

D11.12: Risk Mitigation Registry 4

+CityxChange | Work Package 11, Task 11.5

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20.12.2022	v0.2	Dirk Ahlers, Elisa Junqueira de Andrade, Shreejana Poudyal, WP leads and cities	Updated with current risk status and mitigations, updates of risk tables, integration of feedback

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List of Acronyms

CA	Consortium Agreement
DoA	Description of Action
EB	Executive Board
EC	European Commission
EEAB	External Expert Advisory Board
EU	European Union
GA	Grant Agreement
GA	General Assembly
KPI	Key Performance Indicator
MS	Milestone
NCP	National Contact Point
NAT	National Advisory Teams
PM	Project Manager
PO	Project Officer
SCIS	Smart Cities Information System
SCM	Smart City Marketplace
TB	Technical Board
WP	Work Package
WPL	Work Package Lead

Executive Summary

This deliverable contains the +CityxChange risk management process and a regular review and update of the risk tables. It defines detailed risk management and review processes and sets expectations, procedures, and responsibilities. It presents an extended version of the risk tables, updated with the state at the time of writing with new risks based on lessons learned, and defines more detailed criteria for each identified risk, leading to an operational risk management and tracking. This report also includes a state-of-the-art review done in early 2021 of existing SCC-01 projects in order to identify gaps in this risk management strategy; and includes a risk assessment section for COVID-19 implications done in 2021. This report is the updated version of D11.9: Risk Mitigation Registry 3 and supersedes that document. Specific changes from the previous document are highlighted in the Introduction.



1 Introduction

This deliverable presents the fourth update to the risk management strategy and processes of +CityxChange and the registry in the form of the risk table. The Deliverable is part of Task 11.5: Risk Management and connected to Task 11.2: Delivery of Consortium Plan, and Task 11.1: Project Management.

+CityxChange is a highly complex project in a dynamic environment. To ensure the ambitious goals of the project can be reached, potential or current risks to the project's success need to be identified and handled in a structured and timely manner.

Risk management allows the project to achieve its objectives. It is an integrated part of the overall project management and is necessary in all parts of the project down to individual Work Packages, Tasks, and partners. All consortium partners, Work Package leaders, and the Project Coordinator and Project Manager are included in the risk management process to ensure integration of all stakeholders and viewpoints. Partners are expected to actively participate in risk management and actively work on risk mitigation. The project has a clear commitment to risk management, as part of the overall list of Critical Risks, maintained in the EU Participant Portal and updated as part of the periodic reporting, and through individual processes as part of the management of individual Work Packages and Tasks.

Managing risks is an iterative, adaptive, and ongoing process. It needs to be able to respond to changed context and project characteristics over time. Risk management should aim to not only react, but also anticipate and mitigate risks through appropriate processes and responses.

The risk table of identified risks will be regularly reviewed and evaluated to allow at least yearly updates. Risks will be monitored and reviewed. These will include regular checking and updating of risks, mitigation measures, severity, imminence etc. The detailed risk assessment process consists of risk identification; risk analysis in terms of likelihood, impact, and other factors; and risk evaluation and decisions; leading to risk treatment, in line with ISO 31000. The risk management process itself can also be evaluated and improved through experiences over the project lifetime. Results will be documented in regularly updated risk tables and updates to future versions of this Risk Mitigation Registry Deliverable.

The regular review process of the risk table is linked to the overall project change management as described in D11.1: Overall Consortium Plan to ensure risks are regularly updated in line with overall project and WP management.

Risks related to financial issues in overall project reporting are out of scope of this Deliverable and are addressed by the Coordinator's financial office. Specific economic risks for the project and the demonstrations are part of the risk table.



The current state of the risk table is based on the DoA and its Critical Risks table, and regular additions and updates: until M24 as part of D11.6 Risk Mitigation Registry 2, including COVID-19 updates, and risk impact, likelihood, and weight added in consultation with the partners; updates made as part of the RP2 report after M30; updates at M36 by D11.9: Risk Mitigation Registry 3; updates as part of the RP3 report after M42 and updates since then until M48 as described below.

This public document represents the current state of the Risk Management document and supersedes the previous version, D11.9 Risk Mitigation Registry 3¹ (and the earlier D11.6: Risk Mitigation Registry 2; D11.4: Risk Mitigation Registry 1; D11.3: Risk Mitigation Registry), to which this is an update. Specific changes to the previous document are as follows:

- Update of risks based on the status after RP3 (April 2022) and until M48 (October 2022) as updates to the risk table.
- Summarised lessons learned (Section 5 and Annex)
- The rest of this document remains without significant changes.

¹ <https://cityxchange.eu/knowledge-base/d11-9-risk-mitigation-registry-3/>

2 Processes and Structure

This part is repeated from D11.4 Risk Mitigation Registry 1 without significant changes. A new risk process for COVID-19 implications is described in a separate section 3.

The +CityxChange Risk Management Strategy will ensure early identification of potential risks within the innovation phase as well as during full-scale demo project implementation, monitoring and replication. Potential mismatches between risk owners and risk appetite across the consortium will be addressed, and risk identification and mitigation practices are implemented across the entire life-cycle of the project. It is defined in this Risk Management Plan and tracked in the risk table in the masterlist. Risk management within the project will be governed by the hierarchy of avoidance, transfer (risk shaving), mitigation, adaptation, and acceptance by engaging all partners. Risk management regularly reassesses and acts on the risk identified in the Critical Risk Table. The aim is to keep as many risks as possible at low or medium, through adequate mitigation measures, and hence reducing the risk level. Increased risks, at any stage of the project, will be examined and discussed, and new mitigation measures put in place to reduce the overall risk to an acceptable level.

In some Project Management literature, risks can be negative and positive, as events happening in/to the project. The goal of project risk management then is to increase the level of positive risks and decrease the level of negative risks, to support the project success. We keep with the common definition of risks versus opportunities, to ensure readability and easy understanding. However, we stress that we need to embrace such opportunities and use strategies to exploit (the opportunity directly), enhance (the likelihood), share (by allowing other parties to exploit), and accept (as it comes) such opportunities to embrace both sides of unforeseen events.

The goal of the risk management processes is that project risks are identified, analyzed, evaluated, and treated in a structured process that monitors and tracks them, and raises risks to the right level and responsibilities in the project. The processes and structures in the project are based on best practices, an ongoing screening and updating of risk management processes in other SCC-01 projects and frameworks such as the Open PM2 Project Management Framework² and ISO 31000³ processes.

Risk Management takes a high-level place in the project management structure. As described in the DoA, the Coordinator will appoint a Risk Manager, who will follow the project closely and update the +CityxChange Risk Management Strategy annually (or when otherwise required). The Coordinator appoints the Project Manager to this role, who will be supported by the Management Support Team.

