IRIS

Integrated and Replicable Solutions for Co-Creation in Sustainable Cities

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Executive Summary

This report presents financing solutions for cities authorities and city suppliers. Its purpose is to give an overview over a number of available Financial Instruments and to raise the IRIS-partner's knowledge within financial opportunities for replication and scale-up. The report also provides a tool-section describing a number of steps before approaching a financial entity. Please note that the substance within this report is a necessary ingredient to be able to utilize the tool.

There are two types of necessary investments for large-scale replication of IRIS results. The cities need capital to invest in new infrastructure by purchasing solutions from suppliers and the suppliers, in turn, need to invest in product and service development as well as in competence and human resources. This report D 3.7 contains a description of a number of Financial Instruments representing financial pathways relevant for both the city- and the supplier perspective. It is still of great importance to build a broad basic knowledge about the financing options as many solutions contain ingredients from two or more Financial Instruments and the financing process often requires collaboration between the city and the supplier.

The report gives an overview of the European Structural and Investment Funds, describes a number of European financial platforms for large scale investment, it overviews entities such as the European Investment Bank and the European Investment Fund and it explains Instruments such as Public Private Partnership and Private Finance for Energy Efficiency

The report is partly based on a number of Financial Instruments described within the EU FP7-project CELSIUS. The CELSIUS project deliverables are highly relevant regarding large scale replication of city innovations and the Financial Instruments described in CELSIUS have been used in a number of applied implementation processes in a number of the 75 CELSIUS Replication Cities all over Europe.

Today it is hard to see how the 2021-2027 framework will change the conditions for the Financial Instruments described in the report, according to the intentions as described by the Commission, effort will be put on a more tailored approach to regional development, simplification in application and management and control of funding and projects. Effort will also be put on creating more opportunities for synergies within the EU budget toolbox and an increased use of Financial Instruments.

IMCG will conduct interviews with the Follower Cities during M24-M34 in order to explore Financial Instruments and funding opportunities available on a local level in order to describe good examples and relevant cases. The activities will also include close cooperation with WP8. The result will be presented in an updated version of the report 3.7 in M36, including a section of cases and results from the Follower City interviews.

As a complement to the information preparing the reader for contacts with the financing entities, the report presents a tool for facilitation of the process of analysing eligibility rules, choosing a financial pathway and approaching the organizations providing the Financial Instruments.

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List of Abbreviations and Acronyms

Abbreviation	Definition
CAB	Climate Awareness Bond, also green bond
CEB	Council of Europe Development Bank
CELSIUS	EU FP7 Lighthouse project within District Heating
CHP	Combined Heat and Power Plant
CIP	City Innovation Platform
CF	Cohesion Fund
SEMS	EEEFs Social and Environmental Management System
DBM	Dealer Business Management (system)
DG Clima	Directorate General for Climate Action
DG Energy	Directorate General for Energy
DG Regio	Directorate-General for Regional and Urban Policy
DH	District Heating (Energy)
DSO	Distribution System Operator (Energy)
EAFRD	European Agricultural fund for Rural Development
EFSI	European Fund for Strategic Investments
EfW	Energy from Waste
EEEF	European Energy Efficiency Fund
EIB	European Investment Bank
EIF	European Investment Fund
ELENA	European Local Energy Assistance
ERDF	European Regional Development Fund
ESF	European Social Fund
EUR	Euro (Currency)
GWh	Gigawatt hours
IRR	Internal Rate of Return
JESSICA	Joint European support for Sustainable investment in City Areas
LLDC	London Legacy Development Corporation

NEAP	Member State’s National Energy Efficiency Action Plan
NGO	Non-Governmental Organisation
PF4EE	Private Finance for Energy Efficiency
PPP	Public Private Partnership
PPPP, 4P	Public People Private Partnership
SEK	Swedish Crowns (Currency)
SIA	Social Impact Accelerator
SME	Small and Medium sized Enterprise
SPV	Special Purpose Vehicle (Financial)
URBACT	European exchange and learning programme
USD	United States Dollar (Currency)

1. Introduction

The report intends to give the reader an overview over a number of Financial Instruments available for enabling of innovation scale-up and replication. It is of great importance for the replication partner to build a broad basic knowledge about the financing options as many financial solutions contain ingredients from more than one Financial Instrument and the financing process often requires collaboration between the city and the supplier

Furthermore, the report provides a tool-section describing important steps that partners need to take before it is meaningful to approach an entity providing Financial Instruments. The tool section also shows the estimated relevance of the various instruments compared to the five IRIS innovation tracks. Please note that the substance within this report is a necessary ingredient to be able to utilize the tool

The report addresses the cities need for capital to invest in innovative solutions from suppliers and the suppliers need for capital to invest in product and service development and in competence and human resources

1.1. Scope, objectives and expected impact

The report D 3.7 contains a number of relevant financial pathways for replication of bankable IRIS solutions, a number of good examples and cases on projects and entities with financial needs similar to the IRIS consortia members, and a financial instrument tool with a "how to apply for financing"-section. The ambition is to build a basic knowledge for the reader regarding a number of various financing alternatives available in a European context and to guide him or her while taking the first steps to reach these financing instruments.

Please note that this report will neither give a full picture of European Financial Instruments nor work as a complete guide on how to interact with the organisations, programs and units presented. The report will however raise the reader's knowledge regarding Financial Instruments available in Europe and will also raise the reader's ability of asking the right questions and take the right actions to increase the financial attractiveness within the own organisation.

1.2. Contributions of partners

IMCG will conduct interviews with the Follower Cities during M24-M34 in order to explore Financial Instruments and funding opportunities available on a local level in order to describe good examples and relevant cases. The activities will also include close cooperation with WP8. The result will be presented in an updated version of the report 3.7 in M36, including a section of cases and results from the Follower City interviews. The updated report will also contain a section presenting results from the consultancy activities performed by IMCG until M36, if such activities are being requested by the consortia partners.

1.3. Relation to other activities

WP1 (Transition strategy, five tracks to maximise integration synergy and replicability): The Financial Instruments described in the report all relate to the five IRIS transition tracks (Energy positive districts, Smart energy management, Smart e-mobility, City innovation platform and Citizen engagement and co-creation). The examples presented in section 7 all refer to Financial Instruments relevant to the EU FP7 CELSIUS, but the instruments described are highly relevant to all transition tracks.

WP2 (EU wide cooperation with ongoing projects, initiatives and communities): From a "Financial Instrument perspective" this report is highly relevant to any consortia facing challenges in financing scale-up and replication of city innovations. WP3 can spread its competence within Financial Instruments to a number of different task groups of EIP-SCC, for instance the Replication Task Force Group with activities aligned to the work led by WP8 Replication

WP3 (Development of bankable business models and exploitation activities): IMCG, lead of WP3 is delivering this report describing a set of Financial Instruments and tools for cities investing in large-scale replication. We re-use current financial toolbox and networks from EU FP7 CELSIUS), including Financial Instruments for large scale investments as Structural funds, EIB's and similar, Public Private Partnerships (PPP), innovative Public People Private Partnership (4P) etc.

WP4 (City Information Platform): As WP4 will exploit the results of IRIS through joint exploitation in Europe (primary target) and around the globe (secondary target), the Financial Instruments will be an important enabler to build scalability and replicability as well as eligibility and financial attractiveness.

WP5, WP6, WP7 (Utrecht, Nice and Gothenburg City demonstration activities): The cities and the city suppliers within the demonstrator cities will be the main users of the Financial Instruments and will also be the main targets for further activities within creation of financial attractiveness run by IMCG Sweden AB

WP8 (Replication by Lighthouse regions, follower cities, European market uptake):

As this work package provides the replication toolbox, the financial instrument tool is highly relevant in the replication within Europe and beyond.

WP9 (Key Performance Indicators): KPIs can be set regarding for example eligibility, financial attractiveness and outcome of financial collaboration with for example EIB or EIF intermediaries.

WP10 (**Communication and dissemination):** Led by ESCI, WP10 has made a plan for dissemination of project results. The exploitation will link replication activities carried out by the cities and market-oriented activities carried out by solution providers, creating synergies. Financial Instruments are relevant in communicating the IRIS' offer to cities within and beyond Europe, in transition track pitches and in success stories of scaling-up and replication

WP11 (Project Management): PM has a central role in ensuring partner contribution in activities accelerating the potential within the financial instruments and the financial instrument tool.

1.4. Structure of the deliverable:

Section 2 introduces the reader to a number of key concepts within the deliverable such as the conjunction between IRIS needs and Financial Instruments presented within the EU FP7 project CELSIUS report D 6.3 (Strategic document on financial viability and risk assessment, 2015-05-15), information regarding eligibility criteria for financing and a short introduction to the challenge of creating financial attractiveness while developing an innovation.

Section 3 gives an overview of the European Structural and Investment Funds such as ERDF and CF, and two specific examples, JESSICA and ELENA, of European financial platforms built to channel the funding from the Structural and Investment funds for large- scale investment.

Section 4 gives an overview regarding the European Investment Bank (EIB), the European Investment Fund (EIF) and the European Energy Efficiency Fund (EEEF) explaining basic eligibility rules and explaining how to interact with them and their intermediary partners.

Furthermore, section 3 explains Financial Instruments such as Public Private Partnership, known as PPP, which is a form of interaction between public bodies and private entities facilitating private investment in areas of great public interest such as energy production, grid-solutions and citizen mobility. It also gives an introduction to Private Finance for Energy Efficiency, PF4EE, a joint agreement making commercial financing accessible for energy efficiency investments.

Section 4 also contains a description of green bonds, also often mentioned as Climate Awareness Bonds, which is a Financial Instrument for sustainable projects and activities promoting resilient growth. An overview of initiatives within Crowdfunding and a short overview of a number of “other Financial Instruments” completes the section.

The Financial Instruments mentioned in section 4 are all connected to the “Transition Track relevance tables” in section 5, the Financial Tool-section. The ambition of the section is to facilitate for the IRIS participants to find the relevant Financial Instruments and to facilitate contacts with funding and investment organisations. The Toolbox will point out activities, processes and actions that will pave the way in contact with the various Financial Instrument entities presented in the report. The section provides useful links and a set of lists on how to prepare for contacts with for example the European Investment Bank or an EIB Intermediary Partner.

Section 6 is a forward-looking section presenting a possible IRIS-approach on how to address large public procurement programs, section 7 presents the potential outcome of the deliverable 3.7 to other Work Packages and the final section 8 contains a number of conclusions from the work with Financial Instruments.

Appendix 1 presents reference cases of successful up-scaling and replication of innovative district heating solutions, power plants and other infrastructural investments implemented in the CELSIUS Replication City Group.

2.Methodology

The report is based on a number of Financial Instruments described and analysed within the EU FP7-project CELSIUS, report D 6.3 (Strategic document on financial viability and risk assessment, 2015-05-15). This CELSIUS project deliverable is highly relevant regarding large scale replication of IRIS results as the 30+ CELSIUS demonstrators focuses on:

- Innovative district heating and cooling techniques and technologies (cascade energy usage solutions, energy storage and energy surplus recovery)
- Digital solutions involving DSOs and end-users (visualization tools, smart (digital) end-user energy control systems)
- Demand side management tools
- New business models connected to the innovations

Furthermore, the techniques and solutions demonstrated within CELSIUS often implicate high level of infrastructural investments, technically highly advanced and innovative energy system solutions and a high level of digitalization within the end-user and business solutions.

IRIS addresses five transition tracks, all representing key challenges for the city:

1. Smart renewables and closed-loop energy positive districts,
2. Smart energy management and storage for grid flexibility,
3. Smart e-mobility sector integrating electric vehicles and e-car sharing systems,
4. A digital city innovation platform and
5. Citizen engagement and co-creation.

A number of the IRIS key challenges and the solutions developed by the IRIS partners representing cutting edge solutions for the future innovative energy landscape has a number of synergies with technical and business approaches within EU FP7 CELSIUS Project as CELSIUS in turn, represented cutting edge solutions within the FP7-context regarding transformation to an efficient and sustainable energy system. The CELSIUS project, its results and its “beyond project activities” was described as “instrumental” by DG Energy, a number of the demonstrators within the project still represent state of the art solutions and are being implemented in a number of European cities.

The CELSIUS Financial Instruments have been used in a number of applied implementation processes performed by a fair number of the more than 75 CELSIUS Replication Cities all over Europe. These viable Financial Instruments, used to enable complex, technically advanced and digitalized system solutions with a high share of infrastructural investments often consists of combined Financial Instruments with funding from internal sources, regional funding bodies as well as, for instance, the European Investment bank. This faceted set of Financial Instruments has proven to be functional for addressing both types of investments needed in IRIS, namely the cities need for capital to invest in new infrastructure by purchasing solutions from suppliers as well as for the suppliers need to invest in product and service development and in competence and human resources.

The Financial Instruments eligibility criteria, the participants, applicants or projects freedom of decision-making and the innovations financial attractiveness are three crucial conditions for financing. Whether an innovation is bankable or not could be answered by the simple question: ‘are *lenders willing to finance it*’. In this context and for the purposes of the IRIS partners, “bankable” can be defined as a solution that is:

(a) Scalable - the innovation is easy to replicate and scale-up);

(b) Economically appealing in terms of Internal Rate of Return (IRR), payback period

(c) Involving a relatively low risk regarding technical, operational and financial matters.

Furthermore, in order to be considered bankable from a "European Investment Bank point-of-view" there are a number of public policy goals where of at least one need to be addressed in order to be eligible for EIB-Funding. If a project or an innovation does not address any of the public policy goals, an application for financing will be rejected no matter the technical excellence behind the innovation:

(d) Potential in increase in growth and employment – including SME and mid-cap support

(e) Supporting economic and social cohesion by addressing economic and social imbalances, promoting the knowledge economy/skills and innovation and linking regional and national transport infrastructure

(f) Building environmental sustainability - including supporting competitive and secure energy supply

(g) Supporting action for climate-resilient growth

The European Fund for Strategic Investment (EFSI) dedicates its support in order to "ensure that money reaches the real economy" and provides funding for economically viable projects with a higher risk profile than usually taken on by the EIB. From an EFSI perspective, there are also a number of focus sectors of key importance that needs to be addressed in order to reach funding.

(h) Strategic infrastructure including digital, transport and energy

(i) Education, research, development and innovation

(j) Renewable energy and resource efficiency

(k) Support for small and mid-sized businesses

As all the entities providing Financial Instruments set various requirements for eligibility, ensuring eligibility should be considered as a crucial process to run in order to prepare for replication and scale-up. Developing an innovation without taking steps to ensure its financial eligibility can lead to a suboptimal outcome regarding replication and scale-up.

Step 1 in finding financing should be a direction decision based on which eligibility criteria the innovation, product or project are meeting. This in turn depends on its technical specifications, its business models and its business and customer approach.

