D5.7
HOOP economic impact in the Lighthouse Cities and Regions

RdA Climate Solutions

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000836.

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Table of Contents

1. EXECUTIVE SUMMARY 8

2. INTRODUCTION 10

3. METHODOLOGY 13

4. LIGHTHOUSE UCBE INVESTMENTS 22

4.1. Almere 22
4.2. Albano Laziale / Lazio 24
4.3. Bergen 26
4.4. Münster 29
4.5. Murcia 32
4.6. Porto 34
4.7. Kuopio 38
4.8. Western Macedonia 39

5. HOOP ECONOMIC IMPACT ASSESSMENT 43

6. DISCUSSION 51

7. CONCLUSION 54

8. REFERENCES 57

9. ANNEX 1: PDA DOCS AND TOOLS 60

10. ANNEX 2: QUESTIONNAIRE FORM 62

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

List of Tables

Table 1. **KPIs defined for the category A. Investments.** 14

Table 2. **KPIs defined for the category B. Jobs.** 14

Table 3. **KPIs defined for the category C. Environmental.** 15

Table 4. **KPIs defined for the category D. R&D and Certifications.** 16

Table 5. **HOOP financial leverage factors.** 19

Table 6. **UCBE investments and costs in Almere.** 23

Table 7. **UCBE investments and costs in Albano Laziale / Lazio.** 25

Table 8. **UCBE investments and costs in Bergen.** 27

Table 9. **UCBE investments and costs in Münster.** 30

Table 10. **UCBE investments and costs in Murcia.** 33

Table 11. **UCBE investments and costs in Porto.** 35

Table 12. **UCBE investments and costs in Kuopio.** 38

Table 13. **UCBE investments and costs in Western Macedonia.** 40

Table 14. **Summary of total UCBE investments and costs executed and to be executed by the 8 Lighthouses.** 43

Table 15. **Labour productivity input by the job positions created in each Lighthouse.** 45

Table 16. **Summary of total UCBE investments and costs, in EUR million, executed / to be executed by each Lighthouse.** 48

Table 17. **HOOP economic impact on total investments and financial leverage factors.** 49

Table 18. **Key documentation and tools developed by HOOP PDA for economic baseline and assessment.** 60

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List of Figures

Figure 1 – Methodology for HOOP economic impact assessment. 13

Figure 2 – HOOP economic impact database: an overview. 17

Figure 3 – HOOP economic impact data collection questionnaire: an overview. 18

Figure 4 – HOOP economic impact on UCBE investments. 44

Figure 5 – HOOP economic impact on jobs. 46

Figure 6 – HOOP economic impact on environmental savings. 47

Figure 7 – HOOP economic impact on R&D. 47

Figure 8 – HOOP economic leverage impact. 50

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List of Acronyms

Acronym	Description
AD	Anaerobic Digestion
AI	Artificial Intelligence
ATM	Automatic Teller Machine
CAPEX	CAPital EXpenditures
CIB	Circular Investors Board
EFRE	Europäischer Fonds für Regionale Entwicklung (ERDF – European Regional Development Fund)
ESG	Environmental, Social and Governance
EU	European Union
EUR	Euro (€)
FID	Fomento de la Innovación desde la Demanda (Demand-pulled innovation)
g	Gram
GDP	Gross Domestic Product
GWh	Gigawatt-hour
h	Hour
IP	Intellectual Property
JTF	Just Transition Fund
kg	Kilogram
KPI	Key Performance Indicator
kton	Kiloton
kWh	Kilowatt-hour
k€	Thousands of euro
L	Litre
LH	Lighthouse

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Acronym	Description
LHIP	Ratio between mother and side-mother (LH) and induced (I) projects realised, and the total amount of PDA grant (P).
LHIT	Ratio between mother and side-mother (LH) and induced (I) projects and the total amount of HOOP grant (T).
LHP	Ratio between mother and side-mother projects (LH) and the total amount of PDA grant (P).
LHT	Ratio between mother and side-mother projects (LH) and the total amount of HOOP grant (T).
m³	Cubic metre
mg	Milligram
min	Minimum
M€	Millions of euro
NP	Nitrogen and Phosphorus
No	Number
NRW	North Rhine-Westphalia
PDA	Project Development Assistance
PML	Project Maturity Level
POSEUR	Portuguese Operational Program for Sustainability and Efficiency in Resource Use
P3HB	Poly-3-HydroxyButyrate
R&D	Research & Development
SCG	Spent Coffee Grounds
SME	Small and Medium-sized Enterprise
TLBM	Tailored Lighthouse Business Model
TRL	Technology Readiness Level
TVöD	German Collective Agreement for the Public Sector
UCBE	Urban Circular BioEconomy
UCO	Used Cooking Oil
WP	Work Package

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1. Executive Summary

The HOOP project aims to unlock bio-based investments and deploy local bioeconomies in Europe through a systemic and cross-cutting approach. It offers PDA to a group of eight Lighthouse Cities and Regions to build the technical, economic, financial and legal expertise needed to develop investments to valorise biowaste and wastewater, with the aim of obtaining safe and sustainable bio-based products.

The economic impact assessment of HOOP is based on the financial leverage factor established within HOOP Grant Agreement was defined as minimum of EUR 6 for each EUR of PDA provided to each Lighthouse. The HOOP project started in October 2020, unrolling until March 2025, with a total budget of around EUR 9 million, being the EU grant contribution of EUR 7,999,063.69, where EUR 3,972,669.36 was allocated directly to PDA.

The present report aimed to establish a methodology and monitoring for the definition and calculation of KPIs and financial leverage factors in order to assess the economic impact of the HOOP project by its end in March 2025 on the eight local economies. The economic impact was assessed through a set of 15 monetised KPIs in EUR within four categories: A) project investments and funding, B) job creation and its local impact, C) environmental savings, and D) R&D and certification expenses.

All UCBE executed projects realised an investment that totalises EUR 124.4 million until March 2025. Mother and side-mother projects represent the significant contribution for the execution, about 2/3 of total investment executed for all UCBE projects. Nevertheless, the total UCBE investment executed or planned to be executed will reach EUR 161.6 million, which EUR 37.1 million of that not executed is expected to be invested in the short-term. Porto and Bergen were responsible respectively for 49 and 34 % of all executed investment.

Those executed mother and side-mother projects received EUR 2.9 million of grants and EUR 11 million of loans, meaning that about 17% of the total investment was funded or financed. The total amount of grants obtained for mother and side investments was distributed in 72 and 28 % for Bergen (insect protein and microalgae production) and Kuopio (biochar reactor) respectively. The AD plant from Porto got EUR 10 million of loans from European Investment Bank in 2022 and microalgae project got EUR 1 million of equity in 2023.

The revenues will also cover in the future those investments, considering that the projects will generate annually EUR 9.8 million of sales in material (biochar, P3HB, protein, functional ingredients, etc.) and energy (biofuels, heat and electricity) bioproducts and services. However, the total net revenues, grants and financing should be considered as minimum values.

The new 76 job positions, created by mother, side-mother and induced UCBE projects, have generated EUR 4.5 million of economic impact on the growth of those European regions. However, more than 49 job positions are expected to be created at short-term with the implementation of some projects, with a local impact of more than EUR 2.9 million.

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The quantity of waste management fees saved, and the total bioenergy (biofuels, heat and electricity) sold represent the higher impact within this category, totalising EUR 9.4 and 3.8 million respectively from the execution of the UCBE investments. And at least, a total amount of EUR 1.2 million will be impacted by future investments. The mother, side-mother and induced investments foresee obtaining at least EUR 0.3 million of grants for R&D activities.

The leverage factor LHT (ratio total investments on total HOOP grant) complies totally with that consortium commitment (min. 6) with the value of 10, while the LHP (ratio total investments on PDA grant) measured as 20 complies and surpasses 68% of the minimum reference of 12. Regarding the financial leverage factors LHIT and LHIP, the HOOP economic impact complies and surpass again by more than twice of the minimum references.

We would like to highlight that the HOOP economic impact on the eight Lighthouse Cities and Regions has been a total success, despite the constraints and barriers that arose throughout the HOOP PDA. The impact of HOOP does not finish with the end of the project, but it is expected to increase significantly over the next years with the full concretisation of all UCBE investments, influencing also the development of new projects in the scope of the circular bioeconomy. In short-term it is expected to increase all economic KPIs and impacts, considering the funding and financing proposal submissions, tenders and development of the projects.

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2. Introduction

The HOOP project [1], "Hub of circular cities bOOsting Platform to foster investments for the valorisation of urban biowaste and wastewater", emerges to unlock bio-based investments and deploy local bioeconomies in Europe through a systemic and cross-cutting approach. The HOOP project was granted by the European Union's Horizon 2020 research and innovation programme, from topic call "CE-FNR-17-2020: Pilot circular bio-based cities – sustainable production of bio-based products from urban biowaste and wastewater". In accordance with the Grant Agreement n. 101000836, the project started in October 2020 until March 2025 with a total budget of around EUR 9 million, being the EU (European Union) grant contribution of EUR 7,999,063.69.

HOOP is a pioneering project development assistance (PDA) initiative, where EUR 3,972,669.36 from the EU grant was allocated directly to PDA actions. This budget was estimated from the sum of items "personnel costs" and "other goods and services" from WPs (work package) 1 to 6.

The project offers project development assistance, budgeted with EUR 3,972,669.36 to a group of 8 Lighthouse Cities and Regions to build the technical, economic, financial, and legal expertise needed to develop concrete investments to valorise biowaste and wastewater sludge, with the aim of obtaining safe and sustainable circular bio-based products.

