Enhancing at an Early Stage the Investment Value Chain of Energy Efficiency Projects

Deliverable 4.5:

Triple-A Benchmarking and Evaluation

May 2021

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TRIPLE-A

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Preface

Triple-A has a very practical result-oriented approach, seeking to provide reliable information answering on three questions:

- How to ***assess*** the financing instruments and risks at an early stage?
- How to ***agree*** on the Triple-A investments, based on selected key performance indicators?
- How to ***assign*** the identified investment ideas with possible financing schemes?

The Triple-A scheme comprises three critical steps:

- ***Step 1 - Assess:*** Based on Member States (MS) risk profiles and mitigation policies, including a Web based database, enabling national and sectoral comparability, market maturity identification, good practices experiences exchange, reducing thus uncertainty for investors.
- ***Step 2 - Agree:*** Based on standardised Triple-A tools, efficient benchmarks, and guidelines, translated in consortium partners' languages, accelerating and scaling up investments.
- ***Step 3 - Assign:*** Based on in-country demonstrations, replicability and overall exploitation, including recommendations on realistic and feasible investments in the national and sectoral context, as well as on short and medium term financing.

Who We Are

	Participant Name	Short Name	Country Code	Logo
1	National Technical University of Athens	NTUA	GR	EPU NTUA
2	ABN AMRO Bank N.V.	ABN AMRO	NL	ABN·AMRO
3	Institute for European Energy and Climate Policy Stichting	IEECP	NL	IEECP
4	JRC Capital Management Consultancy & Research GmbH	JRC	DE	jrc CAPITAL MANAGEMENT
5	GFT Italy srl	GFT Italy	IT	GFT
6	CREARA Consulting SL	CREARA	ES	creara
7	Adelphi Research Gemeinnützige GMBH	adelphi	DE	adelphi
8	Piraeus Bank SA	PB	GR	
9	University of Piraeus Research Center	UPRC	GR	TEESlab
10	SEVEn, The Energy Efficiency Center	SEVEn	CZ	SEVEn
11	Public Investment Development Agency	VIPA	LT	VIPA
12	National Trust Ecofund	NTEF	BG	NATIONAL TRUST ECO FUND

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Glossary

BMS:	Building Management System
CAPEX:	Capital Expenditure
DEEP:	Derisking Energy Efficiency Platform
EE:	Energy Efficiency
EEMs:	Energy Efficiency Measures
EFFIG:	Energy Efficiency Financial Institutions Group
ELECTRE:	ELimination Et Choix Traduisant la REalité
EPB:	Energy Performance of Buildings
EPC:	Energy Performance Contract
ESCO:	Energy Service Company
ESG:	Environmental, Social and Governance
EU:	European Union
EUR:	Euro
GHG:	Greenhouse Gases
HVAC:	Heating, Ventilation and Air Conditioning
IRR:	Internal Rate of Return
ISO:	International Organization for Standardization
KPI:	Key Performance Indicators
MCDA:	Multi-Criteria Decision Analysis
NA:	Not Applicable
NPV:	Net Present Value
PI:	Profitability Index
RES:	Renewable Energy Sources
SCOP:	Seasonal Coefficient of Performance
SDG:	Sustainable Development Goals

Executive Summary

The present report introduces the Triple-A benchmarking and evaluation methodology for assessing and categorising Energy Efficiency (EE) project ideas as potential investments to be undertaken by financing bodies. The result of the methodological application is the elaboration of EE project fiches which will be recognised and trusted by EE stakeholders. A special focus has also been given to identifying the most bankable projects that investors should consider for financing.

The presented report analyses the main steps, materials and methodology deployed to formulate the Triple-A EE ideas' Benchmarking. As expected, the proposed benchmarking is a multidimensional approach, as Triple-A supports projects in different sectors and all types of potential investors. So, the idea is to help investors choose the project(s) that fits better to their strategy in terms of CAPEX, technology, time, economic performance and other parameters. It has to be mentioned that the need for a benchmarking procedure and the value that the Standardised Triple-A Tools provide to the market has been proven by feedback received from numerous stakeholder engagement activities and presentations. Specifically, Triple-A Tools provide a complete and reliable solution for pre-evaluating, in no time, any energy efficiency project idea. This is important as it leads to the efficient identification of the bankable project ideas, setting up the frame, and providing background information for a discussion between the project developers and investors.

The benchmarking outcomes are also presented within the present report, along with feedback received by stakeholders and the next steps.

1 Introduction

Decision making in the field of capital investments in Energy Efficiency (EE) is a complex process, made even more complicated when considering the complexities of EE projects [1]. A benchmarking procedure could allow financing institutions and investors to set up their relevant investment strategy and handle demanding investments.

This report analyses the main steps, materials, and methodology deployed to formulate the Triple-A Benchmarking. The main methodological steps of the benchmarking procedure are analytically elaborated along with its main components such as Key Performance Indicators (KPIs), EU Taxonomy compliance and screening criteria, Risks, Decision-Making methods. This deliverable analyses the whole procedure, describing the KPIs selection for the efficient benchmarking of EE investments. The benchmarking results are also presented, along with feedback received by stakeholders and the next steps.

Aside from the Introduction section, the deliverable is structured as follows. In Chapter 2, the context and benefits of the Benchmarking procedure are analysed, while in Chapter 3, the Benchmarking Methodology is presented. Chapter 4 presents the main characteristics and parameters used in the Triple-A Benchmarking. In Chapter 5, the procedure results are described, while Chapter 6 holds the conclusions and next steps.

2 Understanding of the Context and Benefits of Benchmarking

Standardisation is an essential element in various sectors in order to avoid conflict, duplication of effort and establish a common language and framework between different key actors. Even though the EE sector has been set as a high priority for the European Union (EU), it lacks standardisation, common frameworks and methods among interested parties. Standardisation in EE is also critical since EE investments are usually not being realised due to a lack of common understanding between stakeholders (e.g. project developers and investors). In addition, standardisation builds trust between investors and project developers and facilitates the underwriting procedure, which often fails to be completed. Usually, EE project fiches not evolve proper investment ideas due to the lack of a common framework on which projects are considered profitable and merit attention by the financing institutions. Even so, it has to be stressed out that financing institutions mainly evaluate the creditability of a company (profitability and ability to return investment) rather than the project itself.

Implementing EE measures provides numerous environmental and social benefits, apart from the obvious monetary savings, such as the mitigation of energy poverty, the increase of energy security and the achievement of pan European and international sustainable goals, as of the Paris Agreement's and the UN's Sustainable Development Goals (SDGs). Having in mind their importance, effects, and overall impact, it should be clear why EE investments are considered "non-standard" and why they should not be evaluated by "normal" investment criteria [1].

