Policy Actors

Vasilievskiy Municipality



Causal Hypothesis

If the political-administrative actors wish to resolve the specified public problem, they intervene on the building owners with a view to provoking them to retrofit their buildings with green roofs and walls voluntarily, as well as to influence the Deputy's Commission on Courtyard Improvement asking to adopt and finance a new courtyard improvement and greening policy, and on the Head of the Vasilievskiy Municipality with a view to making him/her approve this policy and the new budget.

Negatively-affected third groups

- ❖ Courtyard parking lots users

Positively-affected third groups

- ✓ Citizens
- ✓ Private land improvement and greening companies
- ✓ Gardeners and architects

Chkalovskoe Municipality

Political-administrative bodies

-Municipal Department for Courtyard Improvement and Ecological Security (Municipal Administration Department)

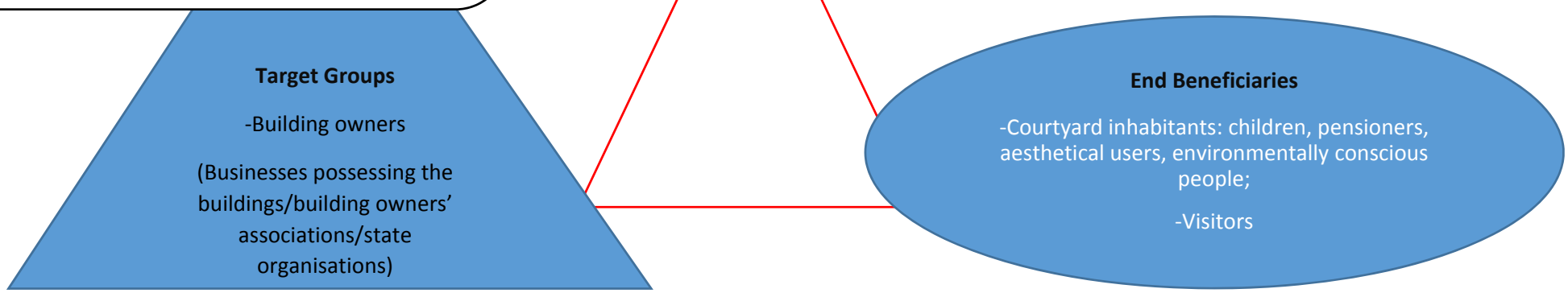
-Head of Municipal Administration

Intervention Hypothesis

If the political-administrative actors wish to change the behaviour of the building owners, they incentivize them to retrofit their roofs, as well as to lobby the Head of the Chkalovskoe Municipality and the Municipal Council to legislate on a modern policy for courtyard improvement and greening (persuasive intervention mode).

Political Definition of the Collective Problem to be solved:

The risk of courtyard inhabitants' frustration and social revolt caused by the uncomfortable courtyard territory.



Negatively-affected third groups

- Courtyard parking lots users

Causal Hypothesis

If the political-administrative actors wish to resolve the specified public problem, they intervene on the building owners with a view to provoking them to retrofit their buildings with green roofs and walls voluntarily, as well as to influence the Municipal Council asking to adopt a new modern courtyard improvement and greening policy, and the Head of the Chkalovskoe Municipality with a view to making him/her approve this policy.

Positively-affected third groups

- ✓ Citizens
- ✓ Private land improvement and greening companies
- ✓ Gardeners and architects

Comparative Statement

Comparative elements		Similarities	Differences
Problem Definition (PD)		The PD is connected with the collective social risk of courtyard inhabitants' frustration and social revolt.	The causes of the common problem are only partially similar. In Vasilievskiy Municipality the cause is not only uncomfortable courtyard territory, but also the lack of GP.
Actors	**Political-administrative bodies (PAB)**	The PABs in both cases belong to the executive municipal body, namely, the Municipal Administration.	In Chkalovskoe Municipality The Department of Municipal Administration dealing with land improvement deals not only with courtyard improvement, but also with more general ecological security matters.
	Target groups (TG)	The TG in both cases is represented by the building owners, namely private and state actors (businesses possessing the building; building owners' associations; state organizations).	
	Beneficiaries (B)	The same end beneficiaries in both cases.	
	Positively-affected third groups (PATG)	PATG are the same and include three main actors - citizens who will benefit from the better ecological situation; private land improvement and greening companies which will benefit from the increasing number of projects to be implemented; and gardeners and architects who will have more job possibilities.	
	Negatively-affected third groups (NATG)	NATG includes only one and the same actor in both cases – these are car owners who strive for more parking lots within a courtyard where the live.	
Hypotheses	**Causal (CH)**	Building owners are the ones who should change their behavior in both cases.	Since in Chkalovskoe Municipality there is no Deputies' Commission dealing with courtyard improvement and greening issues, the lobbying should be aimed at the Deputies' Board of Municipal Council.
	Intervention (IH)	Persuasive intervention mode is used by political-administrative actors in both cases.	
Conclusion	The actors' actions are responsible for results of policy cycle. The actors shape each one of the policy products (Knoepfel, P. (06.05.14). Policy Actors. Lecture conducted from IDHEAP, Lausanne).		

VI.III.V. The Resource Portfolio of Actors

Resources are the product of a process of social construction, carried out in accordance with recognized institutional rules. Thanks to those rules, actors are given the capacity to produce, use, and maintain their resources. The resources become objectivized, transferable, and potentially accessible to all of the actors involved in a public policy (Knoepfel et al, 2011). The actors have a portfolio of specific resources, which provides them with the certain extent of power. The analyst identified abundant and lacking resources for each of the three policy actors and revealed the possible exchange of these resources between them.

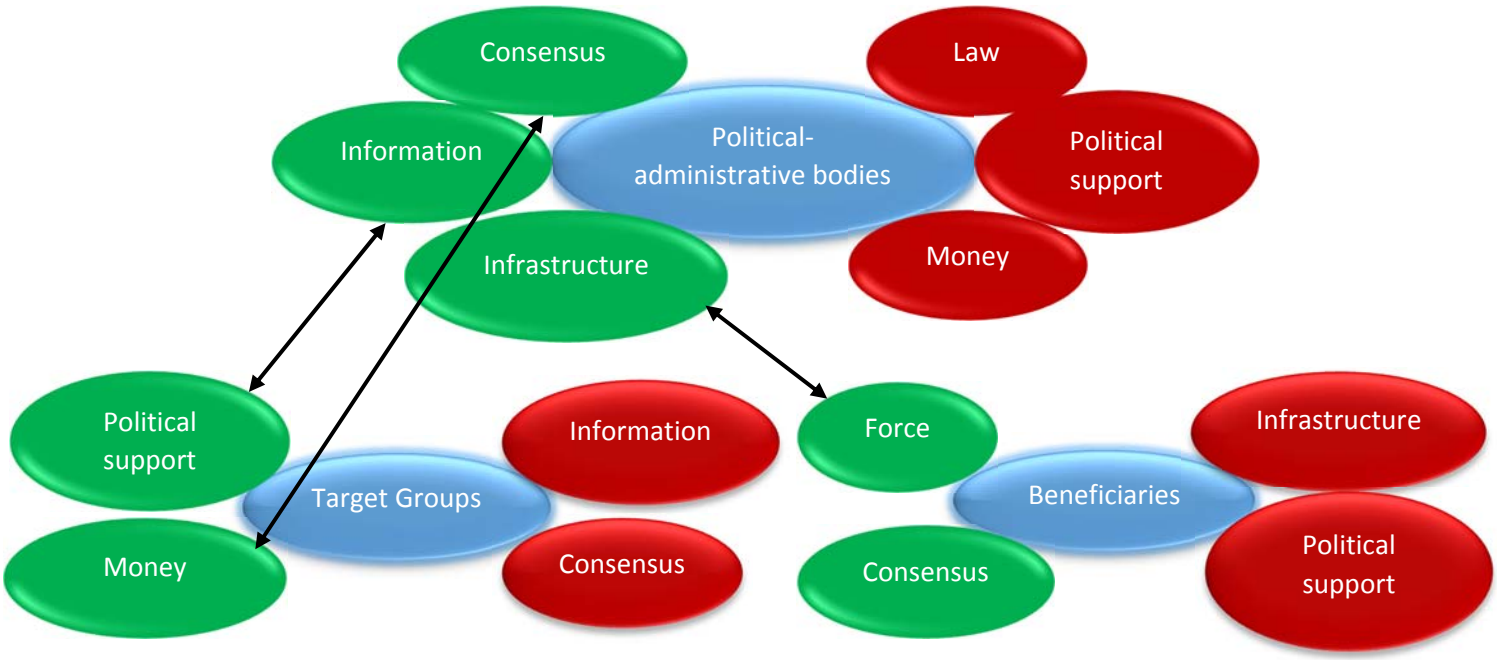
Since the structure of the policy actors is equal in both cases, and their authorities are defined by the same legislative acts, the resources possessed by the actors will be the same.

The political-administrative authorities have information resource regarding the courtyard GP state that allows them to develop a new adequate policy. They also have a consensus in their determination to improve the situation, and infrastructure resource necessary for policy implementation. However, they cannot adopt a new policy and budget for the implementation of this policy that means they lack law, political support, and money resource (Law of SPb "On the organization of municipal self-governance in SPb", 2014).

The target groups have the potential power to gain political support resource, as long as they get the information resource along with the motivation to provoke political municipal bodies to support the new greening policy. The target groups also have the money resource (large businesses possessing the buildings). However, they lack information on the state in the field, as well as consensus. Thus, they exchange political support and money resource with the political-administrative actors for the information and consensus. The target groups being a part of the civil society are directly interested in the improvement in the problem field. This is the factor which makes them support the executive bodies on the way to implementing the new policy.

The beneficiaries have force resource and a power to mobilize in opposition and destabilize the policy, while political-administrative actors are trying to avoid any social conflict. The latter are using infrastructure resource in order to reduce the probability of using the force.

Figure III Portfolio of Resources



VI.III.VI. Political-Administrative Programming (PAP)

According to the book on Public Policy Analysis (Knoepfel, P. et al., 2011), "PAP is considered to represent the set of regulatory acts and norms that parliaments, governments and the authorities charged with execution consider necessary for the implementation of a public policy". It is also written that "from a formal point of view, they are composed of several written documents, mainly laws, decrees and orders, implementation orders and administrative directives adopted at different institutional levels". "The PAP's of different policies can vary in terms of their level of detail (variable regulatory density), degree of centrality (national and/or regional/local authority definition of PAP's), and degree of coherence (the internal appropriateness of the constituent element)" (Knoepfel, P. et al., 2011).

