Assignment 29:
Strategic UDF Investing and Project Structuring

Appendix 4: Portfolio Structuring Model – Concept Paper

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1. Introduction

For the first time in history, more than half the world's population lives in urban areas and this percentage is projected to reach 75% in 2050. The cities of today enjoy unprecedented prospects as hubs of economic opportunity and engines of national growth. However, cities are also facing extraordinary challenges. Among these include:

- *climate change*, as valuable environmental assets are potentially and increasingly vulnerable to threats from climate change, but cities also play a central role in actively combating and adapting to climate change impacts;
- *demographic imbalance* is often dramatic and diverse in different countries, from sharp growth prevailing in many transitional economies, to aging and declining populations in several of the advanced economies; and
- the *current economic turbulence*, which is likely to have long-lasting impacts, particularly on financing urban investment requirements within the evolving policy contexts.

The present global tightening of credit has restricted the ability of local governments and private firms to leverage debt in order to finance investments in urban development, especially when advocating far-reaching sustainable solutions. High cost considerations and protracted delivery timetables continue to dissuade decision-makers and private investors from adopting innovative financing solutions as an alternative for investing in urban projects. However, we need to consider even given the bankruptcy of Detroit, city authorities are still giving the private sector *carte blanche* in some cases to invest in piecemeal projects, including multiplex cinemas, Wi-Fi upgrades in high rise apartments, and waterfront features, to name a few. The result is often a urban mismatch between a bright and shiny downtown, full of cultural attractions for visitors, and deteriorating inner city areas. This *Portfolio Structuring Model Concept Paper argues therefore that city investments need to be treated as an integrated and interdependent entity. From this perspective, a methodology is proposed in order to assess the Non-Financial Impacts of projects and then combine them in a portfolio of investments from a financial perspective.*

The *Non-Financial Impacts model of project* aims to offer the decision maker a metric that encompasses (in a single value, if the decision-maker so wishes) all the various positive Non-Financial Impacts a project can achieve beyond its financial returns. The *portfolio structuring model* then combines the projects which can satisfy both the financial and Non-Financial Impacts. It is important to mention that the portfolio structuring model, which accounts for diverse urban projects, does not simply allow a trade-off between "bad" and "good" projects (kindergartens versus hotels spoiling the waterfront). The objective is to develop a diverse portfolio that allows for different returns on urban investment, thereby giving the private sector sufficient financial returns while also addressing wider environmental/social urban policy objectives.

While drawing principally on project data drawn from JESSICA Evaluation Studies 2007 - 2013, the project and portfolio structuring model presented in this document is aligned with the regulatory framework for the use of Financial Instruments in the next programming period 2014 - 2020.

It can be argued that private sector participation is likely to increase if the investment portfolio ranges across sectors and objectives, including integrated sustainable urban investments and is able to attract various private investors such as pension funds, commercial banks and regional development institutions. For instance, a cross-subsidy process between projects would allow projects such as schools to be built, importantly, without the need for grants or state aid; these investments give low financial returns, but also

produce high Non-Financial Impacts for a city or region. By combining different types of projects and fostering synergies between investments, a diversified portfolio that gives good financial returns on some projects can compensate for (cross-subsidise) poor financial returns of other projects, which nevertheless achieve good Non-Financial Impacts.

Thus, in the design of these two models (Non-Financial Impacts model of project and portfolio structuring model) the main aim has been to understand that investments need to be integrated and interdependent within the urban context. As a prerequisite, it has been necessary to re-envision city financial models so as to offer an alternative method of effectively delivering urban investment that might bridge some of the inevitable silos that arise through urban initiatives (e.g. waste, energy, health, education, transport); it has also been crucial to maximize the benefit of effective management of urban capital assets (e.g. human capital, natural capital and fixed capital). In order for cities to be globally competitive, investment via innovative financial and business models must be unlocked, and for this reason the proposed models exceed the simple analysis of returns of individual investment schemes and capitalize on effective and integrated management of projects/investments as key to devising a focused response.

The remainder of this report is structured as follows:

- Section 2 reviews the JESSICA Initiative and offers insights into its implications for European cities and its implementation drawbacks.
- Section 3 describes the methodology process developed for the collected dataset and discusses how to create the non-financial impact for each project.
- Section 4 describes the methodological foundation of the portfolio structuring model.
- Section 5 describes the main empirical results, where there is a discussion of the main findings and features of the model.
- Section 6 provides the conclusions.
- Appendices 1 and 2 provide further technical information on methodology and calculations.

2. The JESSICA Initiative

The current economic situation of the European Union (EU) has led to a significant drop in public sector revenues, which in turn has influenced levels of investment made by government bodies in cities and regions. The EU Cohesion Policy has emphasized the catalytic role of cities for economic development and innovation to promote jobs and growth, particularly during the EU 2014 - 2020 programming period. However, cities present their own challenges with regard to environmental, economic and social issues, and these need to be addressed in a comprehensive way in order to promote sustainable development and urban regeneration.

In retrospect, the launch by the European Commission of the JESSICA[1] Initiative in 2006 appears to have been far-sighted. The JESSICA initiative provided technical assistance for Member States, to assist them in the implementation of Financial Instruments for urban development and regeneration in the 2007 - 2013 programming period. The initiative was assisted Member States in developing an innovative framework to support sustainable urban transformation and addressing the perceived shortage of investment dedicated to integrated urban renewal and regeneration projects. The main objectives of Financial Instruments promoted through the JESSICA initiative are:

a) to make urban/regional areas become self-sustainable;
b) to recycle the invested capital for future use through revolving financial mechanisms; and
c) to decrease the possible distortions and excessive reliance on non-refundable support created by grant policies.[2]

JESSICA was designed to support Financial Instruments (FIs) that can flexibly bridge both public and private interventions by extending the scope of the investments from projects that merely satisfy financial returns, to projects that achieve combined financial, socio-economic and environmental impacts.

It is worth noting that the investments under the JESSICA initiative are intended as urban impact investments. In other words, they are designed to achieve financial viability criteria and a broad range of Non-Financial Impacts, and therefore to proactively invest in projects that create positive social and environmental benefits rather than investments that merely seek to minimize negative impacts (socially responsible investment). Projects are therefore generally targeted towards addressing environmental and social issues, whilst simultaneously producing a sufficient level of revenue to service their financial obligations. This feature is critically important in so far as private sector involvement is concerned. Private actors have a highly relevant role in the urban strategic investments through the JESSICA initiative. To spur private sector investment, however, it is necessary to create continuous stimulus and incentives in order to diminish the market failures present in these investments. In this context, local government actors, more than central governments, are uniquely placed to foster private sector involvement as well as lead and facilitate development and regeneration efforts in their cities. Local authorities may devise financial solutions to the urban financing problem by leveraging a combination of available resource funds and private money through the Financial Instruments structure.

However, relatively few local government actors have the experience and contacts to build the senior-level private sector relationships needed to develop and deliver effective partnerships and projects; and,

[1] JESSICA stands for Joint European Support for Sustainable Investments in City Areas, a joint initiative of the European Commission, Central European Bank, and the European Investment Bank to support urban development through the use of Financial Instruments.
[2] Under Article 44 Managing Authorities (MAs) can use part of their Structural Fund (SF) allocations through revolving Financial Instruments that support sustainable urban development: Urban Development Fund (UDF) investment via Public Private Partnerships (PPPs) and, optionally, Fund of Funds (HF), which selects and invests in UDFs on behalf of MAs.

although there has clearly been some convergence of economic advantage in European territories, investment performance across the European Union has been uneven. There are substantial differences between European cities with regard to their ability to generate wealth and invest wealth for the future; it has thus been essential to build an investment support framework to account for different contexts and players and respond to them in the most effective way. Against this background, we can observe that the introduction of Financial Instruments in support of urban development, promoted through the JESSICA Initiative for the 2007 - 2013 programming period, was a lengthy process because the shift in the financial approach towards the use of Financial Instruments encountered drawbacks in its practical implementation. It took some time to develop the detailed administrative procedures to implement Financial Instruments in investment areas – urban development and regeneration – where these had not been applied in previous programming periods. More importantly, Member States and Managing Authorities (MAs) had limited experience in designing investment strategies coherent with cohesion policy objectives containing projects capable of remunerating investors, and effectively combining them in operational programmes with more traditional instruments of cohesion policy like grants.

On behalf of DG REGIO, the European Investment Bank (EIB) commissioned approximately 50 geographically-focused Evaluation Studies as well as numerous Horizontal Thematic Studies in order to help MAs understand the demand for such instruments in their regions and to support the practical implementation of deploying Financial Instruments using Structural Funds. To date, there are over 40 Urban Development Funds (UDFs) in operation. Several lessons have been learned with regard to the implementation of Financial Instruments during the programming period 2007 - 2013,[3] including:

- Delays in establishing UDFs can be attributed to the 'newness' of Financial Instruments. As a relatively new instrument, the establishment of Article 44 (b) Financial Instruments has taken longer than expected. It was reported that in some cases it has taken up to three years to set up UDFs.
- In terms of developing a robust 'investment-ready' pipeline of urban projects, it was noted that urban development projects generally take longer to develop, compared to investment that focuses on SMEs under Article 44 (a) of Regulation 1083/2006. As such, putting together a portfolio of urban projects that generate financial returns on the one hand, and achieving non-financial outcomes on the other, has proved to be difficult. This slow process can also be attributed to a lack of framework for strategic investment, which resulted in lengthy timescales for identifying and structuring suitable urban projects.
- Lack of experience of Financial Instruments in the public sector has, moreover, necessitated a steep learning curve and cultural change. It has taken a long time to reconcile the interests and views of numerous stakeholders in order to reach agreement on establishing FI investment strategies.
- Implementation issues have arisen with regard to how some Financial Instruments have not attracted the desired level of private sector co-investment at the fund or project level.

It is therefore important that the results and experience to date are capitalized on during the next programming period. The experience gained in the 2007 - 2013 programming period is likely to help

[3] Financial Instrument Stocktaking Report, March 2013

facilitate quicker implementation of future Financial Instruments during the next programming period, thereby smoothing the transition from grant support to Financial Instruments.

In addition to Evaluation and Horizontal Studies, DG REGIO, together with the EIB and CEB, established the JESSICA Networking Platform (JNP) as a forum for the exchange of knowledge, experience and information. A JESSICA Lessons Learnt (JLL) Working Group was also organized alongside the JNP. The activity of the JLL Working Group involved consultations with 50 representatives from 20 organizations - UDFs, MAs, EC (DG REGIO and DG ECFIN), EIB, public banks, universities, etc. - with the aim to improve the implementation of Financial Instruments promoted by JESSICA. In addition to the aforementioned challenges, the JLL Working Group[4] raised the following limitations and recommendations:

- In the JLL Working Group's view, the JESSICA Initiative did not focus sufficiently on efficient implementation of tailored Financial Instruments in order to increase the intervention of private finance and improve the integration between strategic goals, as defined by MAs.
- Using Financial Instruments require a major shift in the public finance approach and new ways to work on behalf of MAs. Rather than to address only the full absorption of the funds, the Initiative needs to focus on building tools and provide technical assistance and explanation of the use of the financial revolving mechanisms.
- At present, barriers exist with regard to the funding application process by final recipients because the framework to support Project Promoters is unclear and often follows an ad hoc procedure to fit projects into MAs' main strategic goals.
- Cooperation between public and private sectors is weak because a procedure to account for both public and private objectives (problems in co-financing, social impacts, reduction of financial risks for private investors, etc.) is often missing.
- A clear explanation of financial profitability requirements for projects under JESSICA is needed. The financing should not be limited exclusively to fully profitable projects.