²OpenPM² - Open Project Management Methodology
https://ec.europa.eu/isa2/solutions/open-pm2_en

³ ISO 31000:2018 Risk management -- Guidelines, International Organization for Standardization,
<https://www.iso.org/standard/65694.html>



Risk reviews will take place regularly, at least yearly in time for the updated Deliverables of this task. They will also be revisited as part of the Periodic Reporting. Additionally, risks can be raised through the processes described below to ensure fast reaction and mitigation. Risks that develop faster than anticipated, cross a threshold level above medium, or are the results of actual incidents, need to be raised immediately for proper risk handling.

The regular reviews also should include what-if scenarios, to better understand influence factors and possible cross-dependencies, and to understand potential changes in environmental and context conditions through what-if scenario analysis. This holds for all classes of risk and includes identification of new risks, review of existing risks, adaptation of risk level assessments, adapting risk response strategy and mitigation actions, implementation of mitigation and follow up of mitigation results so far, learning from other projects and external factors, other issues, reporting of risks to the relevant bodies, escalation of risks when needed, and consistent and structured tracking with a detailed risk table. Periodic updates are the basis of checking and updating risks, mitigation, severity, imminence etc., the occurrence of risks over time, forecasting in combination with what-if scenarios, regular reviews with the cities and WP leads, clear responsibilities and regular reviews, and a structure for follow ups.

The following graphic provides a high level overview of the steps.



Figure 1: Simplified overview of Risk Management Process

Risk Identification

Risks identification considers both individual Task risks and sources of overall project risk. Risks should be raised by any project member, but should go through the Task leaders as risk owners and then the Work Package leaders as part of overall Work Package responsibility in the respective boards with the Project Manager. The PM organizes the process. Risk needs to be raised in a sufficiently detailed fashion, the risk table will provide a template for this. In addition to the risk description, at minimum the initial estimate of risk likelihood, impact, overall risk level (weight), and imminence need to be documented, together with other factors. Preliminary risk responses may also be identified and recorded.

Risk Analysis

The PM assesses the risk and its status with the one who raised the risk, and coordinates between multiple parties. In case of disagreements in the overall process, they can be escalated to the Executive Board. Risk description, likelihood, impact, and other factors are determined. The risk level and imminence model is described below.

Risk Evaluation and Decisions

This step assigns a risk owner, defines appropriate risk response strategy, and discusses and defines mitigation actions. New risks need to be presented to the Technical Board for



information and coordination between WPs and cities. New risks that are above a threshold of medium also should be raised to the Executive Board for information and risk review. Risks that move from being imminent to being present, either by progression of work or actual incidents need to be raised immediately to the WP lead and to the PM. They will be tracked in the masterlist and appropriate responses will be decided.

Risk Treatment

Risks should be managed locally by the cities for their demonstration activities as well as by Work Package leaders for their Work Packages. Cross-cutting risks are the responsibility of the Coordinator together with all relevant partners as laid out in the risk table. Depending on ownership, mitigation actions need to be initiated and followed up by the respective Task leads, whose organizations are defined as risk owners in the risk table. These need to coordinate with the WP lead in coordination with the PM. In most cases, this should be handled at a Task lead level by the risk owner, but for some cross-cutting risks may be a Work Package leader or City Coordinator as part of the risk-owning partner.

Risk level and imminence assessment

The following matrix is used to assess a risk level based on likelihood and impact. While the combination of “high” and “high” could be considered to lead to a “very high” level, we keep it as “high” as it still mandates action and further makes the matrix easier in line with standard practices.

Likelihood	High	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium
		Low	Medium	High
		Impact		

The following categories are used to specify the imminence of a risk:

Present	Risk is already present and is likely to continue until mitigated
Imminent	Risk will likely occur within the next 3-6 months
Close	Risk will likely occur within the next twelve months
Remote	Risk will likely occur within the lifetime of the project



3 Risk assessment for Covid-19 implications

This section is repeated from the previous version, D11.9: Risk Mitigation Registry 3. Delayed and longer-term impacts from the pandemic are experienced by the project, in the form of general delays of the work, changed economic conditions and willingness to invest, supply chain issues, and more. Those are handled as part of usual risk management now and acknowledged in Section 5.

The main risk and impact on the project in its second year has been the COVID-19 pandemic. It included a lot of direct risk management, continuously adapting work plans to the work-at-home situations and other impacts, replanning work to clearer separate on-site and off-site work, finding alternatives to planned activities, and generally keeping the core of the project running. Handling increased risks due to COVID-19 outbreak provides a stress test of the overall project and its current risk management strategy and identifies new or improved strategies that could also help the project to more effectively manage its risks.

Timeline and national responses

Early reports about the outbreak were not yet considered applicable to the project, but from late February and onwards, the topic was initially discussed as potential project impact. In more detail, during the Technical Board meeting in the beginning of March (03.03.2020) concerns were brought up, mainly about risks regarding the project's supply chains of parts originating from Asia; and to a certain extent – and with a higher uncertainty – around potential impact on physical interventions and access of personnel for the deployment phases in the Lighthouse Cities, with a reduced ability for local meetings, measurements, engagement, and installations and deployment activities. An additional topic was the upcoming Learning Workshop in Pisek planned for March and the possibility of travel restrictions.

The main early response strategy was an observation of respective national and local official responses and an adaptation to those due to the rapidly developing situation. Certain restrictions on travel to and from affected regions or large-scale gatherings came into place in Europe between end of February and beginning of March. After that, the countries went through different stages of their tiered pandemic response.

On 9th March 2020, the Italian government instituted a national quarantine, after the early lockdowns in Lombardy. This impacted the Italian partners in the project to leave their offices and work from home.

As of 12th of March, in the Lighthouse cities of Trondheim and Limerick, and the Follower City Pisek, national restrictions were enacted. Schools, kindergartens, universities were closed, and more measures for social distancing were coming up. The Czech Republic entered a state of national emergency and closed its borders to most other countries.

On 13th March, Estonia and Bulgaria declared a state of emergency, on 14th Spain enacted a lockdown, on the 16th a state of emergency was declared in Romania. Ireland

raised its response to a stay at home order on the 27th. The national responses continued in varying levels until today.

Travel, meetings, and office work had been restricted for many partners already throughout Europe. From this time forward, most other partners were transitioning to work from home for the foreseeable future.

Project responses

Immediate measures were applied early on such as cancelling any in-person meetings and workshops, both locally and project-wide. This also included the project's regular learning workshop and EU activities. The project moved as much as possible to online meetings or postponed/cancelled events. This also led to numerous local and project-wide events being cancelled and moved to online formats, with the first one being the Learning Workshop planned for March in Pisek. However, it was still uncertain at that time how long the situation would persist, so a full cancellation was postponed until more clarity would arise. Details are found in Section 5 and the Annex.

The Board of Coordinators of the SCC1 projects also initiated an early process (20.03.2020) to support specific risk analysis on implications due to COVID-19 and continuous monitoring on how the recent situation will evolve. It distributed a COVID-19 risk impact table to collect information about the impacts on SCC1-projects for an overview across the projects. This table formed the basis for the +CityxChange specific COVID-19 risk assessment. It was also discussed at a following BoC meeting (Some aspects of the BoC meetings are described in D9.10: Report on attendance at events held by other SCC-01 co-ordinators 4).