Researchers, EU funded projects and companies around Europe have tried to set the ground and propose benchmarking and standardisation methods for EE project ideas. Various examples could be referenced, such as the LAUNCH project [2], which aims to accelerate deal closure and pipeline growth for Sustainable Energy Assets through standardised material. Similarly, the RenonBill project [3] provides tools to address the residential sector's energy renovation financing demand and assesses and bundles investments based on a transparent methodology. Furthermore, the Energy Efficiency Financial Institutions Group (EEFIG) has developed the EEFIG Underwriting Toolkit [4] to assist financial institutions in scaling up their capital deployment into EE. EEnvest project's [5] objectives are to secure investors´ trust in EE actions for existing buildings by developing a combined technical-financial risk evaluation framework focused on the renovation of commercial buildings. Also, E2DRIVER [6] project is developing a training platform that will boost the collective intelligence of the automotive industry on EE. The platform will also include energy and financial tools to be used by companies. In the scope of certification, X-tendo [7] and its toolbox introduce ten features of the next generation of energy performance certificates to provide public authorities with improved compliance, reliability, usability and convergence of next-generation energy performance assessment and certification.

In the following table, a complete list of relevant H2020 projects is presented in which tools have been developed regarding the standardisation and evaluation of EE projects.

Table 1: List of relevant H2020 Energy Efficiency (EE) projects

Project	Benchmarking and standardisation approach
AmBIENCe	Provides new concepts and business models for performance guarantees of Active Buildings, combining savings from EEMs with additional savings and earnings resulting from the active control of assets leveraging, for instance, price-based incentive contracts (Implicit Demand Response).
ComAct	Develops and adapts financial tools that provide financing for low-income families.
DEESME	Provides integrated tools to increase the awareness of all companies, motivate and support them in adopting EE solutions and finally support investments, filling the gap between the audit and the implementation of actions in large companies and SMEs.
E2DRIVER	Develops a training platform that will boost the collective intelligence of the automotive industry on EE. The platform will also include energy and financial tools to be used by companies. In the scope of certification
E2DRIVER	Develops tools to increase the collective intelligence of the automotive sector in EE and energy auditing
EeDaPP	Designs and delivers a market-led protocol to enable the recording of data relating to energy-efficient mortgage assets and which will be made accessible via the design of a common data portal.
EEFIG	Maintains the EEFIG Underwriting Toolkit to assist financial institutions in scaling up their capital deployment into EE.
EEnvest	Secures investors´ trust in EE actions for existing buildings by developing a combined technical-financial risk evaluation framework focused on the renovation of commercial buildings.
EN-TRACK	Creates a one-stop-shop platform with standardised data related to the EE performance of the public and private building stock. Enabling interoperability with the most currently active databases and tools will lead to an unambiguous data exchange-based services ecosystem with low transactional costs.
EU-GCC Clean Energy Network	EU-GCC Clean Energy e-Observatory is an online information service aiming at providing and presenting, in an organised manner, information material on clean energy developments in the GCC and the EU.

EXCITE	Delivers a tool for attraction of additional private investment in energy and climate actions by local authorities.
iBroad	Delivers a tool for the evolution of the Energy Performance Certificates (EPCs) and energy audit systems, building renovation roadmaps will serve as a tool outlining a customised renovation plan with a long-term horizon for the deep step-by-step renovation of individual buildings (iBRoad-Plan), combined with a repository of building-related information (logbook, iBRoad-Log).
ICCEE	Designs and delivers a dedicated cold supply chain EE tool to support the decision-making processes of the supply chain companies in estimating their energy-saving potential,
LAUNCHs	Accelerates deal closure and pipeline growth for Sustainable Energy Assets through standardised material
NOVICE	Develops a Tool to assess your buildings potential to adopt a process such as the NOVICE dual services model. Input the type of HVAC systems in your building below to receive advice and information on a specific combined EPC. The NOVICE model is a dual service business model, combining traditional EPCs with a demand-side response for a combined revenue stream.
Persephone	Develops the integrated PERSEPHONE platform, a set of personalised applications, as well as the pilot validation and performance evaluation, results in real settings close to small offices and houses environment.
POWERPOOR	Energy Poverty Mitigation Toolkit aims at providing an integrated solution to users and supporting them in identifying whether they suffer from energy poverty. In case that they do, the Tool can propose changes (behavioural or low-cost EE interventions) they can take to improve their wellbeing. Finally, the Tool can propose customised solutions regarding their involvement funding proposing the users' involvement in innovative funding schemes such as crowdfunding or participation in energy cooperatives.
QualitEE	Develops quality assessment criteria and assurance schemes that you can use with your clients to improve the outcome of their EE services investments. Improving service quality and trust aim to increase demand for EE services and associated consultancy work.
Quest	Develops a reliable and clear methodology for evaluating the risks associated with energy-efficient and sustainable buildings investments by integrating effective quality management services into these projects.

RenonBill	Develops tools to address the residential sector's energy renovation financing Demand and assess and bundle investments based on a transparent methodology
SENSEI	Develops a tool to combine pay-for-performance (P4P) arrangements with the Energy Performance Contracting (EPC) model and engages in negotiation games with preliminary stakeholders.
SMARTER Finance for Families	Develops a Street Lighting Financing Tool (SLFT) so that municipalities can find out the most suitable financing scheme for their Street Lighting project and an Online Assessment Tool can support estimation and analysis of the potential energy and CO2 savings, as well as providing a straightforward cost-benefit overview for any locality, city or country based on their current street lighting technologies.
SMEm Power Efficiency	Develops 4 long-lasting training tools: an advanced training handbook in 7 languages, a web platform for energy analytics, a tool for Monitoring & Targeting, a tool for Measurement & Verification.
SocialWatt	SocialWatt analyser helps utilities and energy suppliers efficiently identify energy-poor households. The Tool is designed in a way so that the user does not require neither specific expertise / technical skills nor substantial resources (financial, human, and computational). SocialWatt Plan enables utilities to develop innovative schemes to alleviate energy poverty by identifying EEMs and renewable energy actions, evaluating their performance in terms of long-term energy savings, sustainability, risk, and investment return. SocialWatt Check assists utilities and energy suppliers in effectively monitoring schemes' effectiveness and evaluating their impact in EE and renewable energy production.
StreamSave	Develops a user-friendly online platform to facilitate the exchange of knowledge and experiences among stakeholders. This platform will provide all stakeholders with access to a community of experts and resources to better implement energy savings calculation methodologies. The streamSAVE platform will become a central point for experts searching for information and their peers on Priority Actions.
Triple-A	Triple-A Standardised Tools facilitate project developers to benchmark their projects in a standardised way (Assess & Agree Tool), while also provide a hub to financers, bankers, and investors (Assign Platform) to finance bankable green projects.