The aforementioned points nevertheless highlight a fundamental aspect of financing urban projects: in general, programme administrators and other professionals who shape our cities are often educated, trained, and hence practice according to theories and experience derived largely through specialization – their approach is therefore often conducted through a single disciplinary lens. These professionals are of course fully aware of the necessary influences of other disciplines, and make due allowances for such influences as they impact on the core discipline in question. However, the tendency to retreat to disciplinary silos predisposes one to narrow analysis, and although appropriate in certain contexts, it is not conducive to the implementation of solutions to the complex challenges posed by cities.

It is therefore necessary to strike a balance between the interdependency between projects and the requirements for reaching an investment 'critical mass' in order to make successful investment decisions, i.e. decrease investment risk and attract the private sector. Cooperation between the public sector and private sector is critical to the development of well-designed support for investment, since the ultimate goal is to share risks and costs so that investments yield income across both local institutions (to defray current expenditures) and private partners (to remunerate their capital contributions). In this context, Financial Instruments are ideal tools to meet this need, as they enable investments to be co-financed/co-

[4] JESSICA Lessons Learnt (JLL) Working Group – Recommendations as presented at the JESSICA Networking Platform, 26 June 2012, Brussels, Belgium.

invested by, for example, Public Private Partnerships (PPPs) in a range of suitable projects that have potential to create impact on economic growth.

In the next sections we will describe the two developed models which constitute a decision-making framework to assist stakeholders and decision makers in the process of urban investment. The aim of the models is to help create clear frameworks for the implementation of Financial Instruments, such as through the JESSICA Initiative, and enable the leveraging of sufficient capital from the private sector to respond to urban challenges in the European Union.

3. Non-Financial Impacts Model

3.1 The Data

The objective of the Non-Financial Impacts Model of Project is to provide a well-defined impact metric that harmonizes the assessment of the non-financial performance of urban investments, through a simple and transparent methodology that can assist stakeholders in designing their investment strategies. O'Donohoe et al.[5] (2010) advocate the creation of standardized metrics for impacts of investments in order to encourage and develop sustainable investments. The model therefore aims aggregate the project's impacts, i.e. the socio-economic and environmental benefits, through a single metric, the financial or Non-Financial Impacts of the project. This metric is designed to input, alongside a Financial Impact metric, into a Portfolio Structuring exercise. In so doing, we have designed the model to possess the following features:

- **Comparability**: the Impact metric can help decision makers compare investments spatially (for instance, in different EU cities or regions) and temporally (for instance in different programming periods).
- **Sensitivity**: users can judge the sensitivity of the Impact metric defined in the model by using a sequence of assessment steps which follow the process leading from investing to outputs and outcomes, over which the investment performance is measured.
- **Comprehensibility**: we have ensured that the range of output indicators is comprehensive and relates not only to the issues that matter to certain stakeholders, but also more generally to issues of sustainability across financial, social, environmental, and economic dimensions.
- **Evidence-Based**: the model has been tested with JESSICA operations data and information in order to test its robustness and transparency.
- **Extensibility**: the model is extensible in that it can embrace new (or different) data, new spatial and temporal definitions, new indicators, and new modelling tools, ideally in a seamless fashion so as to accelerate the implementation of the various Operational Programme(s) in investment areas other than urban or territorial for the next programming period.

Figure 1: Overview of Non-Financial Impacts approach

Figure 1 shows the overall approach to estimating the Non-Financial Impacts of project. The first step in the development of the Non-Financial Impacts Model is to collect the raw data for each project relative to its socio-economic and environmental benefits. On the basis of recent DG REGIO documents,[6] projects financed by Financial Instruments must contribute to the social and public benefits pursued through

[5] N. O'Donohoe, C. Leijonhufund, and Y. Saltuk (2010) Impact Investment: an emerging asset class. The Rockefeller Foundation.
[6] The Programming period 2014 - 2020, Guidance Document on Monitoring and Evaluation – European Regional Development Fund and Cohesion Fund – Concepts and Recommendations. http://ec.europa.eu/regional_policy/information/evaluations/guidance_en.cfm

integrated development strategies and measured by Operational Programme targets for 2014 - 2020. Many parameters and indicators can be used to assess socio-economic and environmental values, but in the present context the proposed approach is based on measuring what best reflects both the interests of Managing Authorities (MAs) within the European Union and the objectives of EU Operational Programmes.

The data have been collected following the Guidance Document on Monitoring and Evaluation (EU, 2013) to obtain a rigorous and transparent methodology based on measurable identified project outputs. The choice to select project output indicators is based on the need for clear and comparable results which are more likely to facilitate the understanding and assessment of the investment. Certainly this is paramount, not only for structuring the intervention and policy, but also for decreasing financial risk in order to attract private sector intervention.

In order to achieve these results, we have selected the output indicators that best represent the project data from the consolidated lists of output indicators identified in the EU regulations (Appendix of Regulation (EU) No 1303/2013 [CPR] and Appendix, of Regulation (EU) No 1301/2013; the Appendices provide a comprehensive definition of the output indicators, and the units in which they need to be measured). By so doing, we are developing a flexible evaluation system of projects already in tune with the Common Provision Regulations (CPR) which sets the framework for Financial Instruments.

It is noteworthy that at present the data on output indicators provided in the JESSICA Evaluation Studies do not follow a specific standard and they are often not homogenous or comparable. Under such circumstances, each JESSICA Evaluation Study was an unique exercise, in which the assessment procedure and thus the comparability processes and lessons to be learnt are onerous. To overcome this problem, all the JESSICA Evaluation Studies on the EIB web-site have been reviewed and assessed, and thereafter, data were collected for 6 projects in 2 EU transitional regions that have more exhaustively reported their non-financial/economic and financial data.

All 6 of the selected projects represent different typologies of urban investment:

- ***Project 1*** focusses on energy savings. The project aims to save on energy in three ways: by introducing energy efficiency measures in main Municipal buildings, by introducing public transportation measures to increase accessibility and reduce use of private vehicles, and finally, by increasing awareness of energy efficiency policy among public sector employees through training and dissemination**.**
- ***Project 2*** is concerned with the implementation of energy efficiency measures in small commerce and service companies along with the construction and operation of a co-generation plant fuelled by local biomass.
- ***Project 3*** is the implementation of a renewable energy efficiency system for producing electricity and hydrogen. The project involves the construction of an upper water tank, a wind turbine, a hydro turbine, and a desalination unit.
- ***Project 4*** is the construction of a technological park, i.e. new business facilities that encourage technological development, innovations and increased support for higher education.
- ***Project 5*** is an entrepreneurial incubator to encourage the start-up of new companies by providing them with attractive rental conditions and offering business advisory services.
- ***Project 6*** is the construction of a multi-function building that includes a large hotel, an opera house and a theatre.

In relation to the 6 considered projects, as explained above, we have selected the set of indicators based on output indicators related to the different ESIF[7] and linked to the 11 Thematic Objectives which are identified in Article 9 of the CPR and reproduced in Table 1. The relationship between output indicators and Thematic Objectives is important because the CPR (Article 96 point 2 (b)) requires that each output indicator must be linked to a priority axis which "shall correspond" (Art. 96 point 1) to at least one Thematic Objective.

Table 1. Thematic Objectives as introduced in Art. 9 of the Common Provisions Regulation (CPR)

Thematic Objectives
1. Strengthening research, technological development and innovation.
2. Enhancing access to, and use and quality of, ICT.
3. Enhancing the competitiveness of SMEs, of the agricultural sector (for the EAFRD) and of the fishery and aquaculture sector (for the EMFF).
4. Supporting the shift towards a low-carbon economy in all sectors.
5. Promoting climate change adaptation, risk prevention and management.
6. Preserving and protecting the environment and promoting resource efficiency.
7. Promoting sustainable transport and removing bottlenecks in key network infrastructures.
8. Promoting sustainable and quality employment and supporting labour mobility.
9. Promoting social inclusion, combating poverty and any discrimination.
10. Investing in education, training and vocational training for skills and lifelong learning.
11. Enhancing institutional capacity of public authorities and stakeholders and efficient public administration.

In Table 2 below, in column 1 we can observe the name of the EU Fund in relation to the output indicators; column 2 lists the output indicators which have been collected for the 6 projects under consideration; column 3 represents the 11 Thematic Objectives linked to the project output indicators (as shown in Table 1). As indicated in the Table, 6 output indicators have been collected for each of the selected projects.

Table 2 thus provides a mapping of the correspondence between three of the ESIF, project outputs and Thematic Objectives. Table 2 is not exhaustive as it contains only those project output indicators for which information was available in the sample of projects under consideration. In fact the range of output indicators referred to in the 2014 - 2020 regulatory framework is much wider – the Annex of the 2014 - 2020 ERDF regulation for instance contains some 40 "common output indicators", from which indicators 1 to 4 in Table 2 are drawn. Conceptually it is important to bear in mind that each output indicator can be linked with more than one ESIF and more than one Thematic Objective. In order to understand how Table 2 was built,

[7] As stated in Art. 1 of the CPR, these are the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF).

let us consider an example, indicator 1 "*Estimated decrease in GHG in CO_2 equivalent*". Output Indicator 1 is measured in tonnes of CO_2 equivalent, it is listed as one of the common output indicators in the Annex of the ERDF Regulation and can be linked to Thematic Objectives 4, 5 and 6. The same approach is followed for the other output indicators.

Table 2. Collected data for project output indicators

Fund Name	Project Output Indicator	11 Thematic Objectives										
		1	2	3	4	5	6	7	8	9	10	11
European Regional Development Fund (ERDF)	**(1)** Estimated decrease in GHG in CO_2 equivalent				✓	✓	✓					
	(2) Number of enterprises receiving support										✓	
	(3) Number of new enterprises supported			✓								
	(4) Number of enterprises cooperating with research institutions	✓	✓									
European Agriculture Fund for Rural Development (EAFRD)	**(5)** Jobs created in supported projects								✓			
European Social Fund (ESF)	**(6)** Total number of participants (number of unemployed + number of inactive participants + number of employed)									✓		

In so far, we have output indicators for the 6 projects, but we must transform this data set into comparable information about the projects. While each of the raw indicators can be taken into consideration in isolation, and this is a necessary and useful intermediate step in assessing Non-Financial Impacts, a more comprehensive approach to impact performance measurement would require a synthetic metric which overcomes on the one hand the fact that the raw indicators are heterogeneous and on the other the fact that they may be correlated, so that any aggregation should take this into account. In order to achieve this result, we need to verify whether the output indicators are correlated between each other, and to contextualize the output indicators to the context of the city and/or region in question.

The step of correlation and contextualisation is essential before a synthetic indicator of Non-Financial Impacts can be robustly generated. Correlation ensures that interdependencies, if any, between output indicators are taken into account. Contextualisation ensures that a standard frame of reference - using ratios and identical geographies - is being used so that different indicators can be compared. For this, the baseline (before the project implementation) percentage at the regional level needs to be established for each indicator. Then the percentage contribution at the regional level to this indicator due to the project's implementation needs to be calculated (see Appendix 1).

When we consider the correlation we may, for example, have the case where a project simultaneously achieves an increase in number of new enterprises supported and in number of jobs created, so that these two output indicators are correlated. In this case we must take into account this relation between the output indicators in order to not introduce a bias in the resulting composite indicator (Pedhazur and

Schmelkin, 2013).[8] In the 6 projects, all of the output indicators are independent except for output indicator 1 *Estimated decrease in GHG in CO_2 equivalent*, which is correlated with output indicator 5 *Jobs created in supported projects*. This means that as more people are employed in a company, the CO_2 production of that company increases and in that way contributes to the CO_2 of the region and/or country. The implication of this result for our data set is that the values of output indicator 1 and indicator 5 are therefore corrected in relation to their correlation.