The topic was discussed at the Executive Board (25.03.2020) and an extraordinary General Assembly was prepared to discuss the situation and possible mitigation measures with all project beneficiaries.

As a reaction to the pandemic, +CityxChange has updated its project risk treatment techniques in order to deal with the unexpected COVID-19 implications on the project implementation. It included a review of the original risk treatment techniques as well as updated project risk treatment techniques under COVID-19 for their applicability to processes in risk management; techniques for establishing context, risk identification, risk assessment and treatment. Added guidance was prepared to include business continuity best practices under disruptions due to pandemic outbreaks.

An additional risk assessment table for the COVID-19 outbreak was created to specifically identify its risk implications, their likelihood and impact in terms of delays, and apply appropriate mitigation strategies. All project partners and the WP leads of the Technical Board were asked for their input and contribution as a first estimate in order to understand the possible impacts and delays. This happened at the end of March, starting 27.03.2020 after the EB meeting.

In addition, an extraordinary Technical Board meeting was held right after (31.03.2020) where the TB members (WP leaders) jointly discussed the impact, expected or occurring delays, and mitigation measures. The meeting went through each WP and through the current state of the COVID-19 risk tracker for a joint understanding and for preparation of the scheduled extraordinary General Assembly.

The preliminary identified impact ranged from almost none, over medium to substantial; with timeframes of potential delays of 0-3, but up to 6-12 months. The impact included direct (personnel, activities, installations, supply chain, KPIs) and indirect implications (change of business scope, changed economic and social landscape, impact on future funding options etc.). No tasks were seen to be completely halted, all could continue at a slower pace or with rearranged work plans and priorities. The basis for this estimate was the assumption of 2-3 months of stronger restrictions or lockdown. Under this assumption, the first estimation showed that the project should be managed with short-term mitigation for 2-3 months. In case of longer lockdowns or restrictions, a reassessment was necessary.

The Extraordinary General Assembly was held online (02.04.2020) with the main scope to take stock of the status and risks for the project as a consequence of COVID-19, discuss broader impact, and whether and which mitigation measures to take. The discussion of the situation followed the line of the TB meeting and risk assessment as described above.

A main decision point was the possible triggering of the actions possible under the Force Majeure clause 51 of GA (recovery of costs; suspension of action). It was decided that there is not sufficient impact and lack of tasks to support a suspension of the action or parts of it. Thus the main decision was the continuation of the action, while limiting the impacts, find good mitigation strategies, shifting/reordering work plans, consolidation of work to date, focus on non-physical or off-site aspects, move to online collaboration, etc. while keeping the situation under observation

A regular General Assembly was held on 26th of August 2020. It was held earlier than usual and not at the Consortium Meeting, since the Consortium Meeting itself was held in an online format, and the GA could give potential guidance to the future work. This ensured best use of time and management of dependencies in the project.

The General Assembly included updates on the COVID-19 Risk Assessment, taking into account the continuous monitoring of the situation. The main updates discussed were that the main estimates and areas from earlier risk assessment still apply.

- Specific impacts on business models, financial schemes, retrofits, building measures are likely to rise
- Impacts on partner efforts, efficiency, and personnel, could manifest later
- Citizen-facing activities are further delayed
- Delay of mobility-related tasks manifesting
- Impact, possible recoveries, and possible extensions beyond end of Year 3 under observation.



The delay estimate was still similar at around 3-6 months, meaning that there is a possibility that efforts will have to be stretched out. Detailed updated timelines and scenarios for Year3 and Year5 were still too early to decide.

Due to COVID-19 the yearly Consortium Meeting 2020 was held digitally from 19th to 22nd of October (see D9.9 Report on Intra-Project Collaboration Including Study Visits and Peer-to-Peer Workshops 4).

The COVID-19 risk impact assessment and situation update has been a topic in all Executive Board and Technical Board Meetings since March 2020 in order to continuously evaluate and review the situation. Outcomes are presented in Section 5 and in the annex.

The text below is an addition in this D11.9 since the last version of this report, describing the development after M24 until M36.

The situation has since then continuously been monitored. The specific COVID-19 risk register has been continued for some time to reflect the dynamic situation and get a better understanding of direct implications, disruptions, and delays. Apart from direct delays, also indirect impacts were collected and mitigation actions developed. Towards the beginning of 2021, it was slowly phased out, and risks clustered and added to the main risk table update due with RP2 after April 2021.

The mitigation actions have been included in the main risk registry and in the regular work and workplans of the projects and its WPs. As a mitigation response, a number of tasks had to be delayed over the original M36 deadlines for implementation & deployment. Due to wider impacts on building availability, financing, linked with some technical delays, temporary demand reduction, and other effects, also some scope changes were needed. At this time, delays have stabilised at around 6-9 months for major tasks, while some could be done close to the original schedule. These were or are being formalised in larger change requests and included in an ongoing amendment process.

A number of indirect and long-term pandemic impacts are continuing to materialise and affect the project beyond the direct delays. These lead to larger restructurings of some demonstrators in a continuing process and may bring longer delays to certain tasks.

Overall, the different cities and demonstrators have been differently impacted, based on local outbreaks, local responses and restrictions, and the sensitivity of demonstrators to those restrictions, disruptions, and other effects.

These questions have also been discussed in the SCC1 Board of Coordinators, partly led by +CityxChange, and also are points in some of the task groups there.

4 State of the art review

This section is unchanged from D11.9.

In order to further identify gaps in the risk management strategy specific to SCC-01 Lighthouse and demo projects, the project conducts a state-of-the-art review of risks of existing SCC-01 projects. While the first risk management Deliverable contained only a rough overview of existing public Deliverables, the second and this third document analyse their detailed contents and derive recommendations and possible updates to the +CityxChange Risk Management, which will also be performed as part of the regular risk review. An internal table is kept for this overview. This is a followup to the development of the risk table in the DoA before, which already took some existing public information from SCC-01 projects into account. The findings are presented below and are planned to be revisited through the regular updates to the Risk Mitigation Registry.

The process for now includes only publicly available information. Once deeper connections have been built with other projects through regular updates, joint events, and the work in Work Package 9, specifically, Task 9.2/Task 9.3 on Extra-Project Cooperation, more detailed interactions can take place and other lessons learned can be integrated. If needed for specific cases, a follow up and interviews with cities and solution providers could bring a better insight into risks and mitigation.

Process and findings of the risk review of other projects

In the earlier deliverable D11.4 Risk Mitigation Registry 1 (Oct. 2019), all 13 other existing projects until 2018 were selected. Projects starting in 2019 did not have at that time any public Deliverables available. New projects had been included in D11.6 (Oct. 2020). Their public Websites as well as the EU CORDIS system for reporting was examined for any Deliverables or reports related to risk management. The reports found this way were then briefly examined for two main aspects of risk management descriptions and processes, and actual risk tables.