U-CERT	Facilitates convergence of quality and reliability, using the EPB standards developed under the M/480 mandate, presenting the national and regional choices on a comparable basis.
X-tendo	Develops a toolbox with features of the next generation of energy performance certificates to provide public authorities with improved compliance, reliability, usability and convergence of next-generation energy performance assessment and certification.

The Triple-A benchmarking methodology, which is materialised by the Triple-A Tools, brings a new approach to the evaluation of EE projects. The methodology aims to set the pace for EE project developers and investors to establish a consensus on which EE potential investments are bankable. Unlike other approaches, the Triple-A methodology establishes an integrated approach, especially in terms of variety of investors and financing options, taking into consideration all possible benefits of EE investments, providing awareness concerning their compliance with the EU Taxonomy, deploying KPIs and thresholds broadly used by the EE and financing sector, and providing a hub in which these projects could be financed.

3 Overview of the Triple-A Benchmarking Methodology

3.1 General Information

The Triple-A benchmarking methodology aims to roll out a standardised procedure toward identifying attractive project ideas for investors, funds, and other financing institutions. The benchmarking deploys outcomes that have emerged from lessons learnt, databases of already financed projects, and stakeholders' consultation to ensure that the evaluation is in line with the market needs. The Triple-A benchmarking is being reified through the Triple-A Tools [8], which provide a one-stop-shop approach for stakeholders, facilitating project developers to benchmark their projects in a standardised way while also providing a hub to financers, bankers, and investors to identify and evaluate bankable green projects. To verify the Triple-A benchmarking, a pipeline of at least 100 EE financially attractive projects has been identified, tested through the Triple-A Tools, while feedback on the benchmarking results has been received from relevant key actors. In addition, for almost all projects, a cross-evaluation of Triple-A tools outcomes has been realised. The information provided directly from key stakeholders is reported in the templates of deliverable D5.1 Developing of Energy Efficiency financially attractive projects' pipeline.

3.2 Defining Assessment Framework

Identification of the main axes needed to be assessed
 	
• Literature review.
• Triple-A stakeholders' consultation.
• Identification of EE project characteristics, such as project sectors and countries.
	Identification of main assessment means and indicators
	
	• Definition of the KPIs.
	• Definition of the multi-criterial decision support methodological steps.
	• Definition of the EU Taxonomy compliance thresholds.
		Assessing of EE investment ideas
		
		• Triple-A stakeholders' consultation.
		  ○ Bilateral Meetings
		  ○ Information gathering via questionnaire and online survey tools.
		• Filtering of collected projects.
		• Insertion of the projects into the Triple-A Tools.
		• Evaluation of the benchmarking.

In this step, the main assessment needs, sectors, projects and countries are defined to serve the purposes of the evaluation.	In this step, the basic benchmarking system characteristics and input needed have been defined.	In this step, the actual assessment of the selected projects is being performed, followed by the evaluation of the benchmarking results. The stakeholder consultation plays an essential role throughout the step realisation.

The first step focuses on identifying the main axes needed to be assessed for the smooth and effective establishment of the assessment framework, beginning with a literature review of best practices, similar applications, and methodologies. Then follows the Triple-A stakeholder's consultation process, which is a fundamental pillar of the methodology, providing valuable feedback. Finally, the identification of EE project characteristics, such as the project sectors and countries incorporated in the benchmarking, is realised. Overall, the first step entails defining the main assessment needs, sectors, projects, and countries to fulfil the evaluation's objectives.

Within the second step, all the parameters that have to be set for the evaluation procedure are determined. Namely, the KPIs and the multi-criteria decision support methodological steps to be used have been decided, as well as the EU Taxonomy technical criteria thresholds that will be used to check the projects' compliance. The scope of establishing the EU Taxonomy check is to raise awareness of the new regulation, avoid greenwashing, set the minimum expected environmental performance goals, and help investors that prefer to invest in sustainable projects.

The final step is the core of the presented study, in which the assessment of the selected projects is being performed, followed by the evaluation of the benchmarking results. The key role for the evaluation has been the stakeholder consultation that has been realised within Triple-A projects' activities. Stakeholder engagement plays the most crucial role throughout this step's realisation and to properly fine-tune and define the benchmarking methodology and incorporate it in the Triple-A Tools calculation algorithms. This interaction results in the optimisation and personalisation of the Tools to the stakeholders' needs. The optimisation is considered critical, as the Tools are the principal mean through which the connection of the project developers and investors is achieved.

Along with the consultation, the filtering of the collected projects and the insertion of these projects into the Triple-A Tools has been performed. The consultation has been realised by utilising various methods, such as bilateral meetings and structured interviews, information gathering via questionnaires and online survey tools, and workshops. The whole procedure has been done repeatably, taking into account a wide range of relevant comments and suggestions. The Triple-A team is committed to continuously improving the methodology to provide the optimum benchmarking, through a practical way, taking advantage of the Triple-A Tools.

3.3 Triple-A Benchmarking Methodological Steps

The primary methodological steps for the effective benchmarking of the EE projects are presented in the following graph:

