

LUCIA

LIGHTING THE BALTIC SEA REGION

CO-CREATING URBAN LIGHTING SOLUTIONS

LUCIA lessons learned report

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LUCIA LESSONS LEARNED REPORT

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Preface

Urban planning processes depend highly on various players and stakeholders coming together to discuss the issues and share their experience. But such communication is not only needed between those who are directly involved in the planning process- experts, specialist planners, policy makers, public managers, etc- but also with the general public and the different interest groups. Within the LUCIA project, the participation and involvement of both experts and the public are therefore an essential part of overall activities. This report will describe the importance and variety of co-creation activities in the planning processes and define what they mean to the LUCIA project.

In recent decades, urban development processes have shown that residents are expressing an increased interest in the structural development and planning of their living environment. Connected with this is the desire for more transparency and participation to allow them to help shape their own city, residential district or surrounding neighbourhood. The need for information and communication about urban development is growing, as is the demand to participate in this development. And the methods for collecting, processing and presenting the desired information have advanced steadily over the past decades. [1]

The LUCIA project aims at helping municipalities in the Baltic Sea Region (BSR) to unlock their enormous potential for smart, energy efficient urban lighting solutions. Besides providing decision makers and experts with knowledge covering aspects of the environment, technology, economy, social acceptance, urban planning and green public procurement, the project further offers strategies on how to boost citizen involvement. But LUCIA also pursues its educational task to inform residents not only about the lighting situation in their own city, but also about the effects of illumination on the surrounding environment.

The guiding principle behind this document is what has become known as “co-creation”, meaning an inclusive and cooperative approach to public participation. The authors focus here on co-creation as it is applied in planning projects, and in particular on the aspects of lighting and illumination within those projects. On the one hand, this “lessons learned report” addresses the thematic foundations of co-creation and why it is important to open up planning processes to the public. At the same time it presents the results of project work done at six pilot sites in different European countries where planners have chosen very different approaches to the topic.

The first part of the document outlines the background and basics of participation and the benefits that co-creative processes bring to the planning process. It also presents a number of methods and activities for organizing co-creation. This is followed by a more in-depth examination that looks at the results of the activities designed and implemented at the different pilot sites within the LUCIA project. The outcomes achieved and the experience gained in the participating countries are brought together to form practical guidelines that can help other projects to conduct their own activities and to encourage the involvement of citizens and other interest groups. The final chapters will therefore look at the key findings from the co-creation activities and present the lessons learned from these activities. As such an approach is innovative and far from common practice, these lessons learned are an important support tool for other cities and municipalities in the BSR who might want to replicate this approach.

CHAPTER 1.

Introduction to Co-Creation

Urban planning processes depend highly on various players and stakeholders coming together to discuss the issues and share their experience. But such communication is not only needed between those who are directly involved in the planning process- experts, specialist planners, policy makers, public managers, etc- but also with the general public and the different interest groups. Within the LUCIA project, the participation and involvement of both experts and the public are therefore an essential part of overall activities. This following section will describe the importance and variety of co-creation activities in the planning processes and define what they mean to the LUCIA project.

In recent decades, urban development processes have shown that residents are expressing an increased interest in the structural development and planning of their living environment. Connected with this is the desire for more transparency and participation to allow them to help shape their own city, residential district or surrounding neighbourhood. The need for information and communication about urban development is growing, as is the demand to participate in this development. And the methods for collecting, processing and presenting the desired information have advanced steadily over the past decades. [1]

The role of public participation has changed in recent years. The need for information and co-creation within planning processes has increased, especially where planning is related to local areas or to topics connected to environmental, cultural or social issues. The reasons for this increase include the desire of many residents to take matters into their own hands, combined with a growing dissatisfaction with political decisions. Local inhabitants today want more government transparency and more participation in the planning processes. Their wish to co-create their living environment, their neighbourhoods and their future, and to achieve concrete aims, certainly has an effect on project development. Structural changes in urban development processes that deny any kind of involvement are often met with public resistance. The negative consequences of insufficient communication may include scheduling delays, higher costs and massive protests accompanied by a drop in acceptance for a project. [2]



Figure 1: Walking through „Alter Elbtunnel“- Hamburgs reopening of it's historical tunnel under the river Elbe

City administrations are becoming more and more aware of these demands and they are working to interact with the public in new ways. Many cities are opening up their planning processes, using proactive communication and (digital) tools that go beyond the customary line-up of participation activities. Various forms of participation and information dissemination have evolved within planning processes. These range from surveys and joint workshops to online participation on a wide variety of topics related to urban development (detailed examples can be found in section 1.3). Examples of successful participation projects include:



Figure 2: A “fluro flash mob” dancing through the city’s streets, LUMIERE DURHAM 2017

LUMIERE – Lighting festival for and with everyone, United Kingdom

Lumiere is a biennial light festival held in the north of the United Kingdom (Durham) that offers an extensive programme for a wide spectrum of the population. There are plenty of opportunities for local people to get involved in the festival, from applying to competitions with an idea for a light work, to being part of an installation, or volunteering as a Lumiere festival maker. Over the last ten years, producers and artists have worked with thousands of local people and schoolchildren in Lumiere projects, including making work with some of Durham county’s prison population.

Each Lumiere festival invites local and international artists to create works that reimagine familiar buildings and public spaces, changing the way urban surroundings are experienced.

RijnWaalpad – supporting mobility through light, Netherlands

The RijnWaalpad is a new, fast connection for cyclists between Arnhem and Nijmegen and is the main cycling link between the two largest cities in the region. As cycling already boasts a high modal share in the Netherlands (supporting goal 11 of the 17 SDGs), the aim now must be to increase cycling comfort and convenience through quality infrastructure. One aspect of this effort is to provide good riding surfaces and to enhance both the subjective and objective level of cycling safety for the members of the target group. With this in mind, the cities of Arnhem and Nijmegen agreed to build a bicycle highway as one solution towards greater transport sustainability. The distance between the cities is roughly 20-25 kilometres and as such is an ideal stretch for an (e-)bike. But this project also included the development of special lighting elements and an illumination concept.

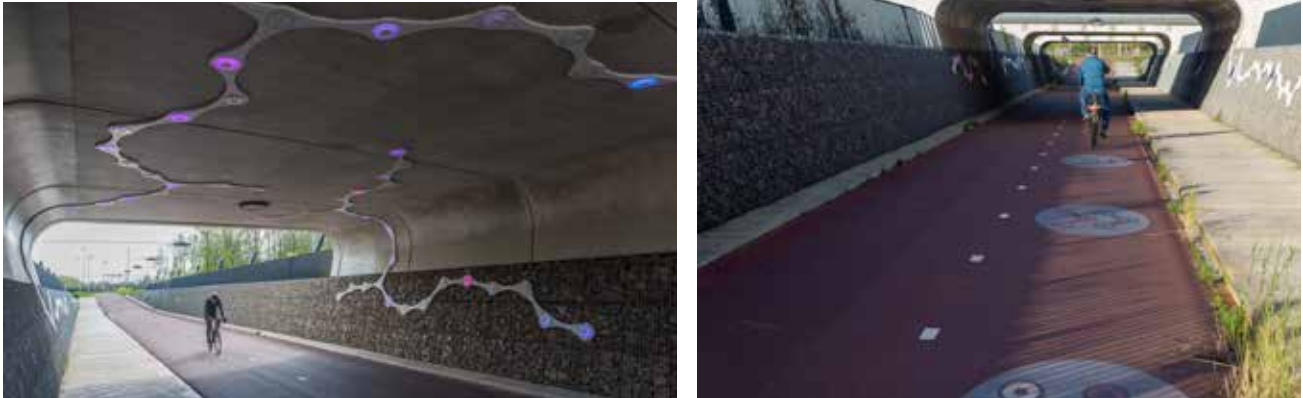


Figure 3 and 3.1: Bicycle-underpass A15 at Rhein Waalpad, Holland

The walls and ceilings of a tunnel on the route were designed with symbolic bicycle chains and the cycle path's logo. In normal operation, these elements light up in a variety of colours. But with a special app, users can request a desired colour to appear when they pass through the tunnel. The more often a cyclist uses the path, the higher their colour will be ranked. [3]

This is of course more “gamification” than “participation”, but it is also an example of how a long co-creation process can produce a successful outcome, in this case a popular cycle path. Subjective and objective safety as well as digitalisation play key roles in the project. Daily use by cyclists serves to anchor the participatory element, with citizens actively experimenting with light and light effects.

The activities described above are part of the process known as co-creation. Originally adopted from business strategies for identifying new forms of customer engagement, the co-creation concept is becoming ever more popular among urban planners as well. The need for co-creation evolved as a response to the very complex challenges facing cities today. Cities and other administrative divisions are increasingly using forms of co-creation that include sharing, combining and maximizing opportunities to involve their residents. [4]

Today, communication and participation must be counted among the core competences of the planning professions. The sharing of knowledge between different stakeholders- administrative divisions, policy makers, investors or the public- is a key part of any urban planning process.

So it is no longer a question of if there is communication and participation, but rather of how, when and with whom they are realised. These questions will be addressed in the following subsections.

1.1 Terms and forms of participation

Communication happens whenever people come together. It may be verbal or non-verbal, and may take place on a digital platform or face to face. The term participation can encompass different meanings and different scopes and as such can be interpreted in different ways. To provide a general overview of the subject, this section takes a brief look at the terminology of participation and at the commonly practiced forms of participation with their different aims, methods and target groups.

INFORMATION

Information has two meanings. The first is to supply yourself with information, i.e. to actively gather information, data and knowledge. With respect to planning processes, this can be accomplished through research, observation and analysis, or by exchanging information with others. [5]

The second meaning concerns the supplying of information to other people. This happens when we pass information, data or knowledge to others or when we notify or make them aware of new facts. In the process of informing others, there is normally no interaction between the different parties. The main goal is to provide information, though of course a reaction by recipients to the information received is always possible. [5]

PARTICIPATION

The involvement of different parties in a (communication) process is known as participation. In urban planning processes or planning projects, the goal of participation is to gather ideas, suggestions and opinions, but also to have an open ear for criticism, concerns and fears. In rare cases, participants may even have the opportunity to take part in actual decision making. Normally, however, decision-making responsibility remains with the public authorities and residents do not have much say when planning decisions are taken. Exceptions to this rule include citizen or public referendums.

With regard to participation and what it means, a distinction must be made between formal participation, regulated by law, and informal participation. Section 1.2 will give a brief overview of the legal differences pertaining to participation in the LUCIA countries.

Workshops, round tables or similar activities not regulated by law take place on a voluntary basis and can be organised independently of standard procedures. Such activities considerably extend the spectrum of communication between the actors and can play a relevant part in the success of a planning process and its outcome. [5]

Figure 4: open light installation in Porvoo, Finland. Residents of Porvoo were introduced to the LUCIA project and could share their opinions and wishes for the planning area



COOPERATION

Cooperation is about different parties working together. Cooperation partners can make their contribution to pursuing topics and solving problems, or they may participate in decision making. The implementation of projects or subprojects can also be carried out with the involvement of various actors. Citizens can get involved through membership in associations or civic initiatives, but it is less likely for individual citizens to join a cooperation. The hierarchies within such models can vary to a great extent, with a diverse spectrum of possible procedures and methods that can be combined in various ways. [5]

CO-CREATION

Co-creation is commonly used to describe the shift in thinking from a hierarchical definition of value to a more participative process where people and organizations together generate and develop meaning with respect to a specific topic. There are various interpretations and applications of the term co-creation. A common understanding or definition does not yet exist. The term and concept of co-creation emerged from the business world in the 1990s as a new form of engagement with customers. The idea was to allow customers to participate in the production of products. Empowered customers are seen in this concept as the main source of innovative ideas. Co-creation consists of active, bilateral (or multi-lateral) relations with the customers. The relationship between government and citizens can be seen in a similar way, where solutions are created with the public sector and not for it. [4]

In the context of the LUCIA project, co-creation is defined as an instrument that gives local residents the opportunity to take part in the lighting planning processes. Since the pilot sites work at specific local areas, citizens can be involved in the examination of concrete questions. Ideally, the participation process will allow for active participation and decision making depending on the specific issue at hand. In addition to participation, LUCIA's educational mandate also involves the provision of information to enhance the public's knowledge and awareness of lighting-related topics. With the co-creation activities, information and co-creation go hand in hand.

1.2 Public participation and co-creation: a (European) approach

For legally standardised planning such as in a land use planning procedure, public participation is often bound to a formal procedure that provides for communication with the public. In the states of the European Union, the legal regulations that determine the degree of participation vary to a great extent. The following overview presents the framework of legal regulations that determine the co-creation processes in the participating countries of LUCIA. This overview helps to classify what depth and scope participation formats can have and how they are anchored in the daily work of urban planning.

Figure 5: Participating countries at LUCIA





DENMARK – INVOLVING THE PUBLIC IN VARIOUS WAYS

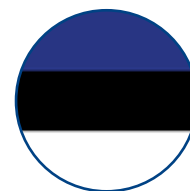
Public participation was introduced in the period 1970–1975 at all planning levels of the Danish planning system, i.e. for regional and municipal comprehensive planning and for local district plans and urban renewal plans. The recent modernization of the Planning Act has focused on promoting strategic planning, reinforcing public participation in planning, improving the opportunities for regenerating disused industrial sites into mixed-use urban districts, promoting environmentally sound location policies, and protecting attractive and vibrant town centres and open stretches of coast. [6]

The act ensures that the overall planning synthesizes the interests of society with respect to land use and contributes to protecting the country's nature and environment so that sustainable development of society with respect for people's living conditions and for the conservation of wildlife and vegetation is secured. Involving the public in the planning process as much as possible is one of the act's main goals. The Planning Act involves the public in the planning. Denmark has a simple and clear spatial planning system with a strongly decentralized division of tasks. The municipal councils are responsible for comprehensive land use regulation at the municipal and local levels with legally binding guidelines for property owners. The regional councils prepare a strategic plan for spatial development in each region.

The Minister for the Environment is responsible for upholding national interests through planning. Before a municipal plan, a regional spatial development plan, a national planning directive or a national planning report may be adopted, a proposal and a report on the premises of the proposal must be published. Property owners, neighbours, nongovernmental organizations, public authorities and others then have at least 8 weeks to submit their objections, comments, proposals or protests.