The **HOOP portfolio of 25 technologies and processes**, explained in the version 2 of D2.2 "State-of-the-art of technologies for production of bioproducts from biowaste and wastewater" (confidential report, but available in open access the article "Innovative Circular Biowaste Valorisation – State of the Art and Guidance for Cities and Regions" [2]), and the initial investment commitment were addressed to **Bergen region (Norway), Kuopio (Finland), Almere (Netherlands), Münster (Germany), Murcia (Spain), Greater Porto region (Portugal), Albano Laziale/Lazio region (Italy), and Western Macedonia region (Greece)**.

The present **report D5.7, led by RdA Climate Solutions, was developed under the Task 5.4** "Assessment of the economic impact of HOOP in the Lighthouse Cities and Regions" within the HOOP's WP5. The task goaled to evaluate the economic impact that the implementation of UCBE projects had on the Lighthouses.

The WP5, intitled by "PDA Innovative financial engineering for leveraging public & private investments and public procurements procedures" aimed at creating a common evaluation framework for public & private investors which allows to mainstream the investment schemes towards the urban circular bioeconomy investments (UCBE), and ensuring the accomplishment of all the public procurement related EU regulations by the procurers (Lighthouses) to prepare the public procurement processes and instruments for a posterior launch (beyond the project) of the tendering processes to trigger the investments in UCBE projects. Some those Lighthouse projects require a tendering process, because they are promoted by public entities, i.e., municipalities or public waste management companies.

The HOOP economic impact is expected to have a minimum investment leverage factor of 6-10, meaning that each million euro invested will trigger EUR 6-10 million additional investment, totalling up to a leverage factor of 20 times in 4.5 years. In other words, HOOP consortium has set a minimum leverage factor of EUR 6 investment for each EUR of HOOP grant provided to the Lighthouses.

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Also, by promoting circular economy bioproducts and business models, the Lighthouses will increase their competitiveness and enhance innovation, growth and employment on their territories. The economic impact is assessed through circular bioeconomy investments, job creation and other relevant KPIs (key performance indicator) defined in **chapter 3**.

The indicators were monitored along the project, giving feedback and advice to the Lighthouses, project partners and UCBE project promoters. The achievements and results documented in this report used a scenario analysis based on the final updated values monetised for all economic indicators by the end of the project for each Lighthouse. Thus, **the objectives of this task and report reflect on**:

1. Definition of the economic KPIs and creation of the economic impact database.
2. Creation of a comprehensive and simple questionnaire to be filled by the Lighthouses for data collection.
3. Monitoring and updating of all economic indicators along the project and respective database.
4. Establishment of a methodology for the calculation of financial leverage factors.
5. Assessment of the economic impact of the HOOP project by its end in March 2025.
6. Reporting with disclosure level of public as transparency policy.

The previous HOOP reports D4.4 “Lessons learnt report from the Tailored Lighthouse Business Model” [3] (September 2023), D5.6 “Investment-ready project pipeline” [4] (September 2023) and D4.5 “PDA Business Models Report II” [5] (August 2024), and the HOOP PDA face-to-face meetings Plan were fundamental to keep a permanent contact with the Lighthouses to collect data and updating the economic impact database. The investment-ready pipeline translated the status and technical and financial overview of 13 UCBE projects assumed as mother projects from each Lighthouse City and Region.

The PDA face-to-face meetings Plan consisted of one to two days of presential meetings in each Lighthouse during the period of October 2023 until February 2024. For each PDA visit, RdA Climate Solutions and Bax & Company teams provided direct assistance to the UCBE projects for all topics concerning the financial PDA (WP4 and WP5) tasks, where the agenda topics included the **update of financial and economic KPIs and respective impact assessment on each Lighthouse**, as described within the version II of PDA report [5].

The PDA service developed, over the years 2022 to 2024, several financial tools, guidelines and other useful resources [6] specifically to support the circular bioeconomy investment projects, which were tested and validated within HOOP PDA provided for European cities and regions. Although these resources were targeted to valorisation projects of urban biowaste and wastewater sludge, they can be applied and replicated to projects from other organic waste sources and bioproducts. These **HOOP financial tools and manuals aim to increase the maturity and bankability of bioeconomy investment projects promoted by public and private entities**.

In this context, the financial tools and guidelines allow investors and project promoters to better navigate the intricacies of the circular bioeconomy sector, ensuring the alignment of projects with investor expectations and the broader sustainable development goals, EU Taxonomy and ESG (environmental, social and governance) criteria and National (waste management general regulation, etc.) regulations and standards.

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When there is a high number of market competitors for some bioproducts, performing a market study is also recommended. Therefore, the **due diligence procedure** [7] was an important auxiliary tool developed that is recommended for assessing and improving the projects, as well as their maturity and bankability. This procedure was **standardised as the first targeted to bioeconomy cluster**. Other tools, manuals, platforms and services were established and standardised for the same purpose, which are publicly available, such as:

- HOOP Virtual Academy and Urban Circular Bioeconomy Hub, with a public repository and assistance [8];
- 3 volumes of the Investment Package Manual [9, 10, 11];
- Circular Valuation Method tool [12];
- Project Maturity Level tool [13] and guidelines [14];
- Due Diligence Standard procedure [7].

A published handbook [15] summarises those **tools and resources developed and validated under the framework of HOOP PDA, which can be exported, replicated and made available for all European municipalities, national and regional agencies, public and private companies, SME (small and medium-sized enterprises) and other stakeholders** aiming at developing bioeconomy investments. The **9. Annex 1 - Table 18** lists all economic and financial resources that were useful for the definition of KPIs, data collection and then the economic impact assessment of HOOP in the Lighthouses.

Other services and tools were also developed and described in **9. Annex 1 - Table 18** and **HOOP Hub** [8], namely the tailored circular business models, financial model with prediction of 20 years for relevant financial metrics, market research and analysis, business plans, market studies, risk analysis, policy recommendations, among others. However, some of these resources are confidential and available only by providing a private technical assistance service.

The **HOOP Circular Investors Board** (CIB) composed by 20 investors (banks, venture capitals, etc.) was an important outcome and milestone from HOOP, which contributed to the improvement of the maturity and bankability of the projects, review of HOOP financial and economic resources and tools and matchmaking with project promoters.

The HOOP investment-ready projects pipeline [4] inventoried and characterised 13 UCBE projects. During the PDA, data and scope of the projects constantly changed as for instance, the technical studies and laboratory tests evolved, or in some cases for financial or regulatory reasons. Therefore, **there are several projects that will be completely implemented after the end of HOOP project.**

From 13 UCBE projects analysed, 8 have PML equal to 5 or 6, i.e., 62% of all projects, and most of the projects exhibit TRL (technology readiness level) of 6 and 8-9. The projects from Bergen (mealworm and microalgae), Porto (AD - anaerobic digestion - plant) and Kuopio are the unique UCBE projects with the highest PML (project maturity level), i.e., of 6. These projects from Bergen and Kuopio were already fully funded, implemented and running for tests with several feedstocks and optimisation of operating conditions.

The projects from Kuopio (biochar), Invertapro (mealworm) and Greentech Innovators (microalgae) were funded with grants of EUR 0.8 million, 1.36 million and 0.75 million respectively.

In terms of financing, the AD plant from Porto got EUR 10 million of loans from European Investment Bank in 2022 and microalgae project got EUR 1 million of equity in 2023.

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3. Methodology

The HOOP economic impact assessment was logically structured by the following steps schematised in **Figure 1**. The methodology was discussed, established and updated over the HOOP project with the contribution of HOOP coordination and technical partners.

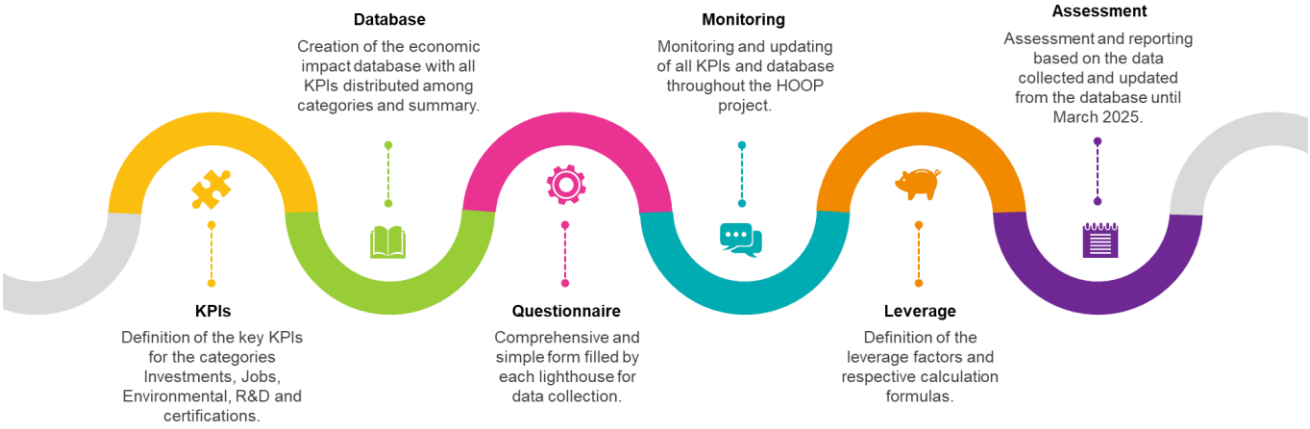

Figure 1 – Methodology for HOOP economic impact assessment.