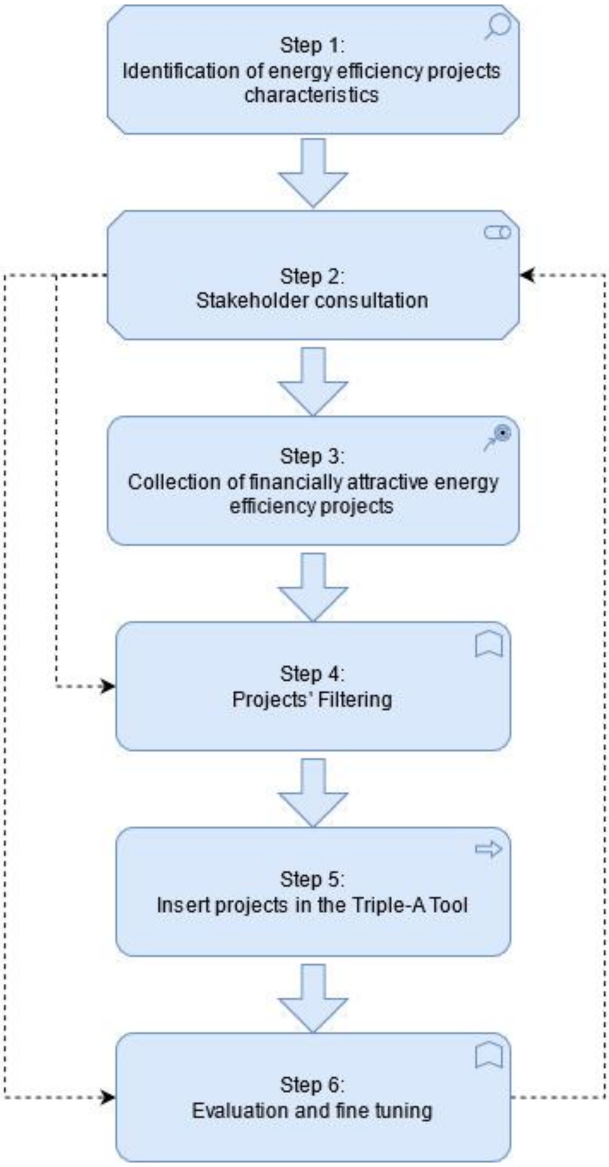


Figure 1: Benchmarking Methodological Steps

Step 1: Identification of EE projects characteristics

The characteristics of the projects have been identified by consultation among project partners in order to spotlight the project's aspects that are the most critical for the project's future technical and financial performance. The characteristics that have been prioritised are shortly presented below.

Technical data

In general, EE projects should fulfil the EU Taxonomy Technical Report requirements. In the section below, the essential data that should be collected are presented:

Buildings

The technical parameters that are being collected are:

- Technology(ies) used (for example, heat pump and heat wheel recovery system)
- Energy performance characteristics for new construction/equipment (for example, luminous efficacy of lamps / luminaires, EPC for new buildings)

In case of building renovations:

- The baseline of building's energy consumption before the renovation
- Estimated energy consumption of the building, after the renovation
- Preferably information on CO_{2eq} emissions, before and after the renovation

In case of replacement of equipment:

- Energy coefficient of performance of existing equipment
- Energy coefficient of performance of new equipment

Manufacturing

The economic activities covered in the "Manufacturing" sector include both 'greening of' and 'greening by' activities.

'Greening of' activities are those that account for a high share of industrial GHG emissions and offer significant potential for GHG emissions reductions. This category includes the following manufacturing sectors: aluminium, iron and steel, cement and chemicals.

The technical parameters expected to be collected from "Greening of" activities:

- Scope 1: All direct emissions related to the production per unit (tCO2e/t) (the process direct emissions and the emissions due to fuel use for energy production or electricity consumed)
- Scope 2: Electricity indirect GHG emissions. Indirect emissions from the use of electricity during the production process

In case of manufacture of aluminium:

- Scope 2: Electricity consumption for electrolysis process and related emissions from the generation of the electricity used

In case of manufacture of Chlorine:

- Electricity use for chlorine manufacturing
- Average carbon intensity of the electricity that is used for chlorine manufacturing

In case of manufacture of organic metals:

- Carbon footprint
- Portion of production derived from renewable feedstock

'Greening by' activities include the manufacturing of low carbon technologies. For this, no criteria on the GHG emissions from manufacturing are given because the benefits these lead to are considered to outweigh their emissions.

The technical parameters collected from "greening by" activities include:

- Type of renewable energy or sectors products, components, equipment and machinery manufactured
- Estimated GHG emission reductions

In case of manufacture of vehicles, fleets and vessels:

- Carbon emission from the vehicles, fleets or vessels

In case of manufacture of energy-efficient equipment for buildings:

- Energy performance characteristics of equipment and their components

Transportation

The technical parameters that are being collected include:

- Type of land transport activities (e.g. light rail transit, metro, tram, trolleybus, bus and rail)
- CO_{2e} emissions per tonne-kilometre (gCO_{2e}/tkm)
- In the case of passenger cars and light commercial vehicles:
- Vehicles' tailpipe emission intensity

District Heating / Cooling

The technical parameters that are being collected are:

- Percentage of renewable energy / waste heat / cogenerated heat or the combination of such energy and heat used in the district heat/cool system or the operating facility
- Emissions related to the production of electricity (gCO_2 per kWh) of power generation technologies
- The power-to-heat ratio of the cogeneration/production of heating/cooling and power technology
- In case of operations with heat pumps:
- Seasonal coefficient of performance (SCOP) of the heat pump

Outdoor lighting

The technical parameters that are being collected are:

- EE label of lighting appliances
- Quality parameters (specified in EN 13201)

In case of renovation and/or expansion of existing outdoor lighting installation

- The baseline of outdoor lighting energy consumption before the renovation
- Estimated energy consumption of the outdoor lighting after the renovation
- Preferably information on PDI and AECI (defined in EN 13201-5), before and after the renovation

Economic data

The economic parameters, which are being collected are:

- Type of asset owner (public, private)
- The total CAPEX of the investment (investment size)
- The percentage of the CAPEX that refers directly and indirectly to EEMs

- The financing tool(s) / structure that is foreseen and, if possible, their major characteristics (interest rate, maturity, collateral type – if any)
- Total Investment Cost of EEMs (€)

Proposed Economic performance KPIs:

- Simple Payback Period
- Net Present Value
- Internal Rate of Return (IRR) - optional

Step 2: Stakeholder consultation

The stakeholder consultation process regarding the Triple-A Benchmarking has been realised utilising via the utilisation of various means. During stakeholder consultation, Triple-A Tools demonstration and testing have been conducted. In bilateral meetings and small workshops, EE stakeholders have participated, such as EE companies and project developers, as well as for financers interested in sustainable financing. The meetings have been implemented in the local languages of the Triple-A case study countries, facilitating stakeholders to participate actively and engage with the Triple-A project, breaking the language barriers. Through the 60 bilateral meetings and the 15 Advisory Board Member meetings, 557 Stakeholders have been identified, while 72 have been actively engaged.

Feedback on the Triple-A Methodology has also been received from 198 stakeholders, disseminating four Triple-A questionnaires. The questionnaires have been designed in such a way as to cover all aspects of the Triple-A Benchmarking Methodology and to receive as most feedback as possible by the stakeholders. The questionnaires are listed below:

1. Questionnaire for Building Sector (indicative target groups: Companies / Project Developers with building stock portfolio, Other Property Valuers, Real Estate Agents, Notaries)
2. Questionnaire on EE Financing Risks & Evaluation Criteria (indicative target groups: Financing Bodies, Companies / Project Developers, Researchers and Academia in Businesses and Techno-economic fields, Other)
3. Questionnaire on EE Financing Schemes (indicative target groups: Financing Bodies, Companies / Project Developers)
4. Questionnaire on Investors Preferences on EE Investments (indicative target groups: Financing Bodies)

Step 3: Collection of financially attractive EE projects

The projects have been collected through direct contact of Project's Partners with project developers in various countries, in two ways: (i) by using the Triple-A Tool and (ii) by feeling a predefined template (foreseen by the Triple-A's project Task 5.1: Pipeline of Energy Efficiency financially attractive projects). Doing so, it was able to have all the needed information and compare the economic performance indicators estimated by the Triple-A Tool and the developers. Thus, has been done a quality control of the input data provided by the users and an extensive debugging and optimisation of the Tool, using real projects data.