The second problem to tackle in order to create a robust data set is to contextualize the output indicators. Let us consider that we have one project which is implemented in two different regions. One of the output indicators of this project is, for example, the creation of jobs, and we assume that the value of this indicator is an increase equal to 30% of baseline jobs. However, to allow comparability between data, we need to relate this value of 30% of new jobs accrued in both regions with the level of unemployment in each region in order to capture the real benefit. In fact, if in one region the total percentage of unemployment is equal to 20% and in the other region it is 10%, the benefit of 30% increase in jobs will clearly be different in the two regions. This step is therefore critical for the decision maker to compare the same output indicators from different projects and from different countries if applicable.

To calculate each output indicator's contextualization in relation to the region, we have used the EUROSTAT data set. The EUROSTAT data set provides a comprehensive data source for EU regions and thus allows for this standard contextualization procedure (UNDP, 2011).[9] In order to calculate each output indicator's contextualization in relation to the region, the output data is normalized in relation to the region under consideration using the EUROSTAT data set. For example, in the case of output indicator 1, *Estimated decrease in GHG in CO_2 equivalent*, the contextualized value of CO_2 decrease output is the % change in the production of CO_2 per capita in the region after the project implementation, based on the CO_2 per capita of the region before the implementation of the project. The following table describes the three analytical steps which have been followed to obtain output indicator 1 *Estimated decrease in GHG in CO_2 equivalent* from the raw data of the projects.

[8] E.J. Pedhazur and L.P. Schmelkin (2013). Measurement, Design and Analysis: An integrated approach. Taylor and Francis.

[9] UNDP (2011) Social Inclusion in CEE: Secondary sources contextualization in survey data. UN: Geneva.

	Steps
Estimated Decrease in GHG in Co2 Equivalent expressed in Kg of CO_2	**First step**: We need to transform the raw data related to energy saving of our projects in quantities expressed in Kg of CO_2. This step is necessary because the Annex of the 2014 - 2020 ERDF regulation requires that the output indicator: Estimated Decrease in GHG in CO_2 equivalent must be expressed in Kg of CO_2. In our projects, the available raw data related to energy savings are: (1) Annual Energy Benefit expressed in KWh and (2) Decrease in Petrol Consumption expressed in Litres of Petrol. We therefore convert these two available data in kg of CO_2 reflecting the most recent analysis by JEC (Joint Research Centre of the European Commission, European Council for Automotive R&D and CONCAWE , see for additional information http://iet.jrc.ec.europa.eu/about-jec/). After doing so, we divide the obtained value for the population of the project region. We have now calculated for the region under consideration the Energy Saving per capita expressed in Kg of CO_2 when the projects are implemented.
	Second step: For all the EU regions, the EUROSTAT data gives us the production of CO_2 per capita per region (*Status quo*). We now have the value of the baseline production CO_2 per capita of the region under consideration and the reduction in production of CO_2 per capita if we implement the projects. All the data are expressed in Kg of CO_2 per capita.
	Third Step: The Estimated Decrease in GHG in CO_2 equivalent is then calculated as the % change in CO_2 per capita in the region *before* and *after* the project.

A similar method is followed for all six output indicators in Table 2. The above two steps are necessary to increase the robustness of our data set of output indicators. Table 3 shows the collected data values for the 6 projects.

Table 3. Contextualisation and Correlation of data

Data of project output indicators after contextualization and correlation						
Output Indicator	**Project 1**	**Project 2**	**Project 3**	**Project 4**	**Project 5**	**Project 6**
(1) Estimated decrease in GHG in CO_2 equivalent	0.923	3.375	1.938	0.000	0.000	0.000
(2) Number of enterprises receiving support	0.004	1.020	0.000	0.082	0.022	0.000
(3) Number of new enterprises supported	0.000	21.429	0.000	6.364	0.000	0.000
(4) Number of enterprises cooperating with research entities	0.000	0.000	0.000	0.013	0.003	0.000
(5) Jobs created in supported projects	0.134	0.398	17.587	4.779	0.695	0.223
(6) Total number of participants (number of unemployed +number of inactive participants + number of employed)	0.000	0.000	0.000	0.106	0.016	0.042

On the basis of the information contained in Table 2 it is possible to compare the projects horizontally in relation to their adjusted output indicators, that is, we can observe for instance that, for output indicator 5, *Jobs created in supported projects,* Projects 3 and 4 achieve the best result in relation to the other projects, whereas Project 1 is the worst performing one. However, it is not yet possible to compare actual projects with each other, and for this reason we need to construct the Non-Financial Impacts of the project, which will identify a single metric for each project that encompasses all the different benefits. This is the focus of the next section.

3.2 Non-Financial Impacts

As we have observed in the previous section, in the regulatory framework of the European Commission for the next programming period 2014 - 2020 in relation to the 11 Thematic Objectives, project output indicators must satisfy at least one Thematic Objective. In light of this requirement, and to easily compare the projects under a standard framework that encompasses any type of output indicator, we construct for each project a vector of 11 cells corresponding to the 11 Thematic Objectives. In order to construct a vector for each project, one must keep in mind that output indicators often correspond to more than one Thematic Objective, as for instance in the case of output indicator 1, *Estimated decrease in GHG in CO_2 equivalent*, which is expected to contribute, respectively, to Thematic Objectives 4, 5, and 6 (Table 4). Note also that the 2014 - 2020 ERDF regulations foresee several other potentially relevant common output indicators[10], however those presented in Table 4 are those few which were available for the sample projects. The problem is now: if an output indicator corresponds to more than one Thematic Objective,

[10] For instance, in the area of energy efficiency, indicators such as "the number of households with improved energy classification", "decrease of energy consumption of public buildings", "number of additional users connected to smart grids".

how much value of the indicator do we place in each cell of the project vector? So in the case of output indicator 1, how much value do we put in cells 4, 5, and 6 of the project vector?

To solve this problem and thus create flexibility in the methodology, we add a weight to each value of output indicator in the vector in relation to the Thematic Objectives. This is an important step because in this way, the decision maker can judge the beneficial impacts of the projects, and where appropriate and feasible adjust the design and the selection of the projects, in accordance with specific priorities and objectives. The weights can be modified and adapted, thereby providing the required flexibility for the user.

In the 6 projects, no specific details have been provided on the strategy of the region/stakeholders with respect to the thematic objectives, which can, when available, easily be associated to a specific project and thus to a system of weights; we therefore follow a general procedure: in the case where an output indicator corresponds to one Thematic Objective, the value of the output indicator was imported unchanged to the project vector using a weight of 1. Whereas in the case where the output value corresponds to more than one Thematic Objective, then the value of the output indicator appears in each correspondent Thematic Objective cell of the project vector, multiplied by a weight which is equal to 1/x where x is the number of times that the output indicator corresponds with the Thematic Objectives. In simple terms, in the case of output indicator 1 *Estimated decrease in GHG in CO_2 equivalent*, the output value will be multiplied by a weight equal to 1/3 and then imported in the project vector in the 3 corresponding Thematic Objective cells. Table 4 below depicts the resulting matrix of output indicators, corresponding thematic objectives and weights.

Table 4. Matrix of Output Indicators, Thematic Objectives and Output Indicator Weighting

Output Indicators	Corresponding Thematic Objectives	Output Indicator Weighting (1 / number of Corresponding Thematic Objectives)
(1) **Estimated decrease in GHG in CO_2 equivalent**	**4.** Supporting the shift towards a low-carbon economy in all sectors. **5.** Promoting climate change adaptation, risk prevention and management. **6.** Preserving and protecting the environment and promoting resource efficiency.	**0.33**
(2) **Number of enterprises receiving support**	**10.** Investing in education, training and vocational training for skills and lifelong learning.	**1**
(3) **Number of new enterprises supported**	**3.** Enhancing the competitiveness of SMEs, of the agricultural sector (for the EAFRD) and of the fishery and aquaculture sector (for the EMFF).	**1**
(4) **Number of enterprises cooperating with research entities**	**1.** Strengthening research, technological development and innovation. **2.** Enhancing access to, and use and quality of, ICT.	**0.5**
(5) **Jobs created in supported projects**	**8.** Promoting sustainable and quality employment and supporting labour mobility.	**1**

(6) **Total number of participants (number of unemployed + number of inactive participants + number of employed)**	**9.** Promoting social inclusion, combating poverty and any discrimination.	**1**

We now have for each project a vector with the same dimension (11 cells), but we still cannot sum the values in the vector cells to obtain a single metric capturing the Non-financial impacts. If we sum the values in the vector we will obtain a meaningless result because in that way we sum 'apples with pears'. In order to avoid this mistake, we transform the values in each project vector cell into percentage values and then sum these values for each project, thereby obtaining the Non-Financial Impacts of the project.

In Appendix 1, we provide a detailed mathematical explanation of how and why we obtain this transformation. In the present context it is important to remember that our objective is to create a single metric that allows the decision maker to compare projects. By following this procedure, we first create a vector for each project of 11 output indicators related to the Thematic Objectives and then transform these indicators into non-dimensional values that can be summed. The result is a single number representing the Non-Financial Impacts for each project.

The Non-Financial Impacts is thus a function of all the various outputs that the projects aim to achieve - ultimately a function of the raw output indicators that should be recorded for each project in line with the regulatory framework and the structure presented in Table 2 above. It should also be noted that in practical programme implementation it is possible that each priority axis in the programme is structured so that it matches a single Thematic Objective. In this case each project could be characterised by a single output indicator referring to a Thematic Objective – the approach presented in this document allows a more flexible approach capable of taking into account projects with multiple thematic impacts, which may well be the case for projects included in an urban priority axis.

The data of the weighted output indicators of the selected projects drawn from the JESSICA evaluation studies are represented in each project vector as shown in Table 5 below. These values are already multiplied by the respective weights. In Table 6 the Non-Financial Impacts for each of the 6 projects are shown.

Table 5. Weighted Output Indicators

Output Indicators weighted for the 11 Thematic Objectives						
Thematic Objective	**Project Vector 1**	**Project Vector 2**	**Project Vector 3**	**Project Vector 4**	**Project Vector 5**	**Project Vector 6**
1	0.000	0.000	0.000	0.006	0.002	0.000
2	0.000	0.000	0.000	0.006	0.002	0.000
3	0.000	21.429	0.000	6.364	0.000	0.000
4	0.308	1.125	0.646	0.000	0.000	0.000
5	0.308	1.125	0.646	0.000	0.000	0.000
6	0.308	1.125	0.646	0.000	0.000	0.000
7	0.324	0.000	0.000	0.000	0.000	0.000
8	0.134	0.398	17.587	4.779	0.695	0.228
9	0.277	0.236	0.005	0.106	0.016	0.043
10	0.004	1.020	0.000	0.082	0.022	0.000
11	0.000	0.000	0.000	0.000	0.000	0.000
Total	**1.663**	**26.458**	**19.53**	**11.343**	**0.737**	**0.271**

Table 6. Synthetic Non-Financial Impacts by project

Non-Financial Impacts						
Non-Financial Impacts	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
	1.663	26.458	19.53	11.343	0.737	0.271

The results here are of significant interest for decision makers, because we can compare projects in relation to Thematic Objectives, for instance, in relation to Thematic Objective 8 (Promoting employment and supporting labour mobility), the highest benefit is obtained by Project 3, and the lowest benefit is achieved by Project 1 (Table 5). We can also now compare projects with each other (Table 6). In the case of the 6 projects, Project 2 achieves the highest Non-Financial Impacts, i.e. the highest positive socio-economic and environmental benefits accrue, whereas Project 6 accrues the lowest value.

We conclude this section with a recap of the formulation of the Non-Financial Impacts of project. The Non-Financial Impacts of project has been defined and tested with the 6 selected projects, but the methodology can easily be extended for much larger sets of projects. To identify the Non-Financial Impacts of a project to be implemented in a specific region, the raw output indicators of the project have been collected, and each output indicator has then been contextualized in relation to region, and correlated in relation to the other output indicators. To these outputs a weight related to the 11 Thematic Objectives was then assigned. The values of the outputs transformed in non-dimensional values are summed, thereby estimating a single metric, the financial or Non-Financial Impacts of the project.

