Model for the ex-ante evaluation of innovation projects

The objective of the ex-ante evaluation model is to help city officials and experts **prioritise smart city projects,** by enabling assessments of specific arguments and indicators, as well as to **choose** projects, by favouring those that contribute most to the established smart city goals. Basically, it functions as a filter that the project must pass through before a decision is made, whereas it is an **inclusive tool.** This means that the assessment of the specific project could be formed after the involvement of the significant participants (various city departments, as well as the universities, civil society and private sector) and to take the average score given by these participants into consideration.

The ex-ante evaluation model for projects is comprised of **two main components:** risk assessments and thematic filters. This is a model that helps to assess ideas and concepts for new smart city projects. The model does not include a detail financial side, since this would assume a finalised project and more precise cost-benefit analysis.

- **The risk assessment** takes various aspects related to the financing and implementation of the project into consideration and is a mandatory component for every project. The higher the risk assessment score, the smaller the perceived risk related to the investment and its implementation.
- **The thematic filter** takes the assumed benefits of the project in consideration based on various horizontal topics and is a mandatory component for every project. The greater the contribution to the project's various fields of activity, the higher the thematic filter score.
  - The thematic filter also includes **additional questionnaires**. This is not a mandatory component, but should be filled out if the project conforms to three basic vertical topics – **energy, mobility and/or ICT**. These are specific and common smart city fields of activity in which the presumed benefits of the project must be precisely assessed.

Ex-ante evaluation model

Risk assessment

Aspect	Yes, absolutely (2)	Rather, yes (1)	Rather no/ information lacking (0)
The project clearly contributes to the solution of the defined problem/issue			
The project clearly takes advantage of the defined (market) opportunities			
The project meets (market) needs or contributes to creating (market) demand			
The project has measurable and quantifiable objectives			

The project's activities will have a long-term impact in the development of the respective field of activity			
The project's results are repeatable, transferable and scalable			
The solution provided by the project (incl. product/service, business model, process) is new and innovative			
The solution provided by the project is based on previous positive results (e.g. a pilot project)			
The project supplements existing initiatives/solutions and seeks synergy with them			
The project corresponds to the main development plans in the respective field of activity and contributes to its priorities			
The project brings together all the necessary knowledge, experts and other participants			
The roles and assignments are clearly defined in the project			
The project has a management system that ensures success			
The project has a monitoring system that ensures success			
The project has the support of the public sector and is backed by political will			
The project has a balanced financing model			
The project has an effective and believable plan for resource use			
The anticipated economic and social benefits of the project are in balance with the required investment			
The anticipated economic and social benefits of the project are in balance with time necessary for implementation			
The anticipated economic and social benefits of the project are in balance with risk level			
RISK ASSESSMENT SCORE		**...**	**/40**

Thematic filter

What will be the benefit of the project?

Theme	Benefit	Direct benefit (2)	Indirect benefit (1)	No benefit/ Information lacking (0)
Economy	**The project supports innovation** e.g. research and developments costs ↑, employment in knowledge-intensive sectors ↑, number of patents ↑, use of innovative business models and solutions ↑.			
	The project supports entrepreneurship e.g. no. of new businesses, no. of 'green' and startup companies ↑, business support structures ↑, self-employed employers ↑, jobs ↑, unemployment ↓.			
	The project supports the economic image and attractiveness e.g. export capacity ↑, image of an innovative environment ↑, foreign investments ↑, integration in international chains ↑.			
	The project supports productivity e.g. GDP ↑, added value of jobs ↑, infrastructure ↑.			
Governance	**The project supports inclusive governance** e.g. participation of experts and the citizenry in planning and decision-making processes ↑, proposals ↑, political activity of the citizenry ↑.			
	The project supports the provision of public and social services e.g. cost for the provision of services ↑, availability of services ↑, satisfaction with the quality of services ↑, no. of service users ↑.			
	The project supports transparent governance e.g. satisfaction with the transparency of the bureaucracy and the fight against corruption ↑, transparency of city processes ↑, evidence-based planning ↑.			
	The project supports the co-production of solutions and services e.g. no. of partnerships with other ecosystem participants ↑, no. of jointly developed			