Legislation relevant to the policies in both cases

Legislation	**Vasilievskiy Municipality**	**Chkalovskoe Municipality**
Federal level	▪ Constitution of Russian Federation (Art. 42, 58), 1993 ▪ Federal Law "On the environmental protection" (Art. 2, 6, 61), 2002 ▪ Federal Law "On the common principles of organization of local self-governance in Russian Federation", 2003	
City level	▪ Law of SPb "On the GP", 2010 ▪ Long-term Programme for greening the territories of GP of SPb for the period 2013-2017, 2013 ▪ Law od SPb "On the city improvement", 2013 ▪ Law of SPb "On the organization of municipal self-governance in SPb" (Art.3), 2014 ▪ Decree of the SPb Government "On the rules of cleaning and order within the city", 2007	
Municipal level	▪ Charter of Vasilievskiy Municipality, 2011 ▪ Charter of the Municipal Service for Courtyard Improvement, 2010 ▪ **Municipal targeted policy on courtyard improvement and greening, 2013**	▪ Charter of Chkalovskoe Municipality, 2011 ▪ Charter of the Municipal Department for Courtyard Improvement and Ecological Security, 2011 ▪ **Municipal targeted policy on courtyard improvement and greening, 2013**

Table XIV Constituent Elements of PAP in Both Cases

Constituent elements of PAP	Vasilievskiy Municipality	Chkalovskoe Municipality
Concrete objectives **"The objectives define the status to be attained by the adopted solution that would be considered as satisfactory" (Knoepfel, P. et al, 2011)**	• Create comfortable courtyard conditions (≥ 18 sq.m. of green space per inhabitant) for living and working within the Municipality • Lower the level of vandalism by courtyard inhabitants • Participation of courtyard inhabitants in courtyard improvement and greening • **Improve the condition of lawns** • Stop cars from parking on the lawns • Improve the quality of courtyard passages • Provide Municipality's inhabitants with more sports grounds and sports complexes, as well as children's playgrounds • Improve sanitary condition of courtyard territories • **Improve ecological condition of the territory by increasing the quantity of GP** (Municipal targeted policy on courtyard improvement and greening, 2013)	• Increase the quality and quantity of GP • Improve the quality and condition of courtyard lawns • Repair roads on the courtyard territories • Install new elements of street furniture within the municipality (benches etc.) • Repair and improve waste areas • Repair and paint the fences of lawns • Modernize children's playgrounds and sports grounds • Improve sanitary cleaning of the territory (Municipal targeted policy on courtyard improvement and greening, 2013)
Evaluative elements **"…the methods used to evaluate the extent to which a policy's objectives have been accomplished" (Knoepfel, P. et al, 2011)**	• Inhabitants' surveys on the initiative of Municipal Council in order to find out their opinion on courtyard GP condition (law "On the organization of municipal self-governance in SPb", 2014) • Permanent monitoring of the courtyard GP by the Municipal Service for Courtyard Improvement	• Inhabitants' surveys on the initiative of Municipal Council in order to find out their opinion on courtyard GP condition (law "On the organization of municipal self-governance in SPb", 2014) • Permanent monitoring of the courtyard lands by the Municipal Department on Courtyard Improvement and Ecological Security

	• Annual inventory of courtyard GP by the Committee on land resources and land use, as well as by the Municipal Service for Courtyard Improvement	• Annual inventory of courtyard GP by the Committee on land resources and land use, as well as by the Municipal Department on courtyard improvement and ecological security
Operational elements (instruments) **"The operational elements define the detailed forms of intervention or measures planned to fulfil the objectives of a public policy…they define those affected, those to whom the measures will be applied". (Knoepfel, P. et al, 2011)**	*Persuasive mode: intervention on the building owners with a view to provoking them to retrofit their buildings with green roofs and walls voluntarily, as well as to influence the Municipal Council asking to adopt a new modern courtyard improvement and greening policy which will prevent courtyard inhabitants from frustration, social revolt, and dissatisfaction with the work of Municipal Council.*	
	In the Municipal targeted policy on courtyard improvement and greening (2013), the author identified 6 Action plans in 6 different spheres of GSM, and analyzed each of them according to the number of parameters. 1. Planting flowers 35 addresses 6400 flowers 104 flowerpots 4 flower gardens 199.431,91 Roubles 2. Planting bushes/perennials/climbers (vines) 21 addresses 1402 bushes 411 perennials 25 climbers 1.027.725,44 Roubles 3. Installation and restoration of lawns/ installation of flower gardens with annuals 10 addresses 2177,6 square meters of lawn to be restored 403 square meters of lawn to be installed 13 square meters of flower garden with annuals to be installed 854.480,65 Roubles 4. Compensatory planting of trees 13 addresses 38 trees 352.235,31 Roubles 5. GP protection:	In the Municipal targeted policy on courtyard improvement and greening (2013), the author identified 8 Action plans in 8 different spheres of GSM, and analyzed each of them according to the number of parameters. 1. Planting flowers and restoration of representative grass areas 75 addresses 8500 flowers 13370 square meters of representative grass area to be restored 2.839.800 Roubles 2. Planting trees and bushes 85 addresses 171 trees 1641 bushes 2.136.400 Roubles 3. Cutting of lawns 30 addresses 71882 square meters 1.373.000 Roubles 4. Cleaning of lawns 30 addresses 71882 square meters 1.066.900 Roubles 5. Rejuvenation and pruning of trees 25 addresses 53 trees 812.000 Roubles 6. Cutting out young growths of trees and bushes

	✓ Spraying 22 addresses 626 trees and bushes 154.142,83 Roubles ✓ Additional fertilizing 23 addresses 225 trees 272.345,18 Roubles ✓ Maintenance 10 addresses Maintenance of lawns (3636,3 square meters) Maintenance of trees (57) Maintenance of bushes (916) Maintenance of annuals (7,5 square meters) 846.890,17 Roubles 6. Sanitary felling 10 addresses 9 trees to be cut down 6 trees to be rejuvenated 14 to be pruned and saved 227.144,42 Roubles (Evaluation of the Municipal targeted policy on courtyard improvement and greening 2013, March 2014)	100 addresses 259 trees 520 bushes 44.700 Roubles 7. Organization of GP inventory 250 addresses 10.000 Roubles 8. Sanitary felling 100 addresses 204 trees 4.068.300 Roubles (Evaluation of the Municipal targeted policy on courtyard improvement and greening 2013, May 2014)
Procedural elements **"The procedural elements of policies determine the roles and relative power of policy actors in the context of all implementation processes" (Knoepfel P. et al, 2011)**	**Stages of the policy implementation by the Municipal Service for Courtyard Improvement:** ▪ Each year the specialists of the Municipal Service for Courtyard Improvement develop a Municipal targeted policy on courtyard improvement and greening, taking into account the wishes of the inhabitants on the case-to-case basis. Within this policy there is a number of address programmes (action plans) devoted to courtyard greening. Each address programme involves the addresses, volumes, types and prices of the works to be performed. ▪ The policy and address programmes are submitted to the Deputy's Commission on Courtyard Improvement	**Stages of the policy implementation by the Municipal Department for Courtyard Improvement and Ecological Security:** ▪ Each year the specialists of the Municipal Department for Courtyard Improvement and Ecological Security develop a Municipal targeted policy on courtyard improvement and greening, taking into account the wishes of the inhabitants on the case-to-case basis. Within this policy there is a number of address programmes (action plans) devoted to courtyard greening. Each address programme involves the addresses, volumes, types and prices of the works to be performed.

	(Municipal Council Department) for approval and assignment of the budget, and then to the head of the Vasilievskiy Municipality and Municipal Council for further approval. ▪ The policy is submitted to the Administration of the Vasileostrovskiy District for final approval. ▪ Municipal Service for Courtyard Improvement conducts an open auction to choose the company which will implement the address programmes' provisions. ▪ The policy is published on the Municipality's official web-site for the inhabitants to be informed. ▪ During the policy implementation the Administration of the Vasileostrovskiy District serves as a control body.	▪ The policy and address programmes are submitted to the Municipal Deputies' Board for approval, and to the head of the Chkalovskoe Municipality and Municipal Council for the approval and assignment of the budget. ▪ The policy is submitted to the Administration of the Petrogradskiy District for final approval. ▪ Municipal Department for Courtyard Improvement and Ecological Security conducts an open auction to choose the company which will implement the address programmes' provisions. ▪ The policy is published on the Municipality's official web-site for the inhabitants to be informed. ▪ During the policy implementation the Administration of the Petrogradskiy District serves as a control body.

Comparative Statement

Comparative elements		Similarities	Differences
Legislation	**Federal level**	The legislation on the federal and city level is the same in both cases, since all the municipalities of the city follow the same legislative framework.	
	City level		
	Local level	Both of the municipalities rely on the 3 basic acts, namely: the Charter of the municipality, the Charter of the Municipal Administration Body which deals with GSM, and the municipal targeted policy on courtyard improvement and greening	
Constituent elements of PAP	**Concrete objectives**	The objectives of the policies are almost the same and encompass the basic parameters for courtyard improvement, including GSM improvement	
	Evaluative elements	The evaluative elements are the same in both cases. They include inhabitants' surveys, permanent territory monitoring, and annual GP inventory.	
	Operational instruments		The Action plans dealing with GSM are more detailed in Vasilievskiy Municipality, however Chkalovskoe Municipality has more of them. The Action plan in Chkalovskoe Municipality covers about twice more addresses and twice more volumes of works.
	Procedural elements	The procedure for the policy implementation is the same in both cases. It includes 6 stages: policy development, policy approval on the municipal level, policy approval on the district's level, conducting a competition for contracting a company for policy implementation, policy communication, and policy control.	

VI.III.VII. Action Plans

Existence of the Action Plans based on the spatial criteria can be observed in both cases. Based on the interviews with the Heads of Municipal Administrations in both Municipalities, the author identified the criteria for the choice for courtyards to be involved in an annual policy. These criteria are the following:
-permanent monitoring of the municipal territory
-wished and recommendations of the inhabitants
-interaction with the Department of land improvement in District's Administration
-the distance to the nearest children's playground or sports ground
-equal distribution of children's playground or sports ground within the territory

VI.III.VIII. Political-Administrative Arrangement (PAA): Vasilievskiy Municipality

Level	Principal Responsible Actors	Secondary Responsible Actors
International		
National		
Regional	Administration of the Vasileostrovskiy District Department on district's improvement	
Municipal	Municipal Administration Head of the Municipal Administration Municipal Service for Courtyard Improvement Specialist on courtyard greening	State actor Deputy's Commission on Courtyard Improvement Head of the Vasilievskiy Municipality Private land improvement and greening company Private actors
Civil society	Building owners	

VI.III.IX. Political-Administrative Arrangement (PAA): Chkalovskoe Municipality

Level	Principal Responsible Actors	Secondary Responsible Actors
International		
National		
Regional	**Administration of the Petrogradskiy District** **Department on district's improvement**	
Municipal	**Municipal Administration** **Head of the Municipal Administration** **Municipal Department for Courtyard Improvement and Ecological Security** **Specialist on courtyard improvement**	**State actor** Municipal Deputy's Board Head of the Chkalovskoe Municipality Private land improvement and greening company **Private actors**
Civil society	Building owners	

VI.III.X. Comparison of Variables' Indicators

In order to test the hypothesis 2 which presumes that good indicators on GP provision per capita in a municipality is an evidence of existence of a detailed courtyard GSM policy, the author of the present paper has identified and compared a number of indicators of independent variables in the following Table.