The Non-Financial Impacts estimation corresponds to the flexibility and simplicity needs of decision makers by allowing them to adapt the methodology to different variables and indicators and to easily interpret and compare the obtained results. In the next section the project assessments (Non-Financial Impacts and Financial Impact) will be integrated under a portfolio approach. The Portfolio Structuring Model brings together the Non-financial and Financial Impact Model for each project, and enable the user to combine the projects to structure the project portfolio so that financial risk is controlled and the synergies of Non-Financial Impacts are captured.

4. Portfolio Structuring Model

4.1 Objectives

As part of the framework for Financial Instruments, the development of a new portfolio structuring model for projects intends to give stakeholders and decision makers a practical tool for the structuring and combination of different typologies of urban investment. The main aims of the portfolio structuring are to:

- Combine different types of projects thus fostering synergy between investments to obtain a diversified portfolio where the good financial returns of some projects can compensate (cross-subsidy) for the 'poor' financial returns of other projects which, however, achieve good Non-Financial Impacts (socio-economic and environmental benefits).

- Increase private sector participation by structuring a portfolio so that it offers feasible and attractive opportunities to invest in different types of urban assets, including energy efficiency, urban development, and urban regeneration.

In order to construct the project portfolio, two values need to be estimated for each project: (1) the Non-Financial Impacts for region h, denoted by I_h^E , which assesses the Non-Financial Impacts of the project as described in section 3; and (2) the Financial Impact I_h^F for each project in region h, which reflects the financial performance of the project. The Financial Impact for each project is calculated through the Financial Modelling Tool presented as part of the deliverables.

To effectively and efficiently structure the portfolio of projects, it is necessary to account for the evaluation of the risks, since a lower level of risk exposure will be an attractive feature of the portfolio, particularly for the private sector. We observe that urban projects are often exposed to high levels of political/government risk, particularly around land purchase, planning, and building permits, which can result in protracted delays. These types of risk are not directly captured by the project's Financial and Non-Financial Impacts; therefore, it is necessary to introduce the estimation of political and governmental risk in the evaluation of the portfolio.

Administrative and political agencies which oversee projects are fundamental to the effective implementation, successful completion and transparent monitoring and assessment of urban investment. Virtuous administrations are sometimes small/middle size administrations and which do not receive the largest capital share for projects. These administrations are sometimes overlooked by lending agencies and private investors paying attention primarily to the number and size of projects.

Against this background, in order to account for good governance in project implementation, and thus incorporate into the assessment political and government risk, we consider an independent measure of the level of Quality of Governance in the region where the project is implemented. The implication is that a high value of Quality of Governance indicates lower risk for private sector investors in relation to financial returns, and positive socio-economic and environmental impacts for the city or region under consideration. In the examined cases the European Quality of Governance Index, as defined by Charron et al. (2011), has been used ($\mathbf{p_h}$). By doing so, the Non-financial and Financial Impacts for each region are discounted in line with the European Quality of Governance Index.

To summarize, in the portfolio structuring methodology the Non-financial and Financial Impacts of the projects are weighted in relation to the European Quality of Governance. This is done to provide investors

with a performance measure incorporating an independent metric of the quality of local governance (Appendix 2 gives a detailed description of how the European Quality of Governance Index is calculated).

In the next sections the formulations of the portfolio structuring methodology are presented before testing the portfolio structuring with real data in Section 5. A visual interpretation of the portfolio structuring model is available at the following address: http://youtu.be/pekwICtMAcQ.

4.2 Unconstrained Portfolio Structuring

The projects selected through the portfolio structuring methodology the combined aims of obtaining maximized non-financial and financial performance. The maximisation is carried out on the possible combinations of projects that can be part of a portfolio. Thus, the **maximization** formula is:

$$\boldsymbol{Max} \quad (\boldsymbol{p_h}\, \boldsymbol{I_h^E} + \boldsymbol{p_h}\, \boldsymbol{I_h^F})$$

where:

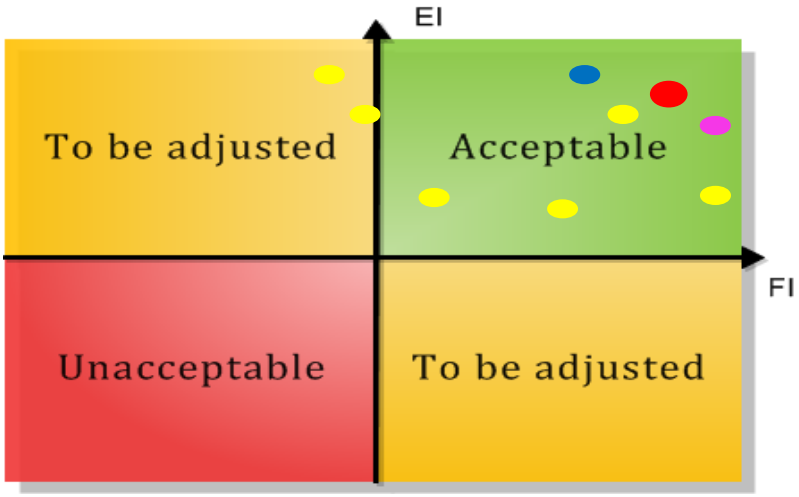
$\mathbf{p_h}$ = European Quality of Governance Index for region h;

$\boldsymbol{I_h^E}$ = Non-financial (economic) impacts for region h;

$\boldsymbol{I_h^F}$ = Financial impact for region h.

The graph below shows an example of portfolio structuring. The Non-Financial Impacts are measured on the vertical axis "EI" the Financial Impacts on the horizontal axis "FI". All yellow dots indicate single projects (in total 6 projects) and the other dots (blue, red and pink) indicate various portfolio combinations of the projects.

Figure 2: Financial and Non-financial Impacts Matrix – Unconstrained Portfolio Structuring



In Figure 2, the portfolio selected by the maximization algorithm is represented by the red dot. This portfolio achieves the highest sum of both impacts (Non-Financial and Financial) on the basis of the maximization formula.

The visualization of the projects and of the portfolio combinations is an important feature of the portfolio structuring model. In fact, the user can easily evaluate different portfolio options (blue, pink and red dots). For instance, depending on the user can choose between the blue or the pink portfolio according to his/her

preference for either Non-financial or Financial Impact. For clarity, the portfolio points in Figure 2 represent on the two dimensions of the "impact" space (EI and FI) the performance of the combinations of the six projects that satisfy the portfolio structuring criteria. If the user place higher emphasis on Non-Financial Impacts than the Financial Impacts, then the blue dot on the graph will be ideal as it has a higher index on the EI axis, implying that this portfolio combination yields the highest possible on the Non-Financial Impacts (blue dot on the graph).

If the user values the Financial performance more than the Non-Financial Impacts, then the portfolio with the highest financial impact (pink dot on the graph) will be selected. Moreover, if new projects are added to the portfolio over time, the user can verify if they improve the overall performance of the portfolio. The investment strategy will help define these investment criteria, which ultimately should help to achieve the Operational Programme objectives.

4.3 Portfolio Structuring with Preference Weights

Thus far, in this portfolio structuring model, the Financial and Non-Financial Impacts have been valued equally. However, the model can provide the user with the flexibility to optimize according to user investment priorities. Weights can be added to the model so that the user can optimize by placing greater emphasis on either financial or Non-Financial Impacts:

$$\boldsymbol{Max} \quad (\boldsymbol{p_h}\ \boldsymbol{w_E}\ \boldsymbol{I_h^E} + \boldsymbol{p_h}\ \boldsymbol{w_F}\ \boldsymbol{I_h^F})$$

Where:

$\mathbf{p_h}$ = European Quality of Governance Index for region h;

$\boldsymbol{I_h^E}$ = Non-Financial Impacts for region h;

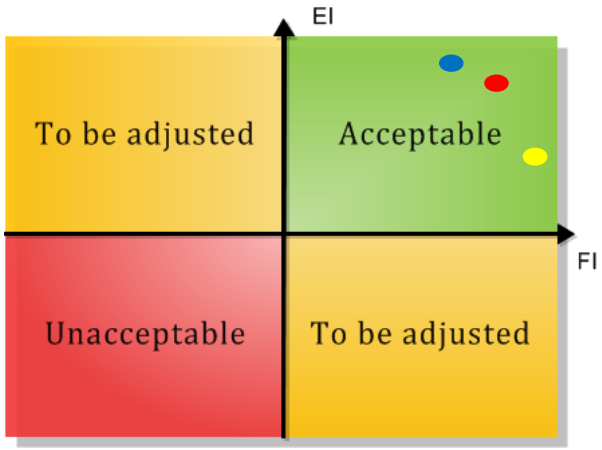
$\boldsymbol{I_h^F}$ = Financial Impact for region h;

$\boldsymbol{w_E}$ = Non-financial Weight;

$\boldsymbol{w_F}$ = Financial Weight;

$\boldsymbol{w_E + w_F = 1}$

Figure 3: Financial and Non-financial Impacts Matrix – Portfolio Structuring with Preferences



Let us consider the case of three portfolios as in the figure above (blue, red and yellow dots). When no preferences are selected with regards to Financial and Non-Financial Impacts, then model will select the red portfolio because it has the highest unweighted sum of Non-Financial and Financial impacts. When weights are introduced, the user can optimize according to the investment strategies and priorities. For instance, if the user wants to achieve with the implementation of the projects in the portfolio with more socio-economic and environmental benefits to the wider society, the user will value the Non-Financial Impacts of the portfolio measured on the EI axis more than the Financial Impacts. In that case, the user will assign a higher weight to the Non-Financial Impacts and the model will automatically select the blue portfolio.

Conversely, if the user values the Financial Impacts of the portfolio more than the Non-Financial Impacts, then a higher weight will be assigned to the Financial Impact. Consequently, the yellow portfolio in the graph will be selected. Moreover, if the selected portfolio does not include all the projects, but for instance, excludes one of the six projects, the user can readjust the weights in order to modify the structure of the portfolio accordingly. In Section 5, these different features of the model will be demonstrated with the real data.

4.4 Constrained Portfolio Structuring

The combination of projects selected in the portfolio is often subject to the available funding available for investments, so it is important in the formulation of the portfolio structuring model to introduce the "budget constraint." The model will therefore select a portfolio with maximized Financial and Non-Financial Impacts, which also satisfies the budget requirements.

$$\boldsymbol{Max} \quad \left(\boldsymbol{p_h}\ \boldsymbol{w_E}\ \boldsymbol{I_h^E} + \boldsymbol{p_h}\ \boldsymbol{w_F}\ \boldsymbol{I_h^F}\right)$$

Subject to: Budget Constraint
where:

$\mathbf{p_h}$ = European Quality of Governance Index for region h;

$\boldsymbol{I_h^E}$ = Non-Financial Impacts of region h;

$\boldsymbol{I_h^F}$ = Financial impact of region h;

$\boldsymbol{w_E}$ = Non-financial Weight;

$\boldsymbol{w_F}$ = Financial Weight;

$$\boldsymbol{w_E + w_F = 1}$$

The model calculates for each portfolio combination taking into account of the required value of investments needed to implement all the projects in the portfolio. The model therefore rejects portfolios that exceed the budget constraint.

In the next section the portfolio methodology will be tested by considering the 6 projects that were described and evaluated in Section 3. The objective will be to show how, through the combination of projects, we can jointly optimise the portfolio's Financial and Non-Financial Impact performance. Moreover, the methodology can be tailored to user needs, so different examples will be shown to demonstrate the flexibility of the tool.

5. Testing the Portfolio Structuring Model

5.1 The Case Study

It is now possible to test the methodology of portfolio structuring as described in the previous section starting from the 6 projects presented in Section 3. It is important to emphasize that the methodology can handle a large number of projects (the algorithm can easily evaluate over 100 projects in the portfolio structuring using a standard desktop computer). Table 7 below provides a brief description of the projects under consideration.