The Planning Act stipulates minimum rules on public participation. The planning authority decides whether it should distribute more material for discussion, arrange citizens' meetings, establish working groups, create electronic citizens' panels, or the like. The municipalities experiment with various ways of involving the public, nongovernmental organizations and other organizations in the planning process. For example, several municipalities have prepared a policy on community democracy. Other municipalities are experimenting with discussing strategy and development potential more informally before the formal planning procedure begins. [6]

ESTONIA – FOCUS ON E-GOVERNMENT



Political participation is closely linked to Estonia's development towards a digital society: following the establishment of e-government, the Estonian government has invested heavily in electronic-governance in recent years. The use of digital communication, which is taken for granted throughout the country, allows for the almost universal use of digital forms of participation. In addition, the digital identity also enables binding signatures for participation instruments and online elections. [7]

The participation endeavours of the government follow the “good practices of engagement” established in 2012. The good practices of engagement offer a guideline on how to utilize public participation. This includes informing interest groups objectively about projects and about their participation options. This is done relative to the size of the given project. The impact on certain groups and the space itself is assessed by consulting the impact assessment guidelines. The Environmental Impact Assessment and Environmental Management System Act, for example, includes public meetings, public display for at least 14 days and, if needed, a modification of plans based on the co-creation outcomes.

The interest groups must be identified before the first draft of any project is sent to the responsible ministries. This is done once before the draft has been fully developed and then a second time when the developed draft is passed on for implementation. The good practices of engagement additionally call for feedback about the consulting process to be provided to the public so that it can learn how policy makers dealt with the information that the public provided. [8]

According to the Planning Act, the administration of planning activities inside the administrative territory of a city is within the competence of the local government. The local government shall: ensure that there are plans which serve as the basis for land use and building; ensure, as a prerequisite for adoption of a plan, that the interests of interested persons are taken into consideration in a balanced manner; ensure that adopted plans are adhered to. [9]

Once the detailed plan has been submitted for approval by the initiator of planning, the city planning office again examines whether the set requirements have been followed in the plan. Approving the detailed plan also needs approval from the neighbours of the area being planned, which is why cooperation between the owners of immovable property located in the planning area is important. Neighbours can intervene through the two-week public display and, if held, through public discussion sessions of a detailed plan. Everyone has the right to present proposals and objections concerning a certain plan during its period of display to the public. An objection is the presentation of a disagreeing opinion concerning a planning solution or a claim that the requirements of the law have not been met in the processing of the plan.

The city government has the right to decide whether to hold public discussion after the public display of a plan, as well to inform the public about the discussion event. On the basis of the outcome of the public display and public discussion, the local government shall make the necessary amendments to the plan and, if necessary, submit the plan to the supervisory authority together with proposals and objections which were not taken into consideration. If the amendments resulting from public events change the basic content of a plan, recoordination of the plan and a new public display should be arranged. The final approval for adoption of the plan comes from the city council. (Planning Act §10-29). [9]

Besides initiatives and involvement administered by the official governing side, Estonian law is also favourable for NGOs. One major step towards an inclusive future was the Estonian Civil development concept, adopted in 2003. This document recognized the plurality of non-profit organizations representing different values and interests. The public and non-profit sectors are obliged to involve citizens, ensure that people receive information on draft decisions and express their viewpoints. In this manner, the citizens and their associations are involved in the process of developing, implementing and analysing public policies and legal acts. [10]



FINLAND – LONG TRADITIONS IN PUBLIC CONSULTATION

„The tradition in consulting started in the post-war years. Consultation is widespread in the Finnish administration although it is more intensive in some areas than in others. Information, consultation and participation have always been high on the agenda in Finland.“ [11]

The participation process in Finland took a turn, however, when in 1999 a new act came into force that replaced the old law on Openness of Government Activities from 1951. The new law provided the public with “the right of access to information in official documents in the public domain”. As a tool to support this, the Register on Projects and Legal Preparatory Documents of the Finnish Government was launched in the years that followed. It not only shows the current public projects of the government, but also provides the people with contact information for submitting comments or opinions about a certain project. [11]

In Finland, planning procedures must be organized and the principles, objectives, goals and possible alternatives of the plan must be released to the public so that it has the opportunity to participate in preparing the plan. This means that a scheme has to be elaborated within a particular period depending on the purpose and significance of the plan. The scheme must cover the procedures of participation and interaction as well as an assessment of the plan’s impact on the people concerned. In addition, the initiation of the planning process must be publicized so that interested parties and landowners have the chance to inform themselves about the process. A planning review can also be published. [12]

In a second step, negotiations are held between the local authority and the regional environment centre about the assessment and participation scheme. Interested parties can also propose negotiations to the regional environment centre. If they deem the plan to be inadequate, the regional environment centre has to re-negotiate with the local authority as well as with the proposing party and other authorities and organizations which are affected by the plan in order to modify the scheme until it is deemed appropriate. Then the plan proposal is made accessible to the public for a period that again depends on the significance of the plan. During that period, the interested parties and members of the municipality can submit comments on the plan and present their point of view. If they have any objections, the local authority must respond to them and present its arguments. [12]

After the plan has been drawn up in this way, contact is made with the competent ministry and the regional environment centre and negotiations are held between them, the regional council and if necessary other concerned authorities to clarify how the key goals relate to the drawing up of the plan. If a plan is important for land use, natural values, cultural environment, or the government authorities’ implementing obligations, it is prepared in consultation with the environment centre and negotiations are set up between local authorities and the regional environment council to clarify how national, regional and other key goals relate to the creation of the plan. When the plan is finally approved, notification of this decision is sent immediately to the interested members of the municipality and to the objectors of the plan. (Land Use Building Act, sections 63-67)

GERMANY - EFFECTIVE DIALOGUE WITH THE PUBLIC



Co-creation processes and bottom-up initiatives are nothing new to the German participation discourse. A steady rise in the extent of public participation and its importance to the political agenda can be witnessed.

The amount of citizen participation and co-creation in Germany varies widely on the different administrative levels. At the federal level, there is very limited room for influencing projects directly. But in smaller-scale administrative divisions, such as municipalities, the possibilities for participation increase. Public participation is organized in various legal codes, including but not limited to the Administrative Procedure Act (§25), the Building Code (§3) or the charters of the individual municipalities. A distinction is made between legally prescribed, formal participation procedures and voluntary or informal public participation. [13]

As of 2013 the Administrative Procedure Act has been significantly changed in order to allow for citizen participation at the earliest possible stage. This change was the direct result of lessons learned from controversial building projects in the past, such as the Stuttgart 21 development project. The additional subsection §3 calls for citizen involvement before the start of the planning phase itself. The aim in encouraging citizen participation as early as possible is to significantly improve the acceptance and quality of planning procedures and of the projects themselves. Formal participation involves inviting and collecting the opinions, concerns, objections and suggestions of the various stakeholders in a building or restructuring project. These stakeholders include citizens and associations as well as other interested parties such as public service organisations (municipal administrations, police departments, fire brigades, etc). The developer is obliged to carry out a weighing process that includes all private and public concerns. [13]

Like the Administrative Procedure Act, the Building Code also dictates the extent to which the public is to be involved. Firstly, the public needs to know the goals of a project and the means by which these goals are to be achieved. If there are different possible plans of action, all must be presented. Furthermore, the development plans must be made publicly accessible for a period of at least 30 days, during which concerns and proposals can be submitted. If more than 50 people voice a similar idea or objection, they are granted access to the planning results.

The municipalities can decide on how public participation is carried out. This may, for example, take the form of citizens' meetings, question times or the public display of plans (town hall, administration building, etc). The citizens themselves can also initiate ideas. One tool for doing so on the municipal level is the citizen proposal. [14]

In addition to the forms of public participation governed by law, informal participation procedures are also now a part of larger-scale building and planning projects. Various formats and methodologies exist to permit the interested public or those affected by the planning to get involved. The goal is establish an effective dialogue between citizens and policy makers. These informal procedures serve to supplement the formal participation formats to give the public a wider range of avenues for shaping their surroundings. [15]



LATVIA – ENCOURAGE PUBLIC DISCUSSIONS

In the case of Latvia, participation in urban planning is a new concept which became relevant after its withdrawal from the Soviet Union and the subsequent privatisation of its housing stock in the 1990s. Citizens were included in urban design and planning in the late 1990s when laws were passed that required public approval of municipal and private development plans. This basically meant that citizen impact on decision-making was limited to the right of veto. In 2009, the situation changed when the municipality of Riga launched the “Apkaimes” (neighbourhoods) project. Among other objectives, the project encouraged residents to participate in public discussions of municipal development plans before they were drafted. Discussions were initiated and organised by municipal agencies and they were limited to public consultation. [16]

The Latvian Regulation on Public Interpretation and Participation in Construction Projects describes the aim, necessity, procedure and measures for involving the public in planning processes. The aim of the ordinance is to hear and weigh the interests of developers and society that are relevant to the decision to issue a building permit. The ordinance has been in force since 2014. The local building authorities are responsible for coordinating and monitoring public participation. However, the costs of organising and conducting public participation are covered by the developer. The building authority decides on the necessity of public participation based on possible adverse effects that the construction project could have on the environment, infrastructure, neighbourhood or people’s health. The specific factors taken into account here include things such as vibrations, noise or odour pollution. The applicant must be able to produce appropriate documents and expert reports to provide information on the possible impacts. If adequate participation is not carried out, no building permit can be granted. [17]

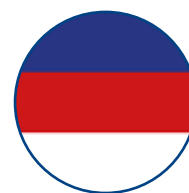
For public participation purposes, the developer must disclose the type of construction project planned, to include the exact location, and indicate the names and addresses of the companies who will be involved in the construction. The developer must further state when the public will be able to view the documents and information on the possible impacts of the construction project, and when the public presentation/presentation of the construction project will take place. It must also be communicated where and in what time frame feedback can be submitted. The prerequisite is that the public has unrestricted access to the information. In addition to publishing the information on the official website of the building authority, the developer is obliged to erect an appropriate construction information board of specified size and material at the planned construction site to provide information about public participation. [17]

During the participation period, the public has the opportunity to inform themselves about the planned project and participate in the public presentation, express their opinions, ideas and criticism, and consult with experts or surveyors. After the participation period has expired, the building authority compiles an overview of the contributions submitted and evaluates them. The compilation is then published no later than one month after the end of the participation period. The building authority will make a decision on the granting of planning permission after evaluating the participation outcomes.

The decisive factors here include the adverse effects on adjacent property owners and neighbouring properties, public opinion and any objections raised by experts. The decision to approve or reject the building permit is published on the official website of the responsible region. [17]

The law on Local Governments allows the creation of boards, commissions or working groups in order to carry out certain duties or to manage the administrative territory, with such bodies consisting of local government council members and residents. They act according to the statutes decreed by the council. The consultative council has advisory rights on issues relating to public agency activities. The opportunities for NGOs to take part in the decision-making processes are: attending advisory board meetings; getting in touch with decision makers by writing letters and/or organising meetings; co-operating with the authority; joining in work groups; participating in weekly meetings of State Secretaries of ministries; getting involved in public discussions organised by state institutions; starting their own campaigns. [16]

RUSSIAN FEDERATION – SUPPORTING CITIZENS IN PARTICIPATION



Russian local self-government legislation is based on the ideas and guidelines of the European Charter of Local Self-Government ratified by Russia in 1998 (Council of Europe, 1985). The government, especially on the municipal level, is obligated to support citizens in their participation endeavours as well as local self-government. [18]

The implementation and regulation of public participation in Russia is the municipalities' task, but the federal law on the basic principles of the organisation of municipal self-government in the Russian federation dictates instances during which participation is mandatory. Examples include the necessity of public hearings/discussions whenever a new master plan is formulated or there is a major change in land use activities for a certain area (Article 28). Public participation is additionally regulated by the town-planning code of the Russian Federation that came into effect in 2004. According to the law, all citizens living in the affected area, owners of parcels within the area and owners of rooms within the area must be informed about the planning process and public discussions or public hearings shall be provided. The time given between the announcement of the public hearings or discussions and the actual event must be more than one and less than three months. Also, the public must have the access to information about the plan and the results of the discussion/hearings. (Town-planning code of the Russian Federation, Article 5.1). [19]

In their charters, municipalities themselves define the topics that are most important and therefore most relevant for public participation. The framework of the charters is defined by the basic principles of the organisation of municipal self-government in the Russian Federation (Article 44). As stated here, the municipal charter must include essential issues, methods, and legal frameworks for citizen participation and local self-government. One such example might be seen in the obligation to hold public hearings in certain situations. In the case of St. Petersburg's charter, these include changes in the municipalities constitution, new budgets, and overall questions regarding transformations within the municipality.

INFORMATION

PARTICIPATION



Denmark

The Planning Act stipulates minimum rules on public participation. Planning reports must be published. Property owners, neighbours, nongovernmental organizations, public authorities and others then have at least eight weeks to submit their objections, comments, proposals or protests.

The planning authority decides whether it should distribute more material for discussion, arrange citizens' meetings, establish working groups, and create electronic citizens' panels or the like.



Estonia

Everyone has the right to present proposals and objections concerning a certain plan during its period of display to the public. An objection is the presentation of a disagreeing opinion concerning a planning solution or a claim that the requirements of the law have not been met in the processing of the plan.

The city government has the right to decide whether to hold public discussion after the public display of a plan, as well to inform the public about the discussion event. The public and non-profit sectors are obliged to involve citizens, ensure that people receive information on draft decisions and express their viewpoints.



Finland

The initiation of planning process must be publicized so that the interested parties and the landowners have the chance to inform themselves. Planning procedures must be organized and the principles, objectives, goals and possible alternatives of the plan must be released to the public, so that they have the opportunity to participate in preparing the plan.

A scheme must be elaborated in a time depending on the purpose and significance of the plan. The scheme must cover the procedures of participation and interaction, as well as an assessment of the plans impact on the people concerned.



Germany

Administrations are legally bound to give public information about planning process and the opportunity to raise options. Formal participation involves obtaining opinions, concerns, objections or suggestions from various stakeholders for a building or planning project. The developer is obliged to include all concerns in a weighing process.

Apart from the legally regulated public participation, there are no other obligatory measures that regulate communication in a planning project. The informal participation formats are initiated voluntarily by the developer. There are various formats and methods for the interested public or those affected by the planning to get involved.



Latvia

A public discussion is obligatory in cases of the creation of a territorial plan or in certain cases of public works. Documents and information on the possible impacts of the construction project are public and when the public presentation of the construction project will take place. It must also be communicated in which period and to which address the feedback can be given.