Each methodology step is described in detail. All steps have considered the distinction between three concepts: mother, side-mother and induced projects, meaning:

► **Mother project:** UCBE project assisted directly by HOOP PDA and considered as mother project for the Lighthouse (LH). These projects are within the scope of HOOP, meaning those for biowaste material valorisation with innovative technologies (excluding composting and AD). The KPIs associated with this category are measured as direct impact on HOOP economic assessment. This concept corresponds to the indicator A.1 within the category A. “Investments”.

► **Side-mother project:** UCBE project related to the mother project assisted directly by HOOP PDA, referring to the small projects that have taken benefit of the knowledge generated in HOOP, also contributing to the success of the implementation of mother projects. In general, these projects are associated with the implementation, improvement and/or extension of separate collection of biowaste and specific biowaste streams (e.g., used cooking oils - UCO). The KPIs associated with this category are measured as direct impact on HOOP economic assessment. This concept corresponds to the indicator A.5 within the category A. “Investments”.

► **Induced project:** UCBE project can be not assisted directly or partially assisted by HOOP PDA but within the scope of HOOP project, benefiting from the knowledge and PDA provided to the Lighthouses and their UCBE projects. The KPIs associated with this category are measured as indirect and/or direct impact on HOOP economic assessment. This concept corresponds to the indicator A.6 within the category A. “Investments”.

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1. KPIs

The KPIs were defined and designed for 4 categories: A) Investments, B) Jobs, C) Environmental, and D) R&D (Research and Development) and certifications. **All KPIs are monetised in EUR million.**

The A. Investments category is composed by 6 KPIs related to the total investments, revenues, funding and financing got for the mother, side-mother and induced projects. The **Table 1** describes the KPIs for investments realised, their impacts and respective literature/tool source linked to the HOOP tasks and deliverables.

Table 1. KPIs defined for the category A. Investments.

KPI	Description	Impact	Source
A.1. Mother project CAPEX	Total investment for the mother projects assisted directly by HOOP PDA.	Direct	T2.3 (D2.3); T4.2 (D4.2); T4.4 (D4.4); T4.5 (D4.5); T5.2 (D5.3, D5.4); T5.3 (D5.5, D5.6)
A.2. Mother project net revenues	Total annual net revenues (goods and services) for the mother projects assisted by HOOP PDA.	Direct	
A.3. Mother project funding	Total grants and subsidies allocated to mother projects assisted by HOOP PDA.	Direct	T2.3 (D2.3); T4.4 (D4.4); T4.5 (D4.5); T5.2 (D5.3, D5.4); T5.3 (D5.5, D5.6)
A.4. Mother project financing	Total loans and equity allocated to mother projects assisted by HOOP PDA.	Direct	
A.5. Side-mother project investment	Total investment allocated to side-projects related to the mother projects assisted by HOOP PDA.	Direct	T2.3 (D2.3); T4.5 (D4.5); T5.2 (D5.3, D5.4); T5.3 (D5.5, D5.6)
A.6. Induced project investment	Total investment allocated to induced projects.	Direct Indirect	

The B. Jobs category is composed by 2 KPIs related to the total annual budget for job positions created by the mother, side-mother and induced projects. The **Table *2*** describes the KPIs for jobs created, their impacts and respective literature/tool source linked to the HOOP tasks and deliverables.

Table 2. KPIs defined for the category B. Jobs.

KPI	Description	Impact	Source
B.1. Mother and side project jobs	Annual budget related to the jobs created by mother and side-mother projects and respective number of job positions.	Direct	T2.3 (D2.3); T4.2 (D4.2); T4.5 (D4.5);

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KPI	Description	Impact	Source
B.2. Induced project jobs	Annual budget related to the jobs created by induced projects and respective number of job positions.	Direct Indirect	T5.2 (D5.3, D5.4); T5.3 (D5.5, D5.6)

This KPI is being assessed under the HOOP economic impact (**chapter 5**) taking into account the number of job positions created and respective annual budget as salary and related social security contributions. The quantification of the impact of these positions on the society is based on the national GDP (gross domestic product) growth rate and respective labour productivity per person employed.

The C. Environmental category is composed by 4 KPIs related to the total environmental savings and bioenergy sold that resulted from the implementation of mother, side-mother and induced projects. The **Table 3** describes the KPIs for environmental aspects, their impacts and respective literature/tool source linked to the HOOP tasks and deliverables. Environmental savings are associated with the waste management fees, distance biowaste transportation and energy saved in comparison with the previous scenario.

Table 3. KPIs defined for the category C. Environmental.

KPI	Description	Impact	Source
C.1. Waste management fees saved	Annual waste management fee savings related to the previous scenario (landfill and/or incineration) resulted from the implementation of mother, side-mother and induced projects.	Direct Indirect	T2.3 (D2.3); T4.2 (D4.2); T4.5 (D4.5); T5.2 (D5.3, D5.4); T5.3 (D5.5)
C.2. km transportation saved	Total km saved related to the previous scenario that resulted from the implementation of mother, side-mother and induced projects.	Direct Indirect	
C.3. Energy savings	Total energy saved due to the implementation of mother, side-mother and induced projects.	Direct Indirect	
C.4. Bioenergy sold	Total annual bioenergy revenues that resulted from the implementation of mother, side-mother and induced projects.	Direct Indirect	

The D. R&D and Certifications category is composed by 3 KPIs related to the total costs related to R&D, IPs (intellectual property), licenses and certifications expensed for the mother, side-mother and induced projects. The **Table 4** describes the KPIs for R&D and certification aspects, their impacts and respective literature/tool source linked to the HOOP tasks and deliverables.

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Table 4. KPIs defined for the category D. R&D and Certifications.

KPI	Description	Impact	Source
D.1. Mother and side project R&D	Annual waste management fee savings related to the previous scenario (landfill and/or incineration) that resulted from the implementation of mother and side-mother projects.	Direct	T2.3 (D2.3); T4.5 (D4.5); T5.2 (D5.3, D5.4); T5.3 (D5.5)
D.2. Induced project R&D	Total km saved related to the previous scenario that resulted from the implementation of induced projects.	Direct Indirect	
D.3. Mother and side project IP, licenses and certifications	Total costs related to intellectual properties (IP), licenses and certifications for the implementation of mother and side-mother projects.	Direct	T2.3 (D2.3); T4.4 (D4.4); T4.5 (D4.5); T5.2 (D5.3, D5.4); T5.3 (D5.5)

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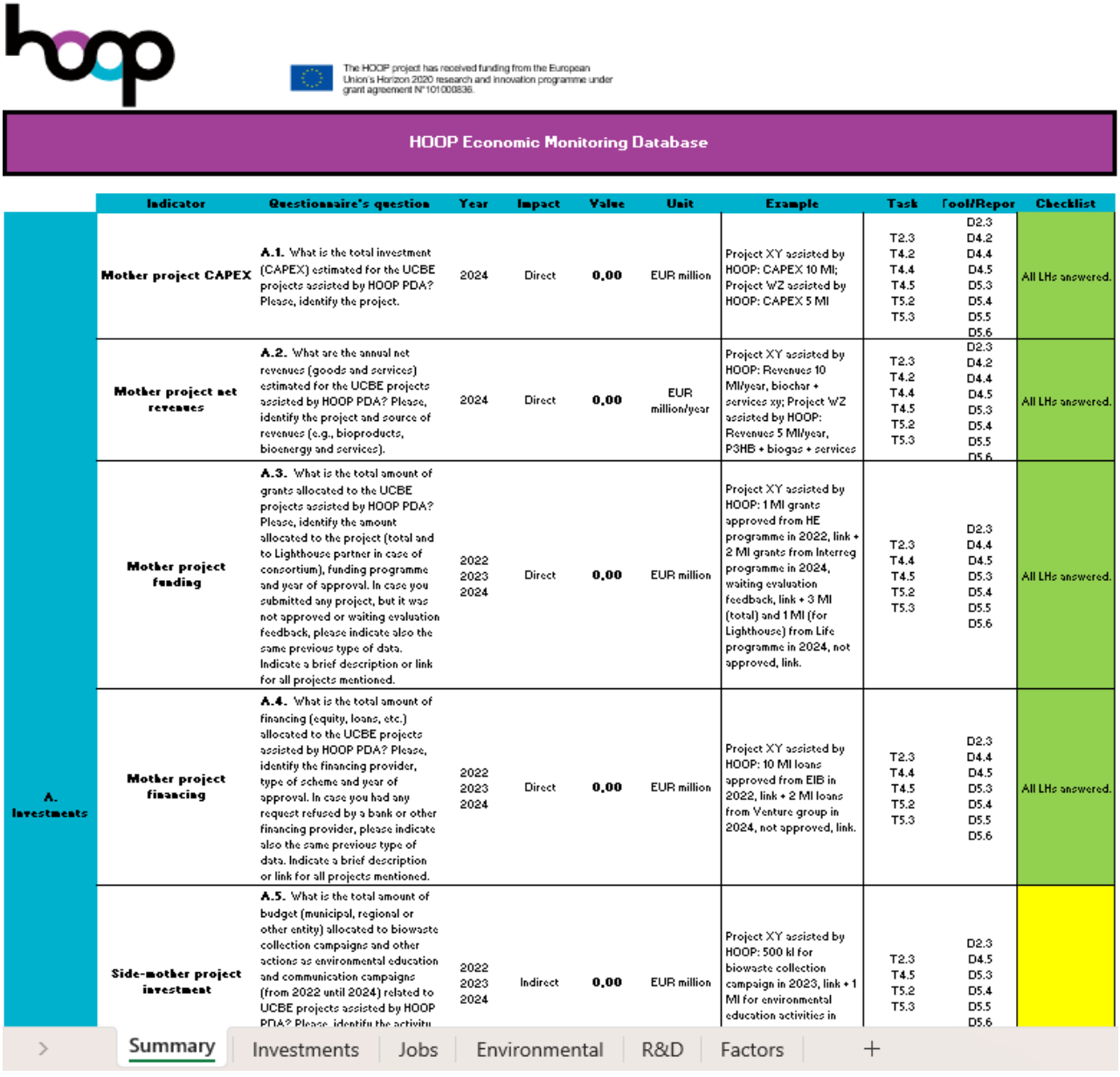
2. Database

A database was created to monitor continuously the values collected for the KPIs in order to assess the economic impact of HOOP. This database includes a summary sheet, the 4 categories/sheets and respective KPIs described previously and the economic impact calculations for the leverage factors. The **Figure 2** illustrates an overview of the HOOP economic impact database created in Excel.