Table 7. Description of the 6 JESSICA Projects

Description of JESSICA Projects	
Project 1	Introduction of energy efficiency measures in Municipal buildings, promotion of sustainable transport and increase awareness of energy efficiency policy.
Project 2	Introduction of energy efficiency measures in small commerce and service companies, construction and operation of a co-generation plant fuelled by local biomass.
Project 3	Implementation of a renewable energy system for electricity and hydrogen production.
Project 4	Construction of a technological research park to support higher education.
Project 5	Entrepreneurial Research Institute that will provide training and advisory services.
Project 6	Construction of a multi-functional building for leisure and entertainment.

Table 8 presents the correspondence between projects, raw output indicators collected for each project and the corresponding 11 Thematic Objectives. In Table 9, for example, the value of the output indicator "*estimated decrease in GHG in CO_2 equivalent,*" has been collected for projects 1, 2 and 3 and may be relevant to Thematic Objectives 4, 5 and 6.

Table 8. Correspondence between projects, output indicators and Thematic Objectives

Project	Output Indicator	11 Thematic Objectives										
		1	2	3	4	5	6	7	8	9	10	11
1-2-3	Estimated decrease in GHG in CO_2 equivalent				✓	✓	✓					
1-2-4-5	Number of enterprises receiving support										✓	
2-4	Number of new enterprises supported			✓								
4-5	Number of enterprises cooperating with research entities	✓	✓									
1-2-3-4-5-6	Jobs created in supported projects								✓			
4-5-6	Total number of participants (number of unemployed + number of inactive participants + number of employed)									✓		

In addition, for every project, the European Quality of Governance Index is applicable to the region where the project is located was calculated as shown in Table 9.

Table 9. Application of the European Quality of Governance Index

European Quality of Governance Index per Region					
Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
0.42	0.38	0.43	0.58	0.58	0.58

In order to test the proposed portfolio structuring model, the Non-financial and the Financial Impact of the 6 projects has been estimated. Table 10 presents the results obtained for each project after the evaluation of both Non-Financial Impacts (as explained in Section 3 and in Table 5) and Financial Impact.

Table 10. Non-financial and Financial Impacts per project

Non-financial (Economic) and Financial Impact						
Impact	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
Non- Financial	1.66	26.46	19.53	11.34	0.74	0.27
Financial	-6	5	7	-3	-1.57	-1

It is important to note that the Financial Impact metric used for the 6 projects, which was calculated through the Financial Modelling Tool presented as one of the deliverables, is a function of two parameters: the performance of the Equity IRR of the project in relation to what is expected by the market, and an overall financial profitability index. The Equity IRR is a significant performance measure for private investors, as it shows the return on equity invested in the project. In order to clarify the benefits of the

model for the private sector, the Equity IRR for the individual project is compared with the Equity IRR of all the optimization solutions. The private sector Equity IRR for each project is provided in Table 11 below.

Table 11. Private sector Equity IRR for each project

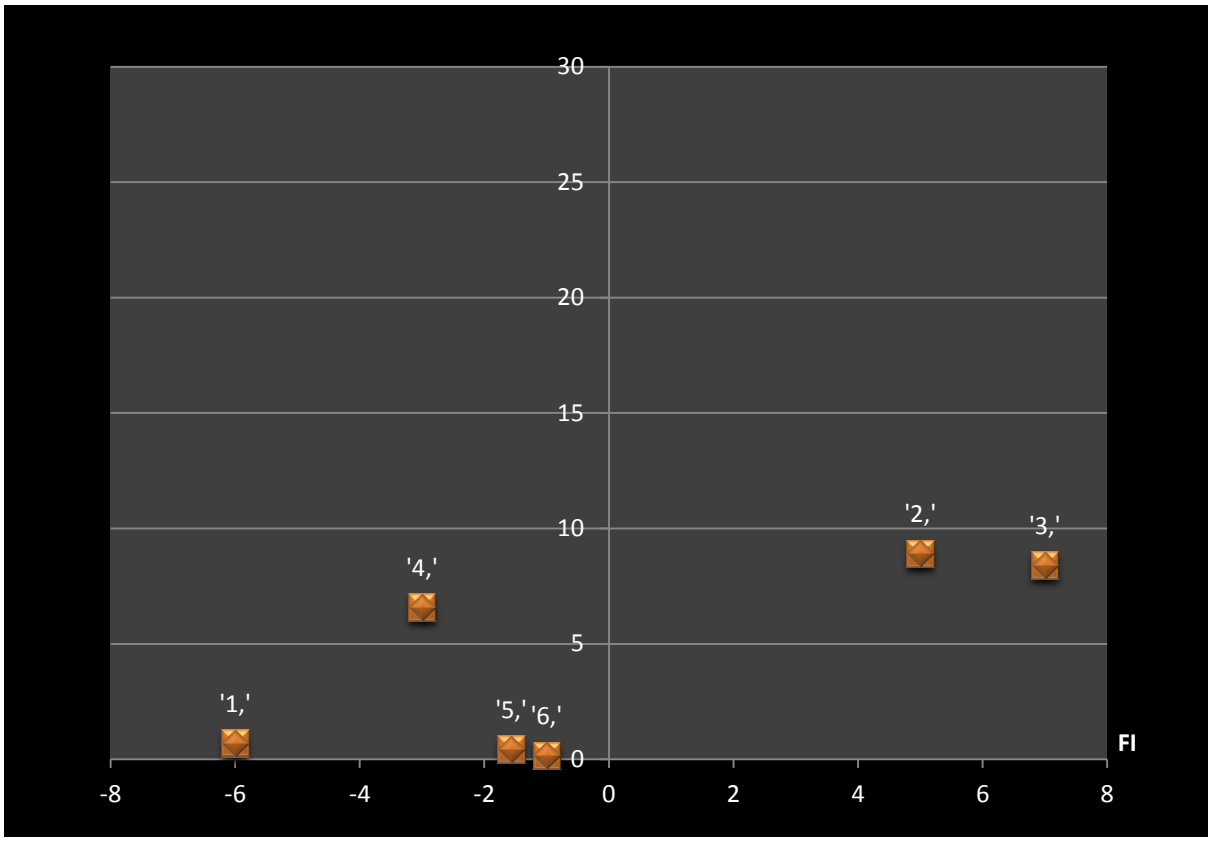
Project Number	Project Equity IRR
Project 1	**0.50%**
Project 2	**17.95%**
Project 3	**29.66%**
Project 4	**4.19%**
Project 5	**3.77%**
Project 6	**7.80%**

The objective here is to consider the 6 projects together and to verify whether a possible portfolio (with all the projects or some of them) satisfies the criteria of the private sector in relation to financial returns and risk exposure, as well as high socio-economic and environmental benefits to society.

In Graph 1 below the position of each project is plotted on the graph against the vertical axis, which represents how much the project contributes to Non-Financial Impacts, and the horizontal axis, which shows the financial performance (Financial Impact) of the project. The graph indicates that all 6 JESSICA projects contribute positively to Non-Financial Impacts; in other words, they all have a positive Non-Financial Impacts. It is worth mentioning that most of them have a negative value on Financial Impact (projects 1, 4, 5, 6).

This suggests that individually they are not financially viable; therefore it would be difficult to obtain private sector financial involvement were they to be taken into consideration individually. However, one of the goals of the portfolio structuring methodology is to build a balanced portfolio of projects which achieve positive Non-Financial Impacts and provides satisfactory financial returns. In this way the selected portfolio will attract private sector participation to JESSICA projects.

Graph 1. Positioning of projects

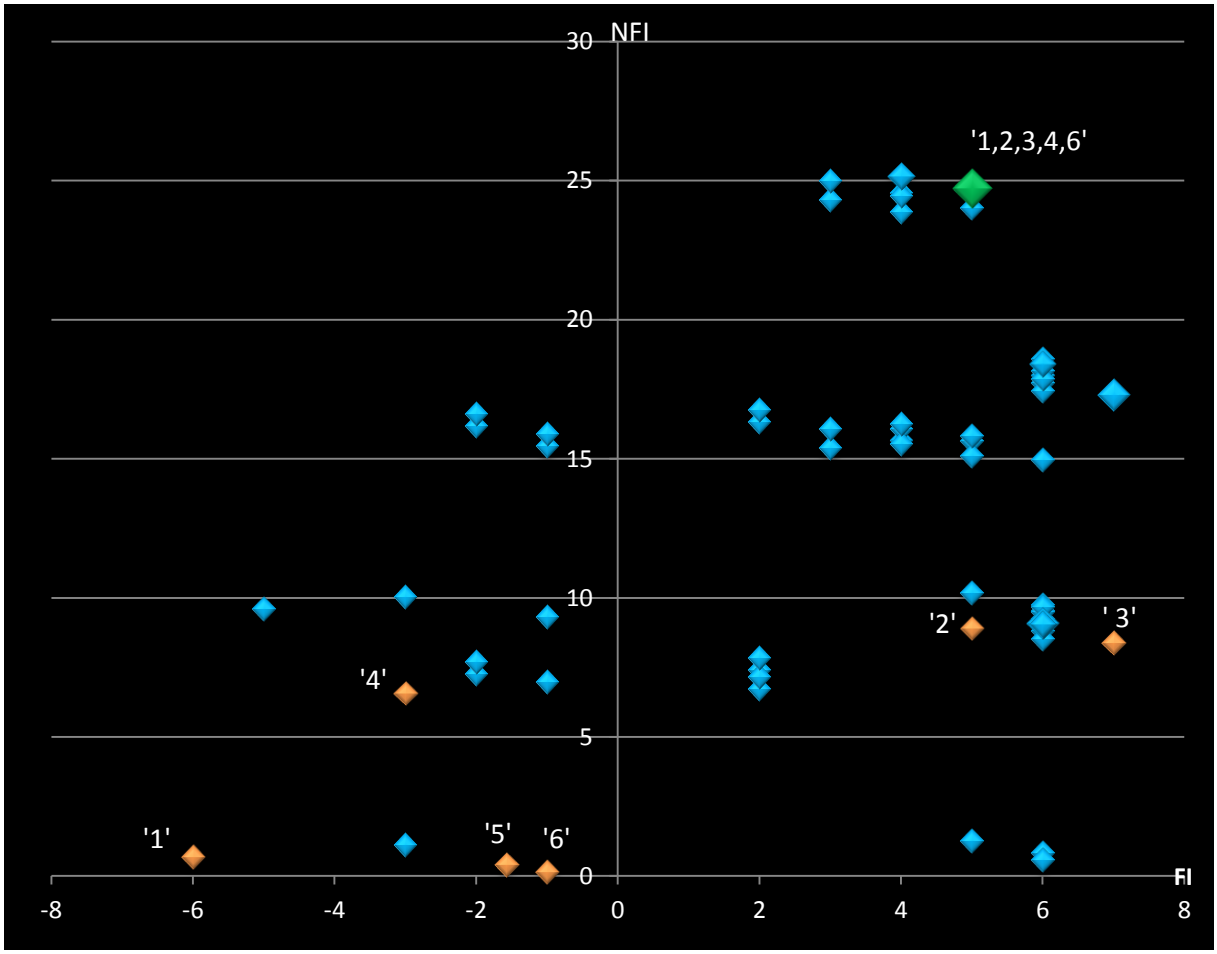


Using the data from the 6 projects of the JESSICA Evaluation Studies, different structured portfolio combinations have been tested to demonstrate the benefits of using the model and to also illustrate the flexibility of the portfolio structuring strategy. It is worth noting that, despite the small number of projects being considered, the model's algorithm produces and evaluates 57 portfolios, i.e. 57 combinations of the 6 projects.