Step 2 should be a decision based on possible financial pathways from a legal or regulatory point of view. Some financial options will be closed due to limitations in the applicant's freedom to enter into agreements, some pathways will be open after preparation or after being handled on a higher decision level according to what specific conditions and circumstances prevail in the specific case.

Once the decision on what kind of financing to apply for is taken and when the communication with the EIB, the EIB Intermediary or the PPP platform is up and running, it is necessary to be able to answer a number of questions asked by the funding organisations. This "creation of economical attractiveness" is the third step to take in order to reach financing. A large company or a public organisation is likely to have resources and ability to provide necessary and requested information to the financing entity while an SME or a Start-up may have severe problems to present documents and plans to match such requests on short notice.

3. Financial Solutions in Europe– an overview

3.1. European Structural and Investment Funds

EU's regional cohesion policy aims to support job creation, business competitiveness, economic growth, sustainable development and the improvement of the quality of life of European citizens. To promote these targets, a third of the total EU budget (circa EUR 351.8 billion) has been set aside, the bulk of which is transferred to the less developed regions in Europe to reduce the economic, social and territorial disparities in the EU. The funds are distributed to different geographical areas in Europe based on GPD per capita. Each member state makes specific partnership agreement with the commission and sets operational programme for their allocated funds. Thereafter, the national authorities implement the programmes in their countries. The European Structural and Investment Funds (ESIF) under which more than €27 billion is ring-fenced to support the shift towards a low-carbon economy during the programme period of 2014-2020.

The fund is divided into three main categories:

1. The European Regional Development Fund (ERDF),
2. The Cohesion Fund (CF)
3. The European Social Fund (ESF).

Two smaller categories include the

- European Agricultural fund for Rural Development (EAFRD)
- European Maritime and Fisheries Fund (EMFF)

For the next long-term EU budget 2021-2027, the Commission proposes to modernize the Cohesion Policy and according to the Commission, five main objectives will drive EU investments in 2021-2027: A smarter Europe, a greener, carbon free Europe, a more connected Europe, a more social Europe and a Europe closer to its citizens. The Commission describe the five main objectives as follows:

1. A Smarter Europe, through innovation, digitization, economic transformation and support to small and medium-sized businesses
2. A Greener, carbon free Europe, implementing the Paris Agreement and investing in energy transition, renewables and the fight against climate change
3. A more Connected Europe, with strategic transport and digital networks
4. A more Social Europe, delivering on the European Pillar of Social Rights and supporting quality employment, education, skills, social inclusion and equal access to healthcare
5. A Europe closer to citizens, by supporting locally-led development strategies and sustainable urban development across the EU.

The approach to regional development will also be more tailored as the cohesion policy will keep on investing in all regions based on three categories; 1) less developed, 2) transition and 3) more-developed. The allocation method will still be based largely on GDP per capita, but a number of new criteria, such as youth unemployment, climate change and integration, will be added in order to make the allocation reflect the reality. The cohesion policy will further support locally-led development strategies and will empower local authorities in the management of the funds and Financial Instruments and a new capacity-building programme for urban authorities, the European Urban Initiative will strengthen the urban dimension.

The Commission stresses that "grants alone cannot address the significant investment gaps. They can be efficiently complemented by Financial Instruments, which have a leverage effect and are closer to the market. On a voluntary basis, Member States will be able to transfer a part of their Cohesion Policy resources to the new, centrally managed Invest EU fund, to access the guarantee provided by the EU budget. Combining grants and Financial Instruments is made easier and the new framework also includes special provisions to attract more private capital" https://ec.europa.eu/regional_policy/en/2021_2027/

Today it is hard to see how the 2021-2027 framework will change the conditions for the Financial Instruments described in the report. According to the intentions as described by the Commission, effort will be put on a more tailored approach to regional development, simplification in application, management and control of funding and projects. The commission will also create more opportunities for synergies within the EU budget toolbox and an increased use of Financial Instruments.

3.1.1. European Regional Development Fund (ERDF)

The ERDF aims to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions. The ERDF focuses its investments on a number of key priority areas, known as 'thematic concentration', the priority areas are:

- Innovation and research;
- The digital agenda;
- Support for small and medium-sized enterprises (SMEs);
- The low-carbon economy.

The ERDF resources allocated to these priorities depend on the category of region. In more developed regions, at least 80 % of funds must focus on at least two of these priorities.

In transition regions, this focus is for 60 % of the funds compared with 50 % in less developed regions.

ERDF channels resources specifically towards low-carbon economy projects:

More developed regions: 20%; Transition regions: 15%; and Less developed regions: 12%.

The overarching objective of the ERDF is to correct imbalances between European regions by strengthening economic and social cohesion. One of its targets is to facilitate the transition to a low carbon sustainable economy. The fund also supports territorial cooperation programmes such as INTERREG and URBACT, both of which have an environmental component as described below.

ERDF allocates about 5% of its budget to Financial Instruments and soft loans and the type of funding is mainly grants (co-financing), loans, risk capital and loan funding.

Local, regional and national authorities, NGOs, companies, SMEs and research institutions from EU28 are eligible to apply for financing of relatively small projects. The focus of this program includes innovation & research, digital development, support for SMEs and a transition to sustainable low-carbon economy. ERDF is coordinated by Directorate-General for Regional and Urban Policy (DG Regio) through national and regional managing authorities. DG Regio is a Directorate-General of the European Commission, supporting the economic and social development of weaker regions of the European Union under Articles 158 and 160 of the Treaty of Rome.

3.1.2. Cohesion Fund – CF

The Cohesion Fund is addressed to member states whose Gross National Income (GNI) per inhabitant is less than 90 % of the EU average. It aims to reduce economic and social disparities and to promote sustainable development.

For the 2014-2020 period, the Cohesion Fund concerns Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

The Cohesion Fund allocates a total of € 63.4 billion to activities under the following categories:

- Trans-European transport networks, notably priority projects of European interest as identified by the EU.
- Infrastructure projects under the Connecting Europe Facility.
- Projects related to energy or transport, as long as they clearly benefit the environment in terms of energy efficiency, use of renewable energy, developing rail transport, strengthening public transport, etc.

3.1.3. European Social Fund – ESF

The ESF invests in people, with a focus on improving employment and education opportunities across the European Union. It also aims to improve the situation of the most vulnerable people at risk of poverty. The ESF investments cover all EU regions. More than € 80 billion is earmarked for human capital investment in Member States between 2014 and 2020, with an extra of at least € 3.2 billion allocated to the Youth Employment Initiative.

For the 2014-2020 period, the ESF will focus on four of the cohesion policy's thematic objectives:

1. Promoting employment and supporting labour mobility
2. Promoting social inclusion and combating poverty
3. Investing in education, skills and lifelong learning
4. Enhancing institutional capacity and an efficient public administration

The European Social Fund is designed and implemented in **a** partnership between the European Commission and national and regional authorities. This partnership also involves a wide range of other partners, such as NGOs and workers' organisations, in the design of the ESF strategy and the monitoring of its implementation. ESF is funding tens of thousands of local, regional and national employment-related projects throughout Europe: from small projects run by neighbourhood charities to help local disabled people find suitable work, to nationwide projects that promote vocational training among the whole population.

There is a great variety in the nature, size and aims of ESF projects, and they address a wide variety of target groups. There are projects aimed at education systems, teachers and schoolchildren, job-seekers and potential entrepreneurs from all backgrounds.

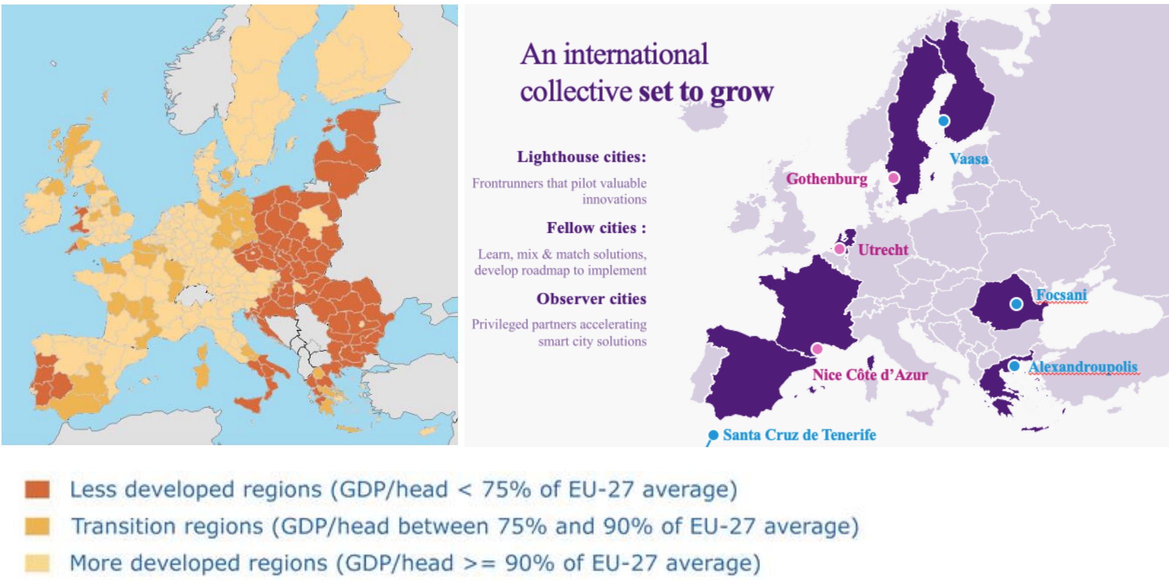

Figure 1 Structural Funds (ERDF and ESF) eligibility 2014-2020 compared to "IRIS geography" (https://ec.europa.eu/esf/main.jsp?catId=525&langId=en)

3.1.4. European fund for Rural Development – EAFRD

The European Agricultural Fund for Rural Development (EAFRD) supports European policy on rural development. To this end, it finances rural development programmes across the Member States and the regions of the Union. The European Commission and the Member States design the programmes in cooperation taking into account the strategic guidelines for rural development policy adopted by the Council and the priorities laid down by national strategy plans. In the 2014-20 programming period, for the first time, the EAFRD is specifically included in the policy framework of the European Structural and Investment Funds (ESIF) and subject to the Common Provisions Regulation (1303/2013).

For the 2014-20 programming period, the Fund focuses on three main objectives:

- Fostering the competitiveness of agriculture
- Ensuring the sustainable management of natural resources, and climate action
- Achieving a balanced territorial development of rural economies and communities including the creation and maintenance of employment.

Cohesion policy also plays a key role in support of the economic regeneration of rural areas, complementing the actions supported by the European Agricultural Fund for Rural Development.

3.1.5. European Maritime and Fisheries Fund – EMFF

The EMFF is the fund for the EU's maritime and fisheries policies for 2014-2020.

It is one of the five European Structural and Investment (ESI) funds which complement each other and seek to promote a growth and job based recovery in Europe.

The overarching aim for the fund is to:

- Help fishermen in the transition to sustainable fishing
- Support coastal communities in diversifying their economies
- Finance projects that create new jobs and improve quality of life along European coasts

- Supports sustainable aquaculture developments
- Make it easier for applicants to access financing.

The fund is used to co-finance projects, along with national funding. Each country is allocated a share of the total budget, based on the size of its fishing industry. Each country then draws up an operational programme, saying how it intends to spend the money and the national authorities and the Commission are jointly responsible for the implementation of the programme.

3.2. Channeling of the Investment and structural funds – two examples:

3.2.1. JESSICA - The Joint European support for Sustainable investment in City Areas

JESSICA is developed by the European Commission and the European Investment Bank (EIB), in collaboration with the Council of Europe Development Bank (CEB). Member States are being given the option of using some of their EU grant funding, their so-called Structural Funds, to make repayable investments in projects forming part of an integrated plan for sustainable urban development. These investments, which may take the form of equity, loans and/or guarantees, are delivered to projects via urban development funds and, if required, holding funds.

Europe uses financial instruments to raise private capital for projects associated with a high level of socio-economic value but often with high levels of risks, possibly long maturity periods or where the market is distorted in any way. Member states invest structural funds in revolving funds, with the objective of mobilizing co-investments from the public or private sectors. This section also covers other forms of soft loan schemes (i.e., below market rates and longer payback periods), loan guarantees (buffer by first losses of non-payment) and portfolio guarantees (reduces risks of payment delays and the overall costs). It also covers equity or risk-bearing mechanisms, all of which allows public funding to facilitate investments in engineering, procurement and construction.

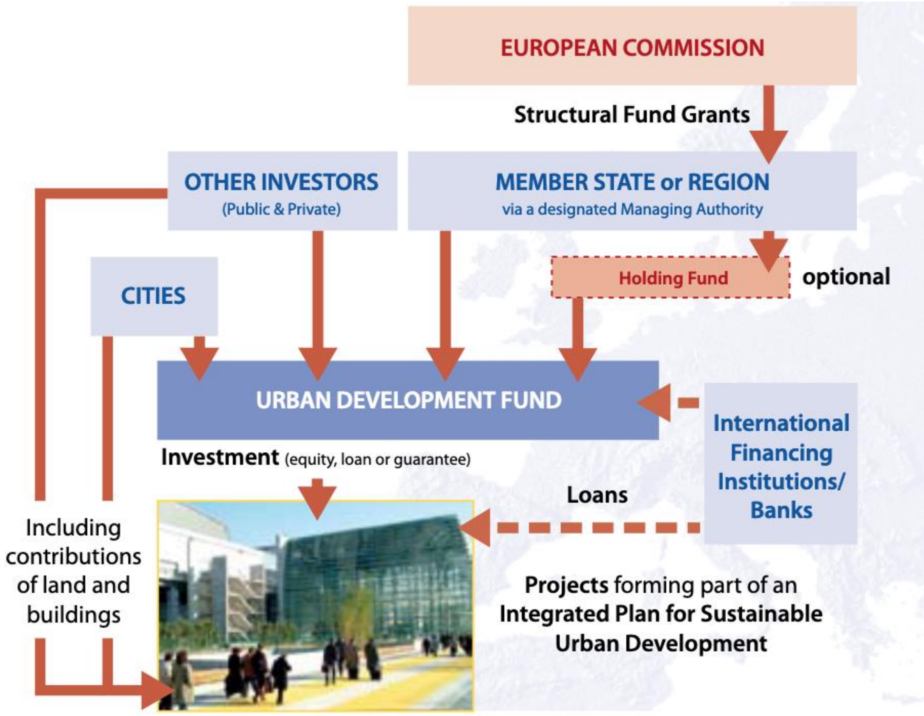

Figure 2 Channeling of JESSICA funds (https://www.eib.org/attachments/thematic/jessica_2008_en.pdf)

JESSICA provides revolving door, loan schemes up to 10 years, loan guarantees, portfolio guarantees with a funding amount to different limits for different countries (circa €50 million)

Rules on the eligibility of project expenditure using JESSICA are the same as those on the use of Structural Funds as a whole, and need to take account of any specific national constraints. JESSICA may allow for more flexible management of projects, respecting at the same time eligibility rules, provided always that the projects being supported form part of "integrated and sustainable" urban development plans. Ineligible expenditure components might be included as part of a larger, multi-sector urban project, provided sufficient additional funding is attracted from other private or public sources to finance these ineligible components.