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HOOP Economic Monitoring Database

	Indicator	Questionnaire's question	Year	Impact	Value	Unit	Example	Task	Tool/Repor	Checklist
A. Investments	Mother project CAPEX	**A.1.** What is the total investment (CAPEX) estimated for the UCBE projects assisted by HOOP PDA? Please, identify the project.	2024	Direct	0,00	EUR million	Project XY assisted by HOOP: CAPEX 10 MI; Project WZ assisted by HOOP: CAPEX 5 MI	T2.3 T4.2 T4.4 T4.5 T5.2 T5.3	D2.3 D4.2 D4.4 D4.5 D5.3 D5.4 D5.5 D5.6	All LHs answered.
	Mother project net revenues	**A.2.** What are the annual net revenues (goods and services) estimated for the UCBE projects assisted by HOOP PDA? Please, identify the project and source of revenues (e.g., bioproducts, bioenergy and services).	2024	Direct	0,00	EUR million/year	Project XY assisted by HOOP: Revenues 10 MI/year, biochar + services xy; Project WZ assisted by HOOP: Revenues 5 MI/year, P3HB + biogas + services	T2.3 T4.2 T4.4 T4.5 T5.2 T5.3	D2.3 D4.2 D4.4 D4.5 D5.3 D5.4 D5.5 D5.6	All LHs answered.
	Mother project funding	**A.3.** What is the total amount of grants allocated to the UCBE projects assisted by HOOP PDA? Please, identify the amount allocated to the project (total and to Lighthouse partner in case of consortium), funding programme and year of approval. In case you submitted any project, but it was not approved or waiting evaluation feedback, please indicate also the same previous type of data. Indicate a brief description or link for all projects mentioned.	2022 2023 2024	Direct	0,00	EUR million	Project XY assisted by HOOP: 1 MI grants approved from HE programme in 2022, link + 2 MI grants from Interreg programme in 2024, waiting evaluation feedback, link + 3 MI (total) and 1 MI (for Lighthouse) from Life programme in 2024, not approved, link.	T2.3 T4.4 T4.5 T5.2 T5.3	D2.3 D4.4 D4.5 D5.3 D5.4 D5.5 D5.6	All LHs answered.
	Mother project financing	**A.4.** What is the total amount of financing (equity, loans, etc.) allocated to the UCBE projects assisted by HOOP PDA? Please, identify the financing provider, type of scheme and year of approval. In case you had any request refused by a bank or other financing provider, please indicate also the same previous type of data. Indicate a brief description or link for all projects mentioned.	2022 2023 2024	Direct	0,00	EUR million	Project XY assisted by HOOP: 10 MI loans approved from EIB in 2022, link + 2 MI loans from Venture group in 2024, not approved, link.	T2.3 T4.4 T4.5 T5.2 T5.3	D2.3 D4.4 D4.5 D5.3 D5.4 D5.5 D5.6	All LHs answered.
	Side-mother project investment	**A.5.** What is the total amount of budget (municipal, regional or other entity) allocated to biowaste collection campaigns and other actions as environmental education and communication campaigns (from 2022 until 2024) related to UCBE projects assisted by HOOP PDA? Please, identify the activity	2022 2023 2024	Indirect	0,00	EUR million	Project XY assisted by HOOP: 500 kl for biowaste collection campaign in 2023, link + 1 MI for environmental education activities in	T2.3 T4.5 T5.2 T5.3	D2.3 D4.5 D5.3 D5.4 D5.5 D5.6	

Summary | Investments | Jobs | Environmental | R&D | Factors | +

Figure 2 – HOOP economic impact database: an overview.

3. Questionnaire

A comprehensive and simple questionnaire was created to be filled by each Lighthouse for data collection, as illustrated in **Figure *3***. The questionnaire in Word form is organised by questions related to each KPI, in accordance with the database established.

Figure 3 – HOOP economic impact data collection questionnaire: an overview.

The HOOP Economic Impact data collection form aims at inventorying the data from the UCBE projects and other side-related investments realised by the Lighthouses. These data are crucial to evaluate the economic impact that the development of biowaste and sludge valorisation projects, through HOOP, had on the Lighthouses Cities and Regions.

The HOOP economic impact data collection questionnaire is completely exhibited in **10. Annex 2**. The questions are also observed in the database and, for each one, some examples of answer were indicated.

4. Monitoring

The questionnaires were prefilled by RdA Climate Solutions with the data collected from HOOP reports and tools in the period 2022-2024 as described in **9. Annex 1**, as well as from the HOOP PDA face-to-face meetings carried out in each Lighthouse in 2023 and 2024 as described in report D4.5 [5]. Then the Lighthouses reviewed and filled with the missing data in the form, constituting the baseline for the economic impact assessment.

The database was monitored and updated by RdA Climate Solutions and CETENMA for all economic indicators throughout the HOOP project until February 2025.

5. Leverage

The financial leverage factor established within HOOP Grant Agreement was defined as minimum of EUR 6 for each EUR of PDA provided to each Lighthouse – this is the concept that the economic impact assessment of HOOP is based on. The HOOP project started in October 2020, unrolling until March 2025, with a total budget of around EUR 9 million, being the EU grant contribution of EUR 7,999,063.69.

The PDA service offered by HOOP to the 8 Lighthouse Cities and Regions was budgeted with EUR 3,972,669.36 to build the technical, economic, financial, and legal expertise needed to develop concrete investments to valorise biowaste and wastewater sludge, with the aim of obtaining safe and sustainable bio-based products. This budget was estimated from the sum of items “personnel costs” and “other goods and services” from WPs 1 to 6, i.e., this amount was calculated from the “total EU grant” contribution allocated to PDA actions. The total grant for HOOP project was not only addressed to PDA purposes, other activities as training, communication, Hub, among others were realised. Thus, these activities were not counted for the “total PDA grant”.

Therefore, the calculation of the financial leverage factors was established for 4 types/levels of factors based on the total investments executed by the Lighthouses, which include mother, side-mother and induced projects, and the total HOOP grant and its amount allocated to the PDA. Thus, the “total LH investments” are equal to the sum of investments from mother and side-mother projects. The following **Table 5** sets the key financial indicators and the math formulas for the calculation of financial leverage factors with respective reference values.

Table 5. HOOP financial leverage factors.

Indicator	Description	Formula	Ref. Value
Total EU grant	Total EU grant contribution for the HOOP project.	N/A	EUR 7,999,063.69
Total PDA grant	Total EU grant contribution allocated to HOOP PDA, i.e., 49.7% of total EU grant.	N/A	EUR 3,972,669.36

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

Indicator	Description	Formula	Ref. Value
Total LH investments	Corresponds to the sum of mother (KPI A.1.) and side-mother (KPI A.5.) investments.	A.1 + A.5	N/A
Total induced investments	Corresponds to the total of induced (KPI A.6.) investments.	A.6	N/A
Leverage Factor LHT	Financial factor set by HOOP Grant Agreement as the ratio between the investments from mother and side-mother projects (LH) and the total amount of HOOP grant (T).	$LHT = \frac{Total\ LH\ investments}{Total\ HOOP\ grant}$	6 (min)
Leverage Factor LHP	Financial factor defined as the ratio between the investments from mother and side-mother projects (LH) and the total amount of PDA grant (P).	$LHP = \frac{Total\ LH\ investments}{Total\ PDA\ grant}$	12 (min)
Leverage Factor LHIT	Financial factor defined as the ratio between the investments from mother and side-mother (LH) and induced (I) projects realised by the Lighthouses and the total amount of HOOP grant (T).	$LHIT = \frac{LH + Induced\ investments}{Total\ HOOP\ grant}$	6 (min)
Leverage Factor LHIP	Financial factor defined as the ratio between the investments from mother and side-mother (LH) and induced (I) projects realised by the Lighthouses and the total amount of PDA grant (P).	$LHIP = \frac{LH + Induced\ investments}{Total\ PDA\ grant}$	12 (min)

The financial leverage factor LHT is the unique set under HOOP Grant Agreement. The other 3 factors compare with 49.7% of the amount of total grant that corresponds to PDA service, and the total investments executed by the Lighthouses in terms of mother, side-mother and induced projects.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

The financial leverage factors LHIT and LHIP keep the reference values of 6 and 12 respectively, in accordance with the previous factors LHT and LHP. This aspect allows to assess the contribution from the induced projects executed by the Lighthouses, while previous step to the innovative investments (laying the groundwork).

Those induced investments are under the scope of HOOP, but they can be not assisted directly or partially assisted by HOOP PDA. However, these investments also contributed to leverage the economic impact of HOOP, because the investments were influenced by the mother and side-mother projects implemented by the Lighthouses. Hence, the induced investments are a complement for the successful of mother and side investments under the HOOP scope.

