A Case Study to Demonstrate the Applicability of a Risk Management Framework Based on Collaborative Governance and Integrated Risk-Resilience Strategies for Smart City Lighthouse Projects

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In a recent work, the authors of the present paper presented a framework and methodology for improving the risk management in smart city lighthouse projects. The work suggested ways of improving the risk management based on the collaborative governance concept and a risk-resilience-based framework. The current paper examines the practical applicability of the theoretical analysis. The aim of the work is to support and give substance to the theoretical findings and recommendations based on a study of a real-life smart city lighthouse project. The study will examine the benefits that the suggested framework can bring to the project and the challenges that the project might face when implementing the suggestions. The Positive CityxChange smart city lighthouse project will be used as the case study. The project has been granted funding from the European Union's Horizon 2020 research and innovation program and will experiment with how the participant cities can become leading cities integrating smart positive energy solutions.

Keywords: Risk management, smart city, collaborative governance, resilience, Positive CityxChange.

1. Introduction

Smart city lighthouse projects represent the collaborative efforts of many stakeholders to make cities smarter and more sustainable places to live. The projects aim to create more inclusive and resilient smart cities that can respond and adapt to the dynamic shift of climate change by developing innovative and carbon-neutral technological solutions, introducing sustainable practices and enacting green policies to make cities more livable and socially inclusive for citizens (Energy Cities, 2022).

In a recent work, the authors suggested ways to improve the risk management of smart city lighthouse projects by presenting a methodology based on the collaborative governance concept and an integrated risk-resilience framework to address the challenges of current risk management approaches in such projects (Karatzoudi and Aven, 2022). The collaborative governance concept applied is based on the collaborative governance model developed by Ansell and Gash (2008). Model variables were used to identify measures such as change of current institutional design and use of facilitative leadership to promote and safeguard an inclusive decision-making process in the projects. A key point of the methodology is to achieve more adaptable project structures that emphasize stakeholder participation and involvement while addressing organizational complexities. As for the integrated risk-resilience based framework, the primary goal of this approach is to incorporate resilience assessments and cross-organizational business continuity plans into traditional project risk-management activities. The analysis emphasizes the inclusion of all project stakeholders in the risk-resilience analysis and management as a suggestion for building project resilience and ensuring project operations' continuity.

The work is a theoretical conceptual analysis, and further research and practical testing is needed to support and give substance to the suggestions. The present paper will use the Positive CityxChange smart city lighthouse project as a real-life case study, to examine the applicability of the theoretical analysis. The project is highly complex in a dynamic and innovative environment. It requires a strong commitment to risk management and resilience, to ensure that the project goals are not threatened by current or new risks and disruptions. The Positive CityxChange aims to co-create an environmentally sustainable future by creating a framework and supporting tools for a common energy market backed by a connected community. To achieve this goal, the project makes recommendations for new policy interventions, energy market (de)regulation and new business models that deliver positive energy blocks while incorporating e-Mobility (eMaaS) to the community, as a service (CityxChange.eu, 2019).

More specifically, the case study will examine the benefits that the suggested risk management framework can bring to the project and the potential enhancements of the current risk management approaches. In addition, it will examine the requirements that the project might face through the framework implementation, as the suggested procedures for improvement are new to the projects.

The paper is organized as follows. Firstly, in Section 2, we provide a brief description of the Positive CityxChange smart city lighthouse project, the project's goals and objectives, as well as its current risk management approaches and their challenges. In Section 3, we examine the applicability of the suggested risk management framework and investigate the benefits and requirements that it may bring to the project. Section 4 discusses the findings from the

previous section. Finally, Section 5 provides some conclusions.

2. The Positive CityxChange project and its current risk management approaches

2.1. *The Positive CityxChange project*

The Positive CityxChange project aims to create and deploy Positive Energy Blocks (PEBs)[a] and Positive Energy Districts (PEDs)[b] as part of the clean energy transition. The project introduces a model that describes the transition from PEBs to PEDs and, finally, to positive energy cities. The project concept includes a new energy market design combined with consumer-driven innovation, created in close collaboration with national regulators, energy system operators, property developers and local energy communities. The new distributed energy system will focus on flexibility, by creating new markets for renewable energy trading, to reduce grid investment needs (CityxChange.eu, 2019).