So far, the state of the art review found relevant public reports from the following projects: SharingCities, SmartEnCity, GrowSmarter, REMOURBAN, Triangulum, IRIS, REPLICATE, SmarterTogether, MySMARTlife, as well as from the crosscutting projects ESPRESSO and SCIS in D11.4 Risk Mitigation Registry 1; POCITYF, ATELIER and Sparcs in the previous deliverable D11.6 Risk Mitigation Registry 2.

An initial classification of the depth of information gives an overview of what to expect. We find general and specific risk management processes; implemented processes as detailed risk tracking methods; tables of described risks, with components of risk descriptions, and sometimes present mitigation actions, risk level, likelihood, and impact assessments; general barriers to implementation. The barriers are used in different understandings, some are closer to risks, some are closer to regulatory barriers.

In +CityxChange, regulatory issues are listed as a risk with their own tasks, and are handled in detail in D2.1: Report on enabling regulatory mechanisms to trial innovation in cities, and the follow-up implementation in Task 4.4 and 5.4 on Enabling Regulatory Mechanisms for the Lighthouse Cities and in Task 6.4 on feasibility studies and replication for the Follower Cities.

Five projects have complete risk management plans publicly available, including detailed risk descriptions, impact and likelihood in their risk tables, as well as detailed risk mitigation strategies. Six of them have included risk management in other forms, as described further below. One of them has an extensive report available on risks related to public-private partnerships and another project has briefly outlined risks and mitigation for each strategy for the Follower Cities. Other projects did not have information publicly available or we were otherwise unable to find it. Regarding the other forms of risk management, for many projects, risk management is part of the internal project management documentation, and those deliverables are not public, therefore falling out of reach both for our initial and later collection. In some cases, risk management is part of only one main project management deliverable, in others, it is separated out into own reports specifically on risks, and additional risks and processes are mentioned in city implementation reports or technical deliveries, often in the form of barriers and threats such as legal and normative, financial, social and cultural as well as, barriers referred to general market, energy supply and use, mobility, ICT integration, social and citizen engagement.

Some projects have performed local risk assessments for their participant cities, while for some other projects the risk management is in the form of impact assessment analysis on some specific work packages. Furthermore, some other projects have performed a PESTEL analysis for their cities' replication plans and SWOT analysis or have instead identified possible factors that can be challenging for their replication plans and they revealed the lessons learned on why the replication⁴ may not happen due to those factors.

The risks taken forward to our risk table are Regulatory/privacy/GDPR issues preventing or delaying use of citizen or stakeholder data as planned; unavailability or insufficient quality of adequate baseline data for one or more cities; and difficulty to form new business alliances for building PEBs, scaling, and replication. These three risks have been considered as applicable to the project and added in the risk table. Other risks were closer to our existing ones and some led to an update of our risk and mitigation descriptions.

The updated review for Deliverable D11.6 (Risk Mitigation Registry 2), added 3 new projects started in 2019 (POCITYF, ATELIER and Sparcs) and reassessed previously reviewed projects to review potential additional documentation.

The review did not provide any significant updates or revisions for the previously reviewed projects. For the 3 new projects started in 2019 (POCITYF, ATELIER, Sparcs), only the first

⁴ SCIS Report: Why may replication (not) be happening Recommendations on EU R&I and regulatory policies, https://smartcities-infosystem.eu/sites/www.smartcities-infosystem.eu/files/document/4767_scis_report_2x16-20seiten_web.pdf



one has yet published risk assessment and contingency plans, including risk assessment for COVID-19 implications. Their main implications are focusing on delays over the overall planning of all pilot cities. In addition, the significant impact on physical meetings occurrence and the deployment of solutions is noted, as this first year phase of their project is mostly dependent on site visits and field work. Another implication is the increasing number of persons going on sick leave with a significant impact on the project progress. This is consistent with our own Covid-19 impacts as described in Section 3 and 5. The lighthouse project just started in 2020 did not yet have any information public at time of writing D11.6.

The outbreak of COVID-19 has led to unexpected emergence of significant risks in all existing projects. The Board of Coordinators had initiated an early process in March 2020 to support specific risk analysis and continuous monitoring (details in Section 3).

Our Deliverable and its regular updates will be public, and therefore we will take care not to publish any details that have not clearly been made public by the other projects, by using only publicly available Deliverables.

The state of the art review has evaluated the above risks, barriers, threats, factors or analyses performed by the existing projects and updated the risk table by adding new risks or updating the risk description of existing risks, based on the following mindset; the study found some risks to be too general and out of scope for the +CityxChange project, while some other risks were found to be too specific that could not be applied to the +CityxChange project and thus, were not taken forward in the risk table. Some other risks overlap to the risks that were initially identified for the +CityxChange project. Although they were not considered to be listed in the risk table, they have inspired us to update the risk descriptions of some existing risks in the risk table or to merge them with previously identified risks due to their similarity to some of the existing risks in the risk table. Finally, the study has considered some new risks to add in the risk table that were not listed in the initial risk table and are applicable for the +CityxChange project.



5 Lessons learned and risk table status

This section is repeated from D11.6, with an update at the end.

Starting from the status of the risk table in the DoA, the risk table was expanded based on project work done until M12 within D11.4 Risk Mitigation Registry 1, up to M24 in D11.6: Risk Mitigation Registry 2 and up to M36 Risk Mitigation Registry 3. From the GAP phase, an added risk concerned modelling accuracy and BEST table uncertainty on reaching the PEBS' energy characteristics. Other added risks included detailed insights around the eMaaS demos and the V2X two-way chargers, their availability, and inclusion in deployment plans; and issues around cooperation with external building owners, tenants, and businesses towards deployment of solutions and appropriate business models to ensure deployment. An adaptation on the mitigation was made for the energy systems integration, which is being handled within the respective work packages and may need smaller deviations from the task descriptions with the experience of the work on the ground.

Based on experience so far and the state of the art review, the current version of the risk tables contains adapted risks, improved mitigation action descriptions, expanded descriptions to broaden the understanding of risks, and new ones as described above. Small adaptations of risk level, description, and mitigation were made to existing risks, but do not substantially change them.

The risks taken forward in D11.4 in the risk table, partly from the state-of-the-art review, were Regulatory/privacy/GDPR issues preventing or delaying use of citizen or stakeholder data as planned. Furthermore, adequate baseline data which is not available for one or more cities, or could be of insufficient quality and finally, difficulty to form new business alliances for building PEBS, scaling, and replication. The above risks had been considered as applicable to the project and added in the risk table. For the Limerick demonstrations, a DPIA (Data Protection Impact Assessment) under GDPR has been performed. An extensive additional risk table on this aspect has been developed for internal use (see D11.16 Data Management Plan 3).

In D11.6: Risk Mitigation Registry 2, the status until M24 was described. A small number of specific project risks have been added and some others updated, based on the experience of the second project year and the move into an implementation and deployment phase.

The largest change is the Covid19 pandemic, which has severely impacted the project overall. For this, a separate risk tracker was set up to keep the general project risks and specific demo risks under close observation and estimate delays and other risks.