The law on local governments allows the creation of boards, commissions or working groups in order to carry out certain duties or to manage the administrative territory, which includes members of the local government council and the residents.



Russia

All citizens who are living in the affected area, owners off parcels within the area and owners of rooms within the area must be informed about the planning process and public discussions or public hearings shall be provided.

Public participation includes local referendums, town hall meetings or citizen initiatives. Said initiatives are created by citizens and officially presented to the municipality's administration only after a citizen's conference, during which aspects of the initiative are being discussed.

Figure 6: Overview of information and participation regulations in the participating countries of LUCIA

Other means of public participation include local referendums (basic principles of the organisation of municipal self-government in the Russian Federation, Article 22), town hall meetings or citizen initiatives (Article 26). Such initiatives are created by citizens and officially presented to the municipality's administration only after a citizen conference is held in which aspects of the initiative are discussed. This process is not limited to only one initiative; multiple initiatives can be discussed at one citizen conference. If there are several similar initiatives or applications, the local administration may hold a contest. After a 30-day period the local administration decides whether to discard the idea or pursue it further.

In the case of St. Petersburg, citizens of the city aged 18 or older, except city administration workers and deputies of any level, can submit ideas to the participatory budgeting (PB) programme. Budgeting committees composed of 20 people are then established in each one of the participating districts of St. Petersburg. The members of these committees have the right to vote on which projects will be given priority in the given district. Committees make their selections by randomly drawing winners from the pool of interested applicants. The method is very similar to citizen juries or court juries. Surveys are another common tool used when matters of local relevance come up. As in other EU countries, the results of such surveys are not legally binding and rather function to assess the general tenor of public opinion, which is then considered before taking further action.

Beyond the formal methods of co-creation and public participation discussed above, the citizens of St. Petersburg have the freedom to participate in planning decisions and practice self-government in other ways as long as they comply with the law. (Organisation of Local Self-government in St. Petersburg, Chapter 5, Article 24). [19]

1.3 Case study: opportunities and methods for involvement

Forms of communication vary widely in both private and professional settings. In the context of planning projects, diverse formats are used to provide information, to interact or to enter into dialogue. Communication no longer needs to happen face to face in order to be effective. There are many ways to communicate, especially in the digital sphere. The following subchapter will provide a brief overview of the common forms of communication and participation within (urban) planning projects that can be also applied to field of lighting planning.

Before diving into specific formats of participation tools, let's look at the three levels of communication that build the foundation of effective interaction. These three levels describe the form of interaction, which in turn defines the form of response and dialogue.

In **one-way communication**, information is transferred in one direction only, from the sender to the receiver. There is no opportunity for the receiver to give feedback to the provider of the information. Examples of such communication include downloads, announcements, newsletters or press releases. These do not allow for dialogue or the exchange of viewpoints. [20]

Two-way communication is based on a dialogue or exchange between different parties and can be referred to as interpersonal communication. The addressed parties are involved in the exchange and also transmit information. Examples here include communication by e-mail, in forums, on contact forms or during bilateral exchanges during meetings. It may also include the recording of requests or reactions in the form of comments. [20]

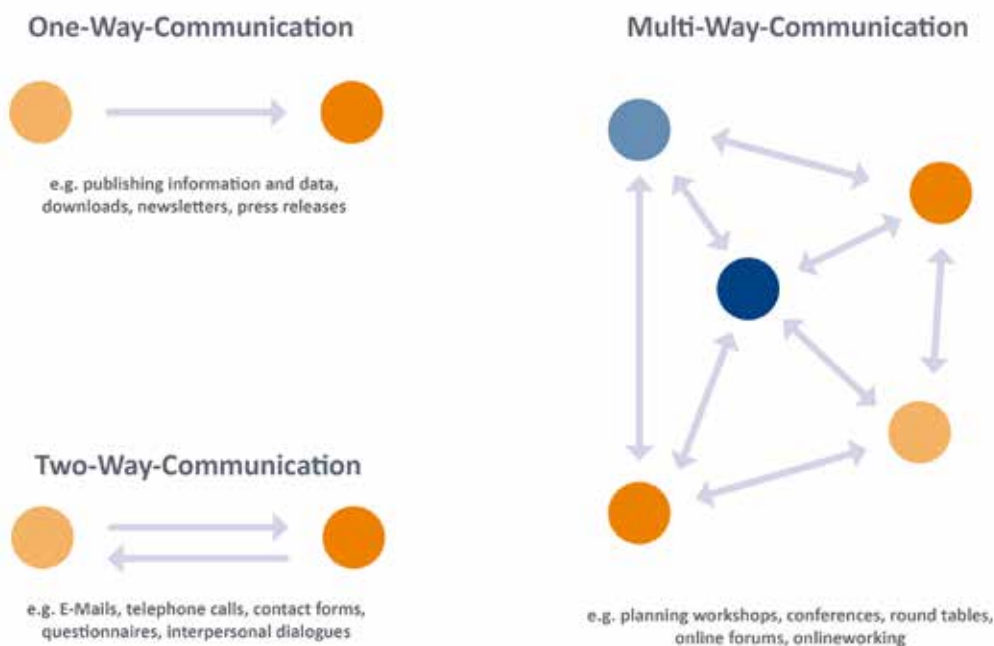


Figure 7: Vizualisation of communication forms

Multi-way communication is an ongoing process of dialogue that enables a joint exchange on various topics. Online platforms for participation, internet conferences, city and citizen servers can be part of such communication offerings. [20]

These different levels of communication define the methods and formats which are likely to be used. When planning information or participation tools, one needs to consider desired outcome and level of communication and then adapt the format and method to these needs.

FORMATS

In order to achieve sustainable urban development, it is important to involve the various stakeholders in the relevant processes. It is furthermore important to develop and apply participation formats appropriate to the given project and topic. These formats usually pursue the goal of informing the interested public and “taking the audience with you”. More extensive programmes will also include events with active participation and dialogue. Such events communicate success and allow people to participate in the implementation of the project. Methods can be divided into two main categories: formats focusing on information and formats focusing on active participation. On the second level, they can be further divided into analogue and digital formats.

Formats with an informational character are chiefly concerned with providing detailed information, raising awareness and conveying content. They serve to publicise information, data and dates and may concern both construction works and the project or topic as a whole. Communication can be a part of it. Methods include informational letters, an e-mail distribution list, newsletters, informational events or a separate website for a project/topic. Combining these measures is an effective way of reaching as many people as possible.

Extensive formats with a participatory character focus on the active involvement of participants in addition to just providing information. In open processes, the aim of such formats can be to collect opinions and ideas and to create an opening for dialogue. Formats may include round table discussions, workshops of various types, competitions, project dialogues, etc.

The difference to the purely informational formats is the active involvement of participants and the openness to new and creative ideas. But all participation formats provide basic information about a project in order to create a common information base and ensure that all participants have the same knowledge.

More detailed examples on how participation tools can be designed specifically for lighting projects are discussed below.

NIGHT-TIME EXPLORATORY WALKS

Guided walks with inhabitants, experts, or any other interested group of people can be very helpful in analysing an area. Experts can elaborate on how lighting is designed and perceived and raise awareness about light pollution and its consequences. Locals can talk about their everyday experience with lighting and explain the demands they place on it. Guided walks can also focus on specific target groups such as elderly, disabled or very young people and discuss their points of view. Group walks bring together inhabitants and other users to walk through an area at night and provide a setting where they can freely discuss how they use and feel about the space.

The organization of a guided walk consists mainly of:

- designing the concept and theme of the guided walk
- developing a tour and preparing background information
- inviting guides, speakers and participants
- documenting the results



Figure 8: Guided LUCIA light walk in the Borough of Hamburg-Altona with elderly

	INFORMATION	COMMUNICATION
TRADITIONAL	<ul style="list-style-type: none"> • informative letters • flyers, booklets, posters • tours, guided walks • information points • visitor centers 	<ul style="list-style-type: none"> • open dialogues, personal interaction • telephone hotlines, citizen consultation • round tables, workshops • all kind of open air activities
DIGITAL	<ul style="list-style-type: none"> • (project) websites • newspapers, online magazines • local press (websites of municipalities or districts) • knowledge portals, specialist media, websites of NGO's and interested groups 	<ul style="list-style-type: none"> • contact forms, persons in charge • online participation tools, for example: mapping, writing comments, voting • online surveys and questionnaires • digital seminars and events

Figure 9: Schematic overview of participation formats

(LIGHTING) WORKSHOPS

Experimenting together can offer a good opportunity to introduce people to the world of lighting. A workshop is an event at which a small group of people concentrates closely on a mostly practice-oriented topic for a limited, compact period of time. One characteristic of a workshop is the cooperative and moderated way of working towards a common goal or a creative output. Workshops on the subject of light can examine specific spaces or situations and also deal with fundamental topics.

Other forms of lighting workshops may integrate concrete issues of design, layout and lighting effects. The scope for designing workshops is very wide in terms of both content and methodology. Ideally, they will offer all participants the opportunity to contribute creatively while at the same time gain new knowledge about the given subject. Working together on a common task is an excellent way to get different actors and groups to sit down at the same table. For children, seniors and people with disabilities, workshops on the topic of lighting can be particularly exciting.

The effort required to organise workshops varies and depends on the activities planned. If the main focus is on content, methods involving writing, painting or recording ideas are suitable. The exciting thing about light, however, lies in the different effects and forms it can have. So investigating and experimenting with forms of light in a workshop is certainly a more exciting approach, but one that of course requires more preparation and time.

The organization of a workshop can consist of:

- specifying the topic, goal and target groups for the workshop
- designing the concept and timeline for the workshop
- inviting the participants and advertising the event if necessary
- preparing the materials, documents, etc necessary for working together
- organising moderators, competent supervisors, speakers or experts to provide guidance and background information
- organising facilities and catering as required
- documenting the results



Figure 10 and 10.1: Guerrilla Lighting social event in Jyväskylä, Finland

GUERRILLA LIGHTING ACTIONS / LIGHT HAPPENINGS

The term guerrilla lighting is commonly used to define a range of ad hoc lighting installations or “happenings”. This movement has become popular around the world, engaging participants in various cities and countries. At a guerrilla lighting event, local players are mobilized for a short time to illuminate certain areas, buildings or selected places. These are mostly participative and playful events, but they serve to mobilise the local community or the target groups around lighting and the transformation of their urban space. This approach aims to reconsider how municipalities use light within the urban environment and raise awareness of the effects that lighting has on its surroundings. [21]

Events like these create a platform for debate about lighting in the public realm. Each experience enhances the dialogue and understanding of users and the perception of night-time environments. The use of mobile, battery-powered equipment makes these lighting events flexible and portable. In addition, people with no previous knowledge of the subject can be included, using torches or coloured gels to illuminate certain locations. [21]

While events and installations like these appear to be spontaneous, they are in fact carefully organized and planned. Issues that need to be considered include, for example, the choice of venue and the technical requirements. The timing and concept of the guerrilla light action should be chosen wisely. Parallel to such activities, it is advisable to create contact points for visitors and interested parties in order to provide information or to actively involve them.

The organization of a guerrilla lighting action can consist of:

- selecting a suitable building/area for the installation
- designing a concept/guiding principle for the illumination
- preparing the technical requirements
- advertising the event, inviting selected guests
- thinking about critical issues/consequence (e.g. light pollution)
- inviting the participants and advertising the event if necessary
- (photo)documenting the results



Figure 11: Examples on lighting actions

1.4 Limits of participation

The previous sections looked at various ways of actively involving the public in projects and highlighted the advantages of such participation. Participatory processes can indeed contribute significantly to better and more accountable decision-making on matters of public interest. However, they are not miracle cures that can be administered any time and any place to solve problems. Participation processes have little chance of success if those affected do not want to participate, for example because they have had negative experiences with participation processes, or see other ways of asserting their interests more effectively. [22]

Participation will also be low if there is a lack of support from decision-makers, if there is no room for negotiation or if the main decisions have already been taken. Social inequalities and differences in access to participation processes can also have a negative impact, for example if it is not possible to involve hard-to-reach or disadvantaged groups. This does not mean that the possibility of participation is excluded in these cases. It will, however, be necessary to create conditions and design frameworks in such a way that participation is possible and makes sense. [22]

CHAPTER 2.

Light and Co-creation: why it's important to involve the public

As stated above, the LUCIA process also has an educational mandate to inform residents not only about the lighting situation in their own city but also about the effects of illumination to the surrounding environment. What most people are not aware of is that humans have only lived in an artificially illuminated environment for little over 100 years. For more than 200,000 years, the natural rhythm of day and night dictated our daily routines. These days, city dwellers only experience true darkness during nature excursions or when they take journeys on overland roads or trips to less advanced places in the world.

The enthusiasm sparked by the new lighting technologies over time ensured that cities around the world would be illuminated, step by step, with electric light. This resulted in city nights becoming brighter and brighter, and artificial light emerged as a symbol of progress and prosperity. As a consequence of the passion for artificial light, we today find ourselves in a situation where cities are flooded with an excess of illumination. [23]

The problematic aspects of artificial (outdoor) lighting and its nearly exponential growth over the last century or so need to be addressed on a wider public scale. Light pollution is primarily a result of the increasing artificial illumination of not only private spaces but of commercial and public spaces as well. It is crucial to provide the public with information on this issue to raise awareness of the problem.

LIGHT AFFECTS HUMAN HEALTH

As the accessibility of humans to electric light grows, less and less of the planet is experiencing genuine darkness any more. In his book “The End of the Night”, Paul Bogard writes that the spread of electricity across many parts of the globe has condemned real darkness to the planet’s history pages. This lack of true night also has biological consequences, as the illumination of residential areas, cities and the general environment disrupts the natural rhythms not only of humans but of all species and other biological systems. [24]

Research shows that the variation of light is by far the most important factor in setting and maintaining our natural daily rhythm, the so-called circadian rhythm. Earth’s daily rotation determines sunrise and sunset and coordinates the daily rhythms of living beings. Artificial lighting results in a lack of darkness in towns and cities, disrupting these natural rhythms. Since humans have only been living in artificially illuminated environments for around 100 years, the long-term effects of light exposure at night are not yet fully understood. Studies conducted in past decades have proven that the negative impacts of excessive artificial light on living creatures are broad and complex. The inappropriate use of artificial light at night can harm the nocturnal environment and rob us of the possibility, common to all humanity just a century ago, to experience the wonder of the naturally lit night sky. [25]

As concerns the LUCIA project and co-creation activities, it is essential that we stress the importance of illumination and its effects on the environment and to enhance awareness of these issues. This message must be sent out not only to municipality governments but also to residents and the general public.