Table XV Comparison of Variables' Indicators (2014)

INDICATORS FOR COMPARISON	Vasilievskiy Municipality	Chkalovskoe Municipality	Comparative Statement
Budget expenditures for GSM	3.934.395,91 Roubles (26,4% of total budget for courtyard improvement)	12.351.100 Roubles (50% of total budget for courtyard improvement)	Budget expenditures for GSM are 3 times higher in Chkalovskoe Municipality. Moreover, the share of budget for GSM within the budget for courtyard improvement is twice bigger in Chkalovskoe Municipality.
Number of courtyards to be involved in GSM activities	50 out of 225	200 out of 250	In Chkalovskoe Municipality GSM works cover 80% of courtyards, whereas in Vasilievskiy Municipality only about 22, 2%. The degree of discriminatory character of the AP is much lower in this case.
Spectrum of works in the sphere of GSM	19 different GSM types of works	12 different GSM types of works	The variety of works in the GSM sphere is bigger in Vasilievskiy Municipality. Its Actions plans are more detailed than in Chkalovskoe Municipality.
Volume of works	**Comparable GSM works**		
	6400 flowers	8500 flowers	1,3 times more flowers to be planted in Chkalovskoe Municipality
	1402 bushes	1641 bushes	1,1 times more bushes to be planted in Chkalovskoe Municipality
	6 trees to be rejuvenated	53 trees to be rejuvenated and pruned	8,7 times more trees to be rejuvenated in Chkalovskoe Municipality
	9 trees to be cut down	204 trees to be cut down	22,7 times more trees to be cut down in Chkalovskoe Municipality
	38 trees to be planted	171 trees to be planted	4,5 times more trees to be planted in Chkalovskoe Municipality
	The volume of comparable GSM works is substantially higher in Chkalovskoe Municipality.		
	Incomparable GSM works		
	• 2177,6 square meters of lawn to be restored • 403 square meters of lawn to be installed	• 13.370 square meters of representative grass areas to be restored	The variety of GSM works is bigger in Vasilievskiy Municipality, but the volume of these works is not substantial. At the same time the smaller variety of GSM works in

	• 13 square meters of flower garden with annuals to be installed • 626 trees and bushes to be sprayed • 225 trees to be fertilized • Maintenance of lawns (3636,3 square meters) • Maintenance of trees (57) • Maintenance of bushes (916) • Maintenance of annuals (7,5 square meters) • 14 to be pruned and saved • 104 flowerpots • 4 flower gardens • 411 perennials • 25 climbers	• 71882 square meters of lawn to be cut • 71882 square meters of lawn to be cleaned • cutting out young growths of 259 trees and 520 bushes • 250 addresses to be counted	Chkalovskoe Municipality has substantial volumes.

VI. IV. Conclusion

The comparative policy analysis provided the author with the clear vision of the decisive variables which determine the indicator on green space provision per capita in a given municipality. These explanatory variables are:

1. GSM budget;
2. The number of courtyards within a municipality involved in GSM;
3. Volume (scale) of GSM works.

It could be clearly seen that in spite of the fact that Vasilievskiy Municipality has a more detailed policy with a big variety of GSM works, it did not make it better in GSM efficiency. The fact that Chkalovskoe Municipality has much higher budget expenditures for GSM, involves almost all its courtyards in GSM activities, and performs the planned work on a big scale in terms of work volume, make its GP quantity, and as a result GP provision per capita, much higher. This shows that the hypothesis stated in the beginning did not prove to be true, since the level of detail and diversity of GSM techniques and works is not enough for increasing the number of GP.

As for the other factors that might have an influence on the dependent variable in question, the resource portfolio and procedure of policy elaboration and implementation are the same in both cases. The only factor that can also be important is PAA specificity for Chkalovskoe Municipality, namely, it does not have a Deputies' Commission dealing with courtyard improvement and greening issues. It might make it easier for the Municipal Administration to get approval of their policy on courtyard improvement and greening, since they will avoid possible arguments between deputies on the policy issues.

CHAPTER VII. ALTERNATIVE GREENING TECHNIQUES AS A WAY OUT FOR THE COURTYARDS IN SPB

VII.I. Introduction

The historical centre of SPb is built in a special way which resulted in existence of well-courtyards with almost no place for GP. It makes traditional greening methods almost impossible in this area. Furthermore, SPb being the city-megalopolis needs to develop new living spaces for its constantly growing population which also plays against the enlargement of space for GP. In order to find a possible solution for the intense problem of courtyard GP' deficit, the author of present paper made an investigation of the European experience. In Europe one may find a number of relatively newly developed untraditional (or alternative) ways of greening, namely, roof greening, vertical greening, eco-parking etc. In this light, the initial hypothesis was that such alternative greening techniques as green roofs and green walls can become a solution of the main problems of courtyard GP management within the historical part of SPb.

VII.II. Green Roof Technology and Policies Worldwide

VII.II.I. Green Roof Technology

Green Roof concept (such names as eco-roof, nature roof, roof greening system, sky garden, skyrise garden are also appearing in the literature) is described in a plenty of different ways. The most widespread are two of them. The first one defines a Green Roof through its components. Such a definition is well presented by Lawlor, G. (2006) who defines a Green Roof as a conventional flat or sloped roof amended with some or all of the following layers or elements: structural support; vapour control; thermal insulation; a waterproofing membrane; a roof drainage layer; a root-protection layer; synthetic planting media; hardy, drought-resistant plants. Another approach is presented by Velazquez L. (2005), member of the American Society of Landscape Architects, who defines a Green Roof through its core characteristics as a vegetated roof with engineered soil and plants layered above a concrete, wood, or metal roof deck which gives a capacity to cover impervious surfaces with permeable plant material.

Semi-intensive green roof

Due to the growing environmental consciousness and green roofs' impressive economic and ecological advantages green roofs have become a very important component of sustainable urban development within the last 30 years (IGRA, 2014). At present, green roofs can be found almost in all the big cities around the world, benefiting the urban environment and their inhabitants.

In the existing literature on the green roofs, one may find only two classifications of green roofs which describe differences in construction, design and costs. The first classification is supported by the International Green Roof Association[7] (IGRA) which distinguishes three types of green roofs: extensive, semi-intensive, and intensive (or roof garden) green roofs. Some other specialists (Lawlor, G., 2006) point out only two types, namely, intensive and extensive green roofs according to the main utilization options: as a roof garden with a pleasant view for the owner, and as an undisturbed habitat for flora and fauna within grey city centres.

Based on the description of Velazquez L. (2005), the author designed a table describing the main differences of two basic types of green roofs. This Table is presented in Appendices.

[7] International Green Roof Association (IGRA) was founded in 2004 to support green roof market on the international level by sharing experience and knowledge within the sectors of green roof technology, standards, policies, and public relation work. Their typical activities include conferences, workshops, newsletters, and publications. Their main goal is to speed up the dissemination of green roof idea on the international level by sharing experiences in the field of technology, policy, research, and public relation.

VII.II.II. Benefits of Green Roofs

The benefits of green roofs are also described in a variety of ways. IGRA divides the benefits into private (or economic) and public (or ecological). Among the private benefits, IGRA members enumerate increase of life expectancy of the roof, reduced noise levels, thermal insulation (savings of energy), heat shield, and use of additional living space. As for the public advantages, they mention that green roofs play a role of natural habitat for animals and plants, as well as give such benefits as stormwater retention, urban heat island effect mitigation, reduction of dust and smog levels, improvement of quality of life in the cities. Another approach to the green roofs' benefits classification is illustrated by the Velazquez L. (2005) who distinguishes 3 types of green roof Benefits, namely:

1. Ecological
    - Absorb CO2 and help lower the urban heat island effect.
    - Reduce ambient air temperatures.
    - Filter air.
    - Absorb and filter heavy metals and pollutants from the rainwater, such as cadmium, copper, lead, nitrogen, zinc, diesel soot, VOC's, hydrocarbons and pesticides.
    - Reduce runoff flow rates and retain 50 - 95% of rainwater. Alleviate stormwater infrastructure systems and reduce combined sewer overflows.
    - Supply green habitat and nesting areas for displaced birds, butterflies and other wildlife.
    - Provide acoustical insulation and reduce noise by 50 dB.
2. Economic
    - Reduce cooling and heating energy consumption and energy costs.
    - Protect the roof's structural elements from UV rays, wind and temperature fluctuation.
    - Double or triple the life of the roof up to 50 years or more.
    - Increase floor-to-area ratios for builders who employ Green Roofs in their designs.
    - Increase property values by utilizing previously unused space, and enhancing visual appeal with roof landscaping.
    - Lower stormwater utility fees.
    - Local job creation. The growth of green roof and wall market gives new job opportunities related to manufacturing, plant growth, design, installation, and maintenance (Green Roofs for Healthy Cities, 2014).
3. Aesthetic and Psychological
    - Enhance quality of life due to the addition of natural green spaces.
    - Foster sense of community through shared views. Intensive green roofs provide amenity space for leisure activities, including community gardening.
    - Offer a welcome respite from dreary "asphalt environment".
    - Create endless design opportunities, limited only by the slope and weight loads.
    - Include many architectural features, such as waterfalls, ponds, and seating.
    - Integrate buildings into the natural environment.
    - Transform commercial and industrial structures from the eyesores to the benefit to the community with a beautiful green roof.

Although economic benefits are not negligible, the main focus of the public authorities is on the benefits of green roofs for the urban ecology (Ansel, W., telephone interview, February 26, 2014). "If we ask urban planners about the pressing current and future environmental challenges, very often climate adaption and storm water management are named" (Ansel, W., telephone interview, February 26, 2014). As a result of global climate change and increased urbanization, increase of days with heat stress, the risk of flooding are forecasted for many cities worldwide. If one looks at the list of advantages that green roofs bring, it can be clear that they are able to mitigate the negative effects of climate change on the urban ecology. "I am quite sure that most, if not all cities would welcome an increase of their urban green spaces, and if we look at the areal pictures of the cities, it becomes quite evident that on tops of the building there is a lot of open space that can be activated for environmental protection. The question is how the public authorities can support this process by the means of green roof policies" (Ansel, W., telephone interview, February 26, 2014). In order to find out the answer to this question, the author of present paper conducted a research on the existing green roof policies.

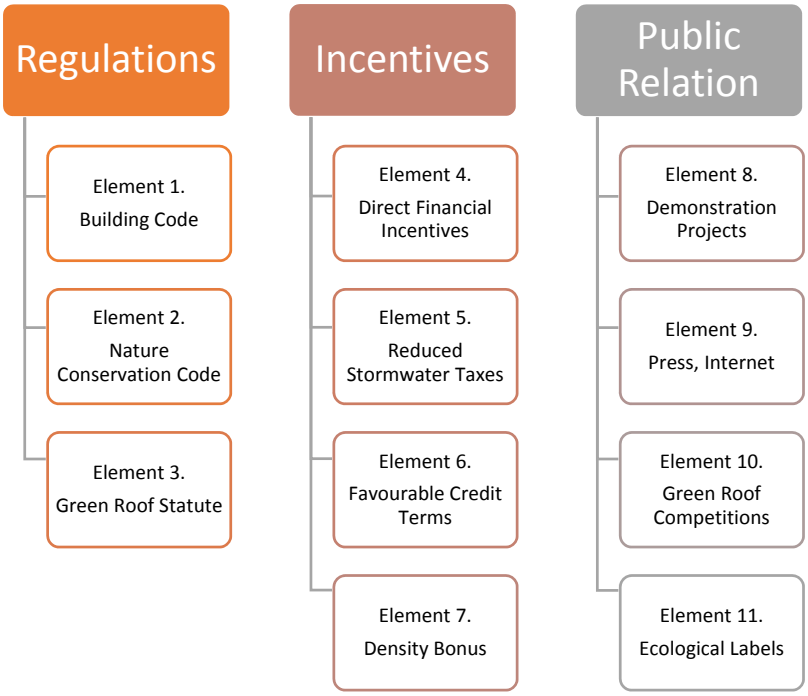
VII.II.III. Green Roof Policies

First modern green roof policies were developed in Germany in the 1960-s (Appl, R., 2009). The continuing boom of green roofs in Germany has been made possible largely as a result of supportive municipal policies.

In order to identify the full spectrum of green roof policy tools, the author analysed the German Roof Gardener Association and Hafen City University Hamburg green roof policy survey among German cities with more than 100 thousand inhabitants. The application of the following tools were investigated: land-use plans and zoning regulations, green roof statutes (or green roof guidance), direct financial incentives, stormwater taxes, and public relation. The results show that for a large number of cities, it has become a routine to integrate green roof regulations in new land-use plans (about 90% of the cities). Another standards are stormwater tax reduction for green roofs (around 85% of the cities), financial incentives (18% of the cities), and green roof statutes (8% of the cities). The application of land-use plans in Germany is normally restricted to new development sites and covers only subareas of a municipality. The stormwater tax reduction covers the whole municipal area, and financial incentives can be adopted to the budget of the city. Very often they are focused on the places where an increase in green areas is particularly important (Ansel, W., 2013).