	solutions ↑, no. of innovative and green procurements ↑.			
Environment	**The project supports the attractiveness of the natural environment** e.g. green and blue areas ↑, quality, protection and diversity of the ecosystem ↑, increased satisfaction with the living environment and public space ↑.			
	The project supports the reduction of pollution e.g. smog, solid particles and greenhouse gasses ↓, CO_2 level ↓, respiratory illnesses ↓, noise level↓.			
	The project supports environmental protection e.g. opinion of environmental protection ↑, individual efforts to protect nature ↑, ability to adapt to climate change ↑.			
	The project supports sustainable resource management e.g. waste generation ↓, recycling ↑, use of recyclable materials and clean energy ↑, lengthening of the life span of products ↑.			
People	**The project supports qualification levels and skills** e.g. no. of educated people and level of education ↑, lifelong learning mindset ↑, skills, conformity with labour market needs ↑, specialisation↑, satisfaction with the accessibility and quality of the educational system ↑, knowledge-centred image ↑.			
	The project supports cosmopolitanism and openness e.g. ethnic and cultural diversity ↑, sense of freedom, openness and equality ↑, creativity↑.			
	The project supports participation in public life e.g. volunteer work ↑, bottom-up and civil society initiatives ↑.			
	The project supports smart consumption (incl. through playfulness) e.g. environmental awareness ↑, sustainable consumption ↑, resource-efficient lifestyles ↑, preference for local resources and products ↑.			
Living	**The project supports culture** e.g. visits to cultural institutions ↑, cultural events ↑, attractive among tourists ↑.			
	The project supports health			

	e.g. life span ↑, years of healthy life↑, satisfaction with the quality of the health system ↑, access to healthcare services ↑, healthy lifestyle ↑, waiting times ↓.		
	The project supports individual security e.g. satisfaction with security and perceived security ↑, crime and assaults ↓.		
	The project supports social cohesion and wellbeing e.g. participation of vulnerable groups ↑, inclusive society ↑, sense of community ↑, wellbeing ↑, exclusion ↓, segregation ↓.		
THEMATIC FILTER SCORE		**...**	**/40**

Thematic filter additional questionnaire – energy

What will be the benefit of the project?

Benefit	Direct benefit (2)	Indirect benefit (1)	No benefit/ Information lacking (0)
The project supports the reduction of energy consumption and savings			
The project supports the reduction of energy costs			
The project supports energy efficiency (incl. more effective use of energy ↑, energy consumption for creating added value ↓)			
The project supports levelling of consumption peaks (incl. network stability ↑)			
The project supports the comprehensive renovation of buildings and/or energy efficiency			
The project supports the use of renewable and clean energy sources and independence from fossil fuels (incl. clean energy storage options ↑)			
The project supports energy self-sufficiency and the use of local resources			
ADDITIONAL POINTS OF THE THEMATIC FILTER		**...**	**/14**

Thematic filter additional questionnaire – mobility

What will be the benefit of the project?

Benefit	Direct benefit (2)	Indirect benefit (1)	No benefit/ Information lacking (0)
The project supports the use of public transportation (incl. no. of public transportation			

networks and rides ↑, satisfaction with the availability and quality of public transportation ↑, travel time ↓)			
The project supports walking and bicycling (incl. the use of engineless vehicles and bicycles ↑, network and quality of the bike paths ↑)			
The project supports a safe transportation system (incl. road safety ↑, traffic accidents ↓, quality of the roads ↑)			
The project supports a reduction in the number of ordinary cars and/or the use of economical cars			
The project supports national and international accessibility (incl. travel time ↓, air transport ↑)			
The project supports the increase of multi-modality and ride sharing solutions			
The project supports traffic management and/or reduces traffic volume (incl. parking management ↑, traffic restrictions ↑, harmonization of traffic flows ↑)			
THEMATIC FILTER ADDITIONAL POINTS		**...**	**/14**

Thematic filter additional questionnaire – ICT

What will be the benefit of the project?

Benefit	Direct benefit (2)	Indirect benefit (1)	No benefit/ Information lacking (0)
The project supports cybersecurity and data protection			
The project supports the growth of e-services (incl. availability quality and number of users, of e-services, and satisfaction with the former ↑)			
The project supports the collection of open data (incl. real-time information ↑)			
The project supports the quality of open data			
The project supports the availability and distribution of open data			
The project supports the interoperability of systems (incl. integrated ticket and payment systems ↑)			
The project supports people digital literacy			
THEMATIC FILTER ADDITIONAL POINTS		**...**	**/14**

Results

- The result is comprised of **two basic components:** the risk assessment score and thematic filter score. Based on the projects and its field of activity, additional questionnaires (energy, ICT and/or mobility) and relevant points are added to the

thematic filter, thereby the maximum score for the thematic filter varies based on the answers to the additional questionnaire. The scores are defined as the amount of points that are given to the project within the framework of the corresponding basic components.