For this reason, the co-creation activities at the pilot sites not only invite participation in the fields of light design and usability, but also ask people to learn more about the negative effects of lighting.

ILLUMINATION SHAPES THE URBAN EXPERIENCE FOR CITIZENS – AND VICE VERSA

The illumination of private and public spaces plays a major role in how the area is perceived by others. Light is one of the essential elements in experiencing spaces, especially public spaces, after dark. But the perception of atmosphere, feeling of safety and quality of vision differ from person to person. These different perspectives may be traced to age, gender, background and life experience. Safety and security, for example, are basic needs shared by all people, but they can still be experienced very differently. Examining such feelings and experiences as they relate to lighting situations is a key factor in good decision-making. The best source of knowledge is, after all, the people who live and experience a given lighting context on a daily basis. It is therefore in the hands of planners or project developers to identify these lighting needs and to ask how residents, tourists and workers experience urban spaces, workplaces or their living environments after nightfall. It must also be said that people tend to demand more light than is actually needed, and engineers and builders are keen to satisfy them. This cannot help but result in the increased illumination of private and public spaces. [25]

Putting people at the heart of planning projects offers not only advantages to lighting designers. It also gives inhabitants the opportunity to actively reclaim their living environment instead of watching from the side-lines as planning decisions are taken. Generally speaking, raising people's awareness and understanding of appropriate light levels is often something that needs to be addressed on a public scale. That is why it is important to involve the public in lighting decisions. [25]

CHAPTER 3. LUCIA Co-Creation in Pilot Sites

The overall aim of LUCIA is to help decision-makers and planners in municipal administrations enhance their knowledge pertaining to energy-efficient urban lighting. To provide liveable, safe and pleasant urban spaces in the long dark winters of the Baltic region, urban lighting must necessarily play a central role in the design of cities. This requires special communication efforts. The project partners have a national responsibility for spreading information and function as disseminators for associated partners and other target groups. Communication and dissemination therefore help to guarantee the durability of the project results.

Besides the actual construction work or the concepts for the pilot sites, communication and co-creation activities involving local residents, interest groups and experts play a significant role and take on special importance within the process at each pilot site. The development of lighting solutions should therefore be carried out as a co-creation process together with local citizens.

This includes a number of focus groups in which citizens and planners collaborate to design a lighting concept that accommodates not only state-of-the-art technology and economic feasibility, but also wishes relating to urban design, the environment, safety, local identity and the needs of local communities.

The general target groups for co-creation activities are grouped into the following categories:

- 1. Local, regional and national public authorities** responsible for urban lighting
- 2. Local authorities in European cities**, in particular local elected officials, decision-makers and officers who work on the development and implementation of urban lighting and city development in general. This includes municipal staff from various departments – public lighting department, technology/smart city departments, transport and mobility departments, safety and security, urban planning departments, etc.
- 3. Metropolitan, regional and national authorities** that deal with urban lighting are also a target. This target group can be sub-divided into specialist and non-specialist audiences:
- 4. Specialists:** municipal lighting managers & technicians, city IOT/technology officers / smart city departments, service providers
- 5. Non-specialists:** local elected officials (mayors/deputy mayors), municipal public works department heads, regional and national agencies
- 6. Urban lighting experts and research experts** such as researchers, technical experts, architects and lighting designers, energy managers, energy agencies.
- 7. Citizens** (depending on the local project) one of the main target audiences for project city partners, specifically in relation to pilot sites, are the local inhabitants.

Each of the six pilot sites are confronted with a variety of demands and spatial requirements associated with the implementation of new lighting concepts. The following sections seek to give a brief overview of the different pilot sites and the challenges they face. It will also present the chosen co-creation activities, their target groups and initial results.

The following overview will describe the co-creation activities organised by each pilot site. The report focuses on the aim of the activities, the target groups, the designed activities and the methods used. The lighting solutions at every pilot site had to implement participatory elements and involve citizens actively in the process. Lighting solutions and concepts should not only consider economic feasibility, but also take into account wishes relating to urban design, safety, local identity and the needs of local communities. Figure 12 shows a matrix of the activities organized at the different pilot sites.

A key challenge for the pilot sites was seen in the restrictions caused by the coronavirus pandemic. Many of the planned activities could not take place to the extent that had been foreseen. The methodological diversity and exchange between the target groups could not be realised in the usual fashion. This situation had a direct impact on the planning and implementation of co-creation activities. This will be discussed in more detail in section 3.7.

To gather information about their activities and experiences, the partners at the pilot sites were asked to complete two detailed questionnaires and to submit regular reports on their planned and accomplished activities. The questionnaire also contained an evaluation section for reporting on both positive and negative experiences.

Implemented and planned participation formats in the pilot sites, status as of 14.01.2021

ACTIVITIES	PILOT SITE				
	Hamburg	Jurmala	Porvoo	St. Petersburg	Tallinn
Surveys					
personal	✓	✓	✓	✓	
online	✓	✓			✓
Workshops					
residents	✓	✓	✓		
experts	✓	✓	✓		✓
Installations					
lighting	✓				✓
others					
Seminars					
classic	✓	✓		✓	
online	✓				
Competitions					
for professionals					✓
for everybody					
Interviews					
residents					
experts					✓
students		X		✓	
Guided walks					
residents	✓		X _c		
experts					✓

LEGEND

 **Planned, completed**
 **Amended, completed**
 **Cancelled**
 **Cancelled (Corona)**

Figure 12: Table listing the implemented and planned participation formats in the pilot sites

3.1 Hamburg, Borough of Altona, Germany

Lighting for the liveable public pathway “Elbewanderweg”



Figure 13: Pilot site of Hamburg along the „Elbewanderweg“

The LUCIA pilot site in Hamburg is situated along the famous “Elbewanderweg”, a walking and cycling pathway along the river Elbe. Most of residents within the district of Altona know this suburban space as a typical recreational area. The pathway is also a key commuter route for cyclists and pedestrians along and across the Elbe to Hamburg-Finkenwerder and to central Hamburg. The existing public lighting was in parts outdated. LUCIA closed these gaps and introduced a light art concept for a small pedestrian and bicycle tunnel under the Elbchaussee Street as well as new, modern and energy-efficient public lighting along parts of the pathway. 25 luminaires were newly installed or modernised.

Energy efficiency played an important role in specifying the technical requirements of the luminaires. The district of Altona also highlights aspects related to the protection of rare species, such as bats and insects, and discusses the issue of “dark sky areas”. At the same time, the administration of Altona aims to increase the feeling of subjective safety with special lighting solutions for “fear areas” like the narrow pedestrian and bicycle tunnel. Several stakeholders are involved in realising LUCIA’s pilot project in Hamburg, covering topics such as the environment, urban planning, technology, social acceptance and energy efficiency.

Goals of co-creation activities

collect experiences and opinions

raise awareness to lighting pollution

co-creative lighting design

exchange of know-how



Main target groups

users of the pathway (all ages)

local residents (all ages)

older people (65+)

experts and technicians



Activities with local residents and the general public

The actions carried out jointly with local residents can be roughly divided into open-air events and digital tools. As a part of its analysis, the Borough of Hamburg-Altona launched an online participation tool for a three month period. The survey for local residents asked users of the pilot site to provide information and report on their experiences. The survey collected information about the perception of light and sense of safety along the river Elbe and in the pedestrian tunnel known as “Schröders Elbschlosstunnel”. Using a map-based questionnaire, citizens were able to describe and site their opinions about and experiences with the lighting situation at the “Elbwanderweg” pilot site. These geo-referenced submissions allowed the participants to assign their comments, opinions and ideas to specific locations at the pilot site and to highlight special areas. The participation tool was online from July until September 2020. The submissions were collected, reviewed and evaluated.

The evaluation of local residents’ everyday experience with the pilot site served to complement the analysis of the feasibility study for the innovative lighting concept by offering a useful overview of where changes were needed.

With the easing of the COVID-19 regulations in Hamburg, an interactive and **creative lighting workshop** gave additional input for the process. The pedestrian underpass called “Schröders Elbschlosstunnel” in the Borough of Hamburg-Altona connects the “Elbschlossstrasse” to the Elbe river bank. Since 1984, pedestrians and cyclists have been able to use it to reach the river Elbe without having to cross a major street and with a barrier free access. In the workshop local residents were invited to experiment with the different effects of lighting in a pedestrian tunnel and discuss their opinions.

The tunnel was provided with a **lighting installation** to explore the different effects. The team of light designers created five individual sectors equipped with various kinds of illumination, light colours and directions. Passers-by and interested citizens could walk through and observe the different situations. The participants were then asked to give their opinions in a written survey. Respondents said that the sense of security, visual comfort and the atmosphere created by the lighting were most important to them. Many cyclists and pedestrians participated spontaneously and were able to enter into an exciting dialogue with the lighting experts. For families and children in particular, the light installation provided an interesting way to explore their perceptions. Within approximately two hours, 32 participants took part in the written survey.

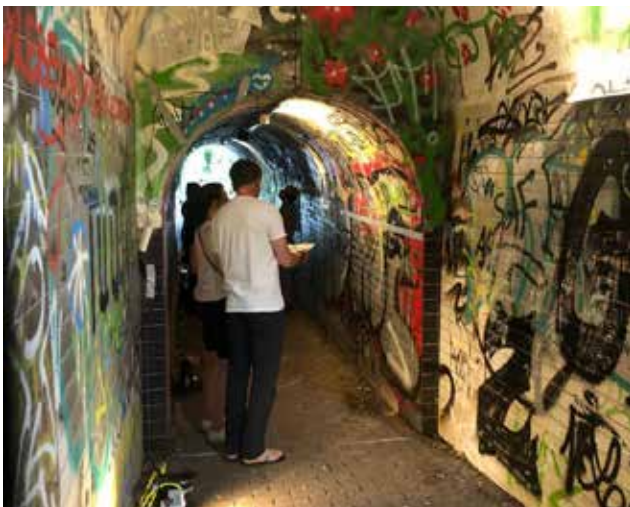


Figure 14: Light workshop with installations of different luminaires at the underpass 2020



Figure 15: Screenshots of the Lucia-subpage for digital participation tools

In addition to the workshop, **guided walks** offered the chance to discuss the effects of illumination with local residents. The focus here was on the lighting situation at the pilot site with respect to light pollution/endangered species and to the subjective experience of safety. Two guided tours were therefore developed in cooperation with lighting experts and the local police department. The focus of each walk was different. One examined how lighting is perceived by elderly people and how their needs differ from those of the younger generations. The second walk looked at the effects of lighting pollution on flora and fauna. Due to COVID-19 restrictions, the walks were held in small groups of 5 to 10 persons.

Webinars for lighting experts and governmental institutions on sustainable lighting

For the regional replication of the topic of sustainable lighting, two webinars were organized within the LUCIA Hamburg project. The webinars contained an input phase with two or three keynotes as well as a discussion where the participants could also join in. The guiding themes of the webinars were “Smart Lighting Technologies” and “Dark Sky/Lighting Pollution”.

The webinars were very well received with more than 30 people attending each event and yielded fruitful discussions. The invitation was sent by email to various institutions, experts and stakeholders in the Hamburg metropolitan area. The webinars were documented by means of a short summary of the keynotes and discussions.

Communication tools

Both digital and analogue channels were used to address the different target groups. The local neighbourhood was contacted through direct letterbox mail. Digital media hosted by local newspapers, clubs and the like were also used as communication pathways. An independently created e-mail distribution list that included clubs, associations, social institutions, educational establishments, etc, was used to send out regular reports on planned events. The separate website for the participation tool provided further information. The online tools were supplemented by personal surveys at the pilot site. In some cases, individual events were advertised on the local Facebook and Instagram forums.

INFOBOX: REGIONAL REPLICATION

Regional replication is a planned activity within the LUCIA project that every pilot site pursues in its own way. It is a defined goal to interact with the surrounding regions of the partner cities, in particular the Helsinki, Tallinn, Hamburg, Riga and St. Petersburg metropolitan areas as well as Greater Copenhagen. The aim of regional replication is to learn together about smart, energy-efficient lighting in general and about the project results in particular. Besides knowledge transfer, the aim of these meetings is to question key stakeholders from target groups and identify the replicability potential in each region.

Evaluation of the co-creation activities

The participation formats have on the whole been very positive. The lighting workshop and webinars in particular provided a good exchange with the target groups and produced interesting results. The events held in small groups of 5-10 people also resulted in intensive discussions on the topics addressed. Nevertheless, the design and resonance of some activities could have been better. Due to contact restrictions in connection with the COVID-19 pandemic, the devised activities could not be carried out as originally planned. Most sorely missed were the personal exchanges with citizens. As for the guided walks, the amount of time and effort required was very high given the very small number of participants allowed due to the COVID-19 restrictions. Nevertheless, the discussions with those who did take part yielded some very interesting perspectives and demonstrated that there is indeed a great interest in lighting issues among members of the public.

The online survey did not generate the amount of results that was expected. Only 14 persons completed the online poll and just three used the map-based tool. Given the running time of more than three months and several attempts to promote the survey, the results were not as good as expected. Even the several press releases and the posts on social media failed to produce the desired outcome. The reason for this may be that the lighting along the pathway is not seen as a serious problem and people did not discern a great need to take part in an online survey. But even if the online tool failed as an instrument for attracting people's attention, it can be assumed that the various other co-creation tools/instruments were of interest.



Figure 16: Opening event of the newly designed underpass

3.2 Jūrmala – Jomas Street, Riga District, Latvia

Central pedestrian street lighting will become more attractive and energy efficient



Figure 17: Pilot site of Jūrmala along „Jomas Street“

Jomas Street, the central pedestrian street in Jūrmala, is a popular meeting point, walking and recreation area for residents and tourists. The street welcomes around 3 million people per year, offering a multitude of cafes and restaurants, as well as other services.

As part of the LUCIA project, the illumination on roughly 1 km of the central pedestrian street will be renovated. About 100 luminaires will be replaced and smart motion sensors will be installed. The motion sensors will control the intensity of the lighting according to the movement and flow of pedestrians and will ensure electricity saving when pedestrians are not visiting Jomas Street. Additional smart features and the functionality of lighting were discussed with residents of Jūrmala City and with technical project designers.