5.2 Unconstrained Portfolio Case

As a first test it is assumed that no budget constraint applies to any portfolio combination of the 6 projects. Graph 2 below depicts all possible portfolios that can be structured with the given data. Orange squares on the graph represent single projects (the number identifies the project), while portfolio combinations are identified by blue dots.

Graph 2. Positioning of portfolios and optimal choice (unconstrained)

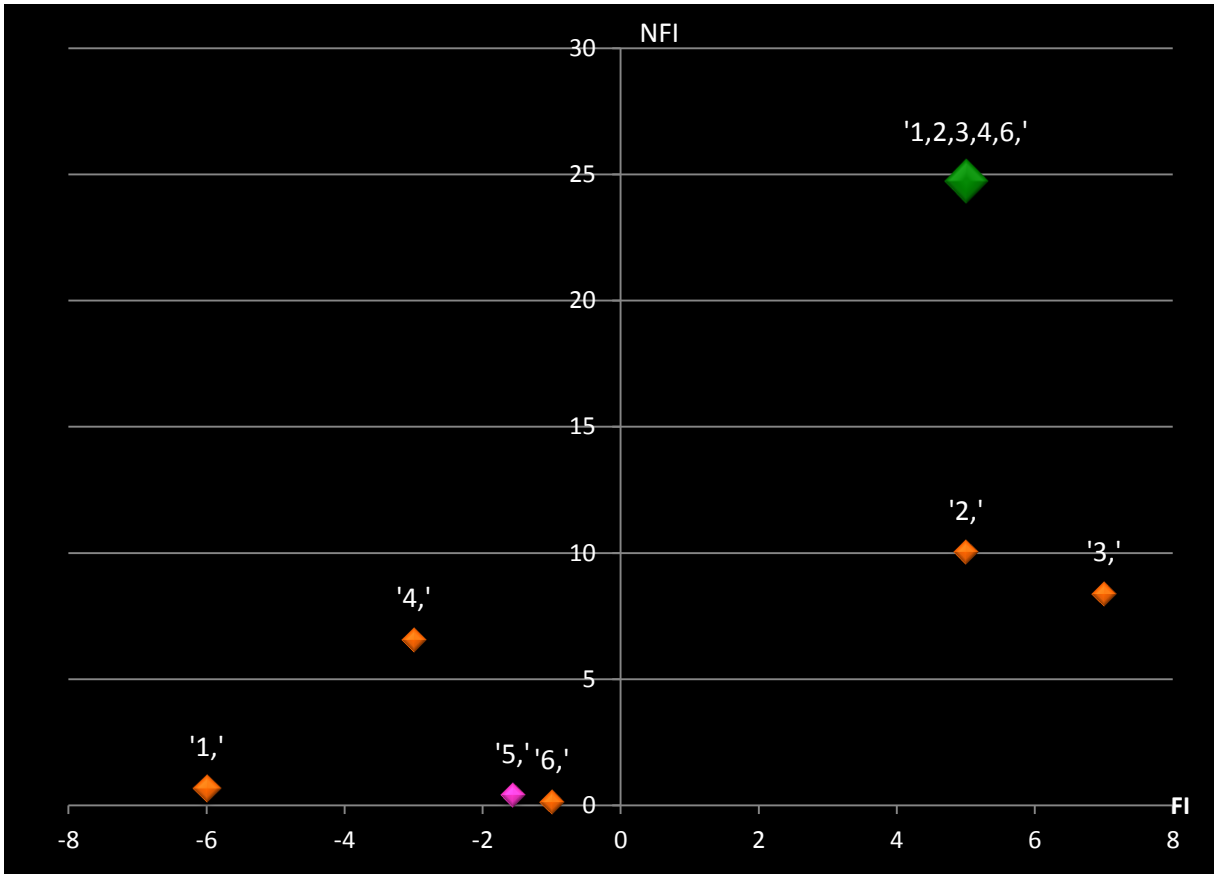


The green dot in the graph represents the optimal portfolio combination in the case where Financial and Non-Financial Impacts are weighted equally. The optimal solution includes 5 of the 6 projects, and the selected projects are 1,2,3,4 and 6. Therefore, in the selected portfolio, project 5 *(Entrepreneurial Research Institute that will provide training and advisory services*) is not selected in the combination of projects.

If we assume that to attract private investors the portfolio must have at least an Expected IRR equal to 15%, the selected portfolio exceeds this requirement, as it yields an Equity IRR of 20.11%. This is a significant result, which demonstrates that by building portfolios with mixed typologies, it is possible to diversify financial risk and provide a viable overall return.

Graph 3 below summarizes the results. The 5 projects included in the portfolio are represented by orange dots, and the pink dot indicates the project that did not meet specific requirements, and therefore excluded from the analysis. By viewing the optimal combination and its components, one can understand the advantages and power of the model. The graph illustrates that the selected portfolio has a noticeably better financial performance than any of the single projects, with the exception of Project 3. Project 3 has a Financial Impact with a value of 6 and Equity IRR equal to 29.66%, while the portfolio has a Financial Impact of 5 and Equity IRR equal to 20.11%.

Graph 3. Summary with rejected project highlighted



Let us next assume that Project 5 *(Entrepreneurial Research Institute that will provide training and advisory services)* is an important project providing jobs for the community. This project will be financed and will need to be analyzed as part of the portfolio. In this case, the user can adjust the portfolio structuring model by changing the Non-financial and Financial weights (w_E, w_F) as described in Section 4.3. Two cases are demonstrated where Project 5 is included in the portfolio (See Graph 4).

In the first case (yellow portfolio) the user places a greater value on the Non-Financial Impacts rather than the Financial Impacts of the projects, so for example, she/he will select the non-financial weight equal to w_E = 0.8 and the financial weight equal to w_F = 0.20.

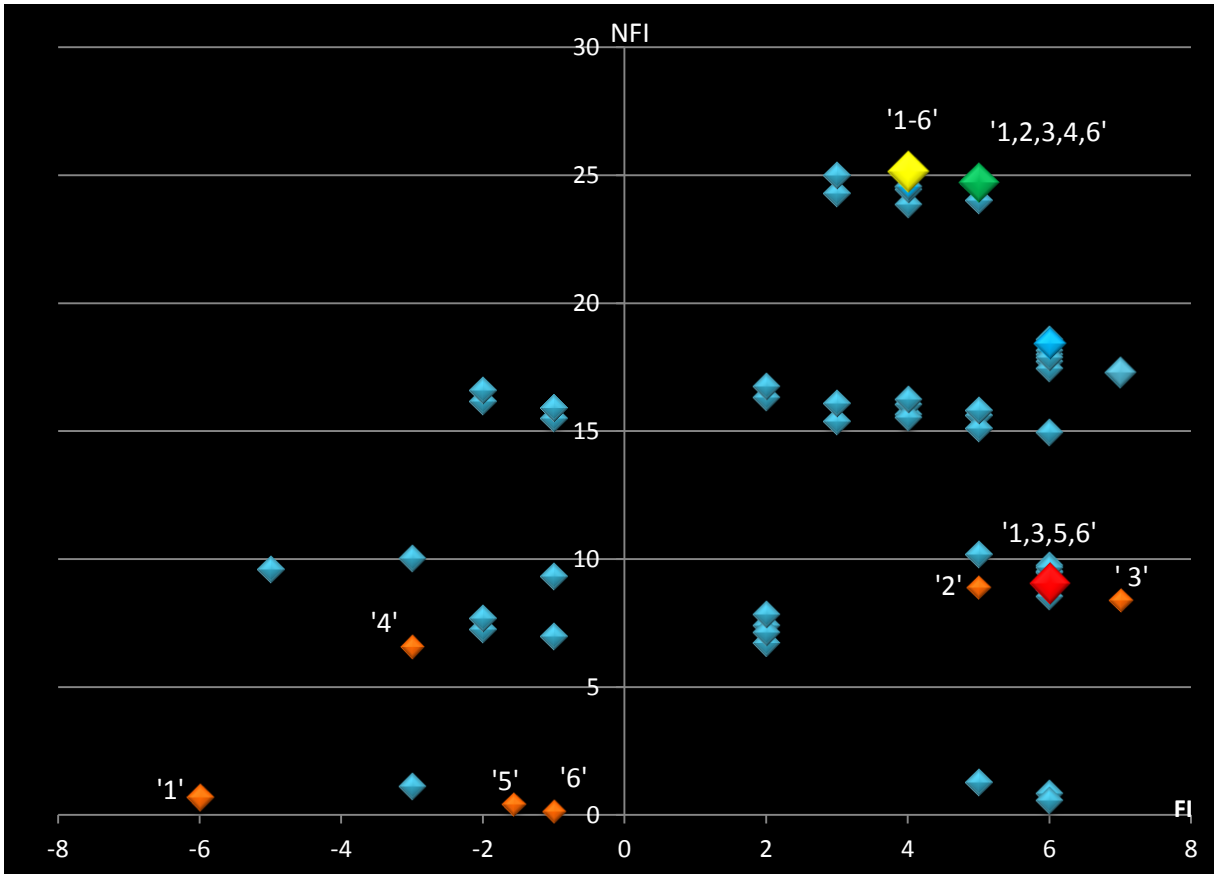
The yellow portfolio represents the optimal portfolio among the various portfolio combinations, given their assigned weights. This portfolio of projects includes all the projects (1, 2, 3, 4, 5, 6) and provides more Non-Financial Impacts than the green portfolio, but compromises slightly on the financial performance of the portfolio. The Equity IRR of the yellow portfolio is just under 19.25%. The small change from the green portfolio, with an IRR of 20.11% in the Financial Impact, indicates that the portfolio structuring optimization strategy is not highly sensitive to the alteration of the weights. This shows that, in light of adjustments, the portfolio maintains a stable and predictable performance, thus reducing risk.

In the second case (red portfolio) the user wants Project 5 in the portfolio but he/she follows a different strategy than the one used for the yellow portfolio: he/she gives greater value to Financial Impacts rather than Non-Financial Impacts of the projects. In this case the portfolio structuring model assigns greater

value to the financial (w_F = 0.70) than the non-financial weight (w_E= 0.30). The red portfolio is the best portfolio selected by the model with Project 5 included, but in this case the projects in the portfolio together with Project 5 are 1, 3 and 6 - Project 4 is excluded. The Equity IRR of the red portfolio is 26.26%. Once again, the results indicate that mixed typologies of projects can improve the financial performance of the overall portfolio.

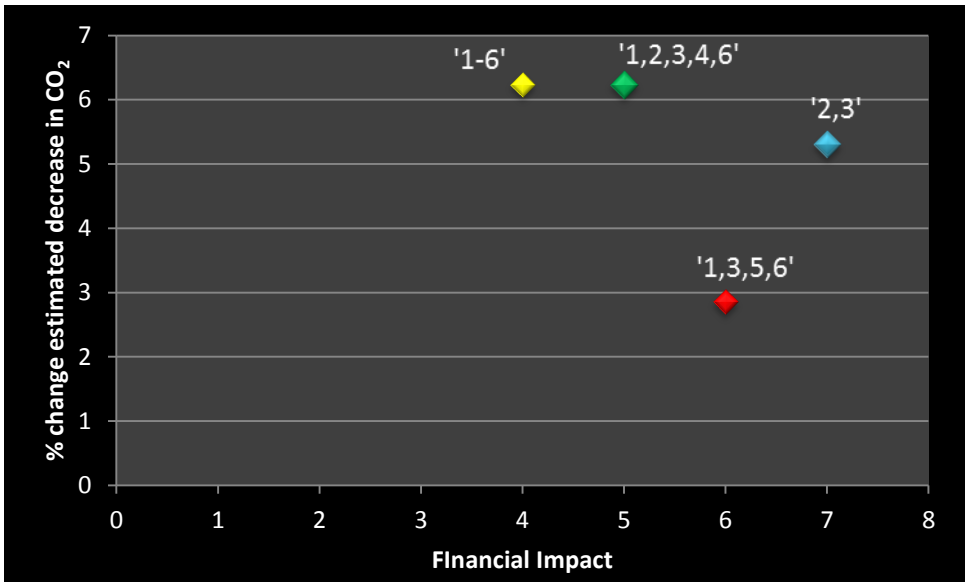
The proposed portfolio approach may also be of interest to investors, like certain pension funds or ethical funds, seeking 'alternative investment products' that provide an acceptable return, but are also 'responsible investment opportunities,' i.e. they convey benefits to the whole society.