Step 4: Projects' Filtering

To set up a pipeline of comparable projects, the expected projects were expected to have a number of minimum requirements. For each sector identified, for the Benchmarking Methodology, appropriate criteria, and presented with a Go/No-Go) approach. The criteria for each sector are:

Building Sector

Installation of renewables on-site and professional, scientific and technical activities and individual renovation measures

- Minimum investment size: 100,000 EUR
- Maximum simple payback time[1],
    - On-site renewable energy installations: 20 years
    - HVAC (except BMS and metering systems): 15 years
    - Lighting: 12 years
    - BMS and metering systems: 12 years
    - Building skin elements: 25 years
- Taxonomy compliance

Major building renovations

- Minimum investment size: 100,000 EUR
- Maximum simple payback time: 25 years[2]
- Taxonomy compliance

Construction of new buildings

- Minimum investment size: 200,000 EUR
- Maximum simple payback time: 60[3]
- Taxonomy compliance

Manufacturing sector

Any investment should:

- achieve or contribute to significant improvement (in terms of market innovation) of the EE of equipment, machinery or/and renewable energy systems, taking into account the relevant EU Ecolabel Regulation[4] (where applicable). At the same time, the enchasing performance should be proven through the use of relevant EU or international standards from accredited laboratories.
- Achieve significant improvement of the EE and reduction of GHG emissions per unit of product of existing industrial or/and manufacturing production lines or/and procedures. In contrast, the improvement should be demonstrated by providing an appropriate energy audit in accordance

[1] For simplicity reasons only 4 values are proposed. Especially for building skin elements the proposed value is shorter from the Average life expectancy of most of buildings' components

[2] Maximum common practice for a bank loan, as there is no reference on the maximum payback period

[3] As long as the new buildings is mandatory to be nZEB, the payback period will be estimated taking into account the national average energy consumption for buildings.

[4] Regulation (EC) No 66/2010 on the EU Ecolabel.

with EN 16247. In case of new production lines or/and procedures, the energy intensity of the line(s) should be compared with common market practice.

Transportation Sector

Public transport Sector

- Minimum investment size: 1,000,000 EUR
- Maximum simple payback time: 6 years
- Taxonomy compliance

Passenger cars and light commercial vehicles

- Minimum investment size: 100,000 EUR[5]
- Maximum simple payback time: 6 years
- Taxonomy compliance

District Energy Networks

- Minimum investment size: 1,000,000 EUR
- Maximum simple payback time,
  - New constructions: 40 years
  - Existing: 20 years
- Taxonomy compliance

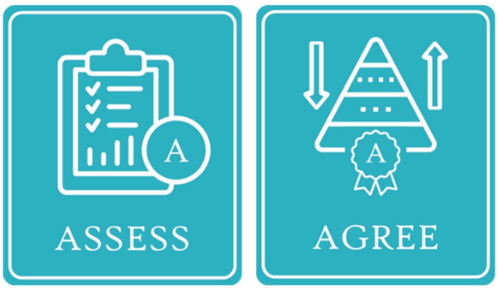
Outdoor Lighting

- Minimum investment size: 200,000 EUR
- Maximum simple payback time: 12 years
- Compliance with criteria proposed by Triple-A

Step 5: Insert projects in the Triple-A Tool.

All projects have been inserted into the Triple-A Assess and Agree Tool from the project developers, as they had to be provided information on:

- specific issues related mainly to risks estimation and
- energy performance information, even it has to be provided by filling the template of Task 5.1 too.



Especially for the district heating systems, in some cases, the Triple-A Tool could not estimate the potential benefits. This happened in the cases that the project has foreseen the replacement of the energy source - fuel, which provides insignificant or even zero energy savings. However, fuel's

[5] The minimum investment size excludes individuals (buying just one vehicle) for Triple A project partners. In the future, support the replacement of taxi vehicles could be reviewed and added.

replacement could provide primary energy, CO_{2eq} and money savings. To resolve such problems, the Triple-A Tool user should be allowed to input the CO2eq and money savings of the project directly.

Step 6: Evaluation and fine-tuning

The main scope of the Task is the evaluation and fine-tuning of projects benchmarking, and in practice, the optimisation of the Triple-A Assess and Agree tools in order to support the users to filter the projects that fit better to their expectations. The evaluation has been done, assuming that investors tend to invest in projects with a specific size and/or technology and/or expect them to have a maximum repayment period/exit and/or be implemented in a particular country.

- cross-checking Triple-A Tools outputs and the information provided from the project developers through the template of Task 5.1 or direct contact with them,
- checking Triple-A Tools outputs in relation to the expected lifetime of the foreseen measures,
- intercomparison of projects with similar CAPEX,
- intercomparison of projects foreseen similar EE renovation measures – technology,
- intercomparison of similar projects (sector, technology, CAPEX), implemented in different countries.

4 Triple-A Benchmarking

In this section, the benchmarking procedure is described. The methodology, input data, KPIs, and possible results of the benchmarking procedure are presented. The possibility to change the benchmarking weights, so each investor can set up its relevant investment strategy and, thus, handle EE investments has to be highlighted.

The KPIs and the threshold of the pilot phase, along with the assessment framework and the questions of the benchmark survey used for the benchmarking, will be presented and described.

4.1 EU Taxonomy

The establishment of the EU Taxonomy constitutes a decisive action from the EU that aims to establish a standardisation system for sustainable energy investments, enabling investors to re-orient investments towards more sustainable technologies and businesses. The Triple-A benchmarking screens the EU Taxonomy compliance of the candidate projects by filtering and identifying the EU Taxonomy Technical screening criteria based on the project's sector. The EU Taxonomy criteria include technical thresholds regarding the Environmental performance of the projects. Outdoor lighting projects are not yet covered by the EU taxonomy. For consistency to other sectors, a relevant list of quantitative and qualitative criteria has been set, which are expected to ensure the projects' high technical and environmental performance.

All projects included in the methodology will be assessed for their EU Taxonomy compliance. The non-EU taxonomy compliant project is not excluded from the projects pipeline, though they are marked with a respective indication to highlight the compliant projects and inform stakeholders, respectively. The scope of setting the EU Taxonomy check is to raise awareness of the new regulation, avoid greenwashing, set the goal of the minimum expected environmental performance and help investors. This could be helpful for investors that that prefer to invest in sustainable projects.