When considering which projects could make use of JESSICA funding, an integrated approach is necessary.

JESSICA funds could be targeted specifically at projects such as:

- Urban infrastructure including transport, water/wastewater, or energy
- Heritage or cultural sites, for tourism or other sustainable users
- Redevelopment of brownfield sites including site clearance and decontamination,
- Office spaces for SMEs, IT and/or R&D sectors
- University buildings including medical biotech and other specialized facilities.

The EU Structural Funds' legislative package for the programming period 2007 to 2013 provides the JESSICA operating framework. Operational procedures are now being drawn up and will take effect once Operational Programmes have been formally agreed with the European Commission. To qualify to use JESSICA, Member States must include an urban agenda in their "Operational Programmes" and, ideally, should also include a statement on the potential use of JESSICA in delivering this agenda.

Member States will then need to decide what proportion of their Structural Funds they would like to channel using JESSICA.

JESSICA is not a new source of funding for Member States, but rather a way of using existing Structural Fund grant allocations to support urban development projects. It is up to Member States and Managing Authorities to decide how much of these Structural Funds to channel in this way. Some countries' legal frameworks have historically prohibited JESSICA funding schemes since it does not comply with state-aid laws. Some of the countries that are eligible for JESSICA include UK, Holland, Italy, Spain, Hungary and Poland.

3.2.2. European Local Energy Assistance (ELENA)

ELENA is a joint initiative by the EIB and the European Commission under the Horizon 2020 programme. ELENA provides grants for technical assistance focused on the implementation of energy efficiency, distributed renewable energy and urban transport programmes.

The grant can be used to finance costs related to feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, as well as to the preparation of tendering procedures, contractual arrangements and project implementation units. Managed and coordinated by the EIB and the EC, this program supports public authorities in project development for relatively large investment above € 30 million, the objective is to assist local authorities to make sound investments and to attract outside finance from local banks or from the EIB.

ELENA supports programmes above € 30 million with a 3-year implementation period for energy efficiency and 4-year for urban transport and mobility. It can cover up to 90% of technical assistance/project development costs. Smaller projects can be supported when they are integrated into larger investment programmes. The annual grant budget is currently between € 40 and 50 million. ELENA evaluate projects and allocates grants on a first-come-first-served basis and may co-finance the preparation of investment programmes in the following fields:

Energy efficiency and building integrated renewable energy including public and private buildings (also social housing), commercial and logistic properties and sites, and street and traffic lighting to support increased energy efficiency. ELENA may also invest in integration of renewable energy sources into the built environment, renovating, extending or building new district heating/cooling networks and networks based on combined heat and power (CHP). Furthermore, ELENA supports local infrastructure including smart grids, information and communication technology and infrastructure for energy efficiency, energy-efficient urban equipment and link with transport.

Urban transport and mobility: Investments to support the use and integration of innovative solutions for alternative fuels in urban mobility. Investments to introduce on a large-scale new, more energy-efficient transport and mobility measures in urban areas including passenger transport, freight transport, etc.

Residential sector**:** Accelerating the energy refurbishment of residential buildings is an important European priority and a key focus of the ELENA Facility. For that reason, in 2017 the European Commission allocated a substantial budget to support the deployment of the "smart finance for smart buildings" initiative. Whereas most of the project development services should be directed to households and homeowner associations (typically 80% or more of the total PDS costs), assistance could also be provided to other bodies. This could for example be financial institutions (e.g. commercial banks) and public authorities to help them establish and deploy Financial Instruments and loan products targeting energy efficiency improvements in the residential sector.

4. Financial Instruments with specific IRIS - relevance

4.1. European Investment Bank

European Investment Bank - Estimated transition track relevance									
Renewables and energy positive districts 1	High	Flexible energy management and storage 2	High	Intelligent mobility solutions 3	Medium	Digital transformation and services 4	Low	Citizen engagement & co-creation 5	High

The European Investment Bank (EIB) was founded in 1958 under the Treaty of Rome. Today EIB is the world's largest international public lending institution, the world's largest multilateral lender and is also the world's largest provider of climate finance. Being approved by EIB creates great legitimacy and is a way of attracting investors from the private sector. EIB is owned by the 28 EU Member states and work closely together with the other EU institutions to implement EU policy. The EIB Headquarters is situated in Luxembourg and EIB have a network of local and regional offices all over Europe. The EIB focus on four main areas:

- Innovation and skills
- Small businesses
- Infrastructure
- Climate and environment

Projects funded by EIB must be bankable and comply with high social, technical and environmental standards. EIB hosts a variety of experts within economy, engineering and financial analysis as well as climate and environment. EIB funds entities within the private as well as the public sector and supports small companies and start-ups through local banks. Mid-cap companies can receive support from EIB for research and development investments, but the support is in general limited to half of the cost of a project in order to crowd in financing from private investors and other public financial institutions.

For projects, supporting innovation, capacity and knowledge generation EIB accepts more risk than commercial banks and EIB can offer technical assistance to help prepare and implement projects. To benefit from financial support through EIB, a project needs to undergo the standard EIB due diligence process to verify if the project is eligible for EIB financing.

4.1.1. EIB project loans

EIB project loans mainly consists of loans and multi-component loans (multi-component, multi annual investment programmes using a single “framework loan) to individual large-scale development projects for which the total investment cost exceeds € 25 million.

In certain cases, EIB approve direct loans to mid-cap companies (up to 3000 employees) with loan volume requested between EUR 7,5m and € 25 million and the support from EIB is often the key to attracting other investors. The loans mentioned above can cover up to 50% of the total cost for both public and private sector promoters but on average, the share is about 30%.

EIB sets a number of eligibility criteria for public/private organizations and partnerships from entire EU. Projects needs to be in line with the EIB lending objectives, needs to be economically, financially, technically and environmentally sound and should contribute to EU economic policy objectives:

1. Promotion of economic and social cohesion (development of poorer regions) in the EU
2. Improvement of EU transport and telecommunications infrastructure (rail, air, road connections and bridges)
3. Secure energy supplies - production, transfer and distribution, more efficient energy use, alternative energy supplies
4. Development of a competitive, innovative and knowledge-based European economy (i2i)
5. Investment in human capital (schools, universities, laboratories, research centres, hospitals etc.)
6. Natural and urban environment schemes (water, waste, cleaner air, urban transport etc.)
7. Development of small and medium sized enterprises
8. Industrial projects improving EU competitiveness
9. Projects that support EU's external co-operation and development policies

The EIB Financing conditions depend on the investment type and the security offered by third parties, such as banking syndicates, other involved financial institutions or parent companies. Interest rates can be fixed, floating, revisable or convertible (i.e. allowing for a change of interest rate formula during the lifetime of a loan at predetermined periods). In some case EIB charge fees for project-appraisal, legal services, non-utilization etc.

Loan repayment is normally on a semi-annual or annual basis and may contain grace periods for capital repayment for a project's construction phase. Most of the EIB-loans are in EUR but can also be in local currencies as GBP, USD, JPY, SEK, DKK, CHF, PLN, CZK and HUF.

4.1.2. EIB-Intermediated loans

EIB make loans to local banks and other intermediaries which subsequently "on-lend" to the final beneficiaries. These loans are addressed to small-and-medium sized businesses, mid-cap businesses, large businesses, local authorities, national administrations or public sector bodies. All intermediated loans must address at least one of EIBs public policy goals:

- Increase in growth and employment potential – including SME and mid-cap support
- Economic and social cohesion by addressing economic and social imbalances, promoting the knowledge economy/skills and innovation and linking regional and national transport infrastructure
- Environmental sustainability - including supporting competitive and secure energy supply
- Action for climate-resilient growth

Loan conditions can be flexible in terms of the size, duration, structure etc. Lending decisions remain with the intermediary institutions, which also retain the financial risk of the lending. Under intermediated loans, we normally have no contractual relationship with final beneficiaries, although final beneficiaries need to be informed about EIB involvement.

Banks, national promotional banks or institutions, or any other financial institutions duly authorised to carry out lending activities can apply for our intermediated financing dedicated to SMEs and mid-caps or other beneficiaries, such as local authorities.

4.2. European Investment Fund (EIF)

European Investment Fund - Estimated transition track relevance									
Transition track #1 Renewables and energy positive districts 1	High	Transition track #2 Flexible energy management and storage 2	High	Transition track #3 Intelligent mobility solutions 3	High	Transition track #4 Digital transformation and services 4	High	Transition track #5 Citizen engagement & co-creation 5	High

European Investment Fund is a part of the EIB Group, focusing on establishing a sustainable venture capital ecosystem in Europe, supporting innovation and entrepreneurship and investing in venture and growth capital, from the very earliest stages of intellectual property development into technology transfer, to more mature phases of development.

EIF does not provide funding or guarantees to individuals or companies directly. Instead, EIF cooperates with a wide range of financial intermediaries such as banks, guarantee institutions, private equity and venture capital funds that offer financial products targeting SMEs and small mid-caps across Europe. Through these intermediaries, EIF supports Europe's SMEs by improving their access to finance through designing, promoting and implementing equity and debt Financial Instruments, which specifically target SMEs. In this role, EIF foster EU objectives in support of entrepreneurship, growth, innovation, research and development, and employment.

To banks, leasing companies, promotional banks, guarantee institutions or any other type of organisation authorised to carry out SME lending or leasing, EIF offers a number of portfolio guarantees and counter-guarantees and guarantees for securitized SME financing instruments. The EIF's equity activity is backed by resources from its main shareholders, the European Investment Bank (EIB) and the European Commission. In addition, the EIF is advising, sponsoring or managing a number of equity funds-of-funds and guarantee / debt funds on behalf of third party investors, including national and regional governments as well as private strategic investors.

4.2.1. EIF financial intermediaries

EIF supports micro, small and medium sized enterprises by working with a wide range of funds, banks, guarantee and microfinance institutions across Europe. These acts as EIF's intermediaries and provide financial products to SMEs.

Intermediaries are available in every EU-country as well as in the candidate countries of Turkey, North Macedonia, Montenegro and Serbia. You will also find intermediaries in the European Free Trade Association Countries of Iceland, Lichtenstein and Norway, in the Western Balkans of Albania, Bosnia - Herzegovina and Kosovo. EIB are also represented by intermediaries in the InnovFin Participating Countries of Israel, Moldova and Ukraine.

In addition, the EIF provides support to an emerging lass of intermediaries focusing their investment activities on achieving social impact. Entrepreneurs in this field seek to address mounting challenges to Europe's social cohesion through business models that generate tangible and measurable societal benefits coupled with sound economics.

EIF is implementing the Social Impact Accelerator (SIA) and the EFSI Equity Instrument in the field of social impact: SIA is the first pan-European public-private partnership addressing the growing need for availability of equity finance to support social enterprises. SIA is a first step in the EIB Group's (European Investment Bank and EIF) strategy to pioneer the impact investing space and respond to the wider EU policy aim of establishing a sustainable funding market for social entrepreneurship in Europe. This segment of the business world is becoming increasingly instrumental in promoting social inclusion, providing alternative sources of employment for marginalized social groups, and contributing to growth. These positive results underline the importance of SIA's aim to build up the existing market infrastructure for social impact investing. SIA operates as a fund-of-funds managed by EIF and invests in social impact funds, which strategically target social enterprises across Europe. In the context of the SIA, a social enterprise shall be a self-sustainable SME whose business model serves to achieve a social impact. It shall provide an entrepreneurial solution to a societal issue based on a scalable approach, and shall have a measurable impact.

Expansion and Growth Window:

Under the newly created Expansion and Growth Window, EIF provides equity investments to or alongside funds or other entities focusing directly or indirectly on later stage and multi-stage financing of SMEs and small mid-caps. Furthermore, for the first time, EIF provides investments with the intention to generate a social impact**,** targeting social enterprises and social sector organisations established or doing business in EU Member States.

Early Stage Window:

Under the Early Stage Window of EFSI, EIF provides equity investments and co-investments to or alongside funds focusing on early stage financing of SMEs and small mid-caps**.** In the context of the EFSI Equity Instrument, InnovFin Equity will be deployed predominantly in EU Member States and observing the requirements and conditions set out in the call.

4.3. Green bonds/climate awareness bonds

Green Bonds/Climate Awareness Bonds - Estimated transition track relevance									
Renewables and energy positive districts 1	High	Flexible energy management and storage 2	High	Intelligent mobility solutions 3	High	Digital transformation and services 4	High	Citizen engagement & co-creation 5	High

Corporate bonds provide an opportunity for institutional investors to invest in infrastructure during a period in which banks are risk averse and increasingly regulated under the Basel accord. The bonds typically give higher (risk-adjusted) returns and bonds yield fixed interest (coupon) rate over a fixed period. A basic bond not including options is called a bullet bond. There are many examples of corporations issuing bonds to finance infrastructure projects. Cities are increasingly being offered bonds that may come with tax advantages.

The World Bank developed the green bond financial framework and the EIB issued the world's first green bond, labelled a climate awareness bond (CAB) in 2007. It is a financial instrument that helps raise financing for sustainable projects or activities that promote the transition to low carbon and climate resilient growth. The loan is paid back in full with regular interest by the lender and the green bond issuance is ring-fenced for sustainable investments only, and is deductible from tax in many countries. In 2014, the 'green bond principles' were developed by a consortium of investors, issuers and underwriters to support transparency in the market. In 2013, the City of Gothenburg was the world's first city to introduce a green bond programme; investment went into sustainable public transport, waste disposal, energy and water management.

In 2014, 35 billion USD was invested in green bonds according to the World Bank, three times as much as the previous year. Since 2008, the World Bank has issued nearly USD 8 billion in green bonds through over 80 transactions in 18 currencies. At first, green bonds were issued primarily by international actors such as the World Bank and the EIB, but today this practice is followed by private companies such as Skanska, SCA, Rikshem and banks as Morgan Stanley and JP Morgan. In 2014, the Swedish bank SEB has been the largest issuer of green bonds, raising as much as USD 3.8 billion. Other public authorities have followed Gothenburg, among them the City of Stockholm and Örebro in Sweden and Johannesburg in South Africa.

As of 31 December 2018, EIB still is the largest issuer of green bonds with more than € 23.5bn raised of which the EUR equivalent of 4.0bn raised in 2018. The EIB provides the market with benchmark green bond issuances in EUR, USD and GBP, but has also issued CABs in SEK, CAD, ZAR, CHF, AUD, JPY, TRY and BRL (in synthetic format). EIB is increasing liquidity, size, and scale of green bond issuance, in addition to gradually building green reference yield curves.