Apart from Germany long standing experiences and case studies exist in many different countries and municipalities. Examples of green roof policies can be found in the cities in Europe, North America, and Asia. According to the Ansel W. (2013), the Director of IGRA, a green roof policy is a sophisticated issue because the regulations and also the legislative requirements differ not only from country to country, but also from city to city. He also mentions that “in the end green roofs are not only an ideology, but also a product which needs good marketing”. IGRA developed a rough classification of the tools that are used for green roofs promotion.

Figure IV The Toolbox: various instruments to promote green roofs



The first category of instruments is the possibility of incorporating green roofs as a condition in land-use plans or zoning regulations. It is an approach taken successfully by many local authorities. Very often the regulations can be traced back to information in the Building or Nature Conservation Codes. For example the German Building Code contains kind of greenery paragraph that can be applied for green roofs. It is important to consider that the regulations concerning green roofs are normally restricted to new development sites. In contrast, green roof statutes can also be applied to the existing buildings when renovations or alterations are made (Ansel, W., Appl, R., 2013).

The second category are incentives. First of all, a number of municipalities are offering attractive start-up grants for those wishing to implement a green roof. The aim of the subsidies is to motivate the owners of privately or commercially used properties to create voluntarily additional green spaces on the city roofs. Green roofs that are required as a result of legal obligations (for example, regulations) are often excluded from direct financial subsidies. Secondly, charging separate fees for the disposal of sewage and stormwater offers the second opportunity for financial incentives. The amount of the stormwater fees is normally based on the total area of the plot and the proportion of the ground that is impervious. Green roofs differ from the standard tiled or gravel covered roofs in that they are able to store a large proportion of water from precipitation and release any excess water gradually over time. These positive effects are rewarded with a reduced stormwater fee. Thirdly, there is such an instrument as favourable credit terms. Climate protection and CO2 reduction are the greatest needs of our time which is why some public authorities are supporting measures for reducing energy consumption and actively improving the environmental situation. Funding is very often given on the basis of lawns with considerable interest relief. In individual programmes repayment free subsidies are also available. Thirdly, density bonus or floor-area ratio can be used as a tool. Parameters such as the number of units on the piece of property and the floor area ratio regulate the level of use for building coverage. Often investors try to gain exemption from these specifications, for example through increased number of units or the addition of an extra storey in order to increase the marketability of the real estate. The density bonus includes the possibility of exceeding the footprint area of the surface area and the number of storeys if a certain environmental equalisation is included for example by installing a green roof (Ansel, W., Appl, R., 2013).

The third category is public relations. Press, Internet, and information events not only advocate green roofs in general, but also support the usage of regulations and incentives. However, the municipality should not restrict itself to the role of an advisor and promoter but rather act as a role model and pace setter by landscaping the roofs of its own buildings and testing and developing new possible fields of green roof applications. It is debatable whether ecological labels are classified as public relation or regulation. Sometimes green building label systems like LEED (Leadership on Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Methodology), or the GSBC (German Sustainable Building Certificate) are fixed in the blueprint of the building, but sometimes it is a voluntary decision of the investor to reach a very high level in sustainability (Ansel, W., Appl, R., 2013).

In order to discover the possible combinations of tools for green roof policy development and implementation the author made a research on green roof policy in different cities worldwide. The results of the research are presented in the following Table.

Table XVI Green Roof Policies in International Experience and Possible Lessons to be learned

City	Start of the policy	Brief Policy Description	Elements of the Toolbox Used in the Policy	Lesson which might be used for SPb municipal policy
Munich, Germany	1996	Munich is employing a wide palette of measures to promote green roofs, in particular the Green Roof Statute to landscape all suitable flat and low-pitched roofs with a surface area of more than 93 square meters. This Statute has led to making green roofs in Munich a recognized construction standard. They also used incentives for the voluntary installation of the green roofs and the reduction in stormwater fees.	Elements 1, 2, 3, 4, 5, 6, 7, 9, 11	• Developing a Green Roof Statute • Using a comprehensive approach
Berlin, Germany	2000	Berlin offers a very attractive stormwater fee reduction of 50% for green roof owners. The saving per year is 12 cents per square feet or 1 euro per square meter. The complete set of support instruments is very impressive, but the Green Roof Statute and the direct financial incentives are missing in comparison to Munich. On the other hand, the pioneering work of Berlin with regard to the demonstration projects is particularly noteworthy.	Elements 1, 2, 5, 6, 7, 8, 9, 11	• Attractive reduction in stormwater fee
Portland, USA	2008	The city promotes green roofs predominately because of advantages for sustainable rainwater management. The city's sewage system is stretched to the limit, so measures which relieve urban drainage are urgently needed, and are supported with grants. In order to establish green roofs firmly in the public mind, actions such as landscaping municipal buildings introducing a floor ratio bonus and public events to be held on green roofs were used to promote a green roof strategy.	Elements 1, 4, 5, 7, 8, 9, 11	• Landscaping municipal buildings with green roofs • Organizing public events on green roofs
Rotterdam, the Netherlands	2008	Green roofs are an essential part of the Rotterdam Climate Initiative. Consequently, the City Council encourage the installation of green roofs by granting an attractive subsidy of 3,8 Dollar per square fit or 30 Euro per square meter for homeowners and by setting a good example installing green roofs on municipal buildings. Like in Copenhagen this policy is new and only few additional instruments are in place to support this initiative. The danger with financial incentives is that they are strongly connected with the budget of the city, and this could have a negative effect on the continuity of the programme in times of economic crisis.	Elements 4, 9, 10	• Granting subsidies for homeowners from the city budget

Singapore, **Republic of Singapore**	2009	The Urban Redevelopment Authority and National Parks Board are introducing a series of initiatives to promote skyrise greenery. These initiatives contribute towards the Sustainable Development Blueprint target of reaching an ambitious goal of 50 hectares of new skyrise greenery areas by the year 2030. Apart from the designation of the green roofs as a measure of compensation for new building projects, a gross floor incentives scheme for roofs and municipal allotment gardens as well as financial subsidies for sustainable landscaping in districts with especially large green area needs have been introduced. Singapore has a good mixture of different instruments. In addition, green roof guidelines and professional training have been introduced into the market, and there are fantastic demonstration projects and reference sites.	Elements 1, 4, 7, 8, 9, 10, 11	• Introduction into the market of green roof guidelines and professional training • Qualitative demonstration projects and reference sites
Copenhagen, Denmark	2010	The success of the green roof policy in Copenhagen is strongly connected with the work of project manager at the Parks and Nature Department (City of Copenhagen), Dorthe Romo. Romo was putting effort into raising awareness for green roofs in the municipal administration. “It is now mandatory that all new flat roofs with up to 30 degrees slope in storey buildings and in private and public buildings have to be vegetated. If old roofs need to be retrofitted and the building owner has received financial support by public authorities the city requires the instalment of a Green Roof”. It means that in the future all new roofs in Copenhagen with a roof pitch under 30 degrees are to be landscaped providing there is no structural, engineering reason preventing it. This initiative is young, and in order to reach a permanent success in Green Roof Statute the development of further support instruments like incentives is now being done.	Elements 3, 9, 10	• Comprehensive information campaign including not only administrative bodies, but also politicians, green roof industries, universities, and the public

Other cities which apply green roof policies are Vienna and Lintz in Austria, Basel and Zurich in Switzerland, Amsterdam in the Netherlands, Sheffield and London in the UK, Malmo in Sweden, Chicago, New York, and Seattle in the US, Toronto and Vancouver in Canada, Tokyo in Japan, Seoul in Korea, Stuttgart, Karlsruhe etc. in Germany (Appl, R., Ansel, W., 2009).

The examples presented in the Table make at least three things clear. First, there is a growing number of cities which choose green roof policies as a control tool to increase the green infrastructure within the cities. Second, the environmental drivers are often similar. And third, the combination of instruments differ from city to city. According to the Ansel W. (2013), with regard to the configuration of the instruments the following points should be considered while developing and implementing a green roof policy:

- ✓ Possible conflict between detailed description and easy application (quality parameters like biodiversity should be included to prevent installation of green roofs with low ecological value);
- ✓ Determination of control and maintenance parameters (if no control instances are established, there is a danger that the requirements are not met);
- ✓ Amount of the penalty for non-compliance should be clearly set;
- ✓ Continued availability of financial budgets (in case of using direct financial incentives, the availability of budgets in a long-term perspective should be guaranteed);
- ✓ Inter-city competition for investment – danger of eco-dumping (it is important to talk with neighbouring cities in order to find a similar green roof strategy, otherwise the investors can try to place cities against each other to achieve minimal environmental standards);
- ✓ Sustainable anchorage within the urban planning (green roof promoters need a lot of patience and endurance to let the basis for sustainable anchorage within the urban planning);
- ✓ Green roofs are not only an ideology, but also a product which needs good marketing.

Thus a big amount of international experience in the field of green roof policy development, as well as existing general recommendations and guidelines are available. The question is if one can extract a kind of recipe for the successful development of green roof policies from these examples. It goes without saying that the examples and recommendations given above create the source of ideas that can be adopted, however they should be modified according to the needs of the local green roof stakeholders. In order to design a roadmap on the way of municipal green roof policy, the author will rely on the lessons extracted from the international green roof policies' analysis.

VII. III. Green Wall Technology and International Experience

VII.III.I. Green Wall Concept

The concept of green walls dates back to the Ancient times. In existing literature one may find examples in architectural history reaching back to the Babylonians who developed the famous Hanging Gardens of Babylon (around 600 BC), one of the seven ancient wonders of the world (Bertram, F., Mohan E., Peck S., 2008).

According to the Encyclopedic Dictionary of Landscape and Urban Planning (2007), a green wall has a number of synonyms such as planted facade, facade greenery, vertical garden, vertical green space, vertical greenery, vertical landscaping, and wall covering with vines. At the same time facade planting is defined in most of the literature sources as covering of a building wall with climbing plants, window boxes or espaliered woody plants which may be shaped by trimming and fastened to the wall surface (Evert, K., 2007).

The term "green wall" is defined in most of the literature sources as the concept that encompasses all forms of vegetated vertical surfaces (Green Roofs for healthy cities, 2014; Shupac, J., 2010; Sharp R., Sable J., 2013; Bertram, F., Mohan E., Peck S., 2008). In most part of the literature one may find only classification which mentions two types of green wall technology, namely, green facades and living walls (Bertram, F., Mohan E., Peck S., 2008; Shupac, J., 2010), whereas very rarely such type as retaining living walls is also mentioned (Green roofs for healthy cities, 2014; Filtrexx Sustainable Technologies, 2014). Both green facades and living walls can be used in a residential structure,

however the former can only be installed on an outdoor wall, whereas the latter can function either as an outdoor or indoor wall (Shupac, J., 2010). In some other sources, there is also classification of green walls similar to the one of green roofs, namely, some authors divide green walls into extensive, semi-intensive, intensive, and free standing (Green Roof Technology, 2014). "An extensive green wall consists of a vine that can climb a structure on its own. Semi-intensive green wall uses a support system for climbing plants. Intensive green walls consist of a planter cell style. Free standing green walls are green walls that are independent of an architectural structure" (Green Roof Technology, 2014).