Along with their business and research partners, the municipalities of Trondheim (Norway), Limerick (Ireland), Alba Iulia (Romania), Pisek (Czech Republic), Sestao (Spain), Smolyan, (Bulgaria) and Voru (Estonia) are working closely to co-create an environmentally sustainable future. As aspirational Lighthouse (Trondheim and Limerick) and Follower Cities (Alba Iulia, Pisek, Sestao, Smolyan and Voru), they have outlined a structured methodology on how to design and deploy PEBs and PEDs and expand them as part of the clean energy transition.

Such a large-scale initiative involves the development, implementation and testing of disruptive and innovative business and investment models that can raise the funds required to finance the transition from a fossil fuel-based energy model to one based on sustainable energy. To maximize the likelihood of success, the project has planned to conduct the business and investment modelling collectively, by engaging and actively involving local and international stakeholders. The project anticipates that this strategy will reduce risks and increase support for the suggested solutions. The aim is that the municipalities involved in the process will play an essential role in the success of energy transition, by including their own business models in the analysis. They are also responsible for taking the lead and interacting with the public, to encourage acceptance of and involvement in energy transition.

The project objective is that new forms of integrated spatial, economic, social, regulatory and technological innovations will deliver new tools to involve industry, civil society and local authorities, respectively, in the transition from Positive Energy Blocks to Positive Energy Cities.

2.2. *The project's current risk management approach and its challenges*

As in most smart city lighthouse projects (see, e.g., Karatzoudi and Aven 2022; Ahlers, Karatzoudi and Wyckmans 2020), the risk management for Positive CityxChange is in line with common standards, as described in ISO 31000 and the Open PM2 Project Management Framework, highlighting the identification, analysis, evaluation and treatment of project risks. The project has a strong commitment to risk management and to regular reviews and updates of risk management procedures. As a highly complex project in a dynamic and innovative environment, it needs to ensure that the project goals are not threatened by current or new types of risks. It also delivers annual, updated risk management plans to the European Commission, including the identification of new risks, a review of existing risks, the adaptation of risk response strategies and mitigation actions, when necessary, and how it incorporates learning lessons from other projects and their risk management strategies.

However, most smart city lighthouse projects have faced challenges concerning organizational and governance issues, as well as vulnerability to disruptions and unpredicted events (see discussion in Karatzoudi and Aven 2022). As a complex and highly interconnected project, the Positive CityxChange has various project stakeholders that need to collaborate effectively to achieve the project's objectives and goals and accomplish the project's deliverables. Despite its high commitment to risk management and risk management procedures, the project has faced organizational and governance challenges during its strategic planning and execution. Many project partners have had difficulties in understanding the role of organizations participating in the project, as different forms of business models, business agreements, ownership models and partnerships are required. Many project partners have raised the problem that lack of appropriate information sharing prevents the involved actors from understanding the complexity of the smart city system and challenges their understanding of the expectations placed on the project (SCIS 2017). These factors have caused delays and misunderstandings among project partners and, in some cases, a lack of response and data contributions during the execution of planned activities and the preparation of project reporting and deliverables.

Besides the above governance and organizational challenges, the project has faced other vulnerabilities that question the effectiveness of traditional risk management practices. The review of projects' current risk management strategy, methods and techniques shows that most lighthouse projects have not included resilience concepts in their assessments, especially in the context of disruptions, changes and disturbances (Karatzoudi and Aven 2022). It has also shown that most projects have no business continuity plans to deal with unpredicted events, as for example during the recent pandemic outbreak or in the case of data breach or cybersecurity attacks. The recent pandemic outbreak has challenged the effectiveness of current risk

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[a] A Positive Energy Block (PEB) is a group of at least three connected neighbouring buildings producing on a yearly basis more primary energy than they use.

[b] Positive Energy Districts (PED) are energy-efficient and energy-flexible urban areas or groups of connected buildings which produce net zero greenhouse gas emissions

management practices in the Positive CityxChange project and has revealed the lack of focus on resilience concepts in the project's risk assessments. This situation resulted in delays in the overall planning of all pilot smart cities and the deployment of smart solutions and had an impact on the project's progress due to disruptions in the supply chain and fieldwork for gathering necessary data and measurements. In addition, the disruption revealed the lack of a holistic risk management framework applied to all project partners in their entirety. More specifically, the lack of focus on resilience-based strategies and the involvement of all project partners in resilience analysis and assessments has resulted in different response and recovery efforts from each partner organization. This fact has prevented project partners from directing coordinated efforts towards the disruptions and system recovery.