Jomas Street was selected as the demonstration site because of its significance in the development of Jūrmala's image. Improvements of the street lighting will benefit not only residents, but also tourists. Jomas Street is one of the oldest and most central streets of Jūrmala with restaurants, summer terraces, hotels and cafes with live music.

Goals of co-creation activities

collect opinions

define expectations

co-creative lighting design

address needs of residents



Main target groups

residents, users of Jomas Street

council planners and deputies

lighting suppliers

entrepreneurs



Activities with local residents/the public

The co-creation activities in Jūrmala focused strongly on the exchange of ideas, experiences and opinions between the Jomas Street neighbourhood and the planners involved in the project. The aim was to hear opinions about existing lighting and expectations for the new design so that the future lighting scheme for Jomas Street will meet the needs of residents, guests and local entrepreneurs. The locals were interviewed using a **questionnaire** both before and after pilot project realisation. The questionnaires contained multiple-choice answers as well as open questions with the opportunity to submit further suggestions. 94 persons completed the questionnaire and provided valuable answers.

Following up on the questionnaires, a **local meeting** with residents, entrepreneurs, lighting suppliers and Jūrmala City Council planners was held in October 2019. The approximately 25 participants were encouraged to take part in discussions, express their opinions and suggest improvements. The topics discussed here went beyond the Jomas Street lighting project and also included suggestions for improvements to other infrastructure in the city.

The chosen formats provided useful feedback and suggestions from target groups regarding the design and technical requirements of the street lighting as well as additional smart features. Involved inhabitants had useful suggestions concerning the improvement of energy efficiency.

Regional seminars for planning experts and governmental institutions

Meetings and discussions within planning and project groups built the base for co-creation. These included a regional seminar with stakeholders from other Latvian municipalities and planning experts in February 2020. Other municipalities provided ideas and suggestions for lighting planning processes that could be transferred to Jūrmala. 27 participants attended the seminar. Additionally, four meetings with the Jūrmala City Council working group have been held. The exchange and discussion with city planners and lighting suppliers was especially successful because it generated good and useful suggestions.

For the evaluation and monitoring of the questionnaire, statistical and qualitative analysis were used, while only qualitative analysis was applied for the results of meetings/seminars. The suggestions made were incorporated into the planning and development of the design and technical requirements for the lighting systems.



Figure 18: Seminar with residents, entrepreneurs, lighting suppliers, Jūrmala City Council planners, 2019



Figure 19: Regional seminar in cooperation with Riga Planning Region for stakeholders from 7 municipalities, 2020

Regional seminars for planning experts and governmental institutions

Meetings and discussions within planning and project groups built the base for co-creation. These included a regional seminar with stakeholders from other Latvian municipalities and planning experts in February 2020. Other municipalities provided ideas and suggestions for lighting planning processes that could be transferred to Jūrmala. 27 participants attended the seminar. Additionally, four meetings with the Jūrmala City Council working group have been held. The exchange and discussion with city planners and lighting suppliers was especially successful because it generated good and useful suggestions.

For the evaluation and monitoring of the questionnaire, statistical and qualitative analysis were used, while only qualitative analysis was applied for the results of meetings/seminars. The suggestions made were incorporated into the planning and development of the design and technical requirements for the lighting systems.

Communication tools:

Communication with the target groups happened mainly on the personal level by means of individual e-mails, phone calls or personal contact. Additional information was presented on the city's website (jurmala.lv). Social media was used for posting information regarding the questionnaire. This took place on Jūrmala's official Facebook-site. The comments on the post were more or less negative because local inhabitants were more concerned about other topics such as the "quality of roads", "city infrastructure" and "financing of this activity" and not about lighting itself.

Evaluation of the co-creation activities

Altogether co-creation activities took up 15% of all the time spent on project-related tasks. The feedback from these activities showed that the results were satisfying. But the amount of co-creation activities could be improved. For example, the number of students involved was lower than originally planned. There is, however, still opportunity to work with this target group until June 2021.

Activities that allowed for personal contact and exchange were far more productive than digital activities. Face-to-face conversations yielded more suggestions than screen-to-screen dialogues. It is also important to carefully select the target groups, as it is sometimes better to work with a selected group of people instead of the general audience. To address the various target groups, the form of communication has to be chosen wisely, with different communication channels applied for different target groups.

3.3 Länsiranta – Porvoo, Finland

Pedestrian route highlights a new area in Porvoo



Figure 20: Pilot site of Porvoo area of „Länsiranta“

The new culture and leisure area of Länsiranta is currently being developed. The planned pedestrian route will connect Länsiranta, the centre of Porvoo and Old Porvoo and serve both residents and tourists. The lighting to be procured is expected to be quite innovative. Local renewable energy combined with storage systems would help to make the district carbon neutral.

Along the new pedestrian route between central Porvoo and the Länsiranta area, a new lighting system that includes atmospheric lighting and other features will be installed according to a concept to be developed by a designer. The city will be building this new pedestrian walkway and lighting system along the Porvoonjoki river. The construction will be carried out in two parts, first on the northern side of Aleksanteri's Bridge and then on the southern side of the bridge. This reinforces the functionality and suitability of the experiments in the area.

The city of Porvoo aims to introduce new, intelligent and energy-efficient lighting to the area. The area is still developing, so it is easy to bring in innovative experiments. The illuminated pedestrian route brings not only comfort but also a sense of security to the area. Länsiranta is home to both residential areas and services, so the well-lit pedestrian path will serve both residents and customers. The illuminated pedestrian route will also attract tourists and boaters passing by.

Goals of co-creation activities

- collect residents opinions
- explore views and needs
- create a vision



Main target groups

- residents of Porvoo (all ages)
- elderly, visually impaired
- entrepreneurs



What's more, the walkway will have a positive impact on the environment, encouraging residents to cycle and walk instead of using a car. Sustainable and efficient lighting begins at the planning stage. The lighting will be built to be durable and permanent in the area.

Activities with local residents/public

In Porvoo co-creation took place at two central events. At the **Porvoon Valot light festival**, the residents of Porvoo were introduced to the LUCIA project and could share their opinions and wishes for the planning area. On the topic of lighting, the participants were able to talk concretely about their perceptions and preferences, e.g. which shade of lighting is most preferably, warm or cold? As **survey** was used to collect the opinions. The event was open to all interested parties and no registration was required.

The second event, the **vision workshop webinar**, focused on the views and needs of different groups and stakeholders. The workshop put together themes for the vision. These were: well-being and experimentalism, energy and cost savings, maintenance, safety, light pollution and ecology. The workshop addressed different groups, e.g. the elderly, young people, the visually impaired, entrepreneurs. The vision workshop was a good opportunity to get opinions from different groups and to co-create the vision to plan the lighting in the pilot area. Because of the COVID-19 situation, the planned "experience walk" was cancelled.



Figure 21 and 21.1: Co-Creation at the LUCIA pilot site within the Valot-light festival 2020

Communication tools

Local newspapers were informed about the light festival and how people could participate in it. The project team was present at the festival and available for contact. They assisted residents/visitors in completing the questionnaires (paper, stickers on the board). For the vision workshop webinar, information about the event was placed on the official Porvoo website. Further addressees were contacted via e-mail. Social media was not used for communication here. For webinar registration the Google Forms app was helpful, but the webinar itself was organized using the MS Teams platform.

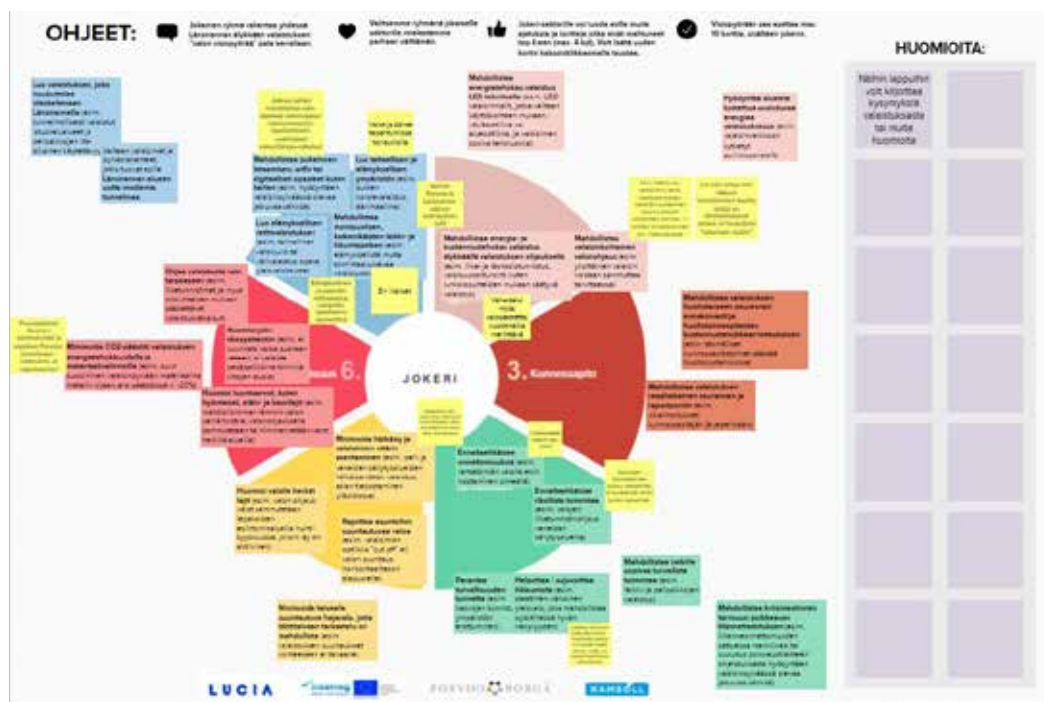


Figure 22: Screenshot from vision workshop webinar using the whiteboard tool „Mural“

Evaluation of co-creation activities

The co-creation activities were on the whole quite successful. It was positively surprising that the participants (residents) took part so actively and provided good results. Both the traditional and digital forms of participation worked well. Online events need to be carefully planned and prepared well before the event begins. Face-to-face events allow for freer conversation and as such generate more ideas and perspectives. Planners have to be bold here and try to use online platforms since they can work as well as face-to-face events. One observation is that the people did not want to attend the workshops because they did not know much about lighting and believed that they had nothing to contribute. But those who did attend were guided through the questions, making it easier for them to reflect on their own opinions and respond accordingly.



Figure 23: Interactive light installation at Valot-light festival 2020

3.4 SPbPU campus, St. Petersburg, Russian Federation

Innovative solutions for an energy-efficient outdoor lighting of a park alley



Figure 24: Pilot site of St. Petersburg, Campus of the Peter the Great St. Petersburg Polytechnic University (SPbPU)

The campus of Peter the Great St. Petersburg Polytechnic University (SPbPU) contains historical and modern educational, social, research and residential buildings as well as green and sports areas. As part of a currently ongoing modernisation of the campus, it is foreseen to install 22 multifunctional and smart illuminations as well as artistic illuminations that provide energy saving solutions and improve the level of comfort and perceived safety on the campus. It is also foreseen to add artistic illuminations of the water tower and other historical buildings.

The land and real estate at the SPbPU campus belong to the state. SPbPU has the right of unlimited use and is obliged to maintain and use the facilities for educational purposes. The Department of the Chief Engineer is responsible for the development and maintenance of outdoor lighting on the campus. A predesign study for a modern outdoor lighting system on the campus was done by this department and the appearance of the new lamp posts was developed and agreed.

Using the experience of St. Petersburg's municipal outdoor lighting company, LENSNET, and the best practices of the other LUCIA partner cities, modern and innovative solutions for energy-efficient outdoor lighting will be piloted on the SPbPU campus.

Goals of co-creation activities

co-create a new outdoor lighting system

introduce new and relevant topics

involve and engage students



Main target groups

local students

employees of the university

bachelor and master graduates



Activities with students of the SPbPU

St. Petersburg focused its co-creation activities on the local students, who are also the main users of the pilot site. Therefore a **working group of students** who are actively interested in the issues of smart energy-efficient outdoor lighting was formed. The aim was to inform, listen to and engage students and others in order to get them involved in co-creation activities. This took place by injecting outdoor lighting topics into the regular education programme (student research and bachelor thesis). Information and project materials were provided to report on issues related to LUCIA and the planned activities. Feedback was continuously generated through discussions, surveys and personal exchanges. The dissemination of the project materials resulted in a new perspective on outdoor lighting that stresses not only bright night-time lighting but also the importance of being able to see the stars after dark.

An **intensive exchange** on the subject of light arose during work on two final theses. One student dealt with smart outdoor lighting on the SPbPU campus as part of her bachelor's thesis. Two other students organised and analysed an extensive survey among the students, in which 169 students took part. Ten SPbPU students also participated in the LUCIA mid-term webinar on October 14, 2020. The webinars were able to impart a great deal of new knowledge that would be dealt with further in the project and added to the educational basis.

As an outlook to further working phases, the possibility of **expanding the target audience of co-creation measures** is being discussed by organizing cooperation with the Sirius Centre - the Federal Centre for Youth Development (Sochy). Negotiations on specific forms of possible cooperation was held in late December 2020 and early January 2021.

Communication tools

The communication with the target group's responsible students was done by means of participation in surveys, case studies, proposals and justifications of their suggestions through social networks, messengers or project representatives. Common tools used for communication and evaluation include Microsoft Teams, Zoom, Doodle, messenger (WhatsApp), Miro and Trello. (Social) media for the co-creation activities were used within the Institute's official social networks: Vkontakte, Twitter, and Instagram. They are popular among students and young staff and residents.

Evaluation of co-creation activities

The work with the students showed that they have fresh and innovative ideas, are flexible and ambitious in what they do, and are open to cooperation. One difficult question to answer, though, was how the ideas and feedback of the students could be incorporated into the actual work at the pilot site. The motivation among students therefore needs to be increased by demonstrating that the opinions of students, staff, and residents will be taken into account and allowed to influence decisions.

While some other SPbPU departments are actively involved in the implementation of other project tasks (where these tasks in part correspond to their main duties), co-creation activities were fully implemented by the project team and no one else at SPbPU is responsible for this type of activity. Experience with the organized activities showed that digital events can reach a wider audience, but face-to-face events provide for more effective feedback. A combination of digital and personal interaction seems to be an optimal solution.