Green facades are defined as the "systems created by vines and climbing plants that are rooted in soil or containers, growing upwards or cascading down, and require a structure to maintain their position, develop growth", and survive through the different seasons (Sharp R., Sable J., 2013). Plants growing on green façades are generally rooted in soil beds at the base of the structure, in elevated planters at intermediate levels, or on rooftops (Green Roofs for Healthy Cities, 2014). Green façades can be used on existing walls or constructed as independent structures.

Green Facade

The term **"Living Walls"** is defined in all literature sources as "panels of plants, grown vertically using hydroponics, on structures that can be either free-standing or attached to walls" (Heffernan, S., 2013). The other terms for this new concept that can be often seen in different sources include a vertical garden, green wall, "mur" vegetal, or ecowall. Living walls typically require more intensive care and maintenance than green facades, namely irrigation, drainage control and nutrients delivered and organized vertically. (Sharp R., Sable J., 2013; Bertram, F., Mohan E., Peck S., 2008; Shupac, J., 2010). In comparison to the green facades, living walls can function either as an outdoor or indoor wall. Used inside or out, a living wall can sustain a greater variety of plant types than a green facade (Shupac, J., 2010). As for the retaining living walls, they are generally defined as engineered living structures that are designed to stabilize a slope, while supporting vegetation contained in their structure (Green Roofs for Healthy Cities, 2014).

Living Wall

VII.III.II. Benefits of Green Walls

A green wall of any kind should serve as an appealing option due to its numerous advantages which are largely described in the literature.

Some specialists enumerate green walls' benefits in a general manner, and mention the positive aspects that are almost the same as those of green roofs, namely:

- ✓ Sound insulation;
- ✓ Regulation of the internal temperature of the house;
- ✓ Storm water management through absorbing a significant amount of rainfall;

- ✓ Heat Island Effect mitigation;
- ✓ Being a natural habitat for animals and insects;
- ✓ Aesthetically-pleasing for the inhabitants (Shupac, J., 2010).

Most of the other green wall specialists divide the benefits into three major groups which are similar to the classification of green roof benefits – public, private, and design specific. From the author's point of view, it is highly important to demonstrate the benefits of green walls in a detailed and comprehensive manner in order to build a solid motivation for policy-makers. The description of these benefits is presented in the respective Tables in Appendices.

VII.III.III. Green Walls in International Policy Experience

The implementation of the green wall technologies is not widespread up to now. There is a very limited number of policies which encourage green wall construction. The outstanding example that is described in a plenty of literature sources is a new ordinance passed by the City of Seattle (outlined below). In terms of incentives to build green walls, one can find an example of the US and Canadian Green Building Councils that offer a variety or achievable credits through the LEED rating system. Several cities have now adopted LEED rating systems to develop their own standards in the sphere of green infrastructure (Bertram, F., Mohan E., Peck S. 2008). The limited experience of green wall promotion by the political-administrative authorities is described in the Table below.

Table XVII Green Wall Policies in International Experience and Lessons to be learned

Place	Start of the Programme/Event	Brief Description of the Programme/Event etc.	Lesson which might be used for SPb municipal policy
Aichi, Japan	2005	The Japanese federal government sponsored a massive Bio Lung exhibit. The wall is comprised of 30 different modular green wall systems available in Japan.	• Sponsoring an exhibit and green wall demonstration project from municipal budget
Seattle, US	2007	Seattle implements the Green Factor Programme which includes green walls as a part of the new landscaping requirement for Seattle's neighbourhood business districts. The City of Seattle passed an ordinance in the Neighbourhood Commercial (NC) zone, requiring that all developments have 30 % vegetation coverage, or its functional equivalent, namely, permeable surfaces in commercially zoned areas. The program provides developers with a menu of landscaping options that gives them landscaping flexibility; green walls are among the options, as are green roofs, large trees, permeable paving, rain gardens, and tree preservation.	• Passing a municipal ordinance requiring 20-30% vegetation coverage for all buildings
North America	2007	"Green Roofs for Healthy Cities" launches full day Green Wall Design 101 course.	• Organization of training course on green wall design for landscape architects and other related specialists
	2008	"Green Roofs for Healthy Cities" launches Green Wall Award of Excellence and Green Wall Research Fund	• Launch of Living Architecture Award of Excellence

Sources: Bertram, F., Mohan E., Peck S., 2008.

VII.IV. Roadmap to the "Green roofs and walls" Municipal Policy for the Courtyards of SPb

VII. IV.I. Key Motivators to Adopt the Policy in SPb

There is a number of factors that lead communities to consider green roofs and walls as a way to mitigate the effects of dense urbanization (Lawlor, G. et al, 2006). Lawlor et al identify 6 key motivators leading the cities to adoption of green roof policies. The author compared the key motivators with the problem areas of municipality's courtyard territories and identified that they are fully covered by the benefits which green roofs can offer.

Table XVIII Correlation between the Courtyard Territories Problems and Key Motivators for Green Roof Policy Initiation

Problems within SPb central districts' municipalities	Key motivators for green roof policy implementation
Lack of green space for social and recreational use within municipality courtyards	Increase green amenity space
High level of air pollution due to the central location of municipal courtyards in the historical part of the city	Reduce air pollution
High level of precipitations and risk of flooding as typical characteristics of the city	Control stormwater runoff affecting drinking water and habitat in local rivers and lakes
Problem of high temperatures during the summer period	Reduce urban heat-island effect and impervious surface areas
Poor biodiversity	Maintain biodiversity

Sources: Lawlor, G. et al., 2006.

Furthermore, during the interviews with the heads of analysed Municipalities in SPb, all of them mentioned that green roof technology is completely unknown, but in their view it could be a perspective solution for the municipal courtyard territories.

Since each country/city/municipality is unique to the local climate, political position, environmental motivators and resource capacity, the author of the present paper developed a specific "recipe" for the successful development of "Green roofs and walls" policy for the municipalities of SPb. This roadmap was developed based on two existing sources, namely, a template for a Course of Action developed by the IGRA (IGRA, 2013), and a Resource Manual for Municipal Policy Makers developed by the Canadian Mortgage and Housing Corporation (Lawlor, G. et al., 2006).

VII.V. Phases of the Roadmap to the "Green roofs and walls" Municipal Policy for the Courtyards of SPb

Figure V Phases in Developing Green Roof Policy for SPb Municipalities

Phase 1: Collection of information

Status Analysis:

- ✓ Municipal Service for Courtyard Improvement and Greening (Municipal Administration Department) discovers the merits and benefits of green roofs and facades (for example, through the present paper as a starting point);
- ✓ Municipal Service for Courtyard Improvement and Greening makes a research on international case studies in the field, technical guidelines, laws, local interest groups.

Advocacy within the Municipal Administration and Municipal Council (it is crucial to address both the administrative and political sector):

- ✓ Municipal Service for Courtyard Improvement and Greening communicates the idea and first research results to the Head of the Municipal Administration;
- ✓ The Head of the Municipal Administration sends delegates from the Municipal Service for Courtyard Improvement and Greening to a green roof and wall conferences.

There are a number of possible opportunities. To mention just a few: 12th annual Green Roof and Wall Conference, Nashville 12-15 November 2014; Grey to Green Conference, Toronto 25-26 August 2014; International Green Wall Conference, Stoke-on-Trent 4-5 September 2014; World Green Infrastructure Congress, Sydney 7 October 2014; 4th International Green Roof Congress, Hamburg May 2015; The Green Roof Research Conference March 2014; The Green Roofs & Walls of the World™ Virtual Summit 2014 etc.;

- ✓ The Head of the Municipal Administration organizes site visits for the delegates to the countries with existing green roof and facades policies;
- ✓ Municipal Service for Courtyard Improvement and Greening organizes meetings with the deputies of the Municipal Council, and with the Head of Municipal Council presenting substantial results of the initial research.

Phase 2: Community engagement and networking

- ✓ Municipal Service for Courtyard Improvement and Greening organizes meetings with architects, landscaping professionals, building owners' associations, large businesses possessing the buildings, state organizations possessing the buildings, and environmental groups. This is necessary in order to raise the profile of green roofs and to gain support for green roofs;
- ✓ Municipal Service for Courtyard Improvement and Greening creates a competent Green Roof and Wall Working Committee from its members, as well as competent delegates from different disciplines;
- ✓ Green Roof and Wall Working Committee outlines strengths, weaknesses, opportunities, and threats of green roof development in the municipality (SWOT analysis). For instance, harsh climate in SPb is a potential threat, a small number of flat roofs within the historical part of SPb is a weakness, specificity of building up in the historical part of SPb with a huge number of blank walls is a great opportunity for green facade development.

Phase 3: Action programme development

1. Specific tasks: what will be done and by whom
    - Identification of policy opportunities based on the review of existing policy options and tools
    - Making a plan for green roof demonstration sites and technical research
    - Setting a timetable for ongoing planning meetings and workshops
2. Time horizon: when will it be done (for instance, 2014-2015)

3. Resource allocation: what specific funds are available for specific activities

- Green Roof and Wall Working Committee explores possible funding sources, such as government programs, utilities or green roof manufacturers. For example, requiring additional budgeting from the city Government, participating in the programme "On the subsidizing legal entities for the reconstruction and maintenance of GP of common use" (2013) etc.

Phase 4: Technical research

- ✓ Green Roof and Wall Working Committee ask for technical assistance of SPb Scientific-Research Institute;
- ✓ Researchers identify and investigate all the key motivators prioritized in SPb (storm water runoff, heat-island effect, air pollution, lack of green space for social and recreational use, decreased biodiversity etc.);
- ✓ Researchers investigate and quantify the benefits of green roofs, which will become part of green roof policy and design guidelines. Research typically involves assessing the ability of green roofs to manage stormwater, mitigate the urban heat island, or provide other necessary environmental benefits, aesthetical, and psychological benefits;
- ✓ Green Roof and Wall Working Committee sets up a research site and identifies the operational fields;
- ✓ Researchers collect and prepare findings for conference proceedings, which are shared at international green roof conferences. Sharing data and research findings is an important part of the technical research phase.

Phase 5: Program and policy development (translation of local and regional research into policy options and tools)

- ✓ Green Roof and Wall Working Committee may expand to include more professionals, such as landscape designers, horticulturalists, designers and city urban planners.
- ✓ Green Roof and Wall Working Committee selects appropriate instruments for the policy implementation. The selection must be well balanced and adapted to the local situation and financial and human resources. The author proposes the following instruments:

    1) Regulations

        1. Municipal Council submits a draft by-law requiring green roofs on new developments with flat or low-pitched roofs to the Council of SPb municipalities in order to gain their support;
        2. Municipal Council having the right of legislative initiative (Law "On the organization of municipal self-governance in SPb", 2014) and having support of the Council of SPb municipalities proposes a draft by-law requiring green roofs on new developments with flat or low-pitched roofs to the Legislative Assembly of SPb with a view to including this by-law into the Law "On the general plan of SPb" (2005);
        3. Passing a municipal ordinance requiring 20-30% vegetation coverage for all buildings within the courtyard (based on the weighted Municipality Green Factor system designed to support green infrastructure implementation by planners, building owners and designers. The Figure below graphically represents the weighting of the different greening methods.