In the coming section, we will demonstrate the practical applicability of the suggested risk management framework (Karatzoudi and Aven 2022), and how it can improve the current risk management approach in Positive CityxChange, by examining both the benefits and requirements the framework implementation may bring to the project.

3. Practical applicability of the suggested risk management framework to the Positive CityxChange project; Benefits and requirements

Table 1 presents the practical applicability of the suggested risk management to the Positive CityxChange project. Firstly, it illustrates the challenges of the current risk management approaches in smart city lighthouse projects and how the suggested risk management framework, based on methodology discussed by Karatzoudi and Aven (2022), meets those challenges. Secondly, it presents the potential benefits and requirements for the practical implementation of the framework to the Positive CityxChange project.

As shown in the first column of Table 1, the current risk management approaches in smart city lighthouse projects face challenges due to the organizational complexity of these projects, mainly as a result of difficulties in understanding the role of organizations participating in the project, as new business models, agreements and different types of ownership are required. To address these challenges, the suggested risk management framework (Karatzoudi and Aven 2022) focuses on two main variables from the Collaborative Governance model (Ansell and Gash 2008): institutional design and facilitative leadership. More specifically, it suggests a change to the current institutional design of the smart city project, giving more weight to collaborative governance issues, such as participatory inclusiveness, process transparency, clear ground rules, etc., and adopting facilitative leadership as a critical variable to promote and safeguard inclusive decision-making and the active engagement of project stakeholders. For the practical application of what the framework suggests to the Positive CityxChange project, the first step is to understand the existing institutional design of the project, meaning its current organizational structure and governance mechanisms put in place to manage and coordinate the project, including the roles and

responsibilities of different stakeholders, such as municipalities, business organizations and citizens, and identify the areas that need to be improved or changed to better align with the project goals and the needs of the project stakeholders. The process requires understanding of the specific roles and responsibilities of each partner organization, and how they interact with each other to identify any gaps or overlaps in responsibilities that need to be addressed, as well as to identify opportunities for collaboration among organizations or ways to incentivize collaboration. Secondly, adopting facilitative leadership as a critical variable to meet this challenge includes clear communication of a shared vision for the project and empowering stakeholders by giving them the autonomy and resources they need to take ownership of the project and make decisions that align with the project's goals. The current project management structure in the Positive CityxChange project follows common project management standards, covering project management activities such as planning, execution, monitoring and controlling, and provides guidance on how to implement them in an effective and efficient manner. However, traditional project management structures are not specifically designed to promote collaborative governance. They may prove to be challenging in complex and multi-stakeholder projects or in projects with high levels of uncertainty or rapidly changing requirements, such as smart city lighthouse projects.

As discussed in Karatzoudi and Aven (2022), reworking the institutional design to be more flexible and inclusive will meet the distinct needs of project stakeholders to understand the complexity of the smart city lighthouse project and will develop a better understanding of their role in the project. Inclusivity in institutional design facilitates the participation and engagement of all stakeholders, thereby promoting transparency in the decision-making process. This is achieved by involving all project stakeholders in the decision-making process and ensuring that they possess a thorough understanding of the reasoning behind the decisions that are made. Additionally, adopting facilitative leadership as a critical variable will facilitate the active engagement of project participants in proposing solutions, choosing priorities and providing feedback on risk management strategies. Moreover, facilitative leadership promotes flexibility and adaptability to changing conditions, which is essential in the complex and dynamic environment of the project. However, implementing these suggestions may cause delays to project operations and progress until the transition from the current project management structures to new, more flexible structures of collaborative governance is completed.