The green bonds are earmarked to match EIB financing contributing to climate action within the sectors of renewable energy and energy efficiency. In renewable energy, this includes wind, solar, hydro and geothermal energy production and in energy efficiency, this includes projects for district heating, co-generation, building insulation, energy loss reduction in transmission/distribution and equipment replacement with significant energy efficiency improvements.

4.3.1. Green bonds in Gothenburg, Sweden

The green bond programme forms an integral part of Gothenburg's work to achieve its climate and environmental goals, as it is an efficient way to raise capital for sustainable investments. First, issued in September 2013, within a few minutes of availability, Gothenburg has raised SEK 500 million selling all the bonds issued on the open market. In the year following this successful debut, Gothenburg issued bonds and raised an additional SEK 1800 million. The green bond is listed on the London Stock Exchange and its maturity is six years. The Gothenburg green bond proved to be very attractive to investors with an ethic or green mandate looking for green projects investments. Investors that usually do not consider Gothenburg an interesting choice for investment actually stood in line to purchase the bond. Two examples of investors are Swedish pension funds and The Swedish Church. Due to the great asset of properties, Gothenburg's holds a high credit rating (AA+/AAA). This event represents a more general trend among investors, interested not only in the identity of the issuer of the bonds, but also in the features of the project into which the investment is channeled. Investors seek to contribute to the development of sustainable projects and want to be affiliated with these projects, using their logos on websites etc.

The following areas are included in the pool of projects financed by the green bond programme in Gothenburg:

1. Renewable Energy (solar, wind, wave and hydro)

2. Energy Efficiency

3. Waste Management

4. Water Management (efficiency)

5. Biofuel (from forestry waste)

6. Smart grids

7. Sustainable housing (e.g. infrastructure and construction)

8. K2020 public transport development program

9. Environmental

10. Development of new nature conservation areas

11. Water clearing facilities

The eligible projects are selected in collaboration between the City of Gothenburg's Environmental Department and the Treasury department. The list is finally approved by the City Council in consultation with a research institute at the University of Oslo, which has provided a second opinion about the elected projects for green bonds. At the moment, Gothenburg does not issue bonds for a single project but in an entire portfolio. It is possible that in the future things will change and bonds will be dedicated to a specific project. The financial risk associated with the bond is connected to Gothenburg's entire balance sheet and not only the concerned projects.

4.4. Public Private Partnerships (PPP)

Public Private Partnerships - Estimated transition track relevance									
Renewables and energy positive districts 1	Medium	Flexible energy management and storage 2	Medium	Intelligent mobility solutions 3	High	Digital transformation and services 4	High	Citizen engagement & co-creation 5	Medium

Public-private partnerships involve collaboration between a government agency and a private-sector company that can be used to finance, build, and operate projects, such as public transportation networks, parks, school buildings or energy infrastructure. PPP is seen as a viable alternative to the traditional model of public investment in many countries. For instance, a city government might be unable to undertake a capital-intensive building project while a private enterprise might be interested in funding its construction in exchange for receiving the operating profits from the completed project.

European Union aims to increase the use of public-private partnership to achieve sustainable economic growth and to respond to the needs on European level, particularly to accelerate the development of trans-national infrastructure. The EU seeks to give an impulse to public-private partnership projects as the earlier economic and financial crisis caused a decrease in infrastructural and other public investments. It also caused risk-averse within the private sector to high value projects. A project can be completed sooner through a public-private partnership or make it a possibility in the first place. From more common PPP contracts involving design, construction and maintenance of public infrastructure, such as roads or bridges, PPP also is implemented in sectors that require special technical and administrative knowledge such as energy system solutions highly relevant to the IRIS Consortia. As a result of PPP, private capital can be involved to provide services traditionally financed and provided by state or municipality, sharing benefits and risks

The private partner participates in designing, completing, implementing and funding the project, while the public partner focuses on defining and monitoring compliance with the original objectives, such as the end-user's need for mobility within a city, rather than focusing on the details within the actual solution. Public-private partnerships typically have contract periods of more than 20 years, sometimes even up to 30 years or more. Financing comes partly from the private sector and partly by regular payments from the public sector and/or from users of the completed building project over the project's lifetime.

PPPs allow large-scale public, municipal and government projects such as roads, bridges or hospitals to be completed with use of private funding, benefiting from the combination of the private sectors technology and innovation capacity with the public-sector incentives to complete work on time and within budget. The risks for the private enterprise include cost overruns, technical defects, and an inability to meet quality standards and the demand may not support the risks for the public partners. Public works and services may be paid for through a fee from the public entity’s revenue budget, such as with hospital projects. Concessions may involve the right to direct user’s payments, as in a case with toll highways where payments are based on actual usage of the service or with a power grid where payments are made with fees collected from users.

In a PPP, the partnership between the private company and the public entity provide advantages to both parties. Private-sector technology and innovation can help provide better public services in the city through improved operational efficiency. The public sector provides incentives for the private sector to deliver projects on time and within budget. In addition, creating economic diversification facilitates the development of the infrastructure on a national, regional or local level, boosting associated construction, equipment, support services, and other businesses.

A number of risks occur in PPP-projects; infrastructural investments such as bridges, roads, railways and energy grids involve construction and quality risks and in if the product is not delivered on time, the investment exceeds budget or the product has technical defects, the private partner bears the burden. Additionally, the private partner faces availability risk if it cannot provide the agreed service level or if it is unable to meet safety or other relevant quality standards, for example, when running a hospital or a school.

Demand risk occurs when there are fewer users than expected for the service or infrastructure, such as toll roads, bridges, or tunnels. If the PPP project is based on an agreement where the public partner agrees to pay a minimum fee no matter the demand, the public partner bears a considerable risk, not least considering the often-long PPP contract periods.

Public-private partnerships are often found in transport infrastructure such as highways, airports, railroads, bridges, and tunnels. Examples of municipal and environmental infrastructure also include water and wastewater facilities. Public service accommodations include school buildings, prisons, student dormitories, and entertainment or sports facilities.

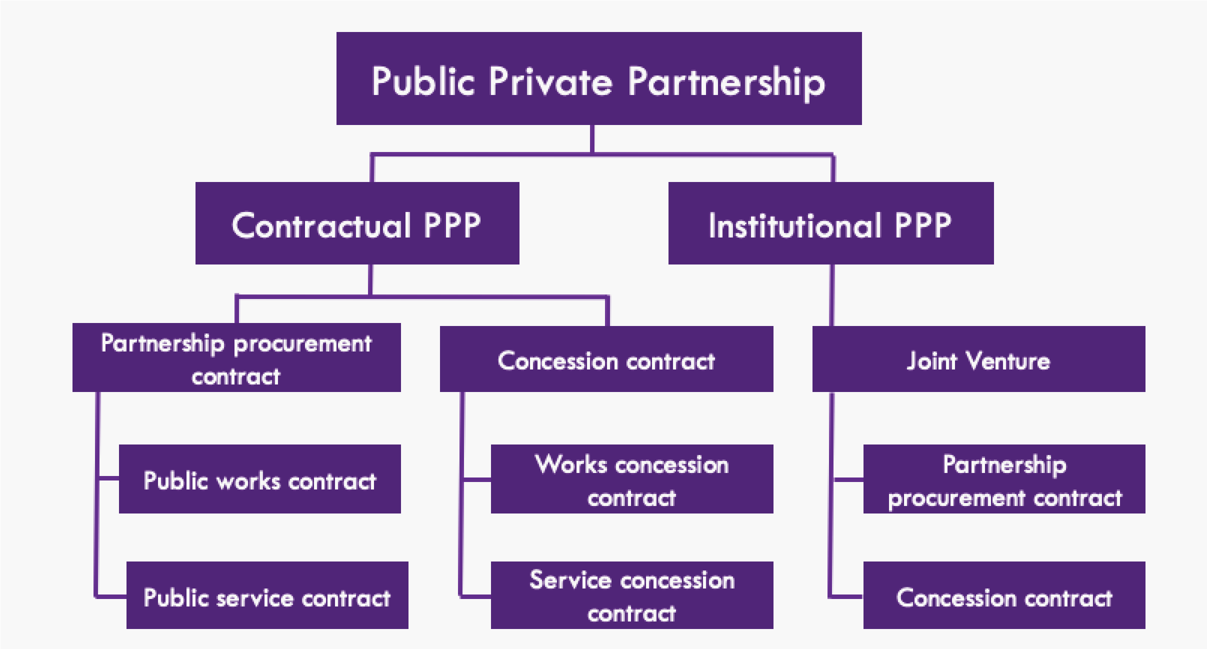

Figure 3 Figure 3: Structure of Public Private Partnership (Extract from: https://www.fm.gov.lv/en/s/ppp/)

Contractual PPP: Within the framework of a contractual PPP, the cooperation between a public partner and a private partner is established by the public partner concluding a contract with the private partner regarding the construction works and/or service provision. In order to ensure a contractual PPP on the part of a private partner, an undertaking of interested parties (a constructor, a manager, a service provider, etc.) a special purpose entity (in the EU member states also known as special purpose vehicle) is established. A public partner can also intend the establishment of a special purpose entity in the PPP procedure documents, setting it as an obligation for the performance of the PPP contract.

Institutional PPP: In the institutional partnership, a public partner and a private partner join in a joint venture (a capital company) and the public partner concludes a PPP contract with it as with a private partner. An institutional PPP can be chosen in case the public partner wishes to have a stronger control over the execution of the PPP. In that case both a public partner and a private partner jointly participate in the administration of an established joint venture. PPP risks, income and losses usually are shared in proportion to the shares of a public partner and a private partner that they have in a joint venture.

4.5. Public Private People Partnership, 4P

Public Private People Partnerships - Estimated transition track relevance									
Renewables and energy positive districts 1	Medium	Flexible energy management and storage 2	Medium	Intelligent mobility solutions 3	High	Digital transformation and services 4	High	Citizen engagement & co-creation 5	High

As in a Public Private Partnership, the 4P enables cooperation between a public entity and a private company in order to finance, build, and operate projects creating benefits for the citizens. The additional "P" adds the general "Public" as a third pillar in order to ensure the citizen end user perspective. The PPP is seen as a viable alternative to traditional public investments and as an efficient way to activate private capital and share risks within, for example, infrastructural investments, but there are a number of challenges regarding the PPP that has demonstrated a need to widen the context.

Public-Private Partnerships are based on an idea of representative democracy and governance practiced through negotiations and contracts. Citizen participation, in turn, is based on the principles of end-user engagement and the idea of offering a possibility of "making one's voice heard". In the PPP-project, there is a risk that the city administration cooperates with the private partner on one hand and that the citizen engagement and the citizen participation is managed as separate processes although both processes are expected to influence the same planning process.

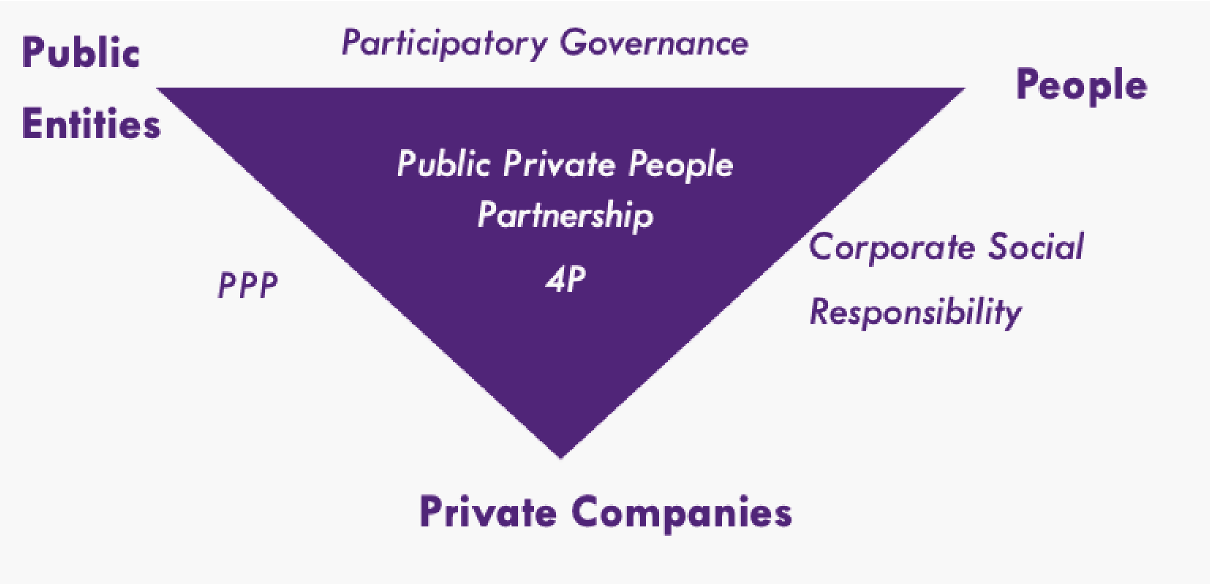

Figure 4 The Public Private People Partnership Mechanism - Mechanisms relating interaction between public entities, private companies and citizens.

The 4P approach is highly relevant as it comes to "understand the different perspectives on the same reality". Therefore, the 4P-approach has been recognized as very effective in crisis prevention projects as it is found necessary to involve not only public entities and private companies but also citizens in the process of building a city's resilience.

Public-Private-People Partnership (4P) is an emerging way of developing the participation and involvement of private partners *as well as* the general public in a joint process. By bringing the general "people" into the partnership alongside with public and private actors, there can be more inclusion and transparency in the project. There is no single model or definition of the 4P concept, and the principles of public inclusion and transparency can be adapted in various ways, but in general, 4P-approaches focus on developing an open planning processes transparent and "available", ensuring the interests for the public and private actors as well as for the general public.

One of the benefits within the PPP project is the risk sharing between the private and the public entities, but as the agreements are often based on an estimation of citizens use of the investment, the public risk will increase if the end user perspective is forgotten. The people-involvement ensures that the public actor have taken the "people-perspective" into account before the processes of procurement and reaching an agreement starts. Reduction of this risk is one of the main advantages in the 4P-project compared to PPP.

The end-user involvement of the local general public in a 4P project must be carried out with a methodology based on legislation, regulatory considerations and on cultural conditions on a local and national level. By addressing the risk of imbalance between private actor influence and the needs of the general public, the Public-Private-People Partnerships can be an important tool in helping planners to turn challenges and differences into a strength within the project.

4.6. Private Finance for Energy Efficiency (PF4EE)

Private Finance for Energy Efficiency - Estimated transition track relevance									
Renewables and energy positive districts 1	High	Flexible energy management and storage 2	High	Intelligent mobility solutions 3	Medium	Digital transformation and services 4	Low	Citizen engagement & co-creation 5	Low

Private Finance for Energy Efficiency (PF4EE) instrument is a joint agreement between the EIB and the European Commission, which aims to address the limited access to adequate and affordable commercial financing for energy efficiency investments. The instrument targets projects, which support the implementation of National Energy Efficiency Action Plans or other energy efficiency programmes of EU Member States.