4.2 Risk Assessment

The benchmarking methodology takes into consideration the total risk of the project under evaluation. The risk is calculated from specific risk factors, classified over five generic risk categories, as these have been identified by the Triple-A methodology [9]. These risk categories are analysed below:

- **Financial** risk category is related to the creditworthiness of the applicant for the loan/financing.
- **Behavioural** risk category is related to the rebound effect that can exist in the context of the inspected EE investment.
- **Energy Market & Regulatory** risk category is related to the energy prices and taxes volatility of the country in which the investment takes place and the request for issuing work permits that may exist in the context of the inspected project.
- **Economic** risk category is related to the economic environment of the country that the investment takes place.

- **Technological, Planning and Operational** risk category is related to the technical complexity, the initial savings assessment, the implemented equipment, the project design, and the Operation & Maintenance (O&M) of the inspected project.

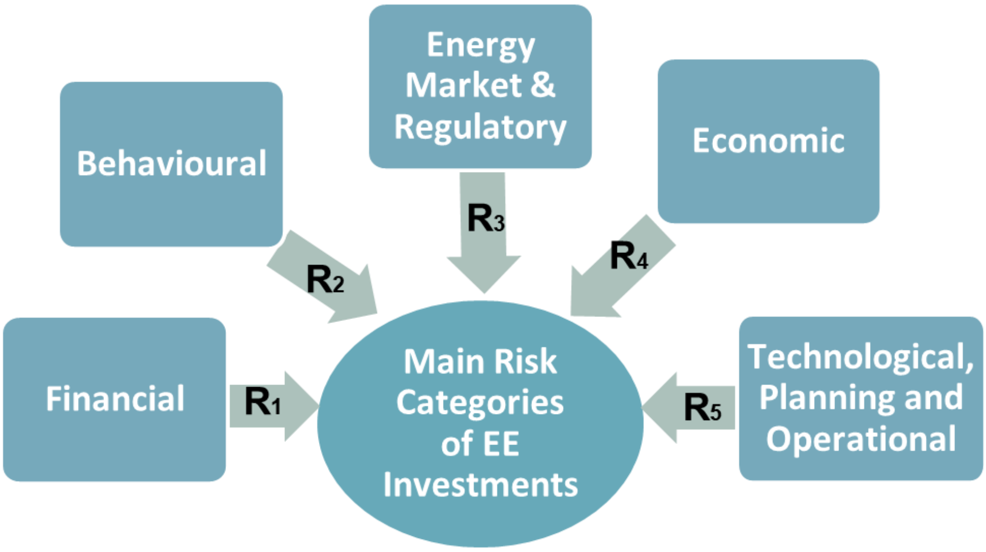


Figure 2: Risk categories in EE Financing

In addition, the **Country risk** is also taken into account. The total aggregated risk is calculated by averaging the values of the risk factors of which each category is composed. The total project's risk value is the weighted arithmetic mean of the risk categories' values.

4.3 Financial Key Performance Indicators

Within the framework of the Triple-A methodology for evaluating and benchmarking EE projects, several different financial KPIs were reviewed to select the most appropriate ones that better match our problem's needs and dimensions. For more information, please refer to the Triple-A project's report "Deliverable D4.2: Final Standardised Triple-A Tools[6] ". Please note that the estimated financial KPIs could differ significantly from those estimated by the projects' developers. This is reasonable and acceptable as long as developers could provide a more detailed and accurate analysis for each project. The provision of the KPIs, estimated by the Triple-A Tools, is used for simplicity, in order to focus on common indicators for achieving the benchmarking and finally, to facilitate the successful connection of projects' developers and investors.

[6] D4.2 Final Standardised Triple-A Tools: https://aaa-h2020.eu/sites/default/files/reports/D4.2%20Final%20Standardised%20Triple-A%20Tools.pdf

In the following table, the Financial KPIs that the Triple-A Benchmarking utilises are presented.

Table 2: Financial Key Performance Indicators (KPIs)

	Name	Description
A_1	*Net Present Value (NPV)*	NPV reflects the risk and cashflows discount by quantising it through the discount rate the profitability of the investment, by involving in the calculations the yearly income. It also reflects the operational costs and the initial investment.
A_2	*Discounted Payback Period*	The discounted payback period is the number of years necessary to recover the project cost of an investment while accounting for the time value of money. It is recommended since it allows for a quick assessment of the duration during which an investor's capital is at risk.
A_3	*Internal Rate of Return (IRR)*	IRR is a rate of return used in capital budgeting to measure and compare the profitability of investments. IRR provides a straightforward mean to compare different projects associated with benefits and risks.
A_4	*Cost-Effectiveness (or Avoidance Cost)*	Cost-effectiveness in its simplest form is a measure of whether an investment's benefits exceed its costs. In the proposed methodology, the Cost-Effectiveness is calculated based on the project cost per kWh saved during the average lifetime of measures.

4.4 Decision Making Process

The Triple-A Benchmarking is based on a Multi-Criteria Decision Analysis (MCDA) method, a general framework for supporting complex decision-making situations with multiple and often conflicting objectives that stakeholders groups and/or decision-makers value differently [10]. The benchmarking procedure exploits four (4) criteria which consist of several performance indicators (financial, SDG, and risk-related). In detail, the first two criteria are financial (K_1 & K_2), followed by one for aggregated risk of the project (K_3) and one SDG criterion (K_4).

The standardised procedure is conducted through the implementation of the ELECTRE Tri MCDA method. ELECTRE Tri is an MCDA method used for classification problems and, more specifically, in discrete classification problems, where the alternatives of the problem should be classified into predefined categories. The classification is made using pair-wise comparisons between the alternatives and the reference profiles based on concordance and discordance checks [11;12].

The KPIs used as criteria are either calculated based on EU Directives and Regulations on Cost-Benefit Analysis of Investment Projects or reflected directly from EU official statistics to provide a standardised, unbiased result. This builds confidence among investors and facilitates financing bodies and EE funds to rapidly detect and aggregate projects that meet the necessary financing criteria.

Financial criteria: A group of two Financial KPIs are applied, selected by the stakeholder to provide a personalised and flexible benchmarking.

Aggregated risk criterion: The value of the total risk of the investment, described in the previous section.