Graph 4. User-weighted portfolios including Project 5 compared to the optimal portfolio (green)



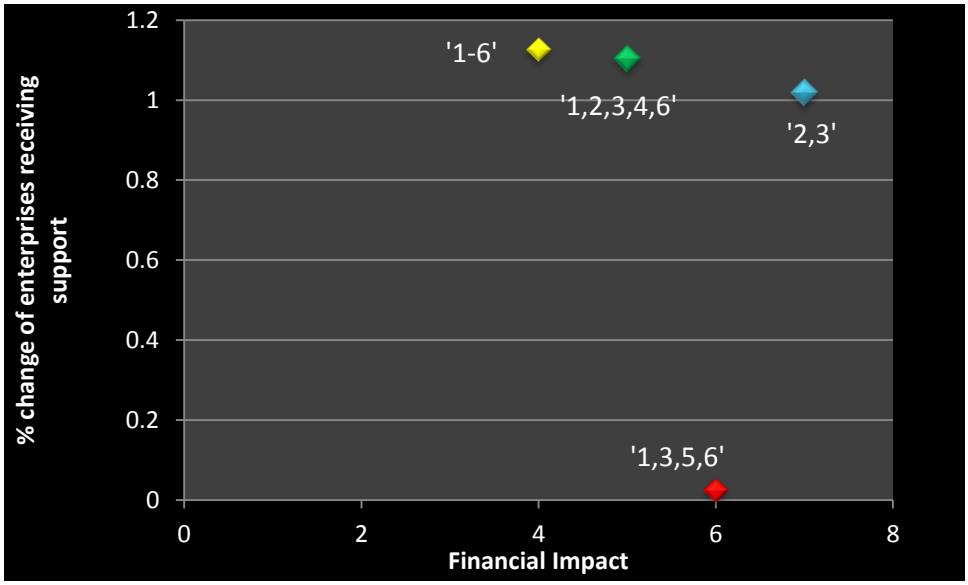
In certain cases the user may prefer to observe directly the output indicators associated to the selected portfolio rather than the value of the synthetic Non-financial Impact. This can easily be achieved and graphs 5-10 show how the three portfolios already examined, plus an additional portfolio (in blue) which is the one with the best financial performance, performs with respect to specific output indicators.

Graph 5. Non-financial output indicator – CO_2

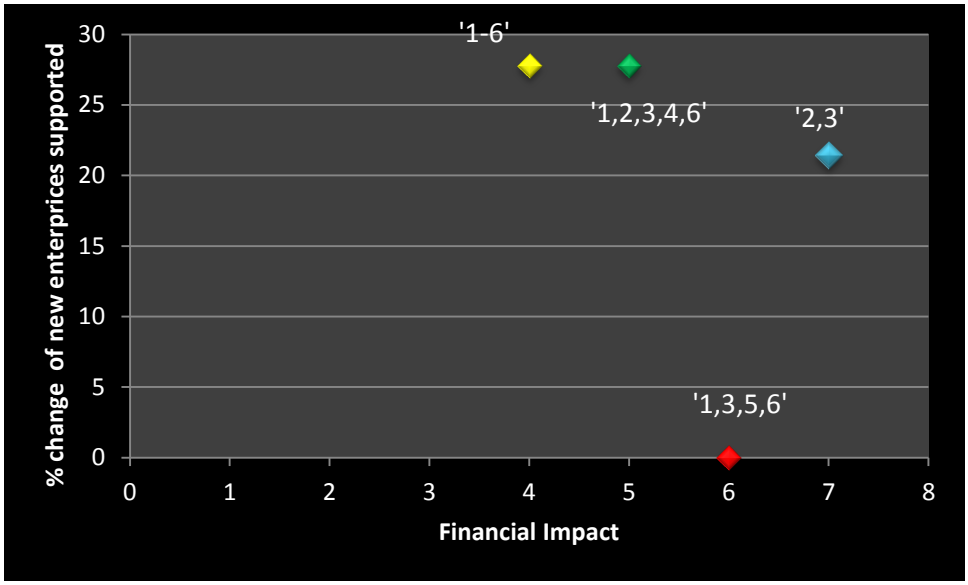


As can be seen from Graphs (5-10) the capacity to examine portfolio choices through the output indicators (vertical axis, expressed in % to ease the comparison) is an important feature of the model in the portfolio and project selection process. Moreover, it is useful when (as in the cases previously discussed) some projects are excluded from the portfolio and the user wants to modify the combination of projects. For example, the red portfolio has a very low value for raw output indicator 2, *number of enterprises receiving support*. Therefore, the choice to give a higher weight to the financial impact rather than the Non-Financial Impacts, as was done to obtain the red portfolio weakens the performance as measured by the number of supported enterprises in the portfolio. Similar discussions are possible for every portfolio and every indicator.

Graph 6. Non-financial output indicator – enterprises supported

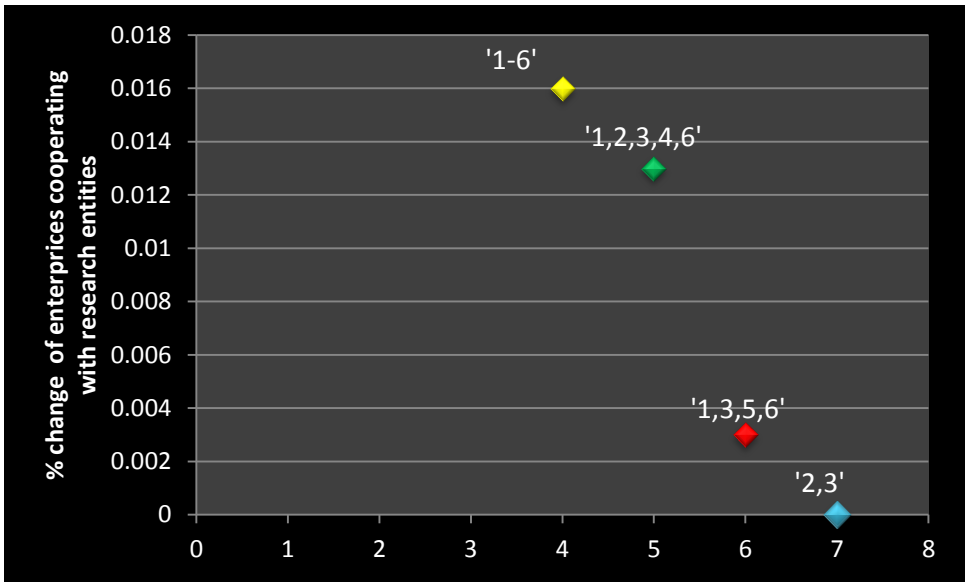


Graph 7. Non-financial output indicator – new enterprises

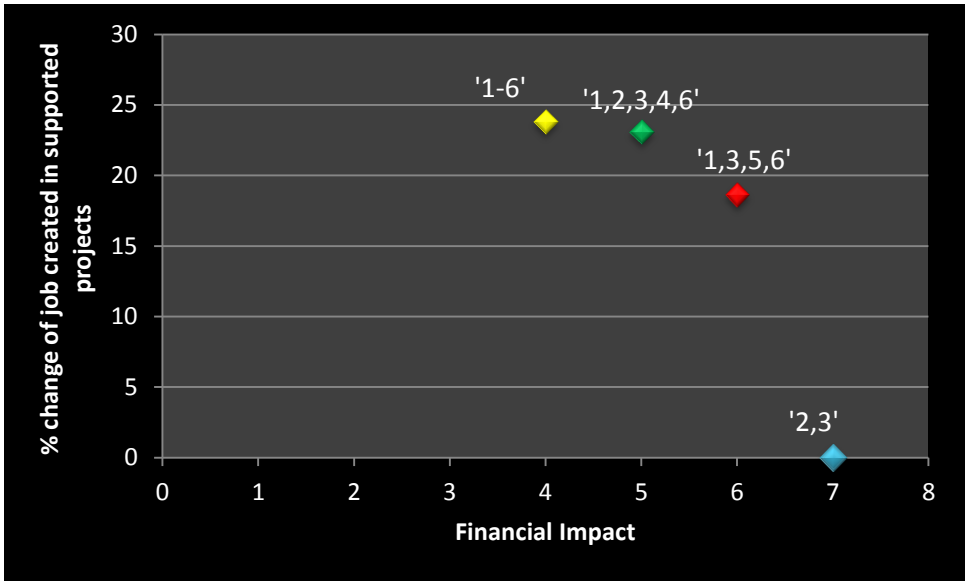


Another important advantage of examining the portfolios through the output indicators is that the user can more easily interpret the results in relation to his/her priorities and objectives. For instance, if we consider two portfolios, yellow and green, it is possible to observe that the yellow portfolio, which includes all the projects, has a higher value than the green portfolio on output indicator 4, *number of enterprises cooperating with research entities* (Graph 8). If, for instance, the user aims to leverage in the portfolio cooperation among enterprises and research institutions, he/she will therefore need to select the yellow portfolio rather than the green one.

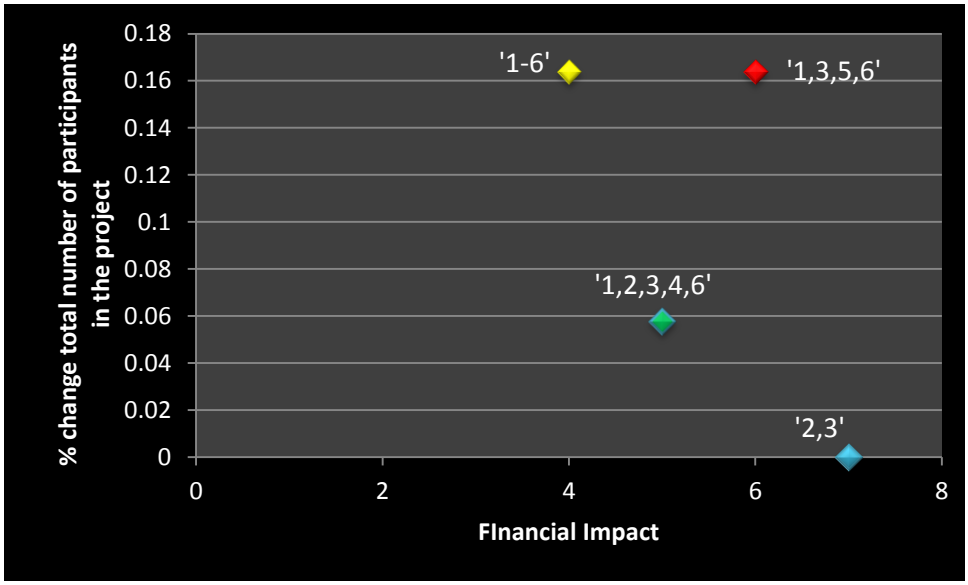
Graph 8. Non-financial output indicator – research cooperation