3.5 Canute Garden, Tallinn – Estonia

Creating a safe, inviting public space with changing lighting scenes

Figure 25: Pilot site of Tallinn, „Canute Garden“



The pilot site at Tallinn is about creating a park of seasons. Using innovative lighting solutions, the light in the park will change with the seasons. The project will also pursue social aims by bringing life to the park during the dark hours. The park is a cultural heritage asset and the lighting is being renewed to harmonize with the lights of the nearby walls and the tower. To this end, a thematic lighting plan will be developed for all of the parks in Tallinn’s Bastion Zone and then be realised in Canute Garden, which is one of the Bastion Zone’s parks. Here, the old pole lights will be replaced with LED lighting, and decorative smart lighting will be installed to illuminate a fountain, a playground and the main seating area within the park.

The LUCIA pilot project in Tallinn aims at enhancing the feeling of safety, replacing old lightings solutions with modern ones and creating an attractive and inviting urban space with a strong identity. In November 2019, the municipality of Tallinn launched an open call for ideas for a general lighting concept covering all six Bastion Zone parks. The work “Echoes” submitted by VALOA Design Ltd. of Finland was chosen as the winner in that competition and will submit a schematic design project for Canute Garden. Electrical design and construction procurement will then follow. After completing the Canute Garden lighting project, the city will continue with the other parks in the green belt around the old town and install smart, energy-efficient lighting there as well.

Goals of co-creation activities

- identify key challenges
- raise awareness
- explore citizens experiences
- collect opinions and proposals
- professional input



Main target groups

- communities
- city workers
- citizens
- students
- lighting designers



Activities with local residents public

The objective behind the idea gathering efforts for the LUCIA project was firstly to collect the opinions and suggestions of city residents concerning the current and prospective park lighting in the Bastion belt, but also to find out what they think about the usability, routes, and feeling of safety in the parks. For these purposes, a public online survey was organized, supplemented by interviews conducted with residents of the Tallinn's old town. As the parks are situated around the old town, the aim was to gather the opinions of old town dwellers with respect to the perception of safety and other lighting issues.

In a **guerrilla lighting workshop**, the Tallinn project team raised awareness of how lighting can transform places. Citizens had the opportunity to give feedback on lighting ideas and also to try out different variations of lighting on site. Participants had the possibility to check different lighting techniques and technologies, test the correct power (lumens) of fittings, try out different light colours and take beautiful pictures for project publicity. As an event of tests and trials, the guerrilla lighting workshop was very useful for checking out how different lighting solutions actually work on site.



Figure 26: Guerilla lighting workshop at Canute Garden

Projectwork with administrative units

In addition to the participation formats involving citizens, an intensive exchange also took place with city employees. A **workshop with city workers** brought together city planners, city district specialists, landscape architects, organizers of the city's light festival and politicians to jointly work on a project to create a safe and pleasant urban environment. The workshop aimed to: exchange information, identify key challenges, frame ideas, set budgets, discuss heritage demands, etc. In the workshop, key elements of good and poor lighting were discussed. In the practical section, schemes and maps of the park were used to define zones and activities. The task of the working groups was to propose a concept describing which objects should be illuminated and in what manner.

External input was generated by organizing an **international ideas competition** aimed at obtaining a professional park lighting concept. All other co-creation activities provided input to this competition. A relevant product of the competition was a schematic lighting design plan for the pilot site at Canute Garden. The outcomes of all the co-creation activities were evaluated against the stated aims.

Evaluation of co-creation activities

The results of all these co creation activities helped lighting designers come up with a satisfying lighting concept and a thematic lighting plan for all of the Bastion parks. The co-creation events were successful and the selected target groups generated both good and mixed results. One example of the challenges that arose was the complete reversal of the initial ideas and opinions expressed. When involving the public, people do not always know what they want, especially in field of lighting. They also often make no difference between good and bad lighting so they have to be educated first. On a wider scale, it is difficult to make decisions if there are too many different opinions, so the options have to be narrowed first before asking people their opinions. A key fact to remember is that even though some community members are more active, one cannot make generalizations based on their opinions.



Figure 27 and 27.1: Canute Garden at daylight and with light installation around the playground

3.6 Co-Creation and Lighting Ambassadors – Portrait of Albertslund

The City of Albertslund and their pilot site deserves specific attention. The content and structure differs from the other LUCIA pilot sites, since it is part of the large scale DOLL Living Lab¹.

The city has in a partnership² in less than 10 years developed a worldwide well known competence center for smart city solutions and public lighting in a local industrial area. DOLL bridges knowledge on technology and research into broad understanding of luminaires.

Under this perspective city administration of Albertslund has another long tradition to provide knowledge towards public lighting. There is a subject-specific communication within the municipality and the ambassadors which supports the idea of creating a cooperative development for the city itself. As part of the large renewal program for public lighting “lighting ambassadors” contributed to bridge knowledge between citizens and city supply departments. As far as DOLL knows, this example is a single case in Denmark.

The mixture of the Living Lab and the citizen involvement in lighting were set in place for the Albertslund pilot in LUCIA.

¹ <https://doll-livinglab.com/>

² DOLL was created in a partnership between City of Albertslund, Gate 21 and the Technical University of Denmark.



Figure 28: Inside the DOLL centre in Albertslund, Denmark

Lighting ambassadors contribute to a sustainable city

The whole concept around the lighting ambassadors is based on a long term process of the municipality itself. The process started in 1980 and the purpose was first to strengthen user influence on questions of central heating aspects. This group is formed by a citizen from each housing area, and is a collaboration partner for the city department on the topics: central heating, water supply, sewage and rainwater, waste and recycling management and later public lighting as well. The group discusses issues on each topic, both concerning new implementations and daily service. In terms of public lighting the group discussed strategy for renewal, criteria's for where to invest within the city and which types of new lighting are best for e.g. housing areas and/or pathways.

When renewal of lighting in a specific housing area is due, the cooperation mainly lays between each specific city department in the municipality and single housing areas, where e.g. lighting ambassadors live. Each ambassador is usually part of a group of homeowners/housing associations. They have specific knowledge about the needs of residents and other related neighborhood groups. Additionally a lighting ambassador becomes an expert for lighting solutions in that area. They are able to convey knowledge about lighting to the residential areas and help to select the lamps. It's a volunteer job and their main tasks are to strengthen the dialogue between citizens, departments and politicians.

Lighting Ambassadors manage knowledge transfer

Technical specifications like dimming and lighting management and/or other smart city related questions are part of the "normal" work in DOLL, as well as gaining information from the supply chain and its consultants.

Visits and knowledge transfer through DOLL Living Lab contributed to set up a sustainable system for the City of Albertslund and increased knowledge under ambassadors. They are actively involved for asking their opinion regarding different choices of luminaires.

The participation and commitment towards work of the lighting ambassadors is a success story. It's a productive process for both sides: for City of Albertslund and for the lighting ambassadors as well. The questions on lessons learnt are, if the citizens are more satisfied with the public lighting due to expanded knowledge of ambassadors? Do citizens appreciate the "Ambassadors Model" and do citizens see the overall benefits? Last but not least: do politicians also see the benefits of the work the ambassadors do for the City?

Altogether it is advisable to involve citizens on several levels before starting to replace lighting in residential areas. If you need to replace lighting in many areas of the city within a few years, a corps of volunteer representatives can contribute actively to a good and sustainable process which leads to greater satisfaction. Nevertheless investing in knowledge building under this group is a vital part to gain sustainable results.

Interview on co-creation with Sif Enevold and Jens Hammer – Experts at Gate 21 respectively DOLL



Figure 29: Interview partners Sif Enevold and Jens Hammer

LUCIA: In which way is public participation or co-creation useful if it comes to public lighting projects?

Jens Hammer: Public Participation (or co-creation) can be a very useful tool to develop answers on so called easy questions. What we discovered here at DOLL - while many municipalities visit us³ - is that they often don't know what they exactly need and want for their city or district in terms of public lighting concepts. Hence it is our job to reduce the complexity for e.g. appearance of smart city solutions, questions towards the internet of things (IoT) or other important aspects like colour of luminaires, technical standards, and choice of sensors and so on.

Sif Enevold: Good co-creation processes with residents help to support decision makers and experts to develop future related questions towards sustainability of public lighting.

LUCIA: Do you see limits and/or negative effects of co-creation during these processes?

Jens Hammer: There is a need to identify the different demands beforehand. It is vital to identify these processes and it's necessary to make the questions "easy". In this sense it is important to reduce complexity and talk actively to people because luminaires nowadays fulfil many functions and they deliver on many options for the development of smart cities.

Sif Enevold: That is why we also support exchange with universities⁴: this group is important for knowledge building. By bringing different stakeholders together and facilitating the exchange of knowledge to a manageable understanding sometimes co-creation is a strong tool.

³ DOLL welcomes on average 130 visiting organizations, of which 80 are from the public sector (including politicians)-(based on 2017-2019).

⁴ One university is also included at DOLL.



Figure 30. and 30.1: Testing phases with different luminaires at DOLL Living LAB

Jens Hammer: Yes, we are the frame joint between science and practice. An ally to reduce this complexity... with that process we are also able to exceed better (and faster) municipalities on their way to become more sustainable and use capacities more actively.

Sif Enevold: ...and in this process lighting ambassadors can be an attractive and additional interlink between city administration and residents.

LUCIA: What are common challenges if you look at typical mistakes municipalities make?

Jens Hammer: Most of the municipalities (and also whole nations) make the same mistakes when it comes to set up new public lighting. Basically they have all the same questions and also same problems if it comes to set up new luminaires. We are pretty sure that all nations make same mistakes over and over so to say... because that is what “learning” also includes: making same mistakes everywhere. That is why co-creation is important. We need co-creation not only to validate our own projects but we need it also to include the process of knowledge building and exchange experiences to others. In this sense it is a substitute to put the (knowledge) wires together and might support a certain “communication standard” under all stakeholders.

Sif Enevold: Especially if it comes to the GPP’s if they are not integrated in national standards. Here we need to communicate on taking them into account for new city standards; especially on a nation-wide/ European wide level. The overall goal is to develop new and sustainable lighting solutions. This is one vital step to create better public lighting in the future.

Jens Hammer: Instead of just replacing the old luminaires, replace for example just every second with a better quality of lumen (watts), advanced technologies and additional technical standards. That saves time in the long run.

Sif Enevold: ... co-creation is one option to reduce complexity of questions and therefore also mistakes. It is most important to communicate with partners (countries, municipalities, universities and companies) to create common knowledge.

LUCIA: When setting up the standards of luminaires for your Pilot Site in Albertslund: Lighting ambassadors were involved in the selection process?

Jens Hammer: For the whole process we gave demands of performance to several lighting vendors and they were welcomed to give a presentation. The lighting ambassadors were involved in the early process giving input on needs and demands from a user perspective on movement controlled lighting, before inviting vendors. Additionally we integrated a lighting designer in the co-creation process.

Altogether inputs from the light ambassadors were used to select the installations packages.

LUCIA: What is the essence, other municipalities and companies should learn from your experiences?

Jens Hammer: If it comes to technology of luminaires we assume that control shall lie in the hands of municipalities and not the other way round. It is a bargaining and can be very valuable. The municipalities can mix and match with fairly high hit rate. Within this process lighting ambassadors are able to support this whole process.

Sif Enevold: In order to get all the solutions in place cooperation with and co-creation between companies were very relevant and beneficial in the case of Albertslund pilot site.

3.7 Co-Creation in relation to the COVID-19 pandemic

The coronavirus pandemic had a tremendous impact on the planning process for the activities, especially considering that the pandemic peaked just at the time when most co-creation activities were scheduled to take place. Many events involving personal contact had to be cancelled or postponed. Some ideas had to be rethought and realised in an alternative way.

In **Hamburg** the originally planned activities, most of which were designed to involve personal contact with residents, had to be reconsidered under COVID-19 conditions. As an alternative to face-to-face polling at the pilot site, a digital questionnaire was created and placed on a special LUCIA website. With the easing of the COVID-19 regulations in June 2020, outdoor events became possible again. Nonetheless, the events had to be planned and held under strict rules requiring social distancing, limited participation and special hygiene measures. These measures were necessary, but they seriously limited the possibilities of the events. For example discussions between residents and the LUCIA team, and among one another, were reduced to a minimum.

Jurmala suffered from the fact that the architectural firm responsible for the technical project delayed the project's development, meaning that no results were available for presentation to the target groups. This led to a reduction in the number of face-to-face activities, meetings and seminars compared to what was originally planned.

Porvoo was also in the situation that planned activities had to be cancelled or revamped. One workshop, originally planned as a face-to-face event, was converted to a webinar (vision workshop). A guided tour with several participants ("experience walk") had to be cancelled due to the pandemic.

At the **University of St. Petersburg**, the immediate consequences of the COVID-19 pandemic were evident in the overuse of online formats and their oversaturation. Due to COVID-19, staff and students were so busy with double (online and offline) work that any further online formats or activities were not readily accepted. This made it difficult to get students to work voluntarily in their free time.

In **Tallinn**, the COVID-19 pandemic had no influence at all on the co-creation activities because these were already completed by February 2020.

CHAPTER 4

Lessons learnt: Public Lighting Co-Creation and creative Formats

After the reports on the activities at the pilot sites were completed, it was possible to draw some interesting conclusions concerning the various participation formats. The exchange with stakeholders not directly involved in the project, including citizens or expert planners, contributes important input and ideas to the work process. Their perspectives, observations, experience and ideas broaden the spectrum and help project planners to develop ideas or concrete plans. In some cases, the results and views that emerged were very different from what had been assumed. This chapter will look at the key findings from the co-creation activities that were carried out and present the lessons that were learned.

We will first look at the key findings and recommendations that can be drawn from the self-conducted activities. The second part will then focus on the target groups and offer a more detailed overview of the features, limitations and degrees of accessibility associated with different groups.

As described in the previous chapter, the five pilot sites implemented different participation formats, taking into account the particular issues found at their locality. The evaluation of the individual measures revealed which of these formats were successful in terms of public acceptance and the ability to deliver helpful results. By contrast, there were also activities that did not produce the desired outcome and where the cost-to-benefit ratio did not balance out.