The main risks added to the main risk table between M13 and M24 all revolve around the Covid19 situation. The summary of the separate Covid19 risk tracking is attached in the annex. The risks taken into the main risk tables include: business and financial impact on beneficiaries and their business continuity; limitations of citizen and stakeholder engagement tasks, in-person meetings, and use of specific venues such as citizen

observatory; impacts on building measures and the necessary financing schemes for them, especially given a large dependency on additional financing to the EU funding to complete the PEBs; an overall negative economic situation making some earlier planned financing and bankability schemes harder to reach and needing a reassessment and replanning around available schemes, funding opportunities, financing options, and future energy prices; delays in site access and hardware deployment to to (partial) lockdowns and similar restrictions; impacts to supply chains; delays in EV schemes and EV car sharing; and an increased difficulty to replicate and scale project results and solutions to other cities due to the change circumstances and priorities. The overall list includes a number of direct and indirect impacts on the project.

Many of these risks translate into delays, which the project may have to accept. The financial implications are different, since these not only cause delays, but possible shortcomings of the overall funding and financing needs, which may risk the financing of the full PEB deployments, and therefore need particular attention and possible adaptations to the project scope. The current situation is still rather unclear to estimate these impacts well. Priorities have shifted towards respective tasks. The situation was kept under close observation and was more formally reassessed in early 2021 and around/after April 2021 in time for the end of the RP2 period.

The state of the art review had shown that other projects had no detailed updates. Some projects are considering extensions and are delayed on building and engagement measures, similar to the +CityxChange project. These were also discussed with other projects within the Board of Coordinators, and the review was not repeated.

The Year 2 and the following Year 3 have been particularly challenging. While Year 2 was mostly on dealing with the direct impacts on work and delays, Year 3 saw indirect and long-term risks materialise that needed a different mitigation and management response. With strong efforts from all partners, we could work on joint solutions. However, the project is encountering delays of 6 and up to 9 months over the end of Year 3. The risk impact assessment due to COVID-19 has been discussed in many Executive Board and Technical Board Meetings since then as part of the meeting agenda in order to continuously evaluate and review the impact.

As said in Section 3, the COVID-19 risk assessment has led to mitigations and decisions taken on extensions of tasks beyond the 3 year deployment period, as well as larger scope changes and an ongoing amendment process. These lock in some changes, but also formalise them as part of an updated workplan and thus ensure a basis for the continuing work and the handling of disruptions and mitigation within the impacted tasks.

Larger updates were done in RP2 after M30, including the formalisation and update of COVID-19 related risks plus some technical ones and a reassessment of their likelihood and impact. D11.9 included these updates, specifically the raising of risk likelihoods around pandemic long-term impacts on building upgrades, energy systems integration, and financial issues.

For this Deliverable D11.12, the updated status until M48 is described below.

Main quantifiable delays in the project have settled at around 12 months, heavily dependent on the previous direct and long-term impacts of the pandemic. This has led to an extended development and deployment/testing phase in the LHCs from 3 to around 4 years. In some cases, this could also give some more time for the solutions to mature further. At the current state, some demonstrators could be completed, while others have experienced further delays or other challenges, and other tasks are still ongoing until the end of the project as planned.

Many ongoing risks and barriers were handled through mitigations, simpler task extensions, and adapted work plans and revised task and PEB structures, which were up to around February 2022 included into an iteratively revised project Description of Action for the ongoing amendment in coordination and iteration with the PO. In addition, for the specific challenges around energy interventions in Limerick, specific mitigation plans were drawn up by WP4 and shared and discussed with the PO, through regular updates and also at RP3. This has also led to the risk tables becoming more specific, as certain risks now materialise in rather different forms or extents in different WPs or cities.

Important updates in the risk tables include:

- Reduction of risk levels for WP5 Trondheim where demonstrators are now completed
- Increase of risk levels for WP4 Limerick, mainly around regulatory processes, dependent energy tasks and deployments, permitting issues, alternatives RES generation, and ongoing processes and mitigation actions
- More difficult financial and funding situations, changed financial landscape, and reduced commitments from building owners, leading to a reduction of retrofits/renovations
- Risk of project impact targets and objectives not being reached in some demos, while still all 11 demos can be show to work in at least one city
- Issues around M&E, delays in finalising definitions, delays around baselines, overall issues with evaluations and learnings, with respective increases in efforts in the city, replication, dissemination, collaboration, and coordination WPs.
- Reduction of minimal monitoring period from 1 to 2 years happening for most energy-related demos, in some cases full monitoring of remaining demos for at least 1 year under mitigation

The updates to the Risk Mitigation Registry will continue with specific mitigation activities in the WPs. The detailed risk tables are attached in the Annex.



6 Conclusion

This report describes the current state of the +CityxChange risk management strategy and processes and the critical risks identified so far. While some risks could be reduced or demos completed, in other demos and tasks the risks have increased despite extended deadlines. At the current state, all 11 demos will be demonstrated in at least 1 city, and many will be demonstrated in multiple cities. The remaining last project year will see further efforts at completing demos and at mitigation actions to reach the best outcomes against the project objectives and for the cities' project and transformation ambitions.

The work of this Deliverable will be regularly updated through reviews and updates of the risk table and the risk management process itself. It will be continued in Task 11.1: Project Management and Task 11.5: Risk Management. The final regular update is due at M60 with D11.12: Risk Mitigation Registry 5. That update will be complemented by the periodic reporting RP4 for the final period of M43-M60 and the respective updates of the risk tables in the portal, based on the state described here and any updates until then.



Annex

This Annex contains the following parts:

- Updated extract of the internal Risk Table
- The COVID-19 risk summary table was included in the last version D11.9⁵. It is unchanged and was phased out and is therefore not repeated here.