The European Investment Bank and European Commission launched the PF4EE to facilitate access to "adequate and affordable" financing for energy efficiency investments. PF4EE makes the lending process to energy efficiency project more accessible within European financial institutions and increases the availability of debt financing to those investments. The Programme for the environment and climate action, also known as the LIFE Programme is managed by the Directorate General for Climate Action (DG Clima) who is also funding the PF4EE. The underlying aim is to facilitate energy efficiency investments in order to implement National Energy Efficiency Action Plans or other programmes in line with EU directives in relation to energy efficiency.

The LIFE Programme committed EUR 80m to fund the credit risk protection and expert support services. The EIB will leverage this amount, making a minimum of EUR 480m available in long-term financing. The PF4EE instrument will provide:

- a portfolio-based credit risk protection provided by means of cash-collateral (Risk Sharing Facility), together with
- long-term financing from the EIB (EIB Loan for Energy Efficiency) and
- expert support services for the Financial Intermediaries (Expert Support Facility)

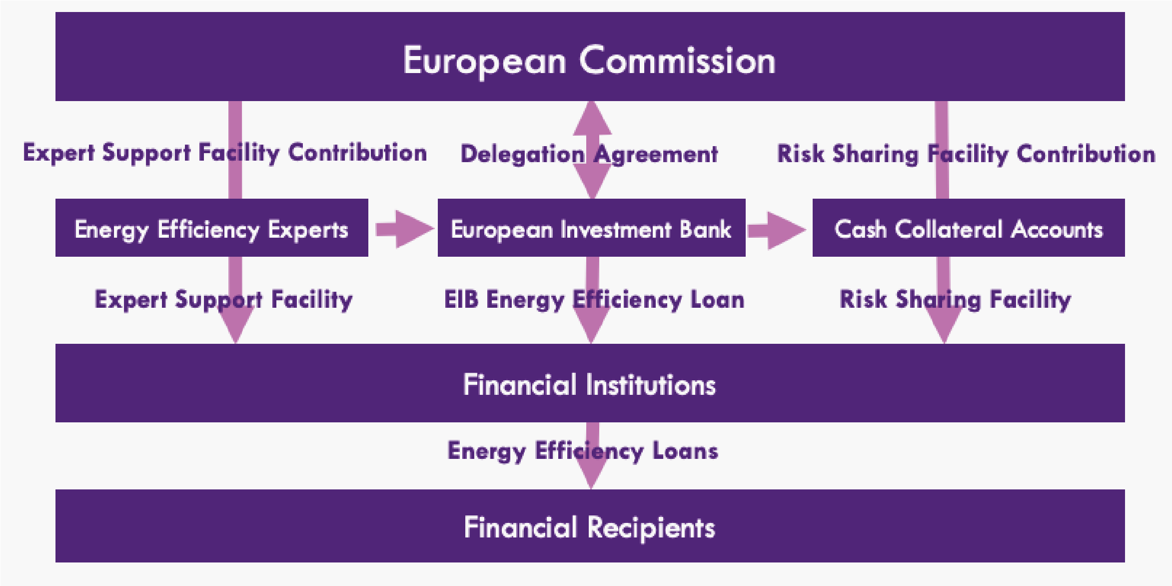

Figure 5 The PF4EE relation structure

One PF4EE operation per country is being implemented in order to reach optimal diversification across the EU Member States. The selection process for financial intermediaries will take into account that no more than one financial intermediary can be selected to distribute the PF4EE Instrument per Member State. Financial intermediaries proposing to operate where energy efficiency investment needs are the greatest will be prioritised. The selection process has been done on a "first-come first-served" basis within a given Member State, provided that the selection conditions presented below are met.

By Q2 of 2019, the EIB has signed an operation in the EU Member States of Czech Republic, Spain, France, Belgium, Italy, Portugal, Croatia, Cyprus and Greece. These financial intermediaries participating in the implementation of the PF4EE Instrument all complies with the following (minimum PF4EE Intermediaries eligibility) criteria:

1. Being a private sector financial institution or to operate in a manner comparable to a private sector financial institution on the market;
2. Being duly authorised to carry out lending or leasing activities according to the applicable legislation and be established and operating in a Member State;
3. Demonstrating operational capacity to manage the PF4EE Instrument;
4. Demonstrating capacity to reach Final Recipients targeted by the relevant NEEAP priority and/or energy efficiency support scheme and/or EU Directives relating to energy efficiency within the Member State concerned;
5. Having sound financial standing with a stable long-term outlook;
6. Having robust credit risk assessment and rating policies, procedures and systems;
7. Not have been convicted or being subject to judgement for offences concerning their professional conduct, for fraud, corruption, money laundering or any other illegal activity detrimental to the European Union or and/or defined in the Anti-fraud policy of the EIB;
8. Being acceptable as an EIB counterparty in accordance with its internal policies and not to have been excluded for the purpose of managing Financial Instruments in line with the applicable Union regulation

4.7. European Energy Efficiency Fund, EEEF

The European Energy Efficiency Fund's objective is to mitigate climate change through energy efficiency measures and aims to support the goals of the European Union to promote a sustainable energy market and climate protection by contribution to the mitigation of climate change, achieving economic sustainability of the fund and to attract private and public capital into climate financing. EEEF contributes with a layered risk/return structure to enhance energy efficiency and foster renewable energy in the form of a targeted private public partnership, primarily through the provision of dedicated financing via direct finance and partnering with financial institutions. EEEF targets local and regional authorities as well as public and private entities acting on behalf of those authorities and finances both project development and construction. Investments should contribute significantly towards energy savings and the reduction of greenhouse gas emissions to promote the environmentally friendly use of energy.

EEEF is formed as a public-private partnership managed by the Deutsche Bank, the European Energy Efficiency funds is managed by the European Union, the EIB, Cassa Depositi e Prestiti and Deutsche Bank. EEEF funds senior and junior loans, guarantees or equity participation, coordination and support actions. Investments should contribute significantly towards energy savings and the reduction of greenhouse gas emissions to promote the environmentally friendly use of energy.

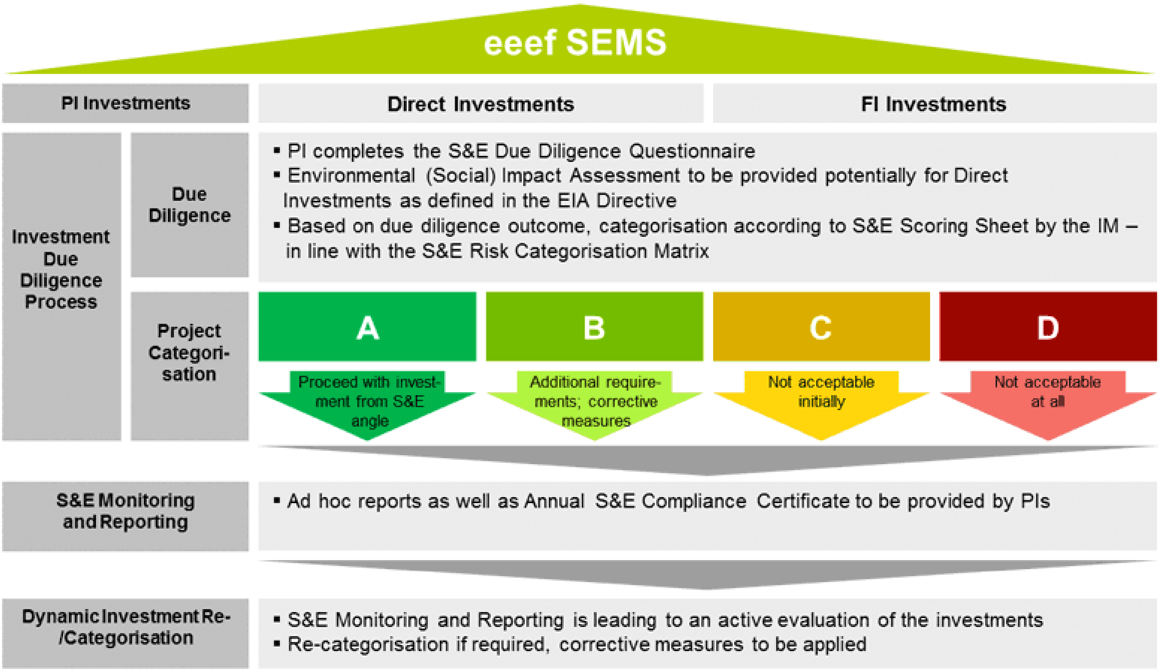

Figure 6 The EEEF Social and Environmental Management System (https://www.eeef.eu/environmental-and-social-standards.html)

The initial fund volume is EUR265m, energy projects range between EUR5m toEUR25m and finances projects launched by public authorities or public bodies working on a public contract. Eligible to EEEF are investments in energy efficiency and renewable energy projects, mostly for buildings and consumers, finance for sustainable energy, project development assistance (PDA) including DH projects and high efficiency CHP. The funding is a portfolio-based credit risk protection provided by means of cash-collateral (Risk Sharing Facility), together with long-term financing from the EIB (Loan for Energy Efficiency) and expert support services for the Financial Intermediaries (Expert Support Facility).

4.8. European fund for Strategic Investments (EFSI)

European Fund for Strategic Investments - Estimated transition track relevance									
Renewables and energy positive districts 1	High	Flexible energy management and storage 2	High	Intelligent mobility solutions 3	High	Digital transformation and services 4	High	Citizen engagement & co-creation 5	High

EFSI is an initiative launched jointly by the European Investment Bank, the European Investment Fund and the European Commission to help overcome the current investment gap in the EU. EFSI is one of the three pillars of the Investment Plan for Europe that aims to revive investment in strategic projects around the continent to ensure that money reaches the real economy. EFSI is a EUR 26 billion guarantee from the EU budget, complemented by a EUR 7.5 billion allocation of the EIB's own capital. The total amount of EUR 33.5 billion aims to unlock additional investment of at least EUR 500bn by 2020. EFSI is implemented by the EIB Group and projects supported by it are subject to usual EIB procedures.

With EFSI support, the EIB Group is providing funding for economically viable projects, especially for projects with a higher risk profile than usually taken on by the EIB. It will focus on sectors of key importance for the European economy, including:

- Strategic infrastructure including digital, transport and energy
- Education, research, development and innovation
- Renewable energy and resource efficiency
- Support for small and mid-sized businesses

EFSI is demand-driven and provides support for projects everywhere in the EU, including cross-border projects. There are no geographic or sector quotas. Projects are considered based on their individual merits.

EFSI Equity Instrument provides financing for the benefit of more vulnerable entities within the EU ecosystem, encompassing micro, small and medium enterprises, social enterprises, social sector organisations and small mid-caps, in specific EU policy areas. The EIF is now implementing a new set of equity instruments, aiming at:

1. Enhancing access to financing for SMEs, small mid-caps, social enterprises and social sector organisations established or doing business in EU member states during their entire lifecycle, from the pre-commercial phase up to their expansion and growth stage of development
2. Ensuring adequate contribution to the market development in the areas such as technology transfer, business angels, social impact, venture capital, and fund-of-funds
3. Catalysing private investments into the private equity and venture capital market to contribute to the development of the European equity ecosystem.

EFSI Equity is deployed in the form of two windows, which may be combined to pursue multi-stage investment strategies. Local authorities, public sector companies or other government-related entities may benefit from project loans or loans to finance research and innovation. EIB's intermediated lending provided by partner institutions may also be used to finance smaller projects. EFSI can support investments in equity, hybrid or debt funds with a focused investment strategy addressing EU priorities and through the EIF funds focusing on small and medium-sized companies. The EIB may co-invest or provide co-financing to eligible projects alongside third parties. This can be done as investment platforms, either under fully delegated structures or with active EIB involvement into the due diligence and structuring process.

To benefit from EFSI resources deployed through the EIB, the applicant and the project need to undergo the standard EIB due diligence process. EFSI projects need to be economically and technically sound and addressing at least one of the EFSI eligible sectors defined in Article 9 of the EFSI Regulation (contributing to EU objectives, including sustainable growth and employment, being mature enough to be bankable). Following a positive outcome of the due diligence process, projects are submitted for approval by the relevant EIB group governing bodies channelling of structural funds

4.9. Crowdfunding

Crowdfunding is an emerging alternative form of financing that connects those who can give, lend or invest money directly with those who need financing for a specific project. It usually refers to public online calls to contribute finance to specific projects.

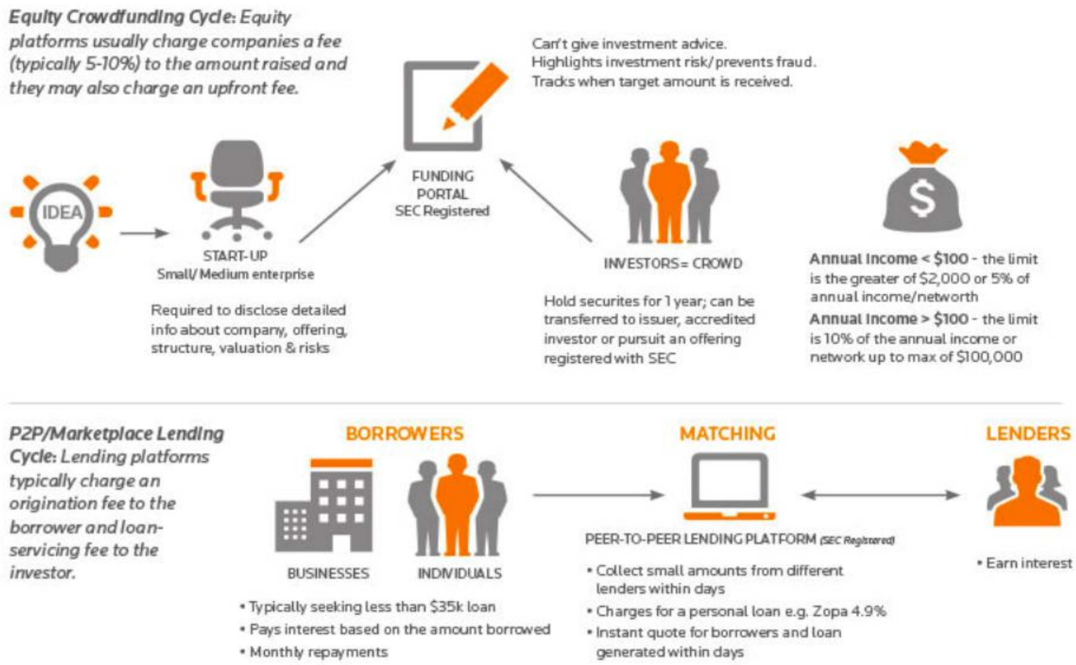

Figure 7 How crowdfunding works (https://blogs.thomsonreuters.com/answerson/crowdfinancing)

The EU-Commission describes the market for crowdfunding as "underdeveloped as compared to other major world economies". One of the biggest hurdles faced by crowdfunding platforms seeking to offer their services across borders is the lack of common rules across the EU. This raises compliance and operational costs and prevents crowdfunding platforms from expanding.