Furthermore, Table 1 addresses governance and organizational challenges in smart city lighthouse projects, specifically, lack of appropriate information sharing among stakeholders, lack of appropriate involvement of project stakeholders in all phases of the project, and lack of clarity in expectations. The suggested risk management framework (Karatzoudi and Aven 2022) uses the collaborative process variable from the collaborative governance model (Ansell and Gash 2008) and suggests making it a main priority in the project. In more detail, the framework suggests introducing protocols of collaboration and policies that do not currently

Table 1. Practical applicability of risk management framework based on collaborative governance and resilience-based strategies to +CityxChange smart city lighthouse project; Benefits & requirements

Identified challenges of current risk management approaches	Suggested risk management framework to meet the challenges	Practical application to +CityxChange benefits	Practical application to +CityxChange requirements
1 Organizational complexity of smart city lighthouse projects	**Methodology used based on Collaborative Governance model (Ansell &Gash 2008):** Model variables **1 Institutional Design** **2 Facilitative Leadership**	1 Understanding of the existing institutional design of the project and identification of the areas that need to be improved 2 Clear communication of a shared vision for the project - empowerment of stakeholders by giving them the autonomy and resources they need to take ownership of the project and make decisions that align with the project's goals	
1a Difficulties in understanding the role of organizations participating in the project – new business models, agreements, ownership are required	1 Change of current institutional design, more flexible organizational structure, giving weight to collaborative governance issues 2 Facilitative leadership critical to promote and safeguard inclusive decision-making and active engagement of project stakeholders	1.1 It will meet the distinct needs of project stakeholders to understand the complexity of the smart city project 1.2 Clear ground rules and more transparent processes in risk management decisions 2.1 It will facilitate the active engagement of project participants in proposing solutions, choosing priorities, and providing feedback on risk management strategies	It can cause delays to project operations and progress until the change from old project management structures to new, more flexible structures of collaborative governance are implemented
2 Governance & organizational challenges	Model variable **Collaborative process**	Introduction of protocols of collaboration	
2a Lack of appropriate information sharing among stakeholders	Introduction of information sharing system, creation of discussion forum	It can help to manage risks by providing real-time data and information that can be used to identify and assess potential risks	No added requirements
2b Lack of appropriate involvement of project stakeholders	Introduction of protocols of collaboration that have cross-organizational effect	It could mitigate the risk of conflicts between project stakeholders due to governance issues	It requires the collaboration and consensus of all project partners and stakeholders, which might not be feasible to achieve in all cases
2c Lack of clarity in expectations from project stakeholders, conflicts	Introduction of cross organizational policies, data usage policies, conflict resolution policies.	It will facilitate project partners to balance their project interests versus commercial interests	It requires the collaboration and consensus of all project partners and stakeholders, which might not be feasible to achieve in all cases
3 Disruptions, disturbances, natural, technological or man-made disasters	**Integrated risk-resilience-based strategies**	Integration into project organizational processes as complementary to traditional risk management activities	
3a Lack of focus on resilience concept	Emphasis on managing smart city system resilience to confront potential surprises and disruptions	It will ensure a high level of resilience in the innovative solutions that +CityxChange project implements	Assessing the resilience of technological solutions is a difficult and time-consuming task for the project
3b Lack of resilience analyses and assessments	1 Integrate resilience analysis and management into project organizational processes 2 Involve all stakeholders to identify the critical functions of the system	1 Focus on both daily threats and hazards to organizational and infrastructure conditions and on longer-term or lower probability – high consequence threats with considerably adverse outcomes for smart city project +CityxChange 2 They contribute to providing data to support the resilience analysis regarding available resources and backup plans for each partner organization in the case of a disruption	The decision to involve all project stakeholders to co-design the risk framing of the projects requires the application of more specific and suitable risk governance principles that reflect current risk knowledge
3c Lack of business continuity planning	Introduce cross-organizational business continuity plans	It will ensure the coordinated efforts of all project partners for the +CityxChange response to and recovery from disruptions	All project stakeholders need to be aware of the business continuity plans of the organizations they represent, to assess the cross-organizational business continuity planning

exist in the project and have a cross-organizational effect. This means that the protocols would be implemented across different organizations that are participating in the project, promoting collaboration and cooperation among all stakeholders. As of today, most smart city lighthouse projects, including Positive CityxChange, have data usage policies and conflict resolution processes in their consortium agreements (a binding contract signed between the partners of lighthouse projects), but those data usage policies concern each partner organization separately and have no cross-organizational effect that applies to all partners in their entirety. The benefits of the suggestion include mitigating the risk of conflicts between project stakeholders and facilitating project partners to balance their project interests versus commercial interests, which is one of the main causes of conflict among project stakeholders. However, the implementation of protocols necessitates the participation and agreement of all project partners and stakeholders. This may prove to be a challenge in instances where consensus cannot be attained.