    2) Incentives

        1. Municipal Council proposes an amendment to the Law "On the subsidizing legal entities for the reconstruction and maintenance of GP of common use" which will stipulate financial incentives for the large businesses possessing the building to retrofit their buildings with green roofs and walls;

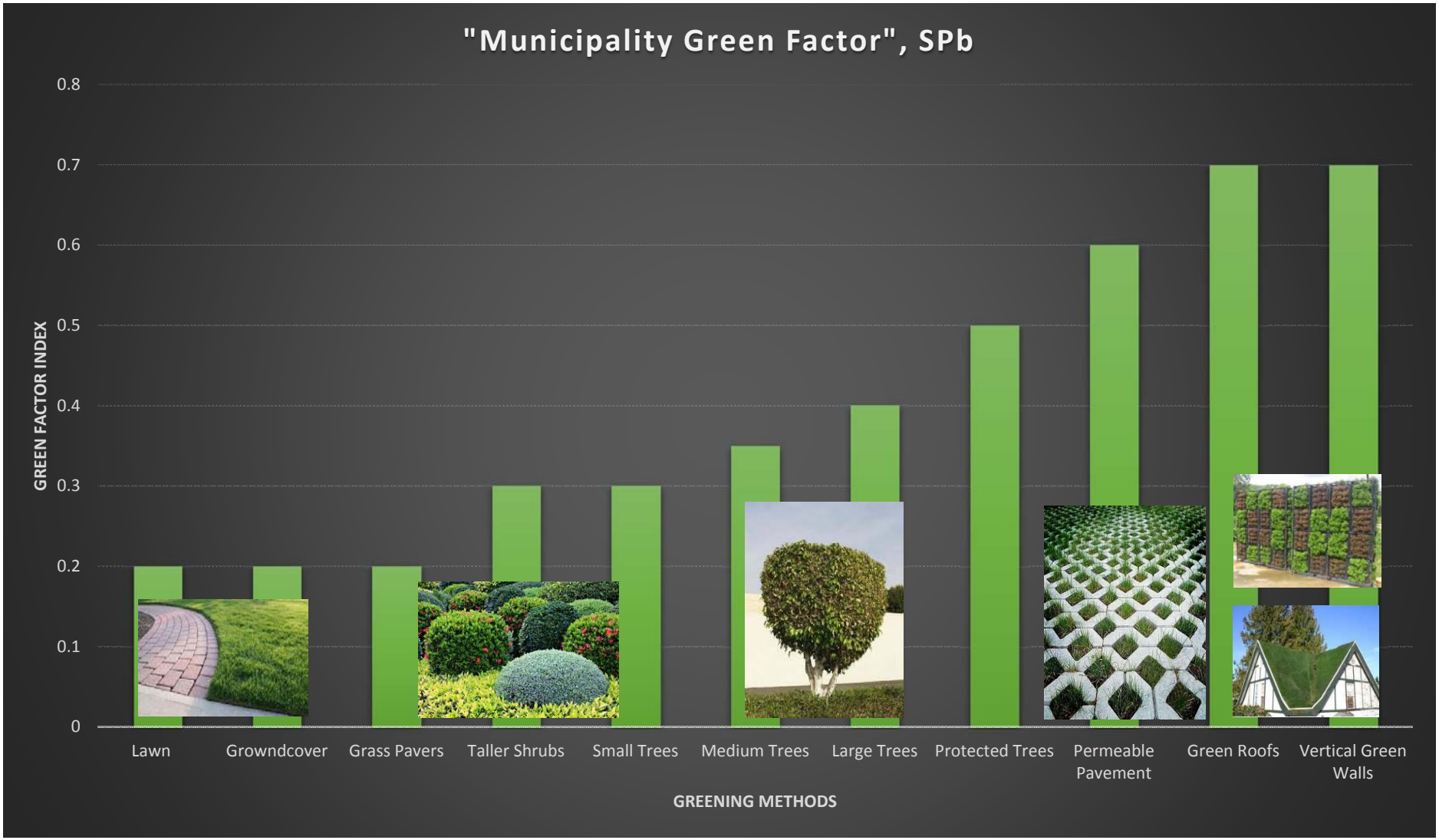
2. Municipal Council makes an inquiry to the Government of SPb for:

- including subsidies for municipalities for extensive green roof installation in the municipal budget;
- establishment of Sustainable Development Fund based on the Lausanne experience (Aubert, P., personal communication, February 11, 2014). This Fund will be based on the introducing a number of additional taxes on water/gas/electricity, for example. The money from this fund will serve for financing sustainable projects, for example, incentive program for green roof installation. The decision on the money distribution will be made by the specially designed Evaluation Committee.

3. Organization of training course on green wall design for landscape architects and other related specialists;

4. Launch of Municipal Living Architecture Award of Excellence.

Figure VI Municipality Green Factor System for the Calculation of the Vegetation Coverage of a Building



Source: developed by the author of the present paper, Ekaterina Leonova

Phase 6: Communicating the policy

This phase is of great importance, since the best administrative set up will not succeed if the public is not convinced that green roofs and facades are reliable technologies that offer a large number of benefits (Ansel, W., 2013).

- ✓ Accompanying public relation activities might include:

1. Public hearings on the initiative of the Municipal Council (Art. 19, Law "On the organization of municipal self-governance in SPb", 2014);
2. Inhabitants' meetings organized by the Municipal Council (Art. 20, Law "On the organization of municipal self-governance in SPb", 2014);
3. Inhabitants' survey organized by the Municipal Council (Art. 22, Law "On the organization of municipal self-governance in SPb", 2014);
4. Sponsorship of the Demonstration Project which will be advertised in local and city press, as well as in social networks;
5. Creation and promotion of the web-site devoted to the green roofs' and walls' benefits and successful world experience;
6. Organizing some public events on green roofs.

Phase 7: Policy Evaluation and Adaption

- ✓ Green Roof and Wall Working Committee collects and analyzes constructive feedback from users, professionals and the building community in order to assess the effectiveness of the policy;
- ✓ Green Roof and Wall Working Committee explores other policy options and performs permanent research to fine-tune existing policy (continuous improvement);
- ✓ Green Roof and Wall Working Committee decides whether to continue on the same path or explore other policy options.

Ideas to keep in mind:

- ✓ "People who work with green roof policies need a lot of enthusiasm" (Ansel, W., telephone interview, February 26, 2014);
- ✓ The goal of municipal green roof strategy should be to develop the most possible positive effects of green roofs by making the most efficient use of financial and human resource available (IGRA, 2013).

VII.VI. Conclusion

Based on the analysis of green roof and wall technologies, their benefits, existing international experience in the sphere of developing and implementing public policies based on these technologies, as well as developing such a policy for SPB, the author came to a number of conclusions:

1. Key motivators for green roofs and walls policy implementation are coinciding with the main problems of courtyard GP territories in municipal responsibility in SPb;
2. The heads of SPb municipalities find green roofs and walls a perspective tool and possible decision for GP deficit within the courtyard territories;
3. Development of the roadmap has shown that a plenty of possible mechanisms are available in order to realize the "Green roofs and walls" municipal policy for the courtyards of SPb.

These conclusions fully prove the initial hypothesis presuming that such alternative greening techniques as green roofs and green walls can become a solution of the main problems of courtyard GP management within the historical part of SPb.

It must be mentioned that green roofs and walls should not be considered as a panacea for the environmental construction ills in general, and courtyard GP deficit problem in particular. Nor should any one single design component carry that burden. The true way out through the means of sustainable living architecture and design should be found in the integration of a number of elements taking into account current innovations and specificity of a place. However, viewed as one layer of a city green building strategy which starts at the municipal level, green roofs and walls can play an important role. As one can see there are various methods of regulation in order to stimulate such an alternative way of greening as green roofs and walls. Taking into account all the European experience in this field the city of SPb will have a chance to design its own specific policy that would stimulate alternative greening in the city and contribute to solving many problems.

CHAPTER VIII. CONCLUSION

The perennial question in urban planning is "how can we create future places that are sustainable and livable?" (Philip R. Berke et al., 2006). The answer is difficult to find, however the approach of the present paper consists in searching for the answer on the most local level, on the most local urban planning unit. Investigating the municipal GSM of the courtyards GP territories in SPb (being the most local unit of GSM), the author was trying to find the answers to 3 crucial questions testing the 3 hypotheses. The results of the research can be summarized as following:

4. What is the urban greening status quo in SPb?

As a result of examining urban greening status quo in SPb, the author discovered a solid legislative base, multilevel structure of GSM, and a list of problems in the sphere of greening. The legislative base is based not only on the local and regional level, but also on the federal level. The 3-level structure of GSM reveals the types of GP territories, the political-administrative bodies being in charge of them, and the most local unit of GSM (municipal) which was chosen to be in the centre of the author's research. In the long list of GSM problems the crucial one is insufficient budget funding which leads to the inability to fulfil all the planned works according to the existing standards, whereas the lack of GP in the central districts of the city was the one which was chosen for the deeper analysis.

5. What is the way green space management is organized on the municipal level?

The first hypothesis which states that bad condition of the courtyards GP is an evidence of substantial problems in municipal GSM **only partly proved to be true**. Poor condition of the courtyard GP was proved in the present paper to be an evidence of a number of other factors lying much deeper than on the level of local self-governance. Plenty of legislative gaps, financial limitations and informational deficit along with the managerial problems (partly caused by the factors above) lead to the inadequate condition of the GP in the city. The possible solutions to these problems are seen by the author in 2 spheres: legislative improvement, and budget increase. First of all, there is a need in a number of legal acts which will stipulate: the way inventory procedure must be done; enlarged competencies of the municipalities; the way of coordination between the bodies in the sphere of GSM; clear distinction in the spheres of responsibility of the different bodies. Secondly, there is a need in the revision of the amount of money municipalities get from the city for the GSM needs, in order to hire more people working for green space development and finish the process of inventory in a proper way.

The second hypothesis which states that good indicators on green space provision per capita in a municipality is an evidence of a detailed courtyard GSM policy, **did not prove to be true**. The level of detail and diversity of GSM techniques and works was proved to be not enough for increasing the number of GP. The comparative policy analysis revealed 3 decisive variables determining the indicator on green space provision per capita in a given municipality: GSM budget; the number of courtyards within a municipality involved in GSM; volume (scale) of GSM works. It can serve as a benchmark for the municipalities in order to improve their GSM efficiency.

6. What is the way to resolve or mitigate the problems in the sphere of municipal green space management?

The third hypothesis presuming that alternative greening techniques (such as green roofs and green walls) can become a solution of the main problems of courtyard GP management within the historical part of SPb, **fully proved to be true**. In this light, the author proposes a 7-phases Roadmap to the "Green roofs and walls" Municipal Policy for the courtyards of SPb based on the European experience.

It is supposed to serve as a guideline or a “recipe” for the successful development of green roofs and walls policy for those municipalities which will be willing to try to realize these alternative greening techniques. The roadmap includes a toolbox based on the regulations, incentives, and public relations.

Moreover, during the course of present research the idea of installing green roofs promoted by the author became a part of an innovative project. This project was elaborated in cooperation with Valeriy Denisov, and Konstantin Litvinenko. Its basic idea is to renovate a well-courtyard in the city centre of SPb by installing a special semi-underground parking zone equipped with a green roof. This project was approved by the Municipalities №7 and №9, as well as by the State attestation Commission of SPb State Mining University (05.06.14). The project will be participating in the Competition “Stroymaster” 2014.

Based on the conducted research, one may claim that municipal GSM in SPb has a number of problems which come from the lack of appropriate institutional, legislative, and financial setup, as well as from the lack of innovative technologies. These problems pose an intractable bottleneck on the way to improved urban greening and sustainability. The true way out can be found through the means of sustainable living architecture and design taken into account while developing innovative municipal public policies based on greening technologies. Sustained improvements in municipal GSM would be possible in case of integration of a number of elements taking into account current innovations and specificity of a place. Employing the elements of the European experience in this field the city of SPb will have a chance to design its own specific policy that would overhaul greening.

Federal and local governments should perceive wise and sustainable urban development as something being of outstanding importance, since the way we design our cities plays a crucial role in developing a “future-proof” society.