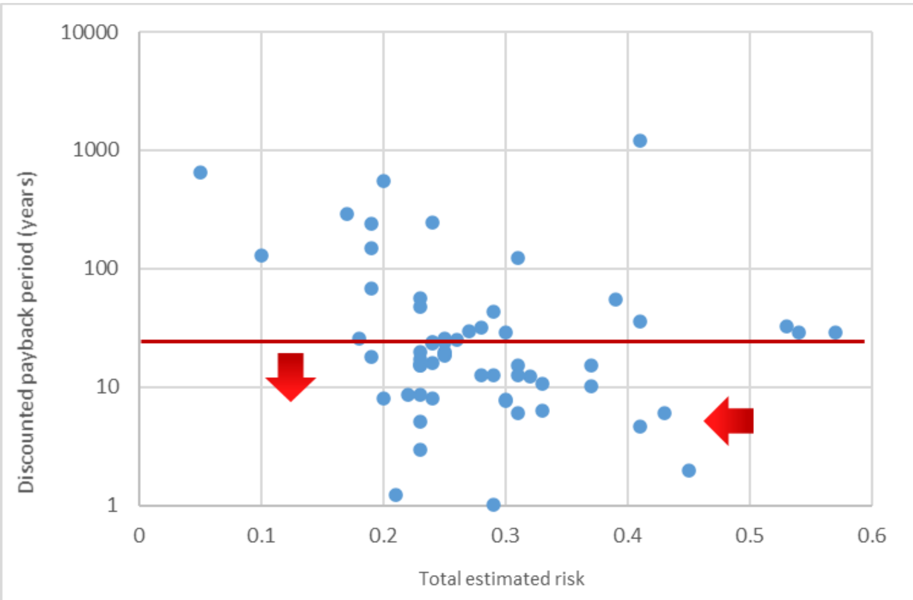
Aggregated SDG criterion: The SDG[7] criterion consists of an aggregation of various SDG indicators. The benchmarking is oriented to evaluate EE investments based on the data, characteristics, and KPI's performance of each project.

5 Triple-A Benchmarking Results and Evaluation

As has already been mentioned, the benchmarking is focused on proving an appropriate solution to all Triple-A Tool users, but mainly to investors and project developers. Thus, the Triple-A approach for achieving the optimum benchmarking has been implemented, taking into account the methodological approach presented in Paragraph 3.3. The benchmarking is presented mainly for building projects, as their number is much higher than any other sector, and it is assumed that they provide a wide range of cases, which is statistically significant. The present report will be systematically renewed with updated results, as more project will be benchmarked.

The benchmarking results presented below are indicative, showcasing the potential of the Triple-A Tools based on the information provided by the project developers. Thus, do not constitute an investment proposal or even express any preference for one project over another.

Considering the results provided by the Triple-A Tools, the projects could be presented taking into account the estimated cumulative risk against the estimated discounted payback period. In this case, it is expected that the discounted payback period should not be higher than the average lifetime of the foreseen measures, and the cumulative risk is as low as possible. Longer payback periods could be accepted in various cases, e.g. in the case that the EE project is part of a wider renovation that allows the utilisation of the asset or the multiple benefits (such as the contribution to the UN SDGs, or the increase in living/ working comfort and the mitigation of energy poverty).



[7] Website: https://sdgs.un.org/

Figure 3: Scatter plot of projects' discounted payback period with total estimated risk.

Excluding the projects with a discounted payback period longer than the estimated average lifetime of the foreseen EE measures, we limit the number of potentially interesting projects (see Figure 1). It is evident that projects with higher risk would be possible less desirable.

Investors could select the projects that fit better to their profile (size of the project, repayment period, maximum accepted and/or type of risks, pricing) and their preferences (country, EU Taxonomy alignment, ESG criteria).

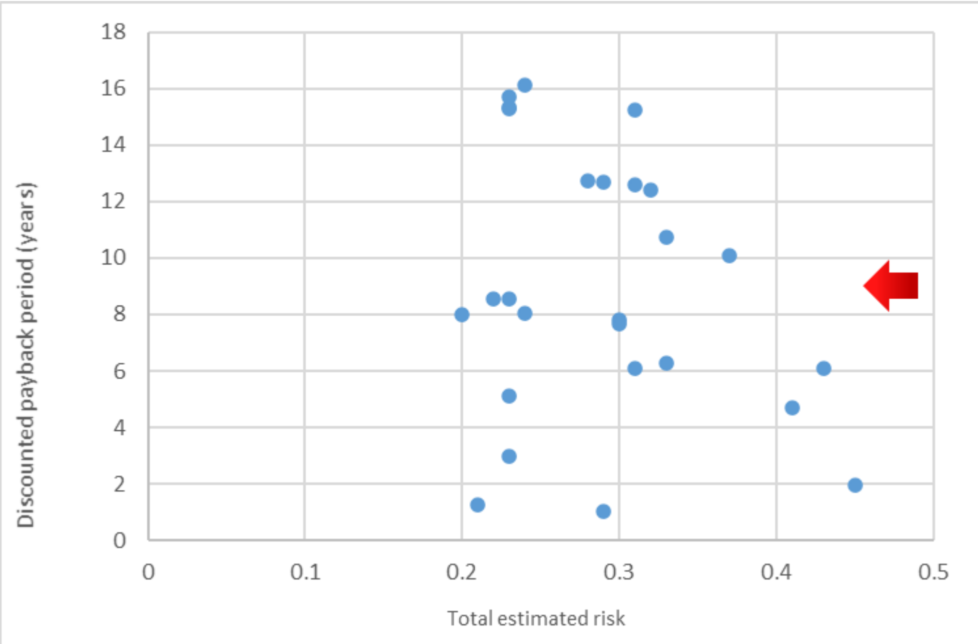


Figure 4: Scatter plot of qualified projects' discounted payback period with total estimated risk.

Projects' size

Project size could be an important parameter. For example, a large project would possibly not be interesting for a small fund, as even it can support it, it could potentially result in concentration risk. In addition, single small size projects cannot attract the same fund due to its high operating cost compared to the project.

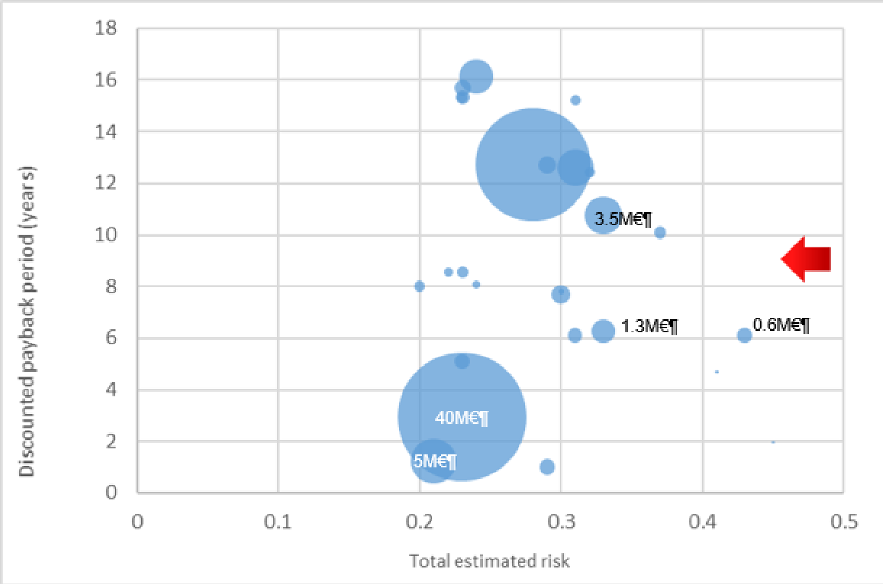


Figure 5: Scatter plot of qualified projects' discounted payback period with total estimated risk and project's size.