⁵ <https://cityxchange.eu/knowledge-base/d11-9-risk-mitigation-registry-3/>

Risk Matrix

					Risk Assessment			Risk Response	
Risk Nr (from Portal or internal)	Date raised	Work package	Partner responsible (risk owner)	Timing	Rating	Likelihood	Impact	Description of risk (and impact)	Mitigation measures
1	01.11.2018	1, 4, 5	IES, POW, MPOW, TE, ABG, ABB, 4C, TE, ESBN, LCCC, TK		Medium	Low	High	Data on the test sites is not securely managed (Privacy/security impact on citizens and project partners)	ICT security measures will be put in place to guarantee ensure a strong data security, including cybersecurity and privacy compliance with GDPR.
2	01.11.2018	1, 4, 5, 6, 7	IES, LCCC, TK, MAI, MP, SB, SMO, VORU, EAP, FAC		Medium	High	High	Insufficient data for benchmarking (Difficult to evaluate the project success against KPIs) or insufficient KPI definitions or data collection	Data requirements will be defined early in the project, as well as any upgrades required to achieve these. M&E of at least 2 years or at least 1 year for all remaining interventions is critical, and the Coordinator is trying to work with WP7 to ensure this. Comparison and M&E is noted as a critical priority to WP7.
3	01.11.2018 (updated 10.09.2019)	1, 2, 4, 5	UL, NTNU, IES, POW, MPOW, ABB, ABG, 4C, TE, SV, ESB, ESBN, LCCC, TK		Medium	Medium	High	Existing technologies do not interface with each other as anticipated (Creation of joint solution is challenging.)	The open ICT architecture will be designed to enable modular integrations and will include APIs to loosely couple systems' functionalities, supporting iterative agile MVP approaches. On energy systems and eMaaS, partners will work together closely in the respective tasks to ensure compatibility between charging technologies, vehicle technologies, grid technologies, market and control systems. Technology choices will be kept under observation by WP Leads, and follow-up measures will be taken with affected stakeholders if issues surface.
4	01.11.2018 (updated 10.09.2019)	1, 2, 7	UL, NTNU, IES, POW, MPOW, ABB, ABG, 4C, TE, SV, ESB, ESBN, FAC		Medium	Low	High	Interoperability and shared data models are not used (Divergent developments of non-integrated solutions) or issues around data compatibility between different partners/systems	Ensuring a joint data model, API, service, and interface repository together with a strong overall enterprise architecture and data governance work.
5	01.11.2018	1, 2	IOTA, ICT and energy partners		Medium	Medium	Medium	Distributed Ledger Technology (DLT) does not perform as anticipated. (Trading is impeded)	DLT is built into the solutions in a modular way, alternative solutions and improvements will be monitored and integrated as needed.
6	01.11.2018	2, 4, 5, 6	LCCC, TK, TE, ESB, ESBN		High	High [1]	High	Regulatory Dispensation/adaptation/licenses for the demos will not be given (Existing concession agreements may prohibit DSOs and district heating companies from setting up markets)	National energy regulatory bodies are actively engaged in the project to provide technical capacity and guidance. Prior approval from national energy regulators will ensure permission to pilot innovative markets (DP04). Mitigations and alternatives are sought where regulatory dispensation is not achieved, dependent impacts on other tasks need to be handled, also in collaboration with the PO and the project. In some cases, e.g. WP4, certain aspects will fail and alternatives are sought, for example a different form of energy community, or a halt of trading markets.
7	01.11.2018	3, 4, 5, 6	LCCC, TK, MAI, MP, SB, SMO, VORU		Medium	Low	High	Weak linkages between city strategies and the Bold City Vision. (The absence of strategic anchoring (particularly within urban planning departments) could create a disconnect between the Bold City Vision and other long-range planning strategies)	Active engagement and buy-in from core city administrative units (planning, transport, ICT) and high-level political support will ensure strategic alignment.
8	01.11.2018	3, 4, 5, 6	LCCC, TK, UL, NTNU		Medium	Medium	Medium	Low levels of engagement (Citizen engagement is crucial for sustainability of the solutions and their uptake)	Dynamic adaptation of engagement and outreach, strong bottom-up approach, and other measures of WP3 strongly implemented in the cities.
9	01.11.2018	4, 5, 6	LCCC, TK, RK, NHP		High	High [2]	High	Buildings not up to a standard to implement a PEB (Low building standards would have too large energy leakage, extensive upgrades would be needed first)	Compliance with ISO 52000-1 and thorough feasibility assessment of PEBs and future development.
10	01.11.2018 (updated 10.09.2019)	4, 5	TK, LCCC, GKIN, TE, SV, RK, NHP, MPOW, ESB, ESBN		High	High	High	Local energy generation insufficient (Lack of local RES capacity will make PEBs difficult to achieve.)	Use of all available energy resources, peak shaving, load optimization, trading, and investment from DSOs/building owners will ensure sufficient installed capacity. Calculations and BEST tables will regularly be revisited. Alternatives for RES will be intensively explored.

Risk Matrix

Risk Nr (from Portal or internal)	Date raised (updated)	Work package	Partner responsible (risk owner)	Risk Assessment			Description of risk (and impact)	Risk Response	
				Timing	Rating	Likelihood			Impact
11	01.11.2018 (updated 10.09.2019)	4, 5	MPOWER, ABB, NTNU, GKIN, TE, SV, POW, RK, NHP, LCCC		High	High	High	Energy system hardware interoperability issues (DP06) (Integration with various vendor-specific building and energy management systems could hamper the creation of PEBs.)	CxC employs an open, distributed architecture and experienced industry partners with clearly identified interfaces at all levels. Interfaces are part of early discussions and planning.
12	01.11.2018	2, 4, 5	NTNU, ABB, MPOW, POW, ABG, 4C, TE, SV, TK, LCCC		High	High	High	Cyber-physical security issues (Existing energy control systems (SCADA, PLCs) are prone to attacks.)	Cyber-security measures (using ENISA best practice), security architecture, integration of SP security teams (see T1.1/T1.2, T11.6, and DMP in Section 2.2.1.4).
13	01.11.2018	4, 5, 6	MAI, MP, SB, SMO, VORU, EAP, LCCC, TK		Medium	Medium	Medium	Lack of political / administrative anchoring (The complexity of SCC1 projects require a high degree of integration into city administration.)	All cities have secured strong political and administrative backing during the project proposal phase and have anchored the project goals and tasks to their city goals
14	01.11.2018	6	OV, EAP, MAI, MP, SB, SMO, VORU, EAP, R2M		High	Medium	High	Lack of financing for Follower City demonstration projects (Inability to secure public or private financing will have a detrimental impact on one of the key project outcomes.)	DP11 will provide FCs with tailored instruments linked to ESIF, EIB, PPP, EEA/Norway grants, other EU financing, and community-sourced financing options. Dedicated tasks for replication preparation for each of the FCs, adapted to local opportunities.
15	01.11.2018	6, 9	LCCC, TK, MAI, MP, SB, SMO, VORU, EAP, NTNU		High	Medium	High	LHCs not closely collaborating, FCs not included and engaged in the project. (Necessary transfer of knowledge and expertise inhibits the ability of the FCs to replicate the DPs)	Dedicated intra- and inter-project collaboration tasks and travel/collaboration/workshop/site visits built into the project structure.
16	01.11.2018 (updated 10.09.2019)	6, 8	MAI, MP, SB, SMO, VORU, EAP, R2M		High	High	High	Replication challenges. (Technical complexity of demos or local conditions may be a barrier to transfer and replicate DPs from LHCs to FCs and outside.)	FCs to closely monitor the progress of LHCs, give feedback and requirements early in the developments and collaborate closely. Clear description of demos, technical results, guidebooks, blueprints, roadmaps, impacts, and benefits, value proposition and investment opportunities. Specific inter-project collaboration and outreach tasks. Use of e.g. SCIS report on replication challenges and engagement in SSC1 BoC Replication group. Update and revision of FC replication tables and actions in progress. WP8 to be linked stronger with FCs. LHCs focusing more on replication after demonstrators are finalised. Links with dissemination of validated project results
17	01.11.2018	7	FAC		High	High	High	Key Performance Indicators are insufficient to measure impact. (Inability to accurately monitor and evaluate project impacts, compromising successful project delivery.) Or insufficient KPI definitions or data collection, or issues with evaluation of project demos. Monitoring and Evaluation and Impact Assessment provides limited insights beyond KPI data tracking.	The KPIs have been designed to incorporate all relevant impact targets and indicators from standardised M&E methodologies (SCIS, Covenant of Mayors, CityKEYs, ISO 52000-1, etc.). M&E of at least 2 years or at least 1 year for all remaining interventions is critical, and the Coordinator is trying to work with WP7 to ensure this. Comparison and M&E is noted as a critical priority to WP7. LHCs are partially running their own KPI tracking and M&E. Evaluation and understanding KPIs in context is critical. Coord is working with WP7 and partners, and is also supporting learning and evaluation in other WPs where WP7 has issues.
18	01.11.2018 (updated 10.09.2019)	7	FAC		Medium	Low	High	Low interoperability of data or availability of high-quality data hinders comparative analysis for M&E (Statistical data and own measurements are hard to compare pre- and post-intervention)	Data interoperability will be ensured through the use of the ICT ecosystem and standardized statistical M&E approaches.
19	01.11.2018	8	R2M, OV, all industry partners		Medium	Medium	High	Lack of market uptake of +CxC solutions (Commercialisation of new products/services is slow or non-existent.)	Replication and exploitation tasks built into the project, SP involvement in dissemination and exploitation, reduction of technical and financial risks.
20	01.11.2018	8	R2M, all industry partners		High	Medium	High	New competing / complementary technology becomes available in a fast-evolving market (First-mover advantage may be lost, missing opportunities for scaling.)	The CxC solutions are modular and aim for future-proofing. New technology can be integrated to raise the energy impact for the cities.
21	01.11.2018	9,10,11	NTNU, LCCC, TK, all partners		Medium	Low	High	Consortium members change in ownership, become insolvent, or otherwise unable to participate (Members must be replaced, which will cause delays to the project.)	A back-up partner list will be created at the start of the project so that potential replacements partners can be found and integrated as quickly as possible
22	01.11.2018	11	All partners, NTNU		Medium	Low	High	The actual costs exceed estimations (Funding limitations to complete the task and hence the project)	Finances and budgets will be reviewed quarterly half-yearly by the project coordinator to ensure costs are within threshold.
23	01.11.2018	4, 5, 6, 11	LCCC, TK, NTNU		Low	Low	Low	External supplier ceases trading (Supplier search and replacement would cause delays.)	Redundancy options will be identified for each supplier at the start of the project