APPENDICES

1. Example of the Interview Transcript

idheap
Institut de hautes études en administration publique
Swiss Graduate School of Public Administration

Interview

Interviewee: Pascale Aubert,
Déléguée à la nature,
Service des parcs et domaines de la ville de Lausanne
e-mail: Pascale.Aubert@lausanne.ch

Interviewer: Ekaterina Leonova,
Master student at the University of Lausanne, IDHEAP
e-mail: ekaterinaleonova06@gmail.com

Date: 11th of February 2014
Time: 15.30 pm

Approximate duration: 45 minutes

List of questions:

1) May you please tell a little about your job? How long have you been working in the sphere of environmental urban development? What is your sphere of responsibility?
2) What is the general structure of administration in the sphere of green space management in Lausanne (municipalities/districts)? Where from comes the budget for green space expenses of Lausanne? Who decides on the budget expenses?
3) What are the problems of Lausanne in green space management? Do you think that there are substantial differences in green space management problems in big and small cities?
4) What do you think about such alternative methods of greening as **green roofs, vertical greening and eco-parking**? Are these methods implemented in Lausanne and how? Are there public policies in the spheres of these 3 techniques? May you give some examples?
5) Do you think that green roof technology and vertical greening can be an answer to modern (especially big) cities' environmental problems? Which kind of public policies do you perceive as the most efficient for implementing these methods (tax abatements/municipality's contribution etc.)?
6) Which other innovative public policies and solutions does Lausanne have in the sphere of green space management? (Sustainable Development Fund, Coefficient of green space for private, Ecological management etc.) How were they initiated and how do they work?

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1) May you please tell a little about your job? How long have you been working in the sphere of environmental urban development? What is your sphere of responsibility?

My task or my function is called Delegation or Delegate for nature. This is the position which was created I think in 2007, first for coaching the gardeners of the city to make the public green management more ecological and then, I mean now, I am working in this position since 2011 and at that time this position was a little bit changed in the responsibility. And this is let's say more transversal position within the city which means not only working with public green space but also with urbanization projects trying to reserve green space in the planning of new allotments or new or let's say neighborhoods where is some densification, which is previewed and where we try to make sure that we have enough space for the population and also for the nature.

2) What is the general structure of administration in the sphere of green space management in Lausanne (municipalities/districts)?

And also in comparison with SPb we have I mean the municipality of Lausanne, the territory of the commune of Lausanne is let's say ruled for the green space management by one service let's say which is the service where I am working with – Service de Parcs Domaine - which manages at the same time the forest, the agricultural land which belongs to the city, and public green space like parks and promenades and so on, and also cemeteries, for instance. So this is one service of the administration. Which means that this is somehow easier because all public green space is in one service so we have an overview and we can orient the strategy more easily that if it is in different services. And then concretely on the field of course we have some organizations where for the public green space the city is divided into 3 regions or zones where you have 1 responsible for each zone which has between (I don't know) 10-15 teams of gardeners and each team has some attributed parks they are caring.

Where from comes the budget for green space expenses of Lausanne? Who decides on the budget expenses?

So it is a budget, it is an annual budget which we have from of course the municipality, from the commune, which is approved each year by the commune and it is a system that works like that since years and years which means that you have to make some adjustments according to which cost you might have more next year because you have some special project or some cost or let's say now we are in period where there is some pressure on the budget because of economic reasons so they give us the task to reduce, so we have to define where we will reduce that budget.

3) What are the problems of Lausanne in GSM?

I think the most urgent problem is the pressure for densification because you have a lot of places where you still have some green spaces also in private not only public or even are also public places which are now not constructed but are getting constructed because we need more habitations for the growing population. So the biggest challenge we have at the moment is to make sure that we keep good quality of life which means also some places outside and green spaces where people can go and enjoy, and relax and so on. And this in the city which is growing bigger and the territory which is not growing bigger. So it means you have to have more buildings near each other. So that is a big question for the future – how do we reserve space for the nature? And of course it is linked with the value of the land-because some land can be constructed it means a lot of money of course even if the city itself builds some buildings and gets rents, it gets every year a lot of money for this thing. And if it is just a green, a free green land, it is nothing, so there is a lot of pressure with that. And we don't know how far politicians are ready to go to really save green space for the people. So that's a big question for the future.

Maybe the other quite important challenge is the place of trees into the city. It is again linked to the space within the soil and also above in the air, because trees when they grow need really a lot of space and it is under evaluated very often. And sometimes if you need to have under soil construction (sewage, optical fibers for the Internet), so always they grab and then they destroy the tree roots and then you have old and even young trees which are injured and then after a few years they just die. So we are all the time renewing the trees but they don't have the opportunity to really grow and become

real trees. And as we know that trees are really important for air depollution and microclimate regulation in the city, so it is also the preoccupation that we have.

And the last preoccupation is –green is not always green which means that this is all the question of the quality of green that we have. And very often around the building you just have very thin grass which is not very interesting for biodiversity. So green is not only having something green but also being habitat for plants and animals. But for having that you need certain quality and the quality is missing a little bit in the city, because we have the standards of how green should be, and very often there is not space enough for wild nature, for plants and animals. So that is another challenge - we have to change the mentality of the people, so in their gardens for instance so they have once based what they use so they want it to be very nice, so there is another zone beneath where they could let a little bit more to the wilderness. So this is a challenge – how to promote this?

Do you think that there are substantial differences in green space management problems in big and small cities?

No, I have an impression the problems should be more or less the same. But the scale is different of course. But the basic challenges they should be the same.

4) What do you think about such alternative methods of greening as green roofs, vertical greening and eco-parking?

So we think that in any case green roof is a very good technology we want to promote and we want it to be like something automatic that you do if you have a flat roof that you have greening on it, because of all the advantages that it can bring in terms of microclimate, climate regulation, also thermic isolation, biodiversity, like new spaces that are otherwise of no use, and here you have a lot of uses. What we also say it is – or our position would be that- it is not because you put green roof on the top of your building that you are allowed not to have any green space around your building because in reality the green roof is a compensation of what you have taken on the ground, I mean if you take that surface on the ground you compensate with green roof, but it doesn't mean that you can destroy everything that is around, because there could be a tendency. So we think it is a very good proposal and if all flat roofs in the city would be green, I think there would be real advantages even in terms of vision, especially in the city like Lausanne where there is a lot of steep slopes, and where you see the city from the top – that would be nicer, let's say. Which is not nothing also in terms of quality of life.

Vertical greening is also something that we want to promote, but we have very little experience at the time. We have some places like Place de l'Europe, but this is very technical vertical greening which is costly and needs a lot of management so that it keeps nice, so it is not very sustainable, because it needs a lot of water, a lot of human resources to keep it nice. So what we see as vertical greening is more like planting plants in the soil and then plants that are growing up on the façade on the walls, because if you choose the good plants, you don't need to put water, you don't need to do anything - it's just growing. So this is the type of vertical greening we would like to promote, but we don't have a lot of experience yet, and there are some constraints – the people which work in architecture or more in civil engineering they feel that these plants destroy the walls, so we don't have good experience and enough knowledge to say in which condition putting this vertical greening would diminish the life duration of the walls, so that's financial question at the end. So this is needs a lot of experience.

Eco-parking – we have an example of eco-parking at Montbenon, where you have a big parking and a top-roof which is a public green space. So this is in reality a good way to save space for green and still have some useful places below. But of course this is also specialty of Lausanne, because we have the steep topography and it is one way to do it, but it could be done otherwise also, I think.

Are these methods implemented in Lausanne and how? Are there public policies in the spheres of these 3 techniques? May you give some examples?

So for green roofs we have started since a few years to promote it but without really big constraints. Only for what is called PPA Plan of urbanization for specific area= where you decide what can be built, how high, how big, and where the construction of building have to stop, where do you have green

spaces etc.), and there you have a reglamentation that goes with this plan, and in there very often (since 3 years) in 90 % of the cases it is said that if you have a flat roof, you have to have greening on it. So this is the way now we can reglament, but we hope that in the future we can make the basic urbanization plan, because this PPA is the urbanization planning for zone which doesn't need to follow the basic rules so it means that you want to make special rules for this area, but you have also the plan for the basic regulation for all zones, and there we would like to write that if you have a flat roof, you have to have some green on it and it is important to put green vegetation and solar energy for instance – it is a combination which is in reality possible and which is good for the productivity of the solar cells, so we will have to see how to formulate the things, and also there are some places where you cannot do that, because you have some patrimony elements of architectural whatever so of course there are some places where it is not good place to do it, but we hope we can formulate that in this basic urbanization rule, maybe within 3-4 years. So that is the plan. I think in Basel and Zurich the cantons already have that in their rules. Plan of urbanization needs amendment now – every 10-15 years it is revised because the context is evoluting. There will be a big change in the whole way this is written.

5) Do you think that green roof technology and vertical greening can be an answer to modern (especially big) cities' environmental problems? Which kind of public policies do you perceive as the most efficient for implementing these methods (tax abatements/municipality's contribution etc.)?

I think it is one part of the solution. Of course, using the top of the roofs to make also public space, why not. I think this is a good solution, because you can have very nice places – the view, feeling free. I think this is one part of the solution, but not the only part, because I see the quality of life and the quality of the environment also linked with the biodiversity and it means also the presence of specific plants and animals and of course not all the animals can go on the roof. So it is not the only solution, of course not, but certainly it is a part of the solution. It can be places for also relaxing for people where they have access and can enjoy but also some of these roofs can only be some kind of ecological compensation for what is not in the soil. But I still think that we have to reserve space on the soil so that the system can work, also just for water management. On the soil you have the real ecosystem with the water that goes down, and all the recycling of elements, and you can have that only partly on the terrace or on the roof because you don't have the direct link with the soil. So this is not really the same. I think you need both.

I mean at the moment this regulation would be amended in that sense and for me it is done, it means that people have to do it. For me that is a solution we should come to. But of course it is difficult to bring it directly, because people are a little bit afraid of what is means and they don't know the technique, it is something new, so that is why it is something that must be implemented in some steps, and one step is certainly what we are putting now into action – it is promotion through the financial incentive for private, for instance. This is something we are putting in place this year – where we say: ok, we give you 40 francs per square meter if you green your roof. So we give them some money for the greening, and we hope that it will motivate some private people to do it. And then through this motivation ad through this experience they will see how it works, and that it is not so complicated and it is not so expensive and so on, we hope that the mentality of accepting it as an obligation will come. And this is how they did it in Basel. They started with the bigger system than we will put in place, because they started with the big amount of 1mln francs for this incentive, and we are starting very little with only 100.000 francs for this time, but we hope that it will work and then in maybe 1 or 2 years we will have a bigger amount of money to do that. And in Basel it really worked like that. They started with the first campaign and then they saw that it is not such a big deal to do it, and then they implemented it in law. I think that is a good way to do it.

At the moment it is not working yet. We are working on it, and in May it will start. And then we will make some communication to the building enterprises and architects and so we will make people know that we have this program. In Basel they started with the incentive system, and then when it was over they had implemented like 150 building which were greened, and then they brought the obligation of green roofing in the law. So it is really good step to show that it is possible, it is not a nonsense. And then you have the political will to bring it to the law, otherwise people would just be scared and don't agree. *(my comment: now you are just making an incentive, and it has to come from*

the bottom, from the people (yes, I want to green my roof, give me the money) and after it will become an obligation).

7) Which other innovative public policies and solutions does Lausanne have in the sphere of green space management? (Sustainable Development Fund, Coefficient of green space for private, Ecological management etc.) How were they initiated and how do they work?