In March 2018, as part of its Fintech action plan, the European Commission presented a proposal for a regulation on crowdfunding service providers. Once adopted at EU level, the new regulation will allow platforms to apply for an EU passport based on a single set of rules. This will make it easier for them to offer their services across the EU. The new rules will improve access to this innovative form of finance for small investors and businesses in need of funding, particularly start-ups. Investors on crowdfunding platforms will benefit from a better protection regime and a higher level of guarantees, based on clear rules on information disclosures for project owners and crowdfunding platforms, rules on governance and risk management and a coherent approach to supervision

The Commission proposal only applies to those crowdfunding services entailing a financial return for investors, such as investment and lending based crowdfunding.

4.9.1. Crowdfunding Platforms

Ulule, France:

Since its launch in October 2010, Ulule has helped finance more than 4900 creative, innovative, or community-minded projects with a 67% crowdfunding success rate in 2014. Ulule is the first platform to offer two fundraising types: the project manager can set a budget target, or a number of objects / items to pre-sell. Ulule offers an open API for entities that wants to use Ulule's data or operate crowdfunding campaigns on their own website.

FundedByMe, Sweden

Founded in Stockholm, Sweden 2011, it is one of the first crowdfunding platforms in the world to offer both reward-based and equity crowdfunding. The platform has a major focus on European entrepreneurs to facilitate cross-border investments that benefit both entrepreneurs and investors to assist with job creation and economic growth. FundedByMe operates on a global scale and has offices in Sweden, Finland, Denmark, Norway, Spain, Germany, Italy, and Singapore. While its reward based orderings are available across the world, equity crowdfunding is available only in Europe and loan-based options are currently available in Germany

Symbid, Netherlands

Symbid is all about investing safely in new, promising, fast-growing businesses with as little as €20. Symbid allows investors to seamlessly become co-owners with a complete legal structure within which the new financers are bundled. As a result, start-ups only have to deal with one shareholder cooperative that bundles all the shareholders together. Some unique features of the Symbid community include 1) an 'Inner Circle' of involved investors who in turn can support the start-up with tips, ideas and comments and 2) the ability to run small private raises or large social-media campaigns.

Goteo, Spain

Goteo is a social network for crowdfunding and distributed collaboration (services, infrastructures, micro tasks and other resources) for projects that contribute to the common good, free knowledge, and open code. Goteo invites both financiers and collaborators to work on getting social good projects off the ground through rewards-based arrangement. Goteo also uniquely offers two co-funding rounds, each with a duration of 40 days. The first is an “all or nothing” round for the minimum essential budget, while the second is for an optimum sum to carry out additional improvements

Invesdor, Finland

Invesidor is a crowdfunding platform that gives businesses full discretion over how they raise money, including deciding who can see their investment requirements and who should be able to invest. The raise consists of a three-phase crowdfunding round that offers start-ups case evaluations and pitching to Invesdor partners before the round goes live. In addition, the platform offers an array of supplementary services that include legal advice, branding and business development, auditing etc.

Crowdcube, UK

Crowdcube is Britain’s largest and the world’s first equity crowdfunding platform, targeted exclusively at investors who are sufficiently sophisticated to understand these risks and make their own investment decisions. More than £26 million have been successfully invested through Crowdcube so far. In February 2014, Crowdcube launched the ‘Crowdcube Venture Fund – that allows investors to crowdfund start-ups with the extra reassurance that their money is invested, managed and monitored by an independent professional fund manager.

Funding Circle, UK

Funding Circle is the leader in the peer-to-peer marketplace that can help businesses access fast and simple finance, whilst investors have the potential to earn better returns by lending to them. It directly connects people and organisations who want to lend, with vetted, credit worthy established businesses who want to borrow, thus eliminating traditional banking. Through Funding Circle, businesses can pick the lowest interest rate offers, borrow from many investors and make monthly repayments. More than £285 million have been lent via Funding Circle

5. Financial tool adapted for cities replication of IRIS integrated solutions (MS5)

Successful demonstrations of IRIS integrated solutions lead to two processes in the IRIS Lighthouse project, Scale-up and Replication. The IRIS project vocabulary differ between the two as:

Scale-Up - a process where actors taking part in the successful demonstration project scale-up the solution within their business. Scale-up needs a business development action.

Replication - a process where new actors replicates knowledge from the successful demonstration. Replication needs a knowledge transfer action, from “someone” to the new actor.

Funding solutions for these two processes may differ in scale as the scaling-up process may aim for a larger roll out, hence needing a larger budget. While replication probably is done initially as a new demonstration project using a smaller budget when focusing on knowledge transfer and considering local conditions. With a successful demonstration, the process can continue with a scaling-activity focusing on business growth. The financial tool adapted for cities replication of IRIS integrated solutions (MS5) as presented below, follows a procedure in which the result from making one step will lead in a certain direction. Factors such as budget volume, country for investment and chosen business model affects the possibilities and sets limitations. The examples presented in section 7 with similar completed funding projects can serve as a guide within this process.

Please note that IMCG Sweden AB offers training sessions and advisory workshops in order to consolidate the knowledge on Financial Instruments. The training focus on practical exercises such as “how to find the right Financial Instrument”, “how to address the financing organisations” and “how to proceed adding increased financial attractiveness” for the partner.

5.1. Phase 1 – preparation

The first phase is a preparation phase where the local consortia decides on business set up.

1. The first actions in the preparation phase needs to be an alignment/direction decision based on which eligibility criteria the innovation, product or project are meeting. This, of course, depends on a number of conditions such as the historical setup of the innovation development process, the specifications of the technical solution, its business model and its sustainability potential to mention some. As many of the various European entities providing Financial Instruments sets various requirements for eligibility, the eligibility check is an important process to run before approaching any of the financial instrument providers. It should also be run as a regular activity within the innovation process as “creation of financial eligibility” is crucial for successful scale-up as well as replication.
2. The second action is depending on whether an innovation or a consortium is found eligible or not for a specific Financial Instrument. There might be actions that can be performed in order to meet specific eligibility criteria. An eligibility plan based on the specific financial instrument criteria will be an effective way to analyse the effort needed, either to make a “quick-fix” or to set a long-term plan for creation of eligibility.

5.2. Phase 2 – choosing relevant Financial Instruments

In phase 2, a decision is made based on possible financial pathways from a legal, regulatory and/or cultural point of view. Some financial options will be closed due to limitations in the applicant's freedom to enter into agreements and some pathways will be open after preparation, negotiation or after being processed on a higher decision level due to contemporary conditions and circumstances.

The tables below contain an overview of the estimated relevance of the various Financial Instruments described in section 4. The estimation is based on the information provided by the Financial Instruments representatives and the intention is to facilitate for the IRIS participants in the various transition tracks to –after the eligibility check has been done and after the decision of direction is made, address the right financial Instrument Entity.

5.2.1. IRIS Transition Track #1:

Smart renewables and closed-loop energy positive districts: Integrating (a) a high share of locally produced and consumed renewable energy at district scale, (b) energy savings at building level reducing the citizens' energy bill and (c) energy savings at district level. Demonstrated solutions integrate high renewables penetration like district scale PV and biomass for district heating, near zero energy housing retrofit, energy efficient low temperature district heating and smart public lighting that is energy efficient, powered by renewables and connected to the district energy system.

Table 1 Transition track 1; Renewables and energy positive districts - Relevance of Financial Instruments in a transition track 1-perspective

Transition Track est. relevance		Project Size	Risk	Time-span	Info
EIB 4.1 European Investment Bank	High	Medium to large	Low risk	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process
EIF 4.2 European Investment Fund	High	Large and mid sized	Low to medium	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process with EIF or Intermediary partner
GB/CAB 4.3 Green /Clim. Awareness/ Bonds	High	Small to large projects.	Low risk	Long to mid-term	financing for sustainable projects and activities that promote transition to climate resilient growth.
PPP 4.4 Public Private Partnership	Medium	Medium to large	Risk-sharing managed in PA	Long to very long	Initiated to enable private capital in infra-structural city investments
4P 4.5 Public Private People Partnership	Medium	Medium to large	Risk-sharing managed in PA	Long to very long	Enabling citizen participation and public/ private cooperation in development projects
PF4EE 4.6 Priv. Finance for En. Efficiency	High	Large and mid-sized	Low to medium risk	Medium to long	Facilitating access to affordable financing for investments with strong energy-efficiency focus
EEEF 4.7 European Energy Efficiency Fund	High	Medium	Low to medium risk	Medium to long	Initiated to bring public and private partner-ship capital into climate change mitigation
EFSI 4.8 European Fund for Strategic Inv	High	Micro, small and mid size	Medium to high risk	Medium to long	Launched to help overcome the current geographic investment gap in the EU
CF 4.9 Crowd Funding	Low	Small projects	Medium to high risk	Short to mid-term	By EU-commission described as an under-developed source of funding and financing

5.2.2. IRIS Transition Track #2:

Smart Energy Management and Storage for Grid Flexibility: Integrating smart energy management and renewable energy storage for (a) maximum profits of renewable power/heat/gas, (b) maximum self- consumption reducing grid stress and curtailment, and (c) unlocking the financial value of grid flexibility. Demonstrated technical solutions include smart ICT to interconnect energy management systems at home, building and district level, and to integrate maximal renewables production (track 2), V2G storage in e-cars operated in car sharing systems (track 3) with additional stationary energy storage.

Table 2 Transition track 2: Flexible energy management and storage - Relevance of Financial Instruments in a transition track 2-perspective

Transition Track est. relevance		Project Size	Risk	Time-span	Info
EIB 4.1 **European Investment Bank**	High	Medium to large	Low risk	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process
EIF 4.2 **European Investment Fund**	High	Large and mid sized	Low to medium	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process with EIF or Intermediary partner
GB/CAB 4.3 **Green /Clim. Awareness/ Bonds**	High	Small to large projects.	Low risk	Long to mid-term	financing for sustainable projects and activities that promote transition to climate resilient growth.
PPP 4.4 **Public Private Partnership**	Medium	Medium to large	Risk-sharing managed in PA	Long to very long	Initiated to enable private capital in infra-structural city investments
4P 4.5 **Public Private People Partnership**	Medium	Medium to large	Risk-sharing managed in PA	Long to very long	Enabling citizen participation and public/ private cooperation in development projects
PF4EE 4.6 **Priv. Finance for En. Efficiency**	High	Large and mid-sized	Low to medium risk	Medium to long	Facilitating access to affordable financing for investments with strong energy-efficiency focus
EEEF 4.7 **European Energy Efficiency Fund**	High	Medium	Low to medium risk	Medium to long	Initiated to bring public and private partner-ship capital into climate change mitigation
EFSI 4.8 **European Fund for Strategic Inv**	High	Micro, small and mid size	Medium to high risk	Medium to long	Launched to help overcome the current geographic investment gap in the EU
CF 4.9 **Crowd Funding**	Low	Small projects	Medium to high risk	Short to mid-term	By EU-commission described as an under-developed source of funding and financing

5.2.3. IRIS Transition Track #3:

Smart e-Mobility Sector: Integrating electric vehicles and e-car sharing systems in the urban mobility system offering (a) local zero-emission mobility, (b) lower household mobility costs, and (c) smart energy storage in V2G car batteries. Demonstrated solutions include extensive deployment of (V2G) e-cars, exploitation of (V2G) e-cars in local car sharing systems, and district-wide smart (V2G) charging stations powered mainly by renewables.

Table 3 Transition track 3; Intelligent mobility solutions (Relevance of Financial Instruments in a transition track 3-perspective)

Transition Track est. relevance		Project Size	Risk	Time-span	Info
EIB 4.1 European Investment Bank	Medium	Medium to large	Low risk	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process
EIF 4.2 European Investment Fund	Medium	Large and mid sized	Low to medium	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process with EIF or Intermediary partner
GB/CAB 4.3 Green /Clim. Awareness/ Bonds	High	Small to large projects.	Low risk	Long to mid-term	financing for sustainable projects and activities that promote transition to climate resilient growth.
PPP 4.4 Public Private Partnership	High	Medium to large	Risk-sharing managed in PA	Long to very long	Initiated to enable private capital in infra-structural city investments
4P 4.5 Public Private People Partnership	High	Medium to large	Risk-sharing managed in PA	Long to very long	Enabling citizen participation and public/ private cooperation in development projects
PF4EE 4.6 Priv. Finance for En. Efficiency	High	Large and mid-sized	Low to medium risk	Medium to long	Facilitating access to affordable financing for investments with strong energy-efficiency focus
EEEF 4.7 European Energy Efficiency Fund	High	Medium	Low to medium risk	Medium to long	Initiated to bring public and private partner-ship capital into climate change mitigation
EFSI 4.8 European Fund for Strategic Inv	High	Micro, small and mid size	Medium to high risk	Medium to long	Launched to help overcome the current investment gap in the EU
CF 4.9 Crowd Funding	Medium	Small projects	Medium to high risk	Short to mid-term	By EU-commission described as an under-developed source of funding and financing

5.2.4. IRIS Transition Track #4:

City Innovation Platform (CIP): Cutting edge information technology and data framework

enabling (a) the above-mentioned solutions, maximising cost-effectiveness of the integrated

infrastructure. Next, the City Innovation Platform with open, standards based application program interfaces (APIs) provides meaningful data and information services for households, municipality and other stakeholders, allowing for a Data Market with new business models. A common architecture, harmonized data models and a sustainable data governance plan ensure the interoperability and replicability of the solutions, transferring them from city to city. The City Data Market and the service marketplace manage access to all data and services, with appropriate licenses and flexible pricing models in and across cities, and allowing real time KPI monitoring and benchmarking of smart energy and mobility performances.

Table 4 Transition track 4, Digital transformation and services - Relevance of Financial Instruments in a transition track 4-perspective

Transition Track est. relevance		Project Size	Risk	Time-span	Info
EIB 4.1 European Investment Bank	Low	Medium to large	Low risk	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process
EIF 4.2 European Investment Fund	Medium	Large and mid sized	Low to medium	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process with EIF or Intermediary partner
GB/CAB 4.3 Green /Clim. Awareness/ Bonds	High	Small to large projects.	Low risk	Long to mid-term	financing for sustainable projects and activities that promote transition to climate resilient growth.
PPP 4.4 Public Private Partnership	High	Medium to large	Risk-sharing managed in PA	Long to very long	Initiated to enable private capital in infra-structural city investments
4P 4.5 Public Private People Partnership	High	Medium to large	Risk-sharing managed in PA	Long to very long	Enabling citizen participation and public/ private cooperation in development projects
PF4EE 4.6 Priv. Finance for En. Efficiency	Medium	Large and mid-sized	Low to medium risk	Medium to long	Facilitating access to affordable financing for investments with strong energy-efficiency focus
EEEF 4.7 European Energy Efficiency Fund	Medium	Medium	Low to medium risk	Medium to long	Initiated to bring public and private partner-ship capital into climate change mitigation
EFSI 4.8 European Fund for Strategic Inv	High	Micro, small and mid size	Medium to high risk	Medium to long	Launched to help overcome the current geographic investment gap in the EU
CF 4.9 Crowd Funding	Medium	Small projects	Medium to high risk	Short to mid-term	By EU-commission described as an under-developed source of funding and financing

5.2.5. IRIS Transition Track #5:

Citizen engagement and Co-Creation: Design and demonstration of feedback mechanisms and inclusive services for citizens to achieve that they are intrinsically motivated to (a) save energy, (b) shift their energy consumption to periods with redundant renewables, (c) use electric vehicles and (d) change the vehicle ownership culture towards a use or common mobility assets culture. Demonstrated solutions include game-theory based engagement methods and instruments ranging from co-creating infotainment apps, local school campaigns, offering training on the job to students living in the district by partaking in the demo activities, competitive energy games using the home energy management system, energy ambassadors creating local energy communities, to Crowdfunding creating a sense of being part of the solution.