Risk Matrix

				Risk Assessment				Risk Response	
Risk Nr (from Portal or internal)	Date raised	Work package	Partner responsible (risk owner)	Timing	Rating	Likelihood	Impact	Description of risk (and impact)	Mitigation measures
24	01.11.2018	11	NTNU, all partners		Medium	High [3]	High	Interim milestones and key components not achieved (The project would be at risk of failure.)	A detailed management approach is provided in Section 3.2, which will be applied to reduce risk of failure. This will be reviewed every 6 months.
25	01.11.2018	1-11	All partners		Medium	Medium	Medium	Key personnel within an organisation leave their employment (Replacements would have to be found, which could cause delays.)	Work will be distributed to reduce the reliance on single person/small group; however each consortium member will be asked to provide replacement options for key personnel at the start of the project.
26	01.11.2018 (updated 10.09.2019)	11	NTNU, R2M, all partners		Medium	Low	High	Licenses or other Intellectual Property (IP) related issues prevent partners from sharing/co-developing solutions with other partners. IP violations between partners. (Potential impact on project results and exploitation.)	The Consortium Agreement (CA) will clearly delineate all background and sideground IP brought into the project from the Solution Providers and has provisions for exploitation and use of jointly owned results.
27	01.11.2018	4, 5	LCCC, TK, GKIN, SV, RK, NHP, TE		High	High	High	Planning and permit delays (Innovative demos do not fit into normal planning/permit processes or zoning)	Permissions will be sought early, buffer built into schedules. Extensions will be sought, aid alternatives and mitigations have to be assessed early.
28	01.11.2018	4, 5, 7, 11	TK, LCCC, NTNU, all KPI owners		High [4]	High	High	Impact targets cannot be reached due to complex interplay of technology and lower-than-expected gains (PEB achievement at risk.)	Ongoing monitoring of impact and evaluation of deployment results to identify underperformance early. Fallback and supporting options will be identified. Mitigation measures for failing demonstrators will be identified, agreed, and pursued. Information to the PO where critical underachievement expected. Coord is asking cities for forecast on results.
29	01.11.2018	1, 4, 5, 6, 7	IES, LCCC, TK, FAC, EAP		Medium	Medium	Medium	The predictions, simulations, models, BEST tables have a certain inaccuracy inherent in them. This might lead to an underestimation of energy consumption for the PEBs.	The project will update the estimates during the project based on the baseline and on data collection and benchmarking. If necessary, measures may have to be adapted in the cities. BEST tables will regularly be revisited, also as part of PEB adaptations in mitigation/adaptation actions.
U1	31.01.2019	2, 4, 5	4C, ABG, ABB, IOTA, RK, TK, LCCC		Medium	High	High	eMobility: V2G/V2B capable chargers may not be available commercially at scale in due time (delays in mobility and PEB demos)	Ongoing discussions and monitoring with all relevant partners. Staged rollout of solutions will reduce dependencies.
U2	31.01.2019	2, 4, 5	4C, ABG, ABB, IOTA, RK, TK, LCCC		Medium	High [5]	Medium	eMobility: Integration of V2G/V2B capable chargers with IOTA and availability is open	Detailed level of integration for IOTA in the technology stacks is being defined early. Initial prototype integration of IOTA with charging station exists and will be examined. Staged rollout of solutions will reduce dependencies. Integration did not happen for a number of technical and integration reasons. Charging or trading is not impacted (see also above on IOTA for trading).
U3	31.01.2019 (updated 10.09.2019)	2, 4, 5	4C, POW, MPOWER, ABB, IOTA, ICT/energy partners		Medium	Medium	Medium	Level of Integration of Tangle/DLT in control structures unclear. Volatility of token prices makes it risky to perform actual payments using cryptocurrencies.	Tangle/DLT integration is handled and defined early. IOTA allows for zero-fee transactions, reducing payment prices. Volatility may be addressed through stable coins or creation of a dedicated token as well as integration with other standard payment systems, using DLT only as a protocol/verification.