Sustainable development fund is a fund that is amended at any moment with different taxes – one tax on power (electricity) - 0,3 centimes per kWh per hour, then also 0, 1ct per kWh on gas, 3 ct per liter of water which is sold from the commune to the population, and 1% of the annual benefit of the commercial Service of the commune which provides electricity, cable for television, gas etc. And so it means that every year we have a lot of money coming into this fund because of course people are consuming all these things (gas, water etc.) and then this fund serves for financing projects in sense of sustainability and you have an Evaluation Committee which evaluates the project and say: ok, this is the project that goes into the criteria we have selected. So very often these are the projects that you want to be innovative, that you can reproduce, and that goes of course into sustainable development and that you can communicate about etc. So that is it. And I think this is a very-very good way of financing different things, for instance this incentive for green roof, this program, will be financed by this Sustainability Fund. And without this Fund there would be so many things that we could never do. For instance, also the quality of greening in the green space we use sometimes in some places native plants which don't even cost very much more, but it gives us the possibility to use this Fund to finance special plants that we don't produce here for instance that we have to buy. So that is a good way to be able to do things differently, which are not normally in the system that we have in place. That is a great way to finance some projects.

How did you come up with the idea for this Fund?

The Chief of the Government of the city being the director of Industrial services and he had the idea to develop this Fund. He said: ok, we need some way to do things differently. He proposed this system to the elected body of the Commune which approved this.

What about the idea of coefficient of green space for private?

In the Regulation for urbanization there is a rule that says that when you build a building you need to have ***20% of the brutto living space of the building in green space***, and this brutto living space is depending on how many flats and floors you will build and of course if you have a lot of floors you have a bigger brutto space and it means that you have to have 20% of green space of this number. It means that if you want to have a biggest surface of living you need also to have a bigger green space, so intrinsically it means if you build higher you have to have more green space around your building. So that is the way to try to keep some amount of green space, but it is not always possible to do that because you have of course the pressure of the real estate which wants to make money and then the political sub-pressure behind. At least we have a rule and we try to implement it and of course if it is not possible we have some measures that you can according to the approval of the municipality you can do something differently but we have this rule which is good. And also linked to that you need to have ***one major tree per 500 meters of land*** so which is also a good way to keep trees and to make people have to put trees in their gardens or around their buildings, so that's also a good thing.

It is good to have some rules for having some surface saving surface, green surface, but of course it does not say anything about the quality of green space. And what we would also like to bring new is the ***Regulation*** is that we can also ask ***for some quality in vegetation***. We don't know if we will manage.

What about the idea of the Ecological Management?

And about ***Ecological Management (the name in French means differentiation of management of green space)***, it says that according to where you are there are some places in the park where you can say are more dedicated to nature, biodiversity and this part is more dedicated to public use (people playing football, reading etc.) – so you really divide green space in different zones and manage them differently so that you have ***multifunctional green space*** let's say. This is something that we have been

implementing since 20 years in the city of Lausanne, and which always goes on because you always can do better, so this is political direction that was taken once upon and now it helps us to create new meadows where the grass is growing bigger and then you can cut it and give it to sheep, for example. We have also some sheep in the city which are grazed in some public places. So these are some ways where you have more nature and still also some places which are very nice because you want them to be very beautiful and with a lot of flowers and so on and so on. And it is a very interesting thing to have, as I said, multifunctional spaces, and also have some kind of economic advantage because all the place that you, for example, don't graze or you don't go every two weeks to make this grass very short but you let it grow and you only have to go twice a year instead of maybe 20 times so in terms of economic benefit it is interesting also. So these are good advantages both ways –ecologically and economically. Even in forests you can find the places which are more for public and which are more managed for biodiversity (I mean where you don't promote the access of the public and you let there more old trees). And it is the same with green open space which does not have many trees you can also decide that you have a part which is for public use and a part which is more for biodiversity.

2. Timetable of the Research

Date	Goal to be achieved
01.10.13 – 31.10.13	- Formulation of the topic - Searching for the relevant literature
01.11.13 – 30.11.13	-Writing and submitting the Research Proposal
30.11.13 – 15.12.13	-Preparing for conducting the empirical part of the thesis: formulating the questions for the interviews and expert questionnaire
20.12.13 – 15.01.14	-Conducting quantitative research (conducting interviews and sending questionnaires; analyzing the results of the interviews, questionnaires, and documentary analysis)
15.01.14 – 30.01.14	-Writing the chapter on literature review
01.02.14 – 15.02.14	-Writing the chapter on methodology
15.02.14 – 01.04.14	-Working on the core chapters -Delivering the presentation
01.04.14 – 31.05.14	-Finalization of the thesis (finishing the main chapters, drawing the conclusions)
31.05.14	-Submission of the thesis draft
01.06.14 – 31.07.14	-Making final corrections
06.08.14	-Final submission of the thesis

3. List of the Interviews

Interviewee	Interviewee's Position	Type/Date of Communication
	Interviewees in SPb (10)	
Irina Shkeul	Specialist of the permanent commission for the urban development and land-use (Committee for Urban Development and Architecture of SPb)	Skype interview (25.10.13); e-mails
Valeriy Denisov	Professor at the SPb Technical University and at the SPb State Mining University, a member of International Academy of Ecological Sciences and Life Safety Activities, and senior research assistant at the SPb Scientific Research Center of Ecological Security (Russian Academy of Sciences)	Face-to-face interview (13.04.14), e-mails
Sergey Stepanov	Head of the Municipal Council, Municipality №7	Face-to-face interview (13.04.14)
Alexandre Gogolkin	Head of the Municipal Administration, Municipality №7	Face-to-face interview (13.04.14)
Yuriy Panov	Head of the Municipal Council, Posadskiy Municipality	Face-to-face interview (16.04.14)
Olesya Maluchenko	Specialist for greening, Posadskiy Municipality	Face-to-face interview (16.04.14), e-mails
Oleg Moskvin	Vice-Head of Vasilievskiy Municipality	Face-to-face interview (15.04.14)
Oleg Pantela	Head of Municipal Administration, Chkalovskoe Municipality	Face-to-face interview (14.04.14); e-mails
Tatiana Feschenko	Specialist for urban improvement, Chkalovskoe Municipality	Face-to-face interview (14.04.14); e-mails
Valeriy Zibarev	Head of Pavlovsk Municipality	Face-to-face interview (23.12.13)
	Interviewees in Switzerland (3)	
Pascal Aubert	Delegate for nature, Service for parks and gardens, Lausanne (Service des parcs et domaines de la ville de Lausanne)	Face-to-face interview (11.02.14)
Roland Schmidt	Delegate for agriculture , Service for parks and gardens, Lausanne (Responsable des domaines agricoles et des auberges foraines, Administrateur du site de la Tuilière (compostière et valorisation du bois-énergie, Service des parcs et domaines de la ville de Lausanne)	Face-to-face interview (13.02.14)
Christian Mathys	Head of Energetics Department, Basel (Ressortleiter Energietechnik; Departement für Wirtschaft, Soziales und Umwelt des Kantons Basel-Stadt; Amt für Umwelt und Energie; Abteilung Energie, Basel)	E-mails (21.02.14, 06.03.14)
	Interviewees in the other countries	
Wolfgang Ansel	Director of the International Green Roof Association (IGRA) Berlin (Germany)	Skype interview (26.02.14); e-mails

4. The Main Differences between Extensive and Intensive Green Roofs

Extensive Green Roofs	Intensive Green Roofs
Low profile/ eco-roofs	**High profile/ roof gardens**
Slopes up to 30 degrees and higher	Relatively flat
Less expensive 12-25 Dollars per square feet	More expensive 25-40 Dollars per square feet
Low maintenance	Higher maintenance
Low water requirements	Irrigation usually necessary
Usually non-accessible	Designed for human recreation
Less variety of plants (low growing plants)	Huge variety of plant selection (trees/shrubs etc.)
Lightweight	Heavier weights

Source: Velasquez, L., 2005.

5. Public Benefits of Green Walls

Sphere of Impact	Description	Benefits
Reduced Urban Heat Island Effect	Since natural vegetation is replaced with growing amount of buildings, pavements, and other urban structures, this results in the conversion of sunlight to heat and temperature increase. Vegetation cools buildings and the surrounding area through the processes of shading, reducing reflected heat, and evapotranspiration.	• Promotion of occurrence of natural cooling processes (photosynthesis, evapotranspiration) • Reduction of ambient temperature in urban areas • Vertical air flow break, resulting in cooling the air (Peck et al. 1999) • Shading surfaces/people
Improved Exterior Air Quality	Elevated temperatures in modern urban environments with increasing numbers of vehicles, air conditioners and industrial emissions have led to a rise in nitrogen oxides (NOx), sulphur oxides (SOx), volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter.	• Capturing of gases and airborne pollutants • Filtering noxious gases and particulate matter • Provision of thermal insulation for buildings resulting in less power demand and fewer polluting by-products
Improved Aesthetical Features of the City	Through the improvement of the environment in the aesthetic manner green walls trigger the feelings of privacy and sense of enclosure. This improves human health and mental well-being while limiting the negative psychological effects associated with property demarcation.	• Creation of visual interest • Hiding unsightly features • Increasing property values • Provision of interesting free-standing structural elements, etc.
Local Job Creation	With the green wall market development such specialist as landscape architects, architects, irrigation consultants etc. will become employed.	• Less number of unemployed people

Source: Bertram, F., Mohan E., Peck S. 2008; Green Roofs for Healthy Cities, 2014.

6. Private Benefits of Green Walls

Sphere of Impact	Description	Benefits
Improved Energy Efficiency	Improves thermal insulation capacity through external temperature regulation.	• Trapping a layer of air within the plant mass • Limitation of movement of heat through the vegetation mass • Reduction of the ambient temperature via shading and plant processes of evapotranspiration • Creating a buffer against the wind • Interior applications may reduce energy associated with heating and cooling outdoor air for indoor use
Building Structure Protection	Temperature fluctuations can be damaging to construction materials in building facades. Green walls provide an additional layer of exterior insulation and thereby limit thermal fluctuations.	• Protects building's facade from UV radiation and rain • Benefit for the seal or air tightness of doors, windows, and cladding through mitigating wind pressure
Improved Indoor Air Quality	Green walls (through the plants and micro-organisms) are able to filter contaminates that are flushed out of buildings through traditional ventilation systems.	• Capturing airborne pollutants such as dust and pollen • Filtering noxious gases and VOC's from carpets, furniture and other building elements
Noise Reduction	Green walls block high frequency sounds, and when constructed with a substrate or growing medium support can also block low-frequency noises.	
LEED	Green walls contribute directly to achieving credits for receiving the ecological labels.	
Marketing Potential	Improved aesthetics brings a competitive advantage to a project that may help to promote it successfully in the marketplace.	

Source: Bertram, F., Mohan E., Peck S. 2008; Green Roofs for Healthy Cities, 2014.

7. Design-Specific Benefits of Green Walls

Sphere of Impact	Description	Benefits
Increased Biodiversity	Green walls sustain a variety of plants, pollinators, invertebrates, and provide habitat and nesting places for a number of birds.	• Increased number of plants and birds in an urban area
Health and Well-Being	Green walls provide visual access to natural settings.	• Increased job satisfaction and productivity/post-operative recovery rates in medical facilities • Improved health and well-being
Urban Agriculture	Green walls can be used as vertical gardens of fruits, vegetables, and herbs.	• Opportunity for urban agriculture development
Onsite Waste Water Treatment	Green walls filter water in a number of ways I order to reuse it for household use or irrigation purposes.	• More rational use of water

Source: Bertram, F., Mohan E., Peck S. 2008; Green Roofs for Healthy Cities, 2014.

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