- The point scores for the risk assessment and thematic filter are considered **separately** and are not added up in order to preserve the point of reference when assessing the risk level and presumed benefits.
- Since the thematic filter score varies according to whether an additional questionnaire was answered for the project, the project score should preferably be shown as a **percentage** of the maximum possible point total.
- **The maximum point totals are:**
  - Risk assessment 40 points
  - Thematic filter 40 points
    - Additional energy questionnaire +14 points for the thematic filter (not mandatory)
    - Additional mobility questionnaire +14 points for the thematic filter (not mandatory)
    - Additional ICT questionnaire +14 points for the thematic filter (not mandatory)
    -

- **Example**: a mobility project received a risk assessment of 35 points: 30 points from the general filter and 10 points from the additional mobility questionnaire, for a total score of 35+40. Since the additional questionnaire was answered, the maximum score for the general filter is 40+14=54 points. Therefore, the result for the project is 88% +74%.
- In the interest of clarity, the score should be designated with a **code,** e.g. 88%(RA)+74%(TF) (the risk assessment and thematic filter respectively).
- If the project is connected to a set of additional questionnaires, they can **all** be filled out and calculated as additional thematic filter points (the maximum score of the thematic filter would be 40, 54, 68 or 82 respectively).
- All the involved experts provide their points separately, based on their assessment of the project. At the end of the assessment, the arithmetic **averages** of the point scores of the various assessors is determined, by continuing to keep the two basic components (risk assessment and thematic filter) separate.
- **The threshold** for weighing the possible implementation of the project could be 60% of the possible maximum point score, i.e. 60% of the maximum of both basic components. That is,
  - At least 24 points from the risk assessment
  - At least 24 points from the thematic filter, if an additional questionnaire is not answered
    - At least 33 points from the thematic filter, if at least one additional questionnaire is answered
    - At least 41 points from the thematic filter, if at least two additional questionnaires are answered
    - At least 50 points from the thematic filter, if at least three additional questionnaires are answered

- o The final score could still be recalculated as a percentage so that the projects that answered or did not answer the additional questionnaires could be compared.
- If the threshold is not exceeded, **rethinking the project idea** could be considered. If, for instance, the anticipated benefits are great, then, for instance, in the case of projects with a higher perceived risk (i.e. with a low risk assessment score), the piloting of the project idea on a smaller scale could be considered.
- The projects that exceed the threshold should be **compared** amongst themselves based on the basic components, i.e. risk assessment vs risk assessment and general filter score vs general filter score.
- Since the method assumes that the projects feature as many different smart city aspects as possible, after the assessment but before making the final decision, the project must also be **qualitatively,** i.e. by estimating the greatest challenges and opportunities by convening all the participants in the relevant fields (assessors, project initiators, suppliers, experts, etc). Ultimately, the projects that are most beneficial for the city may be among the projects that slightly fewer points in the ranking of ideas. But the key is that the threshold be exceeded in for each component.

The organisational arrangement of the initiation and management of innovation projects

The **process** for the initiation, assessment, selection and implementation of smart city innovation projects is summarised by the following diagram.

Model of the process for innovation projects

Project was not selected

Project did not exceed the threshold

Assessment

Initiation
- Writing (or re-writing) of the project idea, incl. need/demand, activities, investment, schedule, management, roles
- Convening of the expert group (ca.n experts involved), incl. important departments and other parties

- Filling out the pre-evaluation form (risk assessment and thematic filter, along with additional questionnaire, if necessary)
- Averaging the scores assigned by the experts
- The threshold for the next phase is at least 60% of the points from both components

Selection
- Regular meetings of the expert group (or groups) for the substantive assessment/defence of the projects that have exceeded the threshold
- Ranking of each project against other new projects, comparison
- Selection of the projects with the greatest added value

Implementation
- Specification of the details of the chosen project with the significant parties
- Designation of the key performance indicators (KPIs)
- Implementation of the project along with constant monitoring
- Assessment of the results

Transfer, further development, scaling of the project results