Table 5 Transition track 5; Citizen engagement & co-creation - Relevance of Financial Instruments in a transition track 5-perspective

Transition Track est. relevance		Project Size	Risk	Time-span	Info
EIB 4.1 European Investment Bank	High	Medium to large	Low risk	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process
EIF 4.2 European Investment Fund	High	Large and mid sized	Low to medium	Long to mid term	Applicants/partners will undergo the EIB Due-Diligence process with EIF or Intermediary partner
GB/CAB 4.3 Green /Clim. Awareness/ Bonds	High	Small to large projects.	Low risk	Long to mid-term	financing for sustainable projects and activities that promote transition to climate resilient growth.
PPP 4.4 Public Private Partnership	Medium	Medium to large	Risk-sharing managed in PA	Long to very long	Initiated to enable private capital in infra-structural city investments
4P 4.5 Public Private People Partnership	Medium	Medium to large	Risk-sharing managed in PA	Long to very long	Enabling citizen participation and public/ private cooperation in development projects
PF4EE 4.6 Priv. Finance for En. Efficiency	Medium	Large and mid-sized	Low to medium risk	Medium to long	Facilitating access to affordable financing for investments with strong energy-efficiency focus
EEEF 4.7 European Energy Efficiency Fund	High	Medium	Low to medium risk	Medium to long	Initiated to bring public and private partner-ship capital into climate change mitigation
EFSI 4.8 European Fund for Strategic Inv	High	Micro, small and mid size	Medium to high risk	Medium to long	Launched to help overcome the current geographic investment gap in the EU
CF 4.9 Crowd Funding	Medium	Small projects	Medium to high risk	Short to mid-term	By EU-commission described as an under-developed source of funding and financing

The communication with, for example, the EIB, an EIF Intermediary partner or a PPP platform is started through the entities "single point entry". As in the EIB-case, the entry is a contact form on the homepage where the applicant fills in contact information and a short description on the scope of the consortia.

5.3. Phase 3 - Approaching Financial Instrument entities

In phase 3 contacts are taken with the chosen Financial Instrument entities. Below you will find a guide on how to approach a number of the various Financial Instruments presented in the report, the section provides useful links and a set of lists on how to prepare for contacts with the European Investment Bank or an EIB Intermediary Partner.

5.3.1. EIB Financing

An EIB appraisal procedure can take anywhere between six weeks and 18 months depending on the project scope, the degree of complication of an operation, and the efficiency of the appraisal process on the part of both the EIB itself and the project promoter.

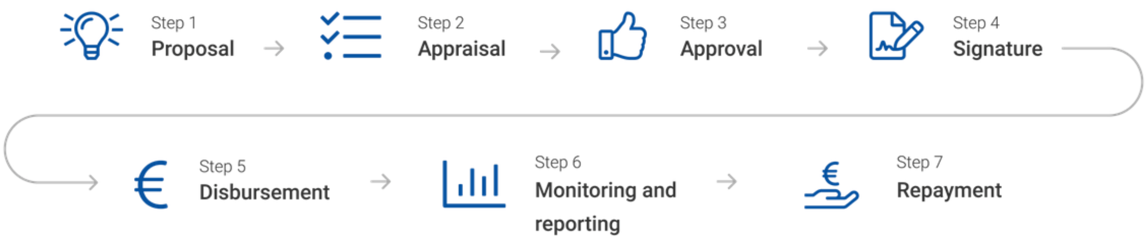

Figure 8 The EIB Project Cycle goes through seven major steps (https://www.eib.org/en/projects/cycle/index.htm)

https://www.eib.org/en/products/sheets/intermediated-lending-smes-mid-caps-features.htm

Individual loans for projects over € 25 million may be requested directly from the EIB. The layout and content of documents to be submitted to the EIB are the responsibility of the project promoter. Given the range and diversity of potential projects, there is no standardised documentation requirement. EIB does not require its borrowers to complete set forms or questionnaires. Generally, the EIB expects to receive a comprehensive feasibility study.

Where this has not been prepared, the project promoter may use his own discretion in compiling detailed information to permit the technical, environmental, economic, financial and legal appraisal of projects. The following documentation list is intended as a guideline for application for a loan. Additional information may be required subsequently.

Examples on eligible public sector applicants are sovereign states, national agencies, departments, institutions and ministries, regional authorities and public sector companies (e.g. utilities). For these applicants, costs over a period of up to three years are eligible. The EU bank typically covers up to 50% of a project's total cost with EIB loans starting at €25 million. Eligible private sector, applicants are large corporates or groups, mid-caps and special purpose vehicles for project finance (including PPPs and Concessions) and investment costs over a period of up to three years are eligible. Research and development expenditures on facilities or activities are also eligible and the EIB typically covers up to 50% of a project's total cost. These loans typically start at €25 million and in certain cases the EIB will consider lower amounts.

The EIB's pricing is advantageous compared to funding costs on the financial markets. EIB adds a margin on top of its funding interest rate to cover the risks and administrative costs associated with each operation. The interest rate or guarantee fee of the product reflects the credit risk profile of the individual project. Depending on the contract, the rate may be fixed or floating and rates are set at signature or at each disbursement.

The EIB may charge fees and expenses, including for costs incurred during the due-diligence process (such as legal fees, technical support, etc.). EIB's financing can be denominated in all major currencies or, where available, also in the local currency and EIB's products are available in all EIB regions of activity, with the exception of some of our guarantees, which are only available in the EU and select countries. Venture debt and credit enhancement for project finance are only available in the EU.

Because of the range and diversity of potential projects approaching EIB, there is no standardised documentation requirement. Where this has not been prepared, the project promoter may use his own discretion in compiling detailed information to permit the technical, environmental, economic, financial and legal appraisal of projects. The following general documentation list is intended as a guideline for application for a loan:

- General information about the enterprise (or institution), its legal status, principal partners and shareholders and its organisational structure
- Legal documents covering incorporation, statutes, activities, accounting policies, management and ownership
- Audited financial statements (balance sheets, profit and loss and cash flow statements) for the last three financial years, details of short, medium and long-term liabilities, dividend distribution policy and financial forecasts

Technical data:

- Legal status of the proposed project, relationship with the borrower/promoter's other activities, licenses and concessions obtained.
- Technical description: technology, site development, buildings, production and storage plant, general services, transport systems and equipment.
- Environmental impact assessment, where relevant and appropriate, including reference to relevant laws, mitigating measures to protect the environment, specific studies.
- Engineering studies and implementation plan: consultants (if any), procedures for tendering and awarding contracts, supervision, works schedule and implementation timetable.
- Detailed cost estimate, itemising site and plant expenditure, provision for physical and price contingencies, interest during construction, initial and start-up expenses, together with a breakdown in foreign and local currencies.
- Operation: raw materials and products, flowcharts, consumption and output levels, managerial staff and workers, management organisation, technical assistance where applicable.

Financial data:

- Breakdown of project operating and maintenance costs, depreciation and overheads, financing plan for the project and schedule of projected expenditure.
- Projected cash flows, profit and loss accounts and balance sheets until the project is expected to come fully on stream.
- Estimate of project working capital requirements over time, calculation of the project's IRR and security and guarantees offered.

Project Finance data for EIB Project Promoter:

- A description of the project's envisaged commercial structure and risk allocation i.e. a description of the purpose of the project, any envisaged offtake (revenue) or supply contracts (including construction and operation/maintenance) and the parties to these contracts (including their experience in the domain of the project and their credit standing).
- An analysis of the project's revenue and cost risks, especially in cases where "term of debt" supply or offtake contracts are not envisaged.
- A description of the financing structure of the project including a detailed breakdown of the financing sources: equity, mezzanine and senior debt, and the envisaged role of EIB within the financing structure.
- A financial model, including cash-flow forecasts for the life of the project in sufficient detail to enable analysis of the underlying assumption (e.g. detailed revenue, funding, operating and maintenance cost forecasts).
- In the case of a PPP, project information on the conceding authority and the procurement timetable, a summary of the key concession terms and a copy of the concession contract.
- Technical, Legal or Insurance Advice received on the project.

5.3.2. Finding EIF/EIF Intermediaries

EIF supports micro, small and medium sized enterprises by working with a wide range of funds, banks, guarantee and microfinance institutions across Europe. These acts as EIF's intermediaries and provide financial products to SMEs

Individual loans for projects under € 25 million may be requested from these financial intermediaries offering financial products targeting small and medium sized companies (also including micro-enterprises). In certain cases, EIF can also provide direct loans to mid-cap companies with up to 3 000 employees where the loan volume requested is between EUR 7.5m and EUR 25m. By following the link, you will be able to find EIF Financial Intermediaries in a country or region:

https://www.eif.org/what_we_do/where/index.htm

5.3.3. EMFF funding:

To see if your project is eligible for EMFF support: First check with the national authority in charge of managing the operational programme in your country. Then follow the relevant application procedures so that the managing authority can check the eligibility of your project and whether it meets the relevant selection criteria and investment priorities.

5.3.4. EFSI financing

If you are looking for finance, contact the EIF financial intermediaries listed on EIF's website, please follow the link:

https://www.eif.org/what_we_do/where/index.htm

5.3.5. Green bonds

The funds are earmarked to match disbursements to EIB lending projects contributing to climate action in the fields of renewable energy and energy efficiency sector. In renewable energy, this includes for example wind, hydro, solar and geothermal energy production projects; and in energy efficiency this includes projects for district heating, co-generation, building insulation, energy loss reduction in transmission and distribution and equipment replacement with significant energy efficiency improvements.

The link below includes EIB green bonds/climate awareness bonds allocation by project for 2018, the link also includes more information on the ongoing projects: https://www.eib.org/attachments/fi/2018-projects-supported-by-cabs.pdf

5.4. Phase 4 - Joint Workshop

The next step is a joint workshop event with participants from all involved consortia actors to establish a joint understanding of "what needs to be done".

1. The first action during the workshop is to set a first draft on a forward-looking working plan, the plan needs to be agreed upon by all consortia members.
2. The second action during the workshop is to reach an agreement to base further actions upon. Depending on the current relation between the consortia members and of more importance, depending on what financial instrument the consortia is approaching, anything from a letter of commitment (Few partners with already ongoing mutually beneficial collaboration) to a full consortia agreement needs to be developed.

5.5. Phase 5 - Carrying out the plan

The last phase is to carry out the plan with support from IRIS partners. IMCG Sweden AB offers training sessions and advisory workshops in order to support IRIS partners to consolidate the knowledge on Financial Instruments and to use the toolbox. The training will be available for IRIS Participants during Q1 – Q2 of 2020, it will be possible to customize the training based on the participant's previous knowledge. Focus will be on using practical exercises, such as "how to find the right Financial Instrument", "how to address the financing organisations" and "how to proceed adding increased financial attractiveness" for the partner. A large company or a public organisation is likely to have resources and ability to provide necessary and requested information to the financing entity while an SME or a start-up may have severe problems to present documents and plans to match such requests on short notice.

6. Large public procurement programs

The IRIS cities will investigate the possibilities from creating large public procurement programs. Sharing knowledge between purchasing organizations may reduce financial risks and by presenting growth in demand, it will give confidence to investors for investing in service providers and supply chain companies. In the action, the IRIS cities will:

1. Investigate joint public procurement programs based on IRIS large-scale replication programs;
2. Assess business planning processes to capture business possibilities from large-scale replication.

This chapter introduces to this concept and a plan on how to work together with cities leading and participating in other SCC01 projects. The outcomes from the actions will be documented in a separate report.

Large public procurement programs could be developed together by the city representatives in the SCC01 program, initially, as a way to present market opportunities for the industry and also to present that there is an increasing demand for new solutions and technologies. Together the city can communicate about their individual procurement activities to present the larger picture for the market as well as making sure that all potential suppliers identify the opportunity to apply for contracts in all city regions and European countries.

By also sharing knowledge about the funding for procurement of solutions, the cities can build a joint knowledge on how to use funding programs on the European market. It can also be a useful network for the funding authorities to promote their services.

Figure 9 Figure 9: Public procurement – Transition track relation. The large public procurement program should follow the transition tracks. Then it will be easier for city representatives to choose which program to participate

During the coming work period in IRIS Smart City project, there will be an evaluation of the city representatives' interest in participating in such program. Key characteristics could be:

1. The large public procurement program should follow the transition tracks. Then it will be easier for city representatives to choose which program to participate
2. In the program, there could be a joint communication plan presenting all ongoing development projects and public procurement of technologies for IRIS Integrated Solutions.
3. There could be a sharing of best practicing when procuring technologies for IRIS Integrated Solutions.
4. There could be joint distribution lists to potential suppliers from all of Europe, making sure procurements receive a large number of competitive bids.
5. An offer from IRIS is to invite replication cities to participate in the joint procurement program.

The interest from city representatives to work together, between cities in a project and between cities in SCC01-projects, have been low so far due to lack of resources. Therefore, it will also be important to address the question for a large public procurement programs to the right contact persons within the city authorities.

Plan forward

The IRIS project presented a first Market Analysis report produced in late 2018. Through the cooperation in the Cross-SCC01 Business Models & Finance Task group IRIS have taken the lead in mapping market demand (purchase or procurement) of technologies of the Smart cities projects in regards to two specific areas: Near zero energy districts and Innovative mobility services. A first result will be presented at the Smarter Together Event in Lyon on the 17th of October. If this process is successful, partner cities in IRIS will be able to investigating the interest of establishing cooperation in large public procurement programs for different smart city solutions. The aim with the programs is to share knowledge on increase in demand to the industry, knowledge of potential solution suppliers and knowledge on recommended procurement specifications.

The cooperation between cities will be open for Cities in the EU, but also for cities outside Europe as a part of the IRIS beyond Europe activity.

Investment strategies that support public procurement

Through the cooperation in the Cross-SCC01 Business Models & Finance Task group, it has been clear that investment strategies that support public procurement programs based on bundled replication programs have been up for discussions in other projects.