Lastly, Table 1 illustrates three main challenges that can arise in smart city lighthouse projects related to disruptions, disturbances, natural, technological or man-made disasters. Challenge 3a highlights the lack of focus on resilience in smart city projects as a major issue. To address this challenge, the suggested risk management framework recommends prioritizing the management of the resilience of smart city systems, in order to better confront potential surprises and disruptions. This approach is expected to lead to a high level of resilience in the innovative solutions implemented by the Positive CityxChange project. However, assessing the resilience of technological solutions is acknowledged as a difficult and time-consuming task for the project.

Challenge 3b addresses the lack of resilience analyses and assessments in smart city lighthouse projects. The framework suggests integrating resilience analysis and management into project organizational processes and involving all stakeholders in identifying the critical functions of the system. This approach is expected to focus on both daily threats and hazards to organizational and infrastructure conditions, as well as longer-term or lower probability – high consequence threats, with considerably adverse outcomes for the Positive CityxChange project. Involving all stakeholders in this process is also expected to provide data to support the resilience analysis regarding available resources and backup plans for each partner organization in the case of a disruption. However, the decision to involve all project stakeholders in co-designing the risk framing of the projects requires the application of specific and suitable risk governance principles that reflect current risk knowledge.

Challenge 3c is related to the lack of business continuity planning in smart city lighthouse projects. Business continuity planning refers to the procedures and strategies that organizations put in place to ensure they can continue to function in the event of a disruption or disaster. For example, Positive CityxChange has experienced COVID-19 implications due to lack of resilience management and business continuity planning; thus, those implications were handled as a part of its usual risk management activities. Specifically, the project is facing the lingering effects of the pandemic, including delays in the progress of the work, shifts in economic conditions and investment priorities, disruptions to the supply chain and other challenges (Ahlers et al. 2022). These impacts have prolonged and deepened the effect of the pandemic on the project. The project is being impacted in various ways, beyond the initial delays. These indirect and long-term impacts are causing significant changes and the re-structuring of some aspects of the project and may result in further delays in certain tasks (Ahlers et al. 2022). The suggested risk management framework highlights that one solution to these challenges is to introduce cross-organizational business continuity plans. This means that all partners involved in the Positive CityxChange project would work together to create a plan that outlines how they will respond to and recover from disruptions. The idea is that, by having a coordinated plan in place, the project will be better prepared to handle disruptions and minimize their impact on the project. However, it is acknowledged that, for this solution to be effective, each partner organization needs to have their own business continuity plan in place and that all stakeholders involved in the project need to be familiar with these plans. This is important because it allows the project stakeholders to assess the effectiveness of the cross-organizational business continuity planning and ensure that the plans align with the overall goals of the project.

4. Discussion

Section 3 of our work demonstrates how the risk management framework suggested by Karatzoudi and Aven (2022) can effectively address the identified challenges of current risk management approaches in smart city lighthouse projects. We outline the necessary processes and actions for a real-life smart city lighthouse project (Positive CityxChange) to implement the framework within its existing project management structures. Additionally, we discuss the potential benefits that the framework's implementation can bring to the project, some of these may include enhanced stakeholder engagement, improved collaboration and communication, alignment with the needs and concerns of the project stakeholders, integration of resilience strategies and increased project resilience to potential threats and hazards. However, the implementation of the framework also requires the consideration of certain requirements, related to, for example, the development of a collaborative governance structure, the availability of resources, proper planning and efficient resource allocation.

The case study of the Positive CityxChange lighthouse project has shown that the implementation of the suggested risk management framework based on collaborative governance and integrated risk-resilience strategies will require a significant shift from its current project management structure and approach. The traditional project management structure of the project focuses on top-down decision-making, in which a central authority makes decisions and implements them through a hierarchical structure. This structure could prove to be inappropriate for addressing the complex and dynamic challenges faced by

the project, as it involves multiple project stakeholders with diverse perspectives and interests. The suggested framework, on the other hand, emphasizes the importance of involving all relevant stakeholders in the decision-making process, promoting collaboration, and empowering stakeholders to take ownership of the project. This approach acknowledges that disruptions and risks can come from multiple sources, including environmental, technological and social, and that a more integrated and holistic approach is needed to effectively manage them.