Risk Matrix

				Risk Assessment				Risk Response	
Risk Nr (from Portal or internal)	Date raised	Work package	Partner responsible (risk owner)	Timing	Rating	Likelihood	Impact	Description of risk (and impact)	Mitigation measures
U4	31.01.2019 (updated 10.09.2019)	4, 5, (6)	LCCC, TK, (FCs)		Medium	High	High	Building Owners/Tenants may withdraw cooperation. Delays in getting building owners' acceptance to participate in the project. WP4 (and limited WP5) partners are dependent on owners/occupants to allow access (to install smart meters / install building controllers / gathering data with consent)	Relationship management and clear value proposition/business cases will be needed to ensure the cooperation and its continuation until the end of the project and beyond. Alternative buildings or energy reductions/production options will have to be sought.
U5	10.09.2019	4, 5, 6	LCCC, TK, IES, EAP, FCs		Medium	Medium	Medium	Regulatory/privacy/GDPR issues preventing or delaying use of citizen or stakeholder data as planned	Data needs will be formulated early. Coordination with engagement tasks is encouraged. Systems are expected to be able to deal with incomplete data or estimations. GDPR issues around citizen data are a high-level concern of the cities to ensure compliance, while enabling the project Demos.
U6	10.09.2019	4, 5, 6	LCCC, TK, IES, EAP, FCs		Medium	High	High	Adequate baseline data is not available for one or more cities, Baseline and/or monitoring data could be of insufficient quality.	Data needs will be formulated early. Systems are expected to be able to deal with incomplete data or estimations. Regularly revisiting calculations should improve estimations. Best practices from e.g. SCIS for baseline estimations Coord is pushing WP7 to complete baselines for all KPIs or understand impact on missing underlying baseline data. Baselines themselves can be simple in many cases, but calculations need to be finalised as well.
U7	31.01.2019	10, 11, all	ISOCARP, NTNU, all partners		Low	Low	Low	Under-recording of dissemination activities, failure to record, or failure to acknowledge project and/or funding body. (can lead to review issues and withheld funding)	Templates, QA, WP10, WP11 ensure that correct references to H2020 funding are included in all Deliverables, dissemination material, press-releases etc. with extra effort to persuade media outlets to mention the funding.
U8	31.01.2019	4, 5	LCCC, TK, OV, NHP		High	Medium	High	Challenges for project and building owners to find a good enough business model for building owners to invest in their buildings	Business model work will be frontloaded where possible. LCCC will start early in identification and development of models. TK starts early in developing business and risk sharing models for the necessary financing
U9	31.01.2019	4, 5	LCCC, TK, OV, NHP		High	High	High	Building owner do not invest - for several reasons incl lack of money to really do so (equity, willingness to make a loan, ...)	Business model work will be frontloaded where possible. LCCC will start early in identification and development of models. TK starts early in developing business and risk sharing models for the necessary financing Alternatives on energy measures, alternatives for finances, or support for support schemes will be sought or provided.
U10	10.09.2019	4, 5, 6, 8	R2M, OV, LCCC, TK, FCs		Medium	High	High	Difficulty to form new business alliances for building PEBs, scaling, and replication	Business model work will be frontloaded where possible. Relationship management and clear value proposition/business cases will be needed to ensure the cooperation and its maintenance until the end of the project. Prioritising investment financing/funding tasks.
U11	31.01.2019	8	R2M, all industry partners		Low	Low	Medium	Inadequate identification/characterization of Exploitable Results (ER)	All partners involved in replication will drive the identification of ER, especially during Year 3-5 2-3 first 2-3 years of the project together with WP8 and the FCs
U12	31.01.2019	11	NTNU		High	High	High	Delays in communication and approval processes with the PO. Delays in confirmations or feedback on mitigations or formal amendments.	The Coordinator is keeping the PO informed early about changes in the project and regularly follows up on open processes. Coord is prioritising any answers to open questions especially around the amendment process. Coord has limited ability to accelerate PO processes.
U13	19.03.2020	4, 5	LCCC		Medium	Medium	Medium	Buildings become unavailable for project uses	Identify alternative buildings or sites, aim to be updated on status of buildings, ability to move activities (or possibly installations) to other locations more flexible
U14	30.03.2020	all	NTNU, all WPs and partners		High	High	High	Overall Covid19 risks and delays as in separate internal risk tracker: Business/financial impacts on partners, efforts and effectivity, business continuity, access to offices/workshops Reduction of on-the-ground fieldwork Impairment of citizen engagement tasks and on ability to address new stakeholders for growth Building measures delayed Hardware installations, surveys, site visits delayed or on hold Supply chains impacted Finance issues: building owners re-prioritise Private investors may reduce/withdraw participation and investments Changed mobility needs	Specific mitigations detailed in separate internal tracker: individual business continuity plans shift to online work frontloading non-site work prioritising investment tasks and additional funding options, updating business models prioritising activities around building measures and their preparation changing approaches to engagement
Summarised above	30.03.2020	all	all partners		High	High	High	Covid19 business/financial impacts to partners or their networks impacts on partner efforts, business continuity: impacts related to health, key people become unavailable, fall sick etc. (task leads, WP leads, coordinators) Reduction of personnel capacity and ability to do on-the-ground fieldwork. Staff may be redeployed for crisis tasks.	usual business continuity plans should apply, ongoing impact assessment business continuity plans, individual partner response Shift to online work, revisiting project roles, more preparation work to ensure fieldwork can be accelerated With the following waves, limitations on what (offsite) work can still be frontloaded

Risk Matrix

				Risk Assessment			Risk Response		
Risk Nr (from Portal or internal)	Date raised	Work package	Partner responsible (risk owner)	Timing	Rating	Likelihood	Impact	Description of risk (and impact)	Mitigation measures
Summarised above	30.03.2020	4, 5, 6	cities		Medium	Medium	Medium	Covid19 Citizen and stakeholder engagement tasks: Engagement, especially for newly to be contacted stakeholder, severely impaired. Can have impact on investment, refurbishments, etc. Venues for engagement set up by the project cannot be used	moving online as much as possible only partly recoverable through online work
Summarised above	30.03.2020	4, 5, 6	cities, building partners, finance partners		High	High	High	Covid19 Building measures (upgrades/retrofits) or finance schemes/support may be delayed or reused Building owners do not invest in improvements due to recession and lack of own resources to do so. Building measures or finance schemes/support may be delayed or municipal funding may be delayed/reused Private investors may reduce / withdraw their participation in LHCs investment as a consequence of the potential financial crisis triggered by the pandemic. Public funds may be reallocated, making targeted programmes unavailable Delays in developing and processing funding applications Uncertainty on future energy prices for model assumptions	Prioritising investment tasks and activities leading to and supporting building measures Will need extra effort to find alternative sources of funding for this work. Needs options with less own financing for owners Reduce volume of investment expected from private investors. Increase public participation in project investments. Pursue more EU/national funding options, closer dialogue with funding agencies Updates and adaptations of business models Possible priority shift to investment tasks
Summarised above	30.03.2020	4, 5, 6	LHCs, industry partners		High	High	High	Covid19 Hardware installations, surveys, site visits, installation in houses, HW development, simulations etc. need access to sites or to workshops hardware supply chains delayed or on hold	Working online where possible. Setup and test more in Lab to make installation as quick as possible when possible again
Summarised above	30.03.2020	4, 5	cities, mobility partners		High	High	High	EV schemes delayed or EV/eMaaS take up delayed	Focusing on integrating other modes of transport into eMaaS focus on planning and business model work Restructure eMaaS and deployment structures
U15	02.11.2020	8	R2M, all partners		Medium	Medium	Medium	Lack of interest from cities outside the project to replicate +CxC solutions due to the current circumstances (different priorities)	Early initial engagement with cities, in particular in the LHC and FC countries. Linked with updated investment priorities and results