Graph 9. Non-financial output indicator – jobs created



Graph 10. Non-financial output indicator – project participants



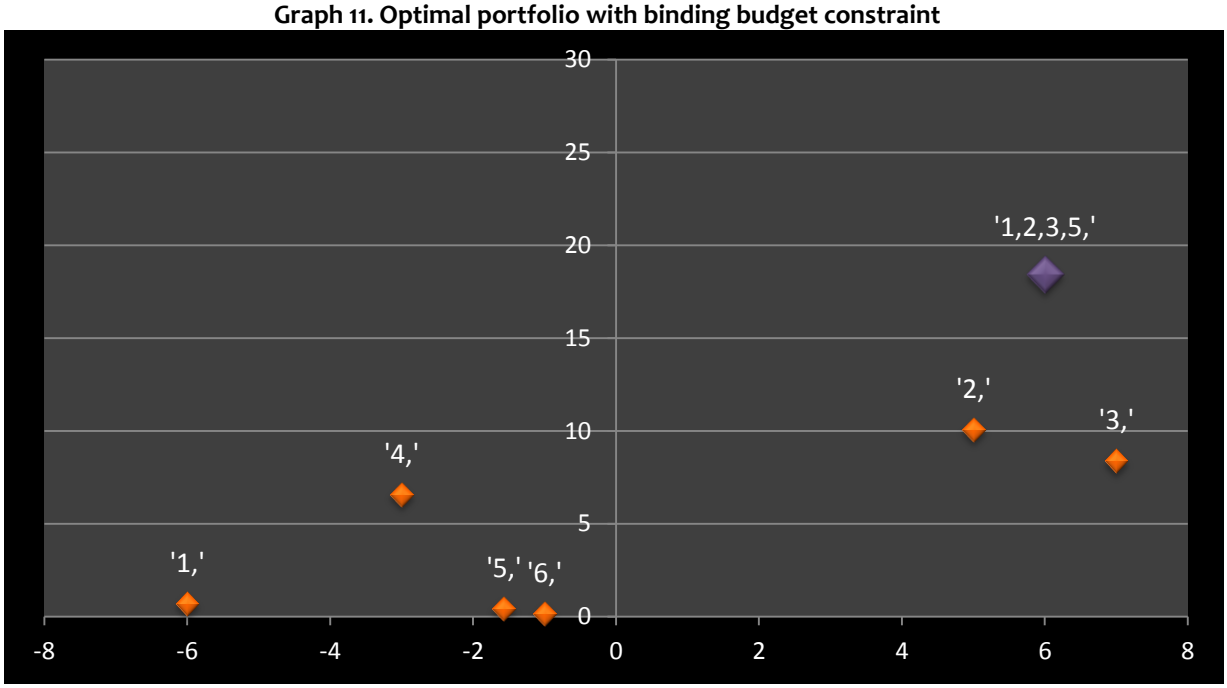
After having tested the capabilities of the portfolio structuring model through different portfolios with the use of the Financial Impact and Non-Financial Impacts and the Output Indicators, in the next section the portfolio structuring model is examined when a budget constraint is imposed.

5.3 Constrained Portfolio Case

As mentioned in section 4.4, it is possible to construct the portfolio when a budget constraint is imposed. In this case the model chooses the portfolio that maximizes financial and non-financial performance and is within the available budget. The overall cost for the 6 considered JESSICA projects is around €86.1 million. Let us assume that the budget is established at €67 million. Given this budget, the model selects as the

optimal combination of projects the portfolio composed by projects 1, 2, 3 and 5 (purple portfolio in Graph 11).

Graph 11. Optimal portfolio with binding budget constraint



In this case of constrained optimization, it is assumed that the financial and Non-Financial Impacts of the project are valued equally. As demonstrated in the unconstrained optimization, the user is free to adjust the weighting between the two dimensions and optimize according to preferred investment strategy. The user can also add new projects and rejected projects to the selected portfolio, and view the consequent changes to the financial and non-financial performance indices.

In conclusion, the portfolio structuring model is a tool that effectively achieves the combination of projects and can overcome the individual "silo" approach in making strategic and integrated investment decisions. The results obtained with real data from the 6 JESSICA projects show that the portfolio model is not only easy to implement and tailor to user needs, but thanks to its simple visualization, it also allows users to compare, assess and verify the projects in the portfolio relating them to the causal chain leading from output indicators to Non-Financial Impacts and the achievement of EU cohesion policy objectives.

6. Conclusions

Cities and regions in Europe are moving from traditional grant-based financing to revolving funds, including Financial Instruments, which is geared towards private sector participation. In this report we have stressed that in order to support this shift we need to create clear and robust technical support for MAs and Fund Managers. Against this background, we have developed and tested two models: the Non-financial (Economic) Impact Model, which aims to define a single and standard impact metric to assess the socio-economic and environmental benefits that a project can achieve, and the Portfolio Structuring Model, which considers the performance of a combination of projects that are expected to generate financial returns as well as positive socio-economic and environmental benefits.

The two models we have developed and tested fulfil three main goals:

- The definition of a **single value metric** for the assessment of the Non-Financial Impacts of a project.
- The **diversification of the project portfolio** in order to decrease financial risk and thus attracts private sector participation in urban investment.
- The **cross-subsidy process between projects** allows for the implementation of projects with low financial returns but with high Non-Financial Impacts, possibly helping to reduce grant requirements.

The methodology shows that not only is it possible to develop a practical decision-support system to assist stakeholders in assessing the performance of individual projects, but also how it is possible to combine projects into an integrated portfolio approach. The applications and thus the validation of the Financial and Non-Financial Impacts will support the Europe 2020 strategy, and is envisaged to enable Managing Authorities, cities and fund managers to deliver the 2014 - 2020 objectives through Financial Instruments. As a French general is said to have responded to his head gardener when told his plans for creating an oak forest would take hundreds of years, *"Quick then, we have not a moment to lose."*

Appendix 1: Notes on Methodology

First, given the data, it is necessary to contextualize each variable region by region. We start with the raw outputs of each project k, in each region h. These variables are r_{kh}. We will then apply a transformation on r_{kh} in order to obtain a percentage, depending on the region. We consider the value of the variable before the project and the contribution due to the project, and then calculate the percentage change, as follows:

$$o_{kh\,i} = \frac{r_{kh\,i}{}^{new} - r_{kh\,i}{}^{old}}{r_{kh\,i}{}^{old}}$$

The result is an a-dimensional number which can be written as (r-1), where r= $\frac{\mathrm{r_{kh\,i}}^{\mathrm{new}}}{\mathrm{r_{kh\,i}}^{\mathrm{old}}}$. Although we expect the reader to be aware of what the percentages are, we want to briefly explain here why percentages of different quantities can be summed altogether. First of all, a percentage is calculated from a ratio. Let us consider the case of CO2 consumption as the output of a project. CO2 consumption can be expressed, for instance, in pounds or kilograms, which is a quantity with dimensions. However, we can compare the output of the project, for instance, with the average CO2 output in the same country of similar projects of similar size. By taking the ratio of the project output to the national average amount, r, we obtain a number which is dimensionless. A number greater than one will imply that, from the environmental point of view, the project is sub-performing, and thus the quantity $\mathrm{I_{CO_2}}$= (1-r) will give an estimated positive impact when the number is greater than one. Since having an increase in CO2 emission is a negative impact, a ratio greater than one implies a negative impact, and thus (1-r) possesses the right sign. On the other hand, for quantities like employment, in which an increase would imply a positive impact, the sign has to be reversed, i.e. the impact takes the form (r-1). In fact, we can do the same in the case of employment by taking the average and calculating the impact in this manner, and thus constructing a vector of impacts formed by dimensionless numbers.

Before continuing, let us introduce the concept of vector. A vector is a mathematical object characterized by an index. Vectors can usually be recognized by the presence of an arrow on top of the representing symbol. Each entry of a vector has the same dimension, or, as it happens for the case of the portfolio structuring in the present document, has no dimensions. The operation of scalar multiplication of vectors of the same dimension is described as follows:

$\bar{\mathrm{i}} \cdot \bar{\mathrm{b}} = \sum_{\mathrm{i}} \mathrm{a_i} \cdot \mathrm{b_i}$

We now have to transform the vector of size N, i.e. the number of chosen outputs, to the thematic objectives vector, which is of size 11. This can be done through a matrix transformation on the index of outputs, of the form:

$$(\overrightarrow{s})_{k'h} = \sum_{k=1}^{N} T_{k'k}\,(\overrightarrow{o})_{kh}$$

Where $T_{k'k}$ is a stochastic matrix on the second index, i.e. $\sum_{k=1}^{N} T_{k'k} = 1$ for all k'. The index k' is associated with each thematic objective and thus runs from 1 to 11, while in principle k has size as the number of project outputs considered. The matrix T, which is of size $11 \times N$, is in principle decided a priori on the

number of outputs. The entries are values between 0 and 1, and represent the contribution of each project output to the thematic objectives.

Let us consider the quantity $I_t = \sum_i s_i$, which is the sum of elements of a vector brutally summed. This quantity will have the sum of all of the output indicator vectors. An overall vector whose sum is positive will imply that overall the project is having a positive impact. However, these quantities might have different importance and thus the user might want to weigh them. This can be done by introducing the strategy vector, in which these weights are introduced. Thus, the weighted impact can be written as $I_w = \sum_i s_i \ w_i$, where w_i are the weights for each project output of interest, and that in turn can be written as scalar product between the output indicator vector and the weights in the strategy vector.

It is possible to sum objects, as in the case of scalar multiplication, only if the quantity summed has the same dimension or, in contrast, the quantities are a-dimensional. A-dimensional quantities can be understood as ratios between quantities of same dimensions. For instance, percentage increases can be summed, as these are a-dimensional quantities. In the case of the portfolio structuring, the optimization occurs on percentage increases, and thus the economic index is indeed a benchmark of the percentage increase of the various quantities under scrutiny. The formula considered in the Non-Financial Impacts for instance, gives the sum of all the percentage increases (or decreases) of the result of a project. Thus, the scalar product formula is just weighting all the percentage increases of each project according to the strategy vector, which contains the weights (the importance) to be given to each single project output.

The analytical expression of the Non-Financial Impacts of the project, implemented in region r, as we have described, can be expressed by the following simple equation:

NON-FINANCIAL IMPACTS per region per project = $\sum_{k'=1}^{11} (\overrightarrow{s})_{k'h} \cdot \vec{w}_{k'} = I_h^{nf}$

Where:

k' is output indicator;

s_{kh} is the matrix containing all output indicators for the project in the region h corresponding to the 11 Thematic Objectives;

w_k is the vector of the weights of the output indicators of the project in relation to the 11 Thematic Objectives.

Appendix 2: Using the Quality of Governance Index

The Quality of Governance (QoG) Indicator was developed for the 27 EU Member States using World Bank 'World Governance Indicators' (WGI) EU data from the mid-1990s to the present (Charron et al., 2011). The four indicators used to construct the QoG indicator for each Member State are:

1. Control of corruption
2. Rule of law
3. Government Effectiveness
4. Voice of Accountability

The QoG Indicator has enabled Charron and his co-authors to build a transparent composite index representing the effectiveness of each country. In the examined case the indicator developed by Charron et al. (2011) is considered at the regional level (for 172 regions), given that the indicator can capture differences in the effectiveness of Governance at the sub-national level. To construct the indicator at the regional level, Charron et al. (2011) used a survey of 34,000 EU citizens from 18 countries. Citizens were asked to rate three public services: healthcare, education and law enforcement, with respect to 'quality, impartiality and level of corruption of each service' (Charron et al., 2011). Lastly, the authors combined the two levels of data to construct a European Quality of Governance (EU QoG) Index. The reason they combined the two is because they correctly assume that each region is affected by the national security system, immigration, and trade; and these elements are not captured by the regional survey.

The formula used to calculate the EU QoG index is the following:

$$EQI_{regionXincountryY} = WGI_{country} + (R_{qogregionXincountryY}\ CR_{qogcountryY})$$

where:

EQI is the European QoG Index;

WGI is the World Bank national average for each country;

Rqo is each region's score from the survey;

CRqog is the country average (weighted by regional population) for all regions within the country from the regional survey.