Country selection

The figure below (Figure 6) shows the selected projects in relation to the country (each colour corresponds to a different country).

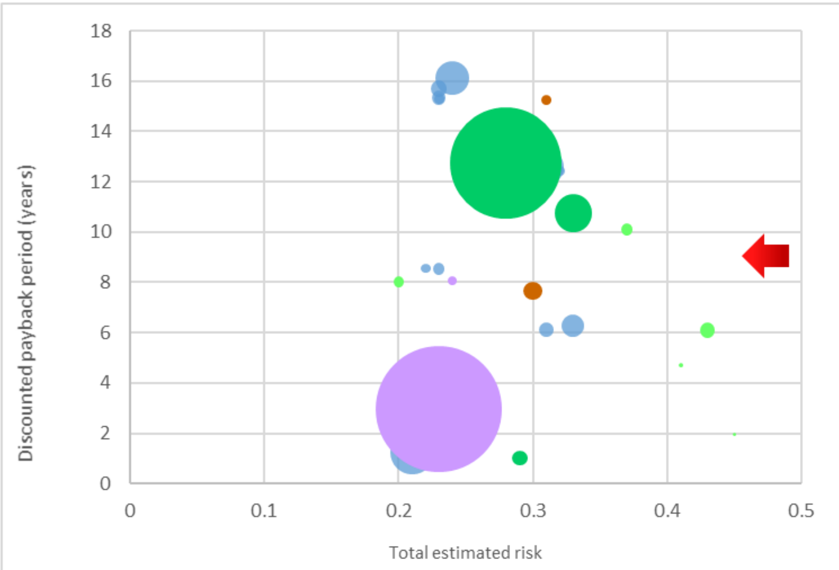


Figure 6: Scatter plot of qualified projects' discounted payback period with total estimated risk and country of selection.

Triple-A Tool's assessment

In six project cases, the "Agree" Triple-A Tool characterised them as "Rejected" (points with red colour in Figure 7). According to the proposed methodological approach, they had to be characterised as "Reserved".

Economic performance

The final benchmarking of the projects could be done by comparing the economic performance of the selected projects. This could be done taking into account the IRR or the NPV indexes, estimated by the Triple-A Tool.

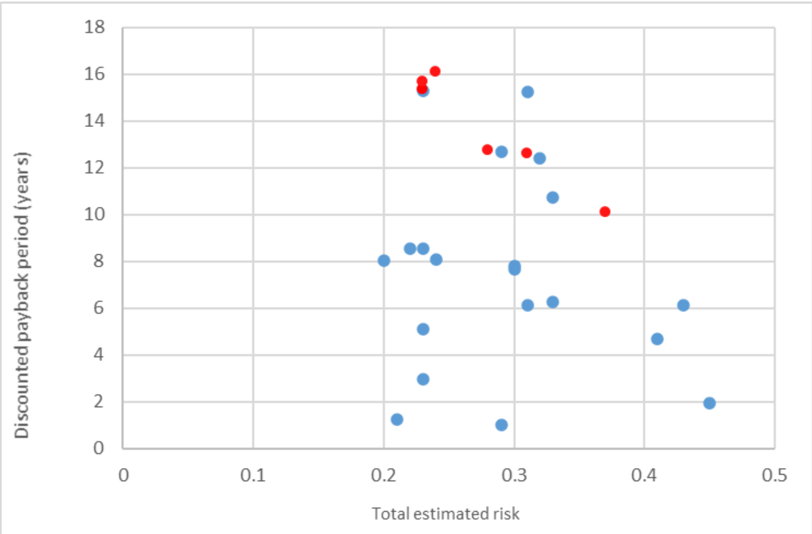


Figure 7: Scatter plot of qualified projects' discounted payback period with total estimated risk, with a classification to Triple-A classes.

Significant comments

- Projects' economic performance estimated by the project developers could differ significantly from that estimated from the Triple-A Tool due to different energy prices assumptions.
- Some projects could achieve significant money and GHG emission savings, but not final energy savings. These projects couldn't be appropriately assessed by the Triple-A Tool.
- The CAPEX provided by the projects' developers often incorporates other costs than those directly related to EE interventions. This affects the economic performance of the project.
- The ownership (public, private) of the assets is a critical parameter that has been ignored in the assessment of the projects. In public assets, a relevant call of tender should be expected, which can be time-consuming. This has been assumed that it is outside of the scope of the benchmarking.

6 Conclusions and Next steps

Triple-A aspires to trigger EE investments by providing handy tools and reliable but simplified procedures that can set the ground for initialising a discussion between projects' developers and investors. Therefore, Triple-A Partners are committed to further develop and optimise Triple-A Tools for achieving appropriate projects' benchmarking, available to all types of users.

According to the Triple-A Tools results and information provided directly from the projects' developers, the Triple-A Tools can support reliably and efficiently both projects' developers and investors. The Triple-A Tools recognise the appropriate status of the projects ("Triple-A", "Reserved", "Rejected"), while they provide relevant indicators regarding the economic performance of the projects. Triple-A Tool's performance is affected by its simplified approach. Thus, several actions could be investigated for optimising the Triple-A Tools. Specifically, the following steps could be examined:

- The electricity price could be inserted as input by the user, providing a predefined value – the one already used by the Tools. This will improve the accuracy of the Triple-A Tools, as many times, the market price is different from the one reported in relevant databases with respect to the country average.
- The annual money savings could be an input by the user, as some projects are excluded, even they have significant money and GHG emission savings, but not final energy savings. For example, in the case of district heating systems, the energy savings are not obvious or easily confined.
- An additional input field could be provided to declare any cost that is not directly related to EE interventions.
- Additional input fields could be provided for buildings renovation for separately declaring costs related to:
    - Buildings' envelope
    - HVAC
    - Lighting appliances
    - Automatic control
    - RES installation

  This is assumed critical for estimating with better accuracy the expected average lifetime.
- Make provision for crosschecking the payback period against the expected average lifetime.
- Estimating the IRR and NPV for specific and predefined periods, e.g. 7, 10, 12 and 20 years. This will allow the user to compare the economic performance of different investments easily.

7 References

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