6. Assessment

The assessment of the economic impact of the HOOP on Lighthouse Cities and Regions, and its reporting with this present deliverable, were based on the data collected and updated from the database until March 2025. This report has disclosure level of public as transparency policy.

The economic impact of HOOP was assessed in accordance with the comparable financial leverage factors described previously.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

4. Lighthouse UCBE investments

The HOOP PDA focuses on a variety of projects within the cities and regions with different investment volumes planned and complemented by public and private investments. Given the great diversity of typologies, scales, valorisation technologies, bioproducts involved and investments concretised and under development by the Lighthouses, this chapter summarises all UCBE investments and related costs within the 4 categories of KPIs described for the database in the previous chapter. Thus, each subchapter dedicated to each Lighthouse allows to get an overview of all UCBE projects with key information and data for investments, jobs, environmental, R&D and certifications.

These data collected for each Lighthouse will feed the results for the economic impact leverage calculated in the next **chapter 5**. **All "total column" values registered in each Table/Lighthouse refer only to the investment and costs effectively implemented or under implementation, i.e., estimations were not accounted.**

4.1. Almere

Initially, Almere purposes several small UCBE projects with small scale and feasibility due to uncertainty in market and supply chain. Under a later stage, Almere established as mother project the multipurpose fibrebank utilising wood waste, garden and park waste, invasive biomass and agricultural waste to produce cellulose fibres. Biocomposite and green concrete applications were also considered since the beginning of the project. Despite initial setbacks with a satellite project on torrefaction due to permit issues, the focus has remained on these applications. The rationale behind the projects is to halt at the intermediate stage of fibre production to avoid market constraints associated with biocomposites. However, the projects have not seen significant investment progress, and key data such as feedstock and bioproduct indicators are still missing. The main challenge has been the absence of a promoter. To address this issue, it was suggested to apply for funding.

The Municipality has invested significantly, as induced project, in improving the biowaste collection system to increase the amount of biowaste collected and reduce contamination levels. Almere has changed the whole biowaste collection system inspired in best practices in HOOP.

Considering that the mother projects in Almere have no significant progress in terms of investments, only investments and costs were reported to the induced project of optimisation of household biowaste collection system in Almere. Therefore, the data only are related to the total investment and jobs created by this project. No progress has been reported for the topics C "Environmental" and D "R&D".

The UCBE investments and costs registered for Almere until March 2025 are described in detail in the following **Table 6** for the 4 categories of KPIs.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

Table 6. UCBE investments and costs in Almere.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	3 mother projects are under study by the Municipality, but without recent investments neither estimations, namely: a) Giant hogweed (harvesting and producing biocomposites); b) Green concrete (producing concrete products with added natural fibers); c) Multipurpose fibrebank.	0	2024
A.2. Mother project net revenues	No revenues to be reported since the mother projects are not operational/implemented neither estimated.	0	2024
A.3. Mother project funding	No grants earned.	0	2024
A.4. Mother project financing	No financing got for the projects yet.	0	2024
A.5. Side-mother project investment	No investments to be reported.	0	2024
A.6. Induced project investment	Optimisation of household biowaste collection system: investments from the Municipality of Almere with the objective of increasing both the quantity and quality of biowaste destined for composting and AD: 3.545 M€ in 2023 and 0.919 M€ in 2024.	**4.464**	2024 2023
B.1. Mother and side project jobs	Projects not implemented and without job estimation.	0	2024
B.2. Induced project jobs	Optimisation of household biowaste collection system: jobs generated as waste coaches and waste checks, budgeted in 0.205 M€ in 2023 and 0.468 M€ in 2024, totalising about 8 jobs.	0.673	2024 2023
C.1. Waste management fees saved	N/A	N/A	2024
C.2. km transportation saved	Optimisation of household biowaste collection system: no km saved to be reported.	0	2024 2023
C.3. Energy savings	Not applicable: projects not related to energy production.	N/A	2024 2023

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
C.4. Bioenergy sold	Not applicable: projects not related to bioenergy production.	N/A	2024 2023
D.1. Mother and side project R&D	No grants for R&D projects earned, neither proposal submissions.	0	2024
D.2. Induced project R&D	No grants for R&D projects earned, neither proposal submissions.	0	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.2. Albano Laziale / Lazio

The Albano Laziale/ Lazio mother project targeted to the fermentation of used cooking oils (UCO) to produce Poly-3-HydroxyButyrate (P3HB), a biodegradable plastic. With an inflow of 350 tons of UCO per year and an expected output of 175 tons of P3HB, this full-scale project targets the cosmetic sector, particularly aiming to use P3HB as a substitute for titanium dioxide in sunscreens. The CAPEX for this project is EUR 24.8 million.

Despite its promising potential, the project faces some challenges such as: i) there is currently no private promoter and investor; ii) the project has a high ticket and then the risk is also high; iii) regulatory constraints for the registration of the formulations for P3HB in cosmetic sector.

To overcome these hurdles, it has been suggested to find a financing scheme as loans or equity. The technology provider is identified, and several meetings have been conducted to engage potential investors from cosmetic sector and others to implement the project.

The side-mother projects consisted of the implementation and extension of UCO separate collection in the municipalities of Albano Laziale and Ciampino [16] in the Lazio region, with the objective of increasing the feedstock amount in the future for the fermentator.

The induced projects are related to the implementation in Albano Laziale of a new electromechanical composting plant [17], the digitalisation of collection points and the new smart biowaste collection containers [18].

Considering that the mother projects in Lazio have no significant progress in terms of investments, only investments and costs were reported to the side-mother and induced projects. Therefore, the data are related to the total investment associated with these projects. No progress has been reported for the topics B “Jobs”, C “Environmental” and D “R&D”.

The UCBE investments and costs registered for Albano Laziale / Lazio until March 2025 are described in detail in the following **Table 7** for the 4 categories of KPIs.

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

Table 7. UCBE investments and costs in Albano Laziale / Lazio.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	Fermentation of UCO for P3HB production: investment not concretised yet. Cost analysis provided in detail by the technology provider with a CAPEX of 24.8 M€.	0	2024
A.2. Mother project net revenues	Revenues estimated according to the technology provider for the bioproduct P3HB for cosmetic sector is 9 M€/year.	0	2024
A.3. Mother project funding	No grants earned.	0	2024
A.4. Mother project financing	Not applicable: promoters are only seeking for grants and subsidies.	N/A	2024
A.5. Side-mother project investment	Extension of UCO separate collection in Albano Laziale: 0.081 M€ Implementation of UCO separate collection in Ciampino [16]: 0.081 M€	**0.162**	2023
A.6. Induced project investment	New electromechanical composting plant funded by the Lazio region and built in Albano Laziale [17]: 0.6 M€ in 2023. Digitalisation of collection points in Albano Laziale invested by the municipality: 0.3 M€ in 2023. Extension and implementation of new smart biowaste collection containers in Albano Laziale [18]: 0.0365 M€ in 2024.	**0.937**	2024 2023
B.1. Mother and side project jobs	Mother project not implemented, but 6 jobs were estimated to be created with a budget of 0.648 M€/year.	0	2024
B.2. Induced project jobs	No data to be reported.	N/A	2024
C.1. Waste management fees saved	No data to be reported.	N/A	2024
C.2. km transportation saved	No data available yet.	-	2024 2023
C.3. Energy savings	Not applicable: projects not related to energy production.	N/A	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
C.4. Bioenergy sold	Not applicable: projects not related to bioenergy production.	N/A	2024
D.1. Mother and side project R&D	No grants for R&D projects earned. Studies realised and funded only by HOOP. A proposal was submitted for INTERREG by October 2024 but not approved.	0	2024
D.2. Induced project R&D	No grants for R&D projects earned, neither proposal submissions.	0	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.3. Bergen

The mother projects for Bergen targeted to:

► The production of yellow mealworm from food waste and by-products, primarily plant-based, managed by Invertapro. With an inflow of 11,200 tons per year, this full-scale project was built to produce larvae protein and frass, positioning itself as a significant player in the sustainable protein market. The project is under upscaling implementation, with a CAPEX of EUR 6 million and secured with significant grants from national funding programmes and a successful crowdfunding campaign with EUR 1.36 million in 2024 from 370 new shareholders.

► The production of Omega-3 enriched microalgae from food waste and by-products second, managed by Greentech Innovators. This pilot project, with a processing capacity of 2,000 tons per year, is under implementation with a CAPEX of EUR 2 million funded by EUR 1 million of equity and EUR 0.75 million of grant in 2023. Additionally, the promoter is developing a related project to produce carbon-rich ingredients from hydrolysate growth medium, with an expected CAPEX of EUR 1.5 million. This project, seeking for grants and equity yet, aims to process 1,000 tons of food waste per year to produce around 800 tons of carbon-rich ingredients such as glucose and other sugars. Successful pilot tests in Spain (in the framework of HOOP PDA) and Portugal have validated the process, demonstrating its potential for feed applications and its effectiveness in growing yeast and fungi. In the future, the upscaling for a full-scale plant is designed to process 5,000 tons of food waste per year and is expected to generate annual revenues of EUR 0.4 million from gate fees and EUR 4.8 million from the bioproduct sales. The plant is still needing about EUR 1 million in equipment and EUR 0.5 million as working capital.

The induced projects are related to the implementation of the biopark of Voss, with a new AD and biogas plant and plot funded by BIR and Enova grant, and the extension of separate collection of household biowaste in Bergen funded by BIR. The waste management company BIR is responsible for waste handling in Bergen and its nine surrounding municipalities, serving over 350,000 inhabitants.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

The Voss biopark is under construction, with a total investment of EUR 30 million, being an industrial symbiosis park where those plants will be settled, among other circular activities, infrastructures, local and regional businesses. BIR, who is managing the biopark, aims at partnering with local startups to co-develop technologies to realise this circular strategy and vision. Collaboration and community are at the heart of their circular journey.