In addition, the implementation of the proposed risk management framework highlights the need for a change in the traditional project management structure and approach in addressing disruptions. The Positive CityxChange lighthouse project case study serves as an example demonstrating the importance of incorporating the concept of resilience in managing disruptions effectively. For instance, the Positive CityxChange project, like many others, was impacted by the COVID-19 pandemic. However, due to a lack of resilience management and business continuity planning, the implications of this disruption were handled as part of its usual risk management activities. Handling disruptions as a part of traditional risk management activities typically focuses on identifying and mitigating risks but may not adequately address the broader systemic and interdependent impacts of disruptions. This can result in solutions that are not robust enough to handle future surprises and disruptions, leading to increased vulnerability of the project and smart city system. Secondly, the traditional approach may not be equipped to handle disruptions that are outside the scope of normal risk management activities. For example, disruptions like pandemics or natural disasters can have far-reaching implications for the projects that are difficult to anticipate and plan for. This can lead to a lack of preparedness and an inability to respond effectively when disruptions occur. Finally, focusing solely on managing disruptions can lead to a narrow perspective on risk and an over-reliance on mitigation measures, rather than promoting a more proactive and systemic approach to resilience. This can result in missed opportunities to enhance the overall resilience of smart city systems and limit the potential benefits that these systems can bring.

The case study of Positive CityxChange also sheds light on the challenges faced by smart city projects in managing the resilience of smart city systems, which gives us new insights for the framework. The framework suggests prioritizing managing the resilience of smart city systems by assessing the resilience of technological solutions that the project implements. However, the resilience assessment of those innovative technological solutions is a rather difficult and complex task for the project that requires specialized expertise and resources. This is because the innovative solutions implemented by smart city projects are often highly complex and constantly evolving, making it challenging to determine their level of resilience. There are many factors to consider when assessing the resilience of technological solutions, such as their ability to adapt to changing conditions, the degree of interdependence among different systems, and their overall reliability and robustness. The constantly evolving nature of the

technology used in smart city projects adds an extra layer of complexity to the framework implementation. It means that it is difficult for the project to keep up with the latest innovations and changes in the field to assess their level of resilience, which can pose challenges for the implementation of what the framework suggests.

It is crucial to acknowledge, though, that, while the proposed risk management framework provides valuable insights and suggestions, its effectiveness will ultimately depend on the unique characteristics and needs of each smart city lighthouse project. The Positive CityxChange project can serve as a beneficial case study for other smart city projects in highlighting the challenges associated with disruptions and the importance of an integrated and holistic approach in managing them effectively. Additionally, it is imperative to implement regular monitoring and evaluation procedures to guarantee the effectiveness of the suggested framework in achieving its established objectives.

5. Conclusion

This paper has examined the practical applicability of the authors' suggested framework and methodology for improving the risk management in smart city lighthouse projects based on collaborative governance and integrated risk-resilience-based strategies. The case study of the Positive Cityxchange project provides practical insights into the benefits and requirements of implementing the framework to smart city lighthouse projects. The case study highlights the need for a shift from a traditional project management approach to a more integrated and holistic approach that takes into consideration the dynamic nature of smart city projects. Thus, the implementation of this framework requires a collaborative effort among project stakeholders, a focus on resilience and a willingness to adapt to the constantly evolving landscape of smart city projects. This framework is expected to improve the risk management and overall resilience of smart city projects, leading to more successful outcomes and benefits for the city and its citizens and ensuring that the project is developed with a focus on long-term sustainability. However, its implementation may also present challenges that need to be addressed. The process of implementing the framework can also be complex and time-consuming for the project, requiring a deep understanding of smart city technology and the ability to continuously monitor and assess the resilience of the technological solutions being implemented. Additionally, the rapid pace of technological advancements in the smart city domain can create a significant challenge in keeping up with the latest innovations and changes in the field to assess their resilience. To enhance the understanding of the framework's practical applicability and to refine the methodology, additional case studies of smart city lighthouse projects should be conducted. This includes exploring the feasibility of implementing the framework to other smart city lighthouse projects, studying the challenges faced by different types of smart city projects, and assessing the long-term effectiveness of the framework. Then there is a need for synthesizing the findings across all case studies, to understand the effectiveness of the risk management framework and identify ways in which it can be improved or

adapted for different contexts. This can help to ensure that the framework is relevant and effective for a wide range of smart city lighthouse projects.

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