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The table in Figure 30 shows that most of the implemented formats were indeed successful. Success is defined here to mean that the co-creation activities produced valuable results, that there was good communication with the target groups, and that the relationship between costs and benefits was well balanced. A moderate rating describes activities where, for example, the amount of input was higher than the output, participant numbers were low or the quality of the results was not sufficient. But even in such cases it is still possible to draw some useful conclusions. Activities that failed are those that produced no or only few usable results, that attracted no participation and/or where the workload was disproportionate to the outcome.

With regard to those events where face-to-face contact was essential, the effects of the COVID-19 situation must be taken into account, as those events could usually only take place with limited numbers of participants and in compliance with special regulations.

4.1 Lessons learned: recommendations

In addition to examining which formats were successfully implemented, recommendations can also be provided based on the monitoring activities conducted. The results from the five pilot sites overlap and complement each other in parts. From these, recommendations and findings can be drawn that are transferable to other participation projects. The key take-aways from the lessons learned are concentrated in three categories.

Self-evaluation of participation formats organized within the pilot sites

ACTIVITIES	PILOT SITE				
	Hamburg	Jurmala	Porvoo	St. Petersburg	Tallinn
Surveys					
personal		✓	✓		
online	X	✓		✓	✓
Workshops					
residents	✓	O	O		✓
experts		✓	✓		
Installations					
lighting	✓				
others					O
Seminars					
classic		✓		✓	
online	✓				
Competitions					
for professionals					✓
for everybody					
Interviews					
residents					
experts					✓
students				✓	
Guided walks					
residents	O				
experts					

LEGEND

**Successful**

Results and measures have achieved
good and usable results

**Moderate**

Results and measures could be improved,
still helpful

**Failed**

Output and number of results are not in
relation to cost and effort

Figure 31: Self-evaluation of participation formats organized within the pilot sites

4.1.1 Target groups

The evaluation of the co-creation activities shows that the involvement of a number of different target groups brings the most helpful results. It is important right from the start to clearly communicate to participants how their ideas and feedback will be incorporated into the project.

Results from various pilot sites have shown that target groups with no prior knowledge of the subject of lighting do not have much to say, but what they do say is very helpful, for example, as to whether they like or don't like certain lighting. At the same time, many do not know how lighting situations could be improved. So in participatory formats involving non-experts, a certain degree of educational work is needed to give people a foundation in the subject. This is an additional effort that has to be calculated into the preparation time.

More in-depth and thematically closer issues can be discussed with experts or specialist planners on a more academic level. But such people lack the perspective from everyday life and daily use that can only be conveyed by local residents and users. We may conclude that involving target groups from different directions and walks of life is a useful measure for mapping perspectives from diverse backgrounds and hence obtaining a more holistic view.

As experience from the pilot site in Tallinn has shown, interviewing a large number of people yields many different opinions all at once. This can make monitoring and the subsequent decision-making more difficult. It should be remembered that participants who are engaged in a particular topic can only give a subjective, partial view and are not necessarily representative, even for their own target group.

4.1.2 Formats

Experience from the pilot sites has shown that both digital and analogue formats can achieve good outcomes. It must be taken into account that both formats have their limitations and need to be chosen with a view to the knowledge being sought. The breakdown of methods into analogue, mixed and digital formats is one result of the demands arising from the coronavirus pandemic, as many conventional forms of participation could not take place due to contact restrictions and hygiene requirements. This is a circumstance that will continue to impact the planning processes and is thus a relevant factor to be considered.

Formats involving personal contact, i.e. events, workshops, light installations or guided walks, enable a more effective exchange. They give expert planners the opportunity to discuss more intensively with participants, to respond to questions and to develop ideas collaboratively. Experience has also shown that the working atmosphere is more productive compared to digital formats. Even formats with small numbers of participants, such as the light walks in Hamburg, can achieve good results through active and intensive exchange and participants who are truly interested in the topic.

On the other hand, the preparation and organisation of local events require more effort as well as more resources, such as staff to support and maintain the physical location. This means that such formats can only be realised for a limited period of time.

Digital formats, such as surveys, map tools, idea competitions or even webinars can be designed without much need for physical resources and they can be made permanently accessible. This allows for a higher number of participants and a broader distribution of the formats across different media. Participants are less dependent on fixed times (with the exception of seminars and workshops). However, the implementation of good, comprehensive online tools requires technical know-how. The support needed to keep digital formats running should also not be underestimated. Experience from the pilot sites show that although good discussions with helpful results can also take place in digital formats, the depth of content does not compare to that achieved in a face-to-face exchange.

Regardless of the choice of format, the success of individual activities will always depend on the participation and commitment of those involved. Even well-organised events with exciting opportunities for participation can fail if the participants or contributors do not engage accordingly.

4.1.3 Communication tools

When addressing target groups, it is important to consider how to reach out to them. Different groups are approached via different media. Certain target groups, such as residents or daily users of an infrastructure, are best contacted in person and on site. Broader groups on the other hand can be addressed using digital media, for example through e-mail distribution lists or advertising campaigns on the internet.

Project work at the various pilot sites has shown the following formats to be successful in terms of communication:

- **For discussions and exchange:** platforms for digital conferences and webinars
- **For providing information:** local newspapers, websites, newsletters, mailing lists, flyers and brochures
- **For arranging appointments:** digital appointment tools, online calendars
- **Social media:** official social media accounts

4.2 Spotlight on target groups – suitability and accessibility

The examination of the different formats has shown that an essential factor contributing to the success of co-creation activities are the people who participate. Depending on the interest of the format, target groups come from different areas and branches. So when thinking about implementing participation formats, one has to think carefully about who the measures are aimed at. Communication channels, information density and opportunities for participation must then be adapted accordingly.

Target groups can be classified from various perspectives. In the context of light and lighting issues, it makes a difference whether the target groups are from the private or public sector. It can also be significant whether the target groups are stakeholders, creators or users. In the course of LUCIA, the Riga Planning region has defined a target group model that deals with relevant groups of interest. It classifies target groups into the following three categories:

1. Public sector with institutions and organisations

e.g.: policy creators, urban lighting managers and specialists within institutions, scientific and educational institutions, decision makers

2. Private sector specialists

urban planners, landscape and architectural designers, digital systems designers, energy managers, technical specialists, designers of lightening elements

3. Civil sector activists and primary users

active NGOs, active citizens, large companies – entrepreneurs, households, housing cooperatives

Target groups can be identified from various perspectives. In order to approach the question of which target groups can provide relevant information, the following questions can be helpful:

- *Is there a need for information with a scientific / professional / technical background?*
- *Is there a need for specialized (technical or legal) solutions or ideas?*
- *Can an open, creative approach be useful?*
- *Is one open to broad ideas from the public or are specialized solutions by experts needed?*
- *Is there enough data and knowledge about special needs / problems?*

Nevertheless, it is not always easy to find out which target group is suitable to obtain the relevant information. The spectrum of possible groups of people is large and difficult to classify. Moreover, the budget for participation and involvement is limited so that the selected groups have to be chosen wisely.

To remedy this and facilitate decision-making, group-specific profiles have been developed within this lessons learned report. These are based on the experience gained from the activities carried out within LUCIA. The aim is to provide information about the potentials and limitations of the target groups and how to reach them. These **target group profiles** will actively help to select possible groups of interest.

The following eight profiles briefly indicate the kind of knowledge and information that each group can provide, the features and limits of collaboration, and how to access the different groups. The profiles are broken down into the categories discussed above: public sector with institutions and organisations, private sector specialists and civil sector activists and primary users.

The aim of the profiles is to identify the potential knowledge available from the selected target groups in order to help in the planning of participation activities. They also include marginal groups having a specific point of view; such groups are often not in the focus of the typical events. Nonetheless the quality of the participation tools depends on the chosen format and, most importantly, on the motivation of the participants. The attitude of participants is especially difficult; it is an open factor which cannot be predicted.

1 CIVIL VOICES

STUDENTS

Disciplines:

- light sciences, engineering
- lighting design
- architecture, interior
- spacial and urban planning
- environmental studies
- culture and arts
- sociology, socio-economic



Key demographics

Age range: 18- ca. 30 years old

Gender: mixed, depends on the study programme

Geographic: local, national and international origins

Features

thinking outside the box, open minded
 fresh, new and creative impulses
 ideas are linked with scientific background
 motivated, engaged, flexible
 politically active with networks to others
 are not bound to bureaucratic structures in their thinking

Possible challenges

unsteady in their engagement, sometimes not reliable
 focus on partial aspects and not the big picture
 high workload, lack of motivation to do further work in their freetime
 lack of experience

Channels for reaching them

digital, via university-related channels such as email distribution lists, websites, forums, social media (linkedin, facebook groups, instagram)

traditional, via notices, personal address, on-site presence in university facilities

organizational, via collaborations with professors, project groups or university associations

2 CIVIL VOICES

ELDERLY

Possible locations:

- local networks for elderly
- associations, initiatives
- nursing and retirement homes
- faith-based institutions
- address at home or near project site



Key demographics

Age range: 65+ years old

Gender: mixed, ratio depends on interview location

Geographic: mostly local

Features

different perception of light

have local information and network

are sensitive to light intensity and glare

have time and motivation to participate
life expertise

(important group because of the demographic shift)

Possible challenges

are often focused on their own problems

lack of foresight

simplified methods and language needed

have limited knowledge with online tools

Channels for reaching them

traditional approach via personal conversation in simple language, alternatively address with postal letter or phone call

on site for example with open air information points or activities, suitable locations can be parks, shopping malls, weekly markets etc.

3 CIVIL VOICES

ENTREPRENEURS

Possible directions:

- businesses, all dimensions
- shops with customer flow
- business that use illumination (e.g. advertising, show cases)
- start-ups
- businesses that value sustainability



Key demographics

Age range: 18- ca. 65 years old

Gender: mixed, ratio depends on the sectors and businesses

Geographic: mostly local, sometimes regional / national / international

Features

economic thinking

are interested in advertising and new proposals

customer orientated, have knowledge about perceptions and needs

local information and network

possible cooperation partners with budget

Possible challenges

high workload, difficult to motivate for longer projects

limited in time and location (opening hours)

clear advantage must be established

Channels for reaching them

traditional approach via official authority if possible, best with a personal conversation at the business or via telephone call, for a broad approach postal letters or flyers

digital via personalized e-mail or mailing list (usually less feedback)

4 PRIVATE SECTOR

EXPERT PLANNERS

Possible directions / disciplines

- light sciences, engineering
- urban and regional planning
- environmental and sustainability studies
- culture and arts
- sociology



● Key demographics

Age range: 25 - open

Gender: mixed

Geographic: local, regional, national or international

● Features

professionally educated, scientific background

legal and bureaucratic knowledge

their input is based on realistic conditions

information from various disciplines (integrative approach)

professional in-depth exchange possible

● Possible challenges

time resources can be limited due to workload

lack of everyday knowledge

top down planning

advocating the interests of their own discipline

bureaucratic restrictions

● Channels for reaching them

digital approach via e-mail or telephone call with advanced notice, direct invitations to events or activities, mailing lists or newsletters for providing information

traditional by networking on events or conferences

5 PRIVATE SECTOR

TECHNICAL SPECIALISTS

Possible disciplines:

- lighting planners, specialists
- electrical installers or engineers
- municipal enterprises
- operators of lighting installations
- architects
- manufacturers of luminaires



● Key demographics

Age range: 25- 65

Gender: possibly dominantly male

Geographic: local, regional, national or international

● Features

basic knowledge of lighting technology

technical and practical know how

(technical) everyday knowledge and experience

innovative and curious for improvement

orientated on solutions

● Possible challenges

functional, partial perspective

emphasis on functionality and effectiveness

dependent on standards and regulations

● Channels for reaching them

digital approach by e-mail or telephone call with advanced notice, best via the management or superordinate body

traditional by networking on events or conferences, postal letter with invitation to participation or cooperation

6 PRIVATE SECTOR

LIGHTING DESIGNERS

Possible directions

- lighting planners, specialists
- product design
- operators of lighting installations
- manufacturers of luminaires



● Key demographics

Age range: 25 - open end

Gender: mixed

Geographic: local, regional, national or international

● Features

extensive knowledge of lighting technology and design
 technical and practical know how
 sense for effect and atmosphere
 innovative and curious for improvement
 design qualities

● Possible challenges

emphasis on design and functionality
 non-economic thinking
 dependent on standards and regulations
 design could outweigh practicability

● Channels for reaching them

digital approach by e-mail or telephone call at the office, best to address superordinate body or management

traditional by networking on events or conferences, postal letter with invitation to participation or cooperation

7 PRIVATE SECTOR

ADVOCACY GROUPS

Possible directions

- associations and federations focused on topics of nature conservation, traffic, light pollution, security
- advisory councils



Key demographics

Age range: not specified

Gender: mixed

Geographic: local, regional, national or international

Features

different perspective on lighting & illumination
are engaged, politically active
local information and network
motivation to participate
advocate needs of underrepresented groups

Possible challenges

advocate the interests on their own discipline
non-economic thinking
high expectations in participation
argumentative

Channels for reaching them

digital mailing lists or newsletters for providing information, direct invitations to events or activities, social media (e.g. facebook, instagram)

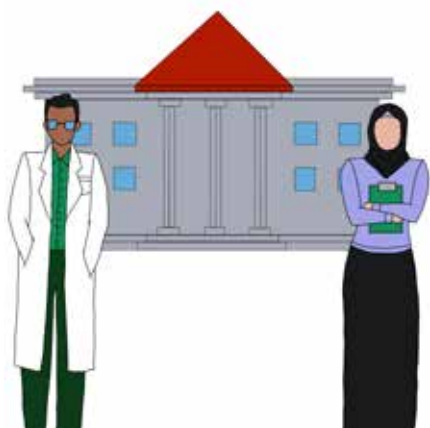
traditional by networking on events or conferences, postal letter with invitation to participation or cooperation, address site

8 PUBLIC SECTOR

SCIENTIFIC INSTITUTIONS

Possible directions

- universities with faculties in design, architecture, engineering, environmental studies
- national and international research institutions



● Key demographics

Age range: 25 - open end

Gender: mixed

Geographic: local, regional, national or international

● Features

extensive scientific knowledge from different perspectives
technical know how
innovative
have current state of research
national and international network

● Possible challenges

lack of everyday knowledge at site
practical application is sometimes missing
time resources can be limited due to workload

● Channels for reaching them

digital approach via e-mail or telephone call with advanced notice, direct invitations to events or activities

traditional by networking on events or conferences, postal letter with invitation to cooperation

The eight target group profiles presented here seek to classify and present the characteristics of the different groups. Of course, the statements made here are generalisations and are not necessarily applicable to all members of a target group. Nevertheless, the profiles should help to make an initial assessment and to move the selection process forward.