The mother and side-mother projects were implemented, excluding the production of hydrolysate growth medium that is seeking for funding and financing support. No progress has been reported for the topics C "Environmental" and D "R&D", since the induced projects are under implementation and the mother projects are studying these aspects yet. However, these projects will have a strong impact on environmental aspects, since the biowaste was being sent to other parts of Norway either for composting or biogas production.

The UCBE investments and costs registered for Bergen region until March 2025 are described in detail in the following **Table 8** for the 4 categories of KPIs.

Table 8. UCBE investments and costs in Bergen.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	Production of yellow mealworm from food waste and by-products: plant upscaled, with a CAPEX of 6 M€ in 2024. Production of microalgae from food waste: pilot plant under development with a CAPEX of 2 M€ in 2024. Production of hydrolysate growth medium from food waste: pilot plant is seeking for grants and equity for 1.5 M€ of CAPEX.	**8**	2024
A.2. Mother project net revenues	Production of yellow mealworm from food waste and by-products: 9 M€/year of revenues related to larvae protein for animal feed industry and food industry, agricultural fertiliser and frass bulk. Production of microalgae from food waste: 0.7 M€/year of revenues related to omega-3 enriched (feed ingredient). Production of hydrolysate growth medium from food waste: 1 M€/year of estimated revenues related to carbon ingredients (yeast, glucose, sugars, etc. + sale of waste management service hydrolysis and microalgae as waste management).	9.7	2024
A.3. Mother project funding	Production of yellow mealworm from food waste and by-products: 1.36 M€ got from a crowdfunding campaign in 2024. Production of microalgae from food waste: 0.75 M€ of national grants got in 2023 from Norwegian Research Council. Production of hydrolysate growth medium from food waste: No grants earned.	2.11	2024 2023

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
A.4. Mother project financing	Production of microalgae from food waste: 1 M€ of equity got in 2023. Production of hydrolysate growth medium from food waste: project is seeking for equity.	1	2023
A.5. Side-mother project investment	No investments to be reported.	0	2024
A.6. Induced project investment	Biopark of Voss (AD/biogas plant and plot) under construction: 30 M€ of CAPEX funded by BIR through the waste fee and Enova grant for the AD/biogas plant. Municipality of Voss got 0.0843 M€ of funding from Hardanger Stiftinga for the project development of the biopark. Extension of separate collection of household biowaste in Bergen: 3.76 M€ funded by BIR through the waste fee.	**33.84**	2024
B.1. Mother and side project jobs	Production of microalgae from food waste + Production of hydrolysate growth medium from food waste – full scale factory: 8 jobs with 0.8 M€/year.	0.8	2024
B.2. Induced project jobs	Separate waste collection of biowaste in Bergen generated 8 jobs in 2024 budgeted with 0.672 M€/year.	0.672	2024
C.1. Waste management fees saved	Before the plant is up and running in 2025, the household food waste is currently sending to Stavanger, this is further away than if it was incinerated locally. There is also a gate fee, so no savings to be reported either.	0	2024
C.2. km transportation saved	Before the plant is up and running in 2025, the household food waste is currently sending to Stavanger, this is further away than if it was incinerated locally. There is also a gate fee, so no savings to be reported either.	0	2024
C.3. Energy savings	Before the plant is up and running in 2025, the household food waste is currently sending to Stavanger, this is further away than if it was incinerated locally. There is also a gate fee, so no savings to be reported yet.	0	2024
C.4. Bioenergy sold	Before the plant is up and running in 2025, the household food waste is currently sending to Stavanger, this is further away than if it was incinerated locally. So, no bioenergy sold. In the future, AD plant of Voss will produce biogas.	0	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
D.1. Mother and side project R&D	Greentech got a grant included in KPI A.3. No more grants for R&D projects earned. Studies realised and funded only by HOOP. Greentech submitted grant proposal for EIC Accelerator 2024.	0	2024
D.2. Induced project R&D	No grants for R&D projects earned, neither proposal submissions.	0	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.4. Münster

The mother projects for Münster targeted to:

► The pyrolysis of lignocellulosic refuse from the composting process to produce biochar. This full-scale project is set to utilise digestate-composting refuse and garden and park waste, producing 700 tons of biochar annually. With a CAPEX of EUR 3 million, this project aims to explore urban applications for biochar due to agricultural regulatory constraints. The project has not been implemented yet, because is under compliance and feasibility analysis.

► Initially, the enzymatic hydrolysis of lignocellulosic refuse to increase biogas yield and enhance biomass circularity. The technical PDA concluded that the use to increase biogas yield was not economically feasible and then, the project was changed into the production of bacterial biostimulants rather than biogas. This full-scale project is not implemented yet, aiming at process digestate-composting refuse and garden and park waste, with the hydrolysate used for anaerobic digestion. Feasibility studies are ongoing, and the project is seeking grants.

The mother and side-mother projects were not implemented, being still in planning phase and studies of regulatory compliance and feasibility. No progress has been reported for the topics B “Jobs”, C “Environmental” and D “R&D”, since the mother projects are still studying these aspects.

The induced project is related to the implementation of a pilot project totally funded by national grants for implementing artificial intelligence to support the existing manual impurities detection during the collection of household biowaste with an automated and efficient detection system.

The UCBE investments and costs registered for Münster until March 2025 are described in detail in the following **Table 9Table *8*** for the 4 categories of KPIs.

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

Table 9. UCBE investments and costs in Münster.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	Pyrolysis of lignocellulosic refuse from composting process: project under compliance and feasibility analysis, with an estimated CAPEX of **3 M€**. Enzymatic hydrolysis of lignocellulosic refuse: currently no investment planned.	0	2024
A.2. Mother project net revenues	Pyrolysis of lignocellulosic refuse from composting process with total estimation of 0.77 M€/year, based on: biochar: 250 k€/year (500 ton/year production with a price of 500 €/ton); Heat: 320 k€/year (4 GWh/year and 0.08 €/kWh injection into district heating network); Sale of CO_2-Sink-Certificates: 200 k€/year (1.375 ton/year CO_2 removed, 145 €/ton certificate price).	0	2024
A.3. Mother project funding	Pyrolysis of lignocellulosic refuse from composting process: project submitted for grants under the EFRE/JTF programme (Regio.NRW – Transformation): and ZiBi national programme (Zirkuläre Bioökonomie Münsterland - Circular Bioeconomy Münsterland).	0	2024
A.4. Mother project financing	No financing got for the projects yet.	0	2024
A.5. Side-mother project investment	No investments to be reported.	0	2024
A.6. Induced project investment	Pilot test of artificial intelligence: under implementation and funded with 80 k€ (2025) by the Federal Ministry for Housing, Urban Development and Building. This pilot implements AI to support the existing manual impurities detection during the collection of biowaste with an automated and efficient detection system.	0.08	2025

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
B.1. Mother and side project jobs	Pyrolysis project: 1 job estimated within the classification level 9b in the TVöD (Collective Agreement for the Public Sector) for 50% position on pyrolysis, 50% position for other tasks; Total personnel expenses (incl. all employer contributions): 38.730 €/year (50% pyrolysis). Current Hoop Project Manager Position (temporary): Planned to be converted into a permanent role (1 job estimated), being a new position responsible for innovation, bioeconomy and climate protection projects as well as corporate sustainability reporting; Classification level 13 in the TVöD – 75 % position; Total personnel expenses (incl. all employer contributions): 74.183 €/year (75% position).	0.07	2024
B.2. Induced project jobs	Not applicable: no jobs generated by the pilot test of artificial intelligence (AI).	N/A	2025
C.1. Waste management fees saved	Projects still in planning phase and waiting funding feedback, without estimation yet.	0	2024
C.2. km transportation saved	Projects still in planning phase and waiting funding feedback, without estimation yet.	0	2024
C.3. Energy savings	Projects still in planning phase and waiting funding feedback, without estimation yet.	0	2024
C.4. Bioenergy sold	Pyrolysis project still in planning phase: 0.32 M€/year considering 4 GWh heat/year at 0.08 €/kWh starting in 2028 (planned).	0	2024
D.1. Mother and side project R&D	No grants for R&D projects earned. Pyrolysis of lignocellulosic refuse from composting process: project submitted into Interreg North-West Europe 2021-2027 programme, waiting feedback. RETAIN (Resilient European Terrains: Adaptive and Integrated Water Management Network in NWE) assisted by HOOP: Grant in approval phase in 2025 (proposal in review, Project ID NWE0400617); Total Budget: 4,866,165 €, being 278,040 € for the City of Münster. Studies to evaluate the pyrolysis of sieving overflow from green waste composting: 3,226.09 € by awm in 2024; Studies to evaluate the pyrolysis of digestate: 5,217.23 € by awm in 2024. Other studies realised and funded only by HOOP.	0.008	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
D.2. Induced project R&D	No grants for R&D projects earned, neither proposal submissions.	0	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.5. Murcia

The mother projects for Murcia targeted to:

► The recovery of nitrogen from anaerobic digestion (AD) supernatant using a treatment train of ion exchange columns and membrane contactors. This full-scale plant, with an inflow of 621 m³/day and an output of 203 tons of nitrogen per year, aims to produce ammonium sulphate as a marketable fertiliser. The CAPEX is estimated at EUR 725,000 and the promoter is EMUASA, the water management company in Murcia. The project was not still executed, being at applying for funding for innovation procurement.