This is, however, a complicated concept as different integrated solutions have different investment needs and cities need to have an investment strategy for each solution. With the joint market analysis presented above, the ambition is to identity common interest between cities for one or two solutions, which could be a starting point for developing investment strategies that support public procurement.

7. Outcome to other WPs

From a “Financial Instrument perspective”, this report is relevant to WP2. EU wide cooperation with ongoing projects, initiatives and communities as financing/funding is relevant in every project, initiative or cluster working with scale-up and replication of innovations. Built up competence, experiences from the project and successful examples within Financial Instruments can be spread to task groups of EIP-SCC not to mention the Replication Task Force Group within all activities aligned to the work led by WP8 Replication. WP4 will build the City Information Platform, an enabler for resilient and resource effective exploitation of the IRIS-results and its joint exploitation in Europe (primary target) and around the globe (secondary target). The Financial Instruments will be a complementary exploitable enabler for building scalability and replicability as well as eligibility and financial attractiveness.

The cities and the city suppliers within the WP5, WP6, WP7 (Utrecht, Nice and Gothenburg City demonstration activities) represent the main users of the Financial Instruments and will also be the main targets for further activities within financing and building of financial attractiveness run during the project by IMCG Sweden AB.

The Financial tool supports WP8, Replication by Lighthouse regions, follower cities, European market uptake. As the financial instrument tool is a highly relevant enabler in the replication within Europe and beyond, there is also a great potential in synergies that can be found in collaboration between suppliers and between cities as well as between city suppliers and cities.

In WP9, Key Performance Indicators, the relevance of KPIs regarding for example eligibility, financial attractiveness and outcome of financial collaboration with EIB or EIF intermediaries can be analysed as a part of the overall evaluation and analysis for impact enhancement.

In WP10, Communication and dissemination, ESCI have made a plan for dissemination of project results and the exploitation will link replication activities carried out by the cities and market-oriented activities carried out by solution providers, creating synergies. Financial Instruments can be a relevant ingredient in communication activities offering the IRIS solutions to cities within and beyond Europe, for instance, in transition track pitches and in success stories of scaling-up and replication.

WP11, Project Management has a central role in ensuring partner contribution in utilizing the Financial Instruments in future work and in activities, all in order to exploit the potential within the financial instrument and the financial instrument tool.

8. Conclusions

The "EU funding and financing landscape" contains a variety of grants, loans and other financing options for the cities as well as for the solution providers. The main challenge is neither to find the financing opportunities, nor to find information on how to get in touch with the financing entities. The challenge is to be able to build the knowledge and to allocate enough time to navigate through this landscape and to find a financing option with reachable eligibility rules.

The more knowledge the IRIS participants acquire regarding Financial Instruments, the more the IRIS scale-up and replication processes will accelerate. Hopefully this report can contribute as an instrument for knowledge building and for facilitation of future decisions and contacts with financial entities within the IRIS-project and beyond. Besides the information in section 3 and 4, the tool-section provides a number of answers regarding "what to do" and "how to do it" before and during the approach of a financial entity. The substance within the report represents a basic level of knowledge regarding Financial Instruments that leaves an IRIS partner that has actually read the report better prepared for scale-up and replication than a partner that has not.

Another challenge is to match the financers expectations within a due diligence process and to be able to match the financers need for additional information "on top of everything" you already are supposed to do. Section 5 presents a long list of information requested by EIB regarding general, technical, financial and promoter-related information necessary to provide to show eligibility and to reach funding. Hopefully no partner will feel discouraged by the apparent complexity of the process. In many organisations, a lot of the requested information is already available in annual reports, in pre-studies, in business plans and in strategies and the rest can be compiled through a dedicated effort. It is just of importance to keep in mind that not to underestimate the time and effort needed to handle the financial process. Also, when needed it is important to involve own or external expertise to match the needs in the process in order to save time and to maximise impact of the provided documentation.

As all the entities providing Financial Instruments sets various requirements for eligibility and because of this eligibility ensuring actions should be a constantly ongoing process for any city or city supplier involved in innovation development, scale-up or replication.

The traditional innovation process contains a number of parallel activities complementary to the actual technical development process. In order to reach scale-up or replication the innovation process needs to involve business modelling, end-user involvement, value-chain expansion, business intelligence actions, market analysis etc. and a dedicated process regarding ensuring eligibility as a complement to the abovementioned can actually accelerate the outcome and contribute to lower risk and faster scale-up or replication.

EIB is the main provider of funding in Europe which leads to the EIB public policy goals as a natural starting point for this eligibility ensuring work:

- Potential in increase in growth and employment – including SME and Mid-cap support
- Supporting economic and social cohesion by addressing economic and social imbalances, promoting the knowledge economy/skills and innovation and linking regional and national transport infrastructure
- Building environmental sustainability - including supporting competitive and secure energy supply
- Supporting action for climate-resilient growth

If a project or an innovation does not address any of the public policy goals, an application for financing will be rejected no matter the technical excellence behind the innovation:

The relevance of the nine presented Financial Instruments are expressed and connected to the five IRIS transition tracks in section 5.2. It is important to see this clustering as a guide and a recommendation rather than a rule. It is fully possible that local conditions, personal contacts or other circumstances will lead an applicant in another direction than the recommended. This is an important aspect and one of the great advantages within the collaborative project. By exchanging experiences and good examples, the partners will be able to benefit from each other's relations and from local conditions and variations. Hopefully, the substance in this report can build basic knowledge regarding financial instruments, serving as a platform for partner cooperation and collaboration within the financing field

Only in the IRIS partner countries there are more than 150 EIB and EIF Intermediaries ready to support any initiative meeting the eligibility criteria. During financing of new energy infrastructure one of the CELSIUS-partners described the financing situation as a paradox, once they set their financing goals on a higher level they had an easier journey through the process, the workload and the support from experts from various parts of the own organisation was easier to motivate when discussing a larger amount of funding. Learning from this one of the challenges might be, if not aiming as high as possible, at east aiming high enough to make the effort worth the result.

As mentioned above IMCG Sweden AB will offer training sessions during 2020 in order to consolidate the knowledge on Financial Instruments. For the moment IMCG see a need for training focused on practical exercises in identifying suitable Financial Instruments, to build processes to increase financial attractiveness for the partner and to assist in building eligibility. If training sessions and workshops are requested by the IRIS partners, the outcome will be reported within the D3.7 update in M36.

Appendix 1 - Reference Cases and Examples

Combined Self-funding and EIB Loans:

Rya Combined Heat and Power plant in Gothenburg Sweden: Gothenburg Energy, Sweden's largest public owned energy company, started to build the Rya Combined Heat and Power (CHP) plant back in 2004 and the plant reached full operational in the autumn of 2006. It is fired by natural gas and meets 35% of Gothenburg's district heating demand and 30% of the city's power requirements. The investment cost for the construction of Rya CHP amounted to SEK2 billion, which was financed partly by Gothenburg Energy's own capital and partly by loans from the European Investment Bank (EIB).

Considering the increased heat supply that Rya CHP would entail in Gothenburg, Gothenburg Energy decided to make a coincident investment in extending the DH infrastructure to 16,000 single-family houses and significantly increase the heat demand in Gothenburg. Due to the close link between the two projects, Gothenburg Energy applied for investment loans from the EIB for the two projects in one single package. The total investment cost for the two projects were SEK3.2 billion and the loan from the EIB amounted to SEK2 billion.

The conditions for the loans were favourable at the time and the interest rate was around 0.5 percentage points compared to the market rate. The procedure in itself was easy too, specifically since Gothenburg Energy had experience in borrowing funding from the EIB and had good relations with the officers working there. Furthermore, Gothenburg Energy's owner, the City of Gothenburg, acted as a guarantor. Gothenburg Energy also received a state grant from the climate investment programme, a national Swedish grant that is no longer available, for the extension of the network (25-20% of the cost).

Lessons learned: EIB requires extensive follow-up and progress reporting from projects that receive capital loans from them. In light of that, Gothenburg Energy realized that two separate applications for the Rya CHP and for the extension of the network to the single-family-houses would have been easier. A conclusion from this is to rather keep an EIB-financing as "clean as possible" and rather deal with the extra work from two separate loans than taking the administrative consequences from a complex reporting in two parallel processes.

Combined Self-funding and Bank Loan/Green bonds

District Heating HP3 Boiler in Sävenäs, Gothenburg, Sweden: In 2010, Gothenburg Energy converted its hot water boiler HP3in Sävenäs for hybrid CHP operation, which amounted for SEK140-150 million. The investment was mainly financed by Gothenburg Energy's own capital (70%) and to a lesser degree by external capital (30%), transferred via the City of Gothenburg's Finance department. In this case external capital refers to loans from banks and other credit institutes. The green certificates (support scheme by the state) played a great role for the decision to move forward with this investment, as it was clear that the operational costs would be much lower with their help

Combination of Equity Capital, Loan and Subsidies,

Rozenburg Incineration plant, Rotterdam, Netherlands: Warmtebedrijf Infra NV has financed and constructed a complete system for the transportation of industrial waste heat from waste incineration plant Rozenburg to the district heating system in Rotterdam. The system includes the installation for the extraction of heat from the incineration plant, the pipeline, a number of booster stations, buffering systems, and IT systems for operation, control and maintenance. The contract form chosen for the realisation of the project was design, build and maintain (DBM) and the total cost of the waste heat recovery system was approximately € 150million and was financed from three main sources: 1, equity capital (ca. € 47million), 2, debt capital (ca. € 85million, project financing) and 3, subsidies (ca. € 27million)

Lessons learned: The main issues in financing and executing the project of this complexity, were the large number of different parties and stakeholders involved. The project included commercial companies, technology providers and experts in different industries, local municipality entities and regional governments and regional as well as state banks, which resulted in communication and administrative challenges. Another challenge was the corporate DBM structure chosen for the project. These two issues resulted in a complex and time-consuming project financing process. Ensuring early involvement of debt investors and ensuring distinct financial flows for infrastructure and commodity related contracts and services. Keep it as simple as possible.

Green Bonds,

City Infra structure development, Gothenburg Sweden: In Gothenburg, the Green Bonds issued so far has helped finance the following projects:

1. Gothenburg Energy's GoBiGas project (SEK 300million), a large-scale biogas plant with the aim of delivering transport fuel.
2. Lackarebäck water plant and purification filter (SEK 155m) with the biggest purification filter in Scandinavia being built.
3. Electric vehicles for municipal staff (SEK 30m).

Some SEK2.3 billion out of the total SEK 38 billion in the city's bond portfolio is currently green. The intention is to increase this share every year. As long as there is a need for more sustainable investments, the city will try to switch as many as possible ordinary bonds into green ones. Bonds that are being renewed each year, accounting for SEK 5 billion, will be switched into green bonds and at least one new type of green bond will be issued each year.

The programme does not only raise capital for projects, but also creates significant visibility for the environment efforts in Gothenburg. It is a way to get investors more aware about climate challenges and possible solutions.

Lessons learned: Though it is not more expensive for Gothenburg to issue green bonds than regular ones, green bonds necessitate a process known as "impact reporting" to make it transparent to bond holders, where the money is going to. This creates additional work (i.e., updating websites, sending letters), but many in Gothenburg council appear to believe it is worth the trouble. The City of Gothenburg, Örebro and City Council of Stockholm all announced that the green bond programme has provided them with access to new capital markets, increasing and diversifying the diversified investor bas

Public grants,

Rhein Energie Power Plant, Cologne, Germany: Rhein Energie is an infrastructure and service provider for the Rhine region. It delivers energy (electricity, gas, heat, etc.) and drinking water to approx. 2.5 million residents, industrial units, and organisations that provide trade and commerce. The City of Cologne owns the majority of the shares in the company, its revenue in 2010 was €2.6 billion. A core component within Rhein Energie consists of district heating, which started in 1962 with the construction of its first combined heat and power plant (CHP) and extended in the 60s and the 70s. Today the company produces 2,060 GWh heat from CHP (incl. heat for industrial purposes), saving 280 ktCO2 every year in comparison to alternative production of heat without using co-generation. The district heating grid is more than 280 km long, supplying 8,900 houses with a share of 80% of households served in the city of Cologne.

When the heat network and the CHP plant were first constructed, investments were financed by Rhein Energie's own capital/cash flow. Rhein Energie enjoyed relatively high profit margins and there was no need for external finance or governmental support. This period is referred to as the "golden time of energy" in Germany.

Lessons learned: Currently, Rhein Energie plans to build a new CHP plant in the north of Cologne, designed to be connected to the existing grid. Unfortunately, the profits are not as high as during the golden days and Rhein Energie is applying for public grants from a Northern Westfalen Federal Investment Programme in order to raise the necessary funds for the project.

Public Private Partnership, Energy Supply Concession Agreement

London Olympic Park Infra structure, London, England: Financing: The Olympic Delivery Authority was responsible for the construction of venues and infrastructure for the London Olympic Games (London 2012). This included energy and heating for the Athletes' Village which is now called East Village and all future commercial and residential developments to be built within the Olympic Park.

After a tendering process, Cofely (now operating as Cofely East London Energy Ltd), was awarded a 40 year contract. This consisted of a Concession Agreement entered into between the ODA and Stratford City Development Limited and Cofely in 2008 for the supply of energy services in the Concession Area. In the event Cofely designed, built, financed and own the two energy centres and the primary heating and cooling distribution networks between the energy centre and the development site boundary. Then in 2014, using national legislation, and with the agreement of the Greater London Authority the property rights and liabilities of the schemes were transferred from the Olympic Delivery Agency the London Legacy Development Corporation.

Lessons learned: A key part of the agreement is a residential "Price Control Formula" which is supervised by the LLDC. The company has a well-developed customer engagement programmes, including the use of an ombudsman service. This is an example of a complex financing situation with long contracts and still a successful mix of funds based on contractual complexity and cooperation.

Combination of Low Carbon Infrastructure Fund and loan

Waste EfW-plant, Nottingham, England: Nottingham has the largest district heating system in the UK, serving close to 5,000 homes and more than 100 businesses with 65km of pipes. The heat is produced by the Eastcroft Energy from Waste (EfW) plant. The EfW plant is owned by Nottingham City Council and operated by a private contractor. The steam is sold to Enviro-energy Limited, an energy services company wholly owned by Nottingham City Council. Enviro-energy run the CHP and district heating infrastructure and manage distribution, metering and billing.

Lessons learned: Because of specific conditions and local agreements, the scheme was funded in two stages. Phase 1 had a total budget of £1.9million. The Homes and Communities Agency (HCA) contributed £1.5 million from the Low Carbon Infrastructure Fund and £0.4 million came from prudential borrowing. Phase two, extending the scheme, has a total budget of £1.8 million and was funded entirely by the Low Carbon Infrastructure Fund. Dividing the financing process in phases can be a pathway to a successful mix of funding simplifying the process rather than complicating it.