In addition to the target groups, divided into public and private sector actors, there are further differentiations that need to be taken into account. These include certain parts of the population that make up a diverse and multifaceted society but who are sometimes left out of participatory processes because including them requires an increased amount of effort. In the following illustration, some specific population groups with particular characteristics, such as language barriers or disabilities, are listed. However, children, young people and, on some issues, gender-specific groups are also part of the population that should be considered separately in participation programmes.

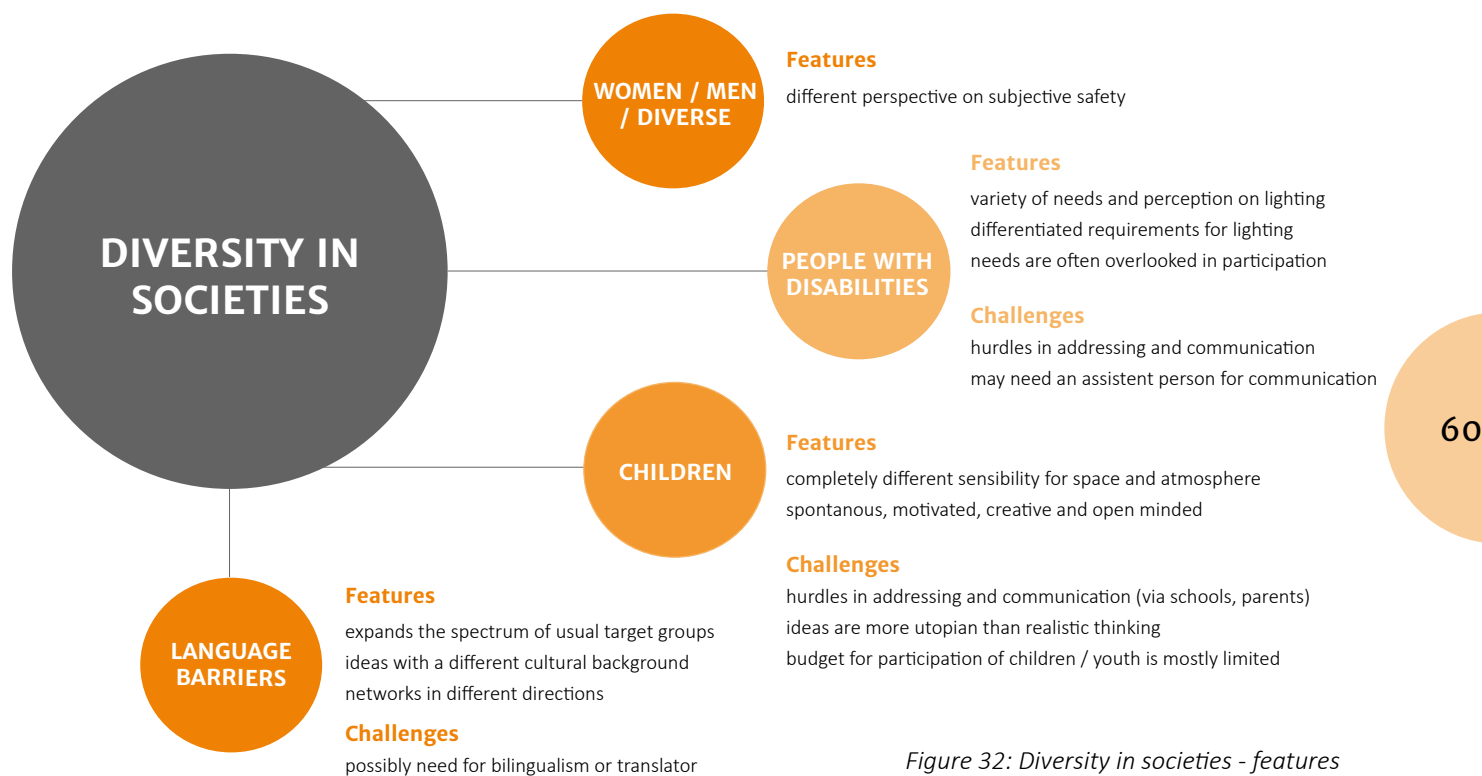


Figure 32: Diversity in societies - features

Besides the classification into target groups and sectors, another approach involves the spatial proximity to a project. Especially where projects concern the lighting situation in residential and frequently used areas, the involvement of local residents and users can be important. Considering the impact of the planned projects/themes, a spatial distinction can be made between the direct neighbourhood, the surrounding area and the district as a whole.

An overview of possible target groups in the neighbourhood (Figure 33) shows that not only people who live there are important, but also the persons who pass through the area, who work there or use the area for recreation, hobbies or shopping.

TARGET GROUPS CAN BE PERSONS WHO USE THE PROJECT AREA...

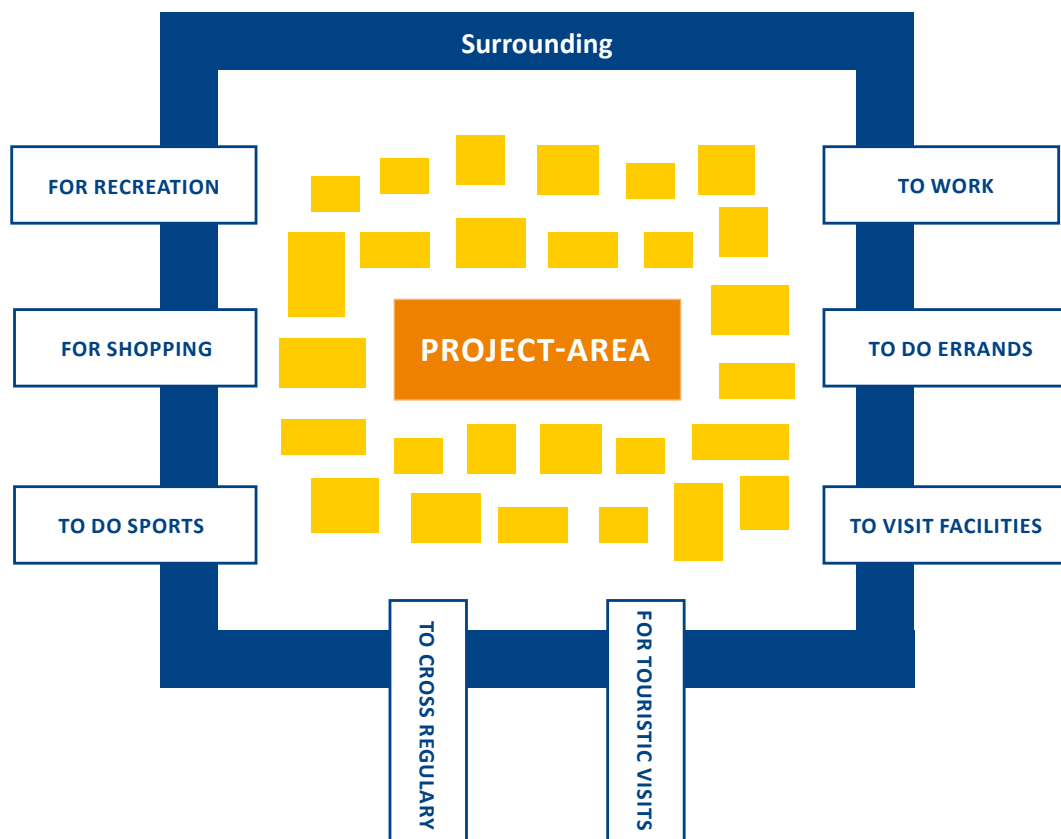


Figure 33: Possible target groups in the surrounding of a project-area

The selection of who to involve depends on the impact of the planned project and how extensive the participation/co-creation should or can be. The LUCIA co-creation activities have shown that involving and experiencing people with different perspectives yields a more holistic and realistic assessment than would be possible by working with one target group only.

Summary - working with target groups

We learned about different target groups and their characteristics, the useful information they can provide and their limitations. The eight target group profiles presented give an initial overview of the diverse groups of people with whom one can work co-creatively on the topic of lighting. It is important to bear in mind that society is multi-layered at all levels and that participation should be as inclusive as possible.

It is not always necessary to do professional and elaborate research to reach interesting target groups. Sometimes it only takes a look at the project environment to get useful information from users and residents. So there are different approaches to selecting suitable people for co-creative formats and to gathering good information.

CHAPTER 5

Concluding remarks

In the previous chapters we learned about the need for and the benefits of actively involving citizens in the planning of lighting-related projects. Getting citizens involved enriches the planning and project development processes by supplying valuable real-world information. Community groups from a wide range of backgrounds are given the opportunity to contribute important information. Citizen involvement furthermore promotes the building of local communities and encourages identification with a specific place. A holistic view of the perceptions and interests of residents, the environment and expert planners is needed in order to achieve a realistic assessment.

The advance of digital technologies is opening up more and more avenues for involving people in the planning processes. This is expanding the range of methods available for creative brainstorming, exchange of opportunities and the discussion of problems. It is also making participation increasingly independent from the limitations otherwise imposed by time and (physical) space. The COVID-19 pandemic has offered municipalities and the public many opportunities to discover and explore the possibilities created by digital ways of working and communicating. The increased use of digital formats has shown that the quality of discussions does not have to be compromised. Beyond this, the digital sphere allows for many different perspectives and can simultaneously involve multiple target groups.

Nevertheless, personal exchange and interaction in the traditional formats should not be underestimated. The quality of a discussion between experts and the public is important when talking about fears, problems and unanswered questions, for example when spatial changes are planned. Building up trust, exchanging arguments and taking part in lively conversations all have their limits when attempted in digital formats.

Public lighting and co-creation are also topics which help to overcome barriers and have strong socio-spatial perspectives. Open discussions on lighting are conducive to adopting a social perspective on spatial planning in different parts of a city or urban area. For lighting is no longer a luxury issue, but affects many socio-spatial aspects.

In summary we can say that the topic of “public lighting” can be particularly effective as a focus issue in co-creation processes. The diverse forms of illumination give rise to great opportunities to involve all kinds of people. The different colours, directions, sizes, luminosities and textures of light, combined with positive experiences of darkness, generate many new and creative forms of interaction between humans and light. At the same time, new plans can be mapped out and brought to life in the real world. Even if the whole process is reduced to “simple questions and actions”, many different stakeholders and interested parties can be involved in a playful way.

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Graphics and Illustrations

Figure 1: Walking through „Alter Elbtunnel“ - Hamburgs reopening of it's historical tunnel under the river Elbe, photo by ZEBAU GmbH

Figure 2: A “fluro flash mob” dancing through the city's streets, LUMIERE DURHAM 2017 photo by

<https://www.lumiere-festival.com/programme-item/the-umbrella-project>

Figure 3 and 3.1: Bicycle-underpass A15 at Rhein Waalpad, Holland, photo by Sjors van Duren and RoyalHaskoningDHV

on <https://www.snelfietsroutes gelderland.nl/RijnWaalpad/Hoogtepunten/Fietstunnel-A15.html>

Figure 4: Open light installation in Porvoo, Finland, photo by City of Porvoo

Figure 5: Participating countries in LUCIA, own illustration

Figure 6: Overview of Information and participation regulations in the participating countries of LUCIA, own illustration

Figure 7: Visualization of communication forms, own illustration

Figure 8: Guided LUCIA lightwalk in the Borough of Hamburg-Altona in 2020 with elderly, photo by konsalt GmbH

Figure 9: Schematic overview of participation formats, own illustration

Figure 10 and 10.1: Guerrilla Lighting social event in Jyväskylä, Finland photos by Riikka Kaakkurivaara

Figure 11: Examples on lighting actions, photo by Touho Häkkinen

Figure 12: Table listing the implemented and planned participation formats in the pilot sites, own illustration

Figure 13: Pilot site of Hamburg along the „Elbewanderweg“, photo by konsalt GmbH

Figure 14: Light workshop with installations of different luminaires at the underpass 2020, photo by konsalt GmbH

Figure 15: Screenshots of the lucia-subpage for digital participation tools, own illustration

Figure 16: Opening event of the newly designed underpass, photo by konsalt GmbH

Figure 17: Pilot site of Jūrmala along „Jomas Street“, photo by Jūrmalas pilsētas dome

Figure 18: Seminar with residents, entrepreneurs, lighting suppliers, Jūrmala City Council planners, 2019, photo by Jūrmalas pilsētas dome

Figure 19: Regional seminar in cooperation with Riga Planning Region for stakeholders from 7 municipalities, 2020 photo by Jūrmalas pilsētas dome

Figure 20: Pilot site of Porvoo area of „Länsiranta“, photo by City of Porvoo

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Figure 22: Screenshot from vision workshop webinar using the whiteboard tool „Mural“, own illustration

Figure 23: Interactive light installation at Valot-light festival 2020, photo by City of Porvoo

Figure 24: Pilot site of St. Petersburg, Campus of the Peter the Great St. Petersburg Polytechnic University (SPbPU)

Figure 25: Pilot site of Tallinn, „Canute Garden“, photo by City of Tallinn, Urban-Environment-and-Public-Works-Department

Figure 26: Guerilla lighting workshop at Canute Garden, photo by City of Tallinn, Urban-Environment-and-Public-Works-Department

Figure 27 and 27.1: Canute Garden at daylight and with light installation around the playground, photo by City of Tallinn, Urban-Environment-and-Public-Works-Department

Figure 28: Inside the DOLL centre in Albertslund, Denmark, photo by Jeppe Carlsen

Figure 29: Interview partners Sif Enevold and Jens Hammer, photo by Gate 21

Figure 30 and 30.1: Testing phases with different luminaires at DOLL Living LAB, photos by Nicolai Parjesi, nicolaiparjesi.com

Figure 31: Self-evaluation of participation formats organized within the pilot sites

Profiles on target groups, 1-8, own illustrations

Figure 32: Diversity in societies – features, own illustration

Figure 33: Possible target groups in the surrounding of a project-area, own illustration

Further information:

Lighting Metropolis, „Lighting Metropolis Knowledgebase“ [online]

Available: <https://lightingmetropolis.com/knowledgebase/>

LUCI Association international network of cities on urban lighting [online]

Available: <https://www.luciassociation.org/>

LUCIA Project Website [online]

Available: <https://lucia-project.eu/>