► The AD plant coupled with composting tunnels for biowaste to high quality amendment, which was funded by Municipality of Murcia and other grant sources. The total investment is about EUR 7 million and the project is currently under implementation.

The induced project is related to the implementation of an UCO collection system in Murcia, that was totally funded by European grants from NextGeneration programme.

The mother project related to nitrogen recovery is still not implemented, being in funding seeking phase. The technology provider is already identified, and the cost analysis were estimated in detail. The other mother project of AD plant has not any impact to be reported yet.

The side-mother projects are associated with the implementation of the separate collection of household biowaste in Murcia, which was funded by the European programme NextGeneration with EUR 6.794 million, and the campaign for contamination (impurities) prevention in food waste, what was funded by LIFE programme with EUR 350,000.

Consequently, no progress has been reported for the topics B “Jobs”, C “Environmental” and D “R&D”, since the mother and side-mother projects are under initial implementation without significant impacts on these aspects.

The UCBE investments and costs registered for Murcia until March 2025 are described in detail in the following **Table 10Table *8*** for the 4 categories of KPIs.

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

Table 10. UCBE investments and costs in Murcia.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	Nitrogen recovery from AD supernatant: project was not sill implemented, being the estimation for the CAPEX of 700 to 750 k€. Biowaste to high quality amendment, an infrastructure project (AD coupled with composting tunnels) funded by Municipality of Murcia and other grants, totalising an investment of 7 M€.	**7**	2024
A.2. Mother project net revenues	Nitrogen recovery from AD supernatant: Revenues estimated for N fertiliser is 0.175 M€/year. Soil amendment from compost and digestate: not estimated yet. Revenues will come from the service of biowaste management and from selling the soil amendment, that is expected to have good market demand.	0	2024
A.3. Mother project funding	Soil amendment from compost and digestate project submitted to the NextGeneration call by the Municipality of Murcia, what is under evaluation by the funding programme.	0	2024
A.4. Mother project financing	Not applicable: promoters are only seeking for grants and subsidies.	N/A	2024
A.5. Side-mother project investment	Implementation of separate collection of household biowaste in Murcia funded by NextGeneration programme with a total of 6.79 M€. Food prevention action with contamination prevention in food waste: project Greenme5 funded by LIFE programme with 0.35 M€.	**7.14**	2024
A.6. Induced project investment	Implementation of UCO separate collection in Murcia funded by NextGeneration programme with 0.55 M€.	**0.55**	2024
B.1. Mother and side project jobs	Biowaste collection and composting plant: estimation of 27 jobs to be created with a salary of 35 k€/year, budgeting 0.95 M€/year.	0	2024
B.2. Induced project jobs	Projects started recently by 2024, without jobs to be reported actually.	0	2024
C.1. Waste management fees saved	Projects started recently by 2024, without fees saved to be reported actually.	0	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
C.2. km transportation saved	Implementation of household biowaste collection system: no km to be reported actually.	0	2024
C.3. Energy savings	Projects started recently by 2024, without energy savings to be reported actually.	0	2024
C.4. Bioenergy sold	Not applicable: projects not related to bioenergy production. No energy (from CH_4) is expected to be sold, that will be used for internal consumption in the waste treatment plant.	N/A	2024
D.1. Mother and side project R&D	No grants for R&D projects earned for nitrogen recovery from AD supernatant project. Consortium will apply for Spanish 2nd call FID 4 in May 2025 [19].	0	2024
D.2. Induced project R&D	No grants for R&D projects earned, neither proposal submissions.	0	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.6. Porto

The mother projects for Porto targeted to:

► The production of biochar from invasive biomass and garden and park waste. This full-scale project aims to process 2,750 tons of biomass annually, producing 700 tons of biochar. With a CAPEX of EUR 2 million, the project aims to support regional waste management and biochar market development. The project has encountered difficulties in engaging municipalities to secure enough feedstock. HOOP provided the market and risk analysis study, and the compliance study is under evaluation.

► The nutrient recovery from liquid fraction from anaerobic digestion (AD) digestate. This full-scale project, integrated into a larger AD plant with a CAPEX of EUR 53 million, aims to recover 15% of the existing phosphorus, ranging from 50 to 250 mg/L. For nitrogen the desired degree of recovery was higher, with 40% of the initial 3.0-4.5 g ammonium/L. The CAPEX for the nutrient recovery line is EUR 759,000. The project is placed within a larger framework, and an open market consultation was realised. Project to be funded and financed by bank loans and national grants.

The induced projects are related to the construction of the green composting park, that was totally funded by national grants from POSEUR programme, the home and community composting, where the bins were offered by LIPOR to the local communities.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

The mother project under implementation related to AD full-scale plant got EUR 10 million of loans from the European Investment Bank, and actually LIPOR is seeking for national grants. The technology provider is already identified, and the cost analysis was estimated in detail.

The side-mother projects are associated with the implementation of a small-scale AD plant and depacker, which was funded by the POSEUR programme with EUR 0.76 million, and the extension of separate collection of biowaste (food and green waste), what was funded by POSEUR programme with EUR 3 million.

No progress has been reported for the topic D “R&D”, since the mother and side-mother projects are already implemented or under implementation.

The UCBE investments and costs registered for Porto region until March 2025 are described in detail in the following **Table 11Table *8*** for the 4 categories of KPIs.

Table 11. UCBE investments and costs in Porto.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	AD full-scale plant under implementation with CAPEX of 53 M€, which includes a NP nutrient recovery line. The consultation is already concluded, and the technology provider will be identified. Project to be funded and financed by bank loans and national grants. Production of biochar from invasive plant biomass: CAPEX estimated in 2 M€, project is still under compliance and market analysis studies.	**53**	2025
A.2. Mother project net revenues	AD full-scale plant with NP nutrient recovery line: revenues estimated of 0.048 M€/year only for P fertiliser. The estimation for N is under assessment. Production of biochar from invasive plant biomass: 1.1 M€/year of revenues estimated for biochar applied to agriculture.	0.048	2025
A.3. Mother project funding	No grants earned.	0	2024
A.4. Mother project financing	AD full-scale plant with NP nutrient recovery line: 10 M€ of loans approved from European Investment Bank in 2022; 2 M€ of loans not approved from Venture group in 2024.	10	2024
A.5. Side-mother project investment	Small-scale AD and depacker project of 0.76 M€ funded by the national programme POSEUR in 2024 [20]. Extension of separate collection of biowaste (food and green waste) funded by POSEUR with 3 M€ in 2024.	**3.76**	2024

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
A.6. Induced project investment	Green composting park funded with 3.3 M€ of grants from POSEUR in 2024 [20]. Home composting project: compost bins offered by LIPOR in 2022-2024 with a total investment of 0.069 M€. Community composting bins offered by LIPOR in 2022-2024 with a total investment of 0.133 M€.	**3.50**	2022-2024
B.1. Mother and side project jobs	AD full-scale plant with NP nutrient recovery line: estimation of 36 jobs to be created with a budget of 1.2 M€/year. Production of biochar from invasive plant biomass: estimation of 2 jobs to be created in the future, corresponding to 0.04 M€/year. Small-scale AD and depacker: 0.02 M€/year for 1 job created.	1.22	2024
B.2. Induced project jobs	Green composting park: 0.07 M€/year for 3 jobs created. Community composting: 0.03 M€/year for 2 jobs created.	0.1	2024
C.1. Waste management fees saved	AD full-scale plant with NP nutrient recovery line: estimation of 65 kton biowaste feed and a tariff of 83 €/ton, corresponding to 5.4 M€/year. Production of biochar from invasive plant biomass: estimation of 2 kton biomass feed and tariff of 83 €/ton, corresponding to 0.17 M€/year. Small-scale AD and depacker: 400 ton biowaste feed in 2023 and 2024 and tariff of 83 €/ton, corresponding to 0.03 M€/year. Extension of separate collection of biowaste (food and green waste): 7 kton biowaste (difference between separate collection quantities in 2022-2024) for a tariff of 83 €/ton, corresponding to 0.58 M€/year. Green composting park: 600 ton green waste in 2024 for a tariff of 83 €/ton, corresponding to 0.05 M€/year. Community composting: 10 ton biowaste (2022-2024) for a tariff of 83 €/ton, corresponding to 0.001 M€/year. Home composting: 800 ton biowaste (between 2022 and 2024) for a tariff of 83 €/ton, corresponding to 0.07 M€/year.	6.13	2022-2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
C.2. km transportation saved	Without estimation yet for the projects: AD full-scale plant; production of biochar; extension of biowaste collection; home and community composting. Small-scale AD and depacker: 110 circuits of 50 km in 2024. Price of fuel (average in 2024 for Portugal): 1.6 €/L and considering a consumption of 6 L/100 km, the total is 0.0005 M€/year. Green composting park: 116 circuits of 60 km in 2024. Price of fuel (average in 2024 for Portugal): 1.6 €/L and considering a consumption of 6 L/100 km, the total is 0.0007 M€/year.	0.001	2024
C.3. Energy savings	Small-scale AD and depacker: 23 kWh/h in 2023 and 2024. Considering 0.15 €/kWh in 2024 (average in Portugal), the total is 0.03 M€/year. Not applicable: projects of AD full-scale plant, biochar, green composting, extensions biowaste collection, home and community composting are not related to energy production.	0.03	2023-2024
C.4. Bioenergy sold	AD full-scale plant with NP nutrient recovery line: 3.7 M€/year estimated for biomethane. Production of biochar from invasive plant biomass: estimation of 550 kWh/h for heat production, and considering 0.15 €/kWh in 2024 (average in Portugal), the total is 0.723 M€/year. Small-scale AD and depacker: estimation of 54 kWh/h for electricity production in 2023 and 2024, and considering 0.15 €/kWh in 2024 (average in Portugal), the total is 0.071 M€/year. Not applicable: projects of green composting, extensions biowaste collection, home and community composting are not related to energy production.	3.77	2024-2025
D.1. Mother and side project R&D	2 k€ for physicochemical analysis for digestate (AD full-scale plant) and biochar (pyrolysis) samples. Not approved the project MIDDEN: fermentation of domestic food waste to biosurfactants with ID of SEP-210931354 from programme HORIZON-CL6-2023-CircBio-02-3.	0.002	2024
D.2. Induced project R&D	3.8 k€ for physicochemical and biological analysis for digestate (AD small-scale and depacker) and compost (green composting park, home and community composting) samples.	0.004	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.7. Kuopio

The mother project for Kuopio refers to a biochar pilot reactor consuming garden and park waste and post-consumer wood waste. The reactor, characterised by a feed capacity of 60-90 kg/h and a biochar production rate of 20-30 kg/h, was commissioned and optimised by Savonia University of Applied Sciences. Funded by various grants (European Regional Development Fund, European Social Fund, University of Savonia and Municipality of Kuopio), the project got a total of EUR 803,000 in 2023. This non-profit project supports R&D activities aimed at advancing biochar technologies with tests of several feedstocks and then optimising the operating conditions. In the future, the reactor will be scaled-up.

Consequently, no progress has been reported for the topics B “Jobs”, C “Environmental” and D “R&D”, since the pyrolysis reactor is a non-profit project only targeted to R&D activities.

The UCBE investments and costs registered for Kuopio until March 2025 are described in detail in the following **Table 12Table *8*** for the 4 categories of KPIs.

Table 12. UCBE investments and costs in Kuopio.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	Biochar pilot reactor by slow pyrolysis funded and implemented in 2023 with CAPEX of 0.83 M€.	**0.83**	2023
A.2. Mother project net revenues	Not applicable: biochar pilot reactor by slow pyrolysis is a non-profit project, only targeted for R&D activities.	N/A	2023
A.3. Mother project funding	Biochar pilot reactor by slow pyrolysis: 802,942 € of grants approved from European Regional Development Fund, European Social Fund, University of Savonia and Municipality of Kuopio in 2023.	0.803	2023
A.4. Mother project financing	Not applicable: promoter was only seeking for grants and subsidies.	N/A	2024
A.5. Side-mother project investment	No investments to be reported.	0	2024

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
A.6. Induced project investment	No investments to be reported.	0	2024
B.1. Mother and side project jobs	Biochar pilot reactor by slow pyrolysis: 2 temporary jobs created, but no data about the costs.	0	2024
B.2. Induced project jobs	No jobs to be reported.	0	2024
C.1. Waste management fees saved	Not applicable: pilot plant only targeted to R&D activities.	N/A	2024
C.2. km transportation saved	Not applicable: pilot plant only targeted to R&D activities.	N/A	2024
C.3. Energy savings	Not applicable: non-profit project not related to energy production.	N/A	2024
C.4. Bioenergy sold	Not applicable: non-profit project only targeted to R&D activities.	N/A	2024
D.1. Mother and side project R&D	Answered in A.3.	N/A	2023
D.2. Induced project R&D	No grants for R&D projects to be reported.	0	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

4.8. Western Macedonia

The mother projects from Western Macedonia are targeted to:

► The fermentation of used cooking oils (UCO) to produce P3HB. This pilot project aims to process 2.5 tons of UCO annually, producing 1 ton of P3HB. With a CAPEX of EUR 4.5 million, market studies to assess feasibility and demand were realised. The technology provider is identified, providing the cost analysis in detail. However, feedstock availability constraints pose significant challenges.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

► The extraction of functional ingredients from spent coffee grounds (SCG). This pilot project aims to process 1,000 tons of SCG annually, producing 60 tons of coffee oil and 2 tons of polyphenols. With a CAPEX of EUR 600,000, the project is exploring market opportunities for these high-value ingredients. However, key financial data and business model specifics need further refinement.

The induced project is related to the extension of separate collection of household biowaste in the region.

The mother projects are still not implemented, being in funding seeking phase. The technology provider is already identified, and the cost analysis were estimated in detail.

The side-mother projects are associated with the extension of separate collection of UCO and related equipment (bins and collection bottles), which was funded by the national Green Fund with EUR 16,520 and INTERREG with EUR 57,000, and the implementation of SCG separate collection and related equipment (electric vehicles and bins), what was funded by INTERREG programme Greece – North Macedonia with EUR 38,000.

Consequently, no progress has been reported for the topics C “Environmental” and D “R&D”, since the mother projects were not implemented yet and the induced and side-mother projects are already implemented but not targeted to R&D and without any significant environmental impact due to the small size of investments.

The UCBE investments and costs registered for Western Macedonia region until March 2025 are described in detail in the following **Table 13** for the 4 categories of KPIs.

Table 13. UCBE investments and costs in Western Macedonia.

KPI	Description	Total [M€]	Year
A.1. Mother project CAPEX	Fermentation of UCOs: investment not concretised. Cost analysis provided in detail by the technology provider. CAPEX estimated in 4.5 M€. Functional ingredients from SCGs: investment not concretised. CAPEX estimated in 0.6 M€ by the technology provider.	0	2024
A.2. Mother project net revenues	Fermentation of UCOs: Revenues estimated in 0.043 M€/year according to the technology provider for the bioproduct P3HB targeted to cosmetic sector, considering a plant of 2.5 ton UCO/year into 1 ton P3HB/year. Functional ingredients from SCGs: revenues estimated in 0.195 M€/year for 100 kg of wet SCGs into polyphenols.	0	2024

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
A.3. Mother project funding	Projects submitted and under evaluation: - COREV.PCP: grant of 4,270,000 € in a reserve list from PCP/PPI call in 2022 (HORIZON-CL4-2022-RESILIENCE-02-PCP). - CHORUS: 782,473.86 € of grants. Successfully approval within 1st stage. Approval pending for the second stage from Interreg VI-A IPA Greece-North Macedonia 2021-2027. - CLOSURE: Interreg Euro-MED Euro-MED0501797. Rejected within 1st stage.	0	2024
A.4. Mother project financing	No financing got for the projects yet.	0	2024
A.5. Side-mother project investment	Extension of separate collection of UCO: Equipment for UCOs collection (ATMs and collection bottles) budgeted in 16,520 € funded by National Green Fund Αρχική - In2UCO. Equipment for UCOs collection (ATMs and collection bottles) funded with 57,000 € by Interreg Greece - Albania. Implementation of SCG separate collection: Equipment for collection of SCGs (electric vehicles, bins) funded with 38,000 € by Interreg Greece - North Macedonia.	**0.11**	2024
A.6. Induced project investment	Extension of separate collection of household biowaste with total investment of 1.12 M€ in 2024.	**1.12**	2024
B.1. Mother and side project jobs	Fermentation of UCOs: estimation of 8 jobs to be created, corresponding to 0.124 M€/year. Functional ingredients from SCGs: estimation of 5 jobs to be created, corresponding to 0.08 M€/year. Extension of separate collection of UCO: 0.016 M€/year for 1 job created.	0.02	2024
B.2. Induced project jobs	Extension of separate collection of household biowaste: 0.06 M€/year for 4 jobs created for transportation service. Biowaste composting: 0.03 M€/year for 2 jobs created.	0.09	2024
C.1. Waste management fees saved	Project not assisted by HOOP: Waste ending to a mechanical biological treatment plant of 92 kton/year and considering the landfill fee of 35 €/ton, the total is 3.22 M€/year.	3.22	2024
C.2. km transportation saved	Projects implemented for biowaste, UCO and SCG collection not saved km.	0	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Description	Total [M€]	Year
C.3. Energy savings	Not applicable: projects not related to energy production.	N/A	2024
C.4. Bioenergy sold	Not applicable: projects not related to bioenergy production.	N/A	2024
D.1. Mother and side project R&D	No grants for R&D projects earned. Studies realised and funded only by HOOP.	0	2024
D.2. Induced project R&D	Answered in A.3.	N/A	2024
D.3. Mother and side project IP, licenses and certifications	No IP and certifications to be reported.	0	2024

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

5. HOOP economic impact assessment

In accordance with the data described in detail for each Lighthouse in the previous chapter, the **Table 14** summarises all KPIs distributed within 4 categories for the total of UCBE investments and costs executed until March 2025 by the 8 Lighthouse Cities and Regions. The sum of investments and costs for each indicator was calculated considering the mother, side-mother and induced projects. The total investments and costs were distinguished between executed (UCBE projects implemented and/or under implementation) and to be executed (UCBE projects not implemented yet and under early stage, i.e., with low maturity).

Table 14. Summary of total UCBE investments and costs executed and to be executed by the 8 Lighthouses.

KPI	Total executed [M€]	Total to be executed [M€]	Total [M€]
A.1. Mother project CAPEX	**68.83**	**37.13**	**105.96**
A.2. Mother project net revenues	9.75	12.28	22.03
A.3. Mother project funding	2.91	0	2.91
A.4. Mother project financing	11.00	0	11.00
A.5. Side-mother project investment	**11.18**	**0**	**11.18**
A.6. Induced project investment	**44.41**	**0**	**44.41**
B.1. Mother and side project jobs	2.11	1.88	3.99
B.2. Induced project jobs	1.54	0	1.54
C.1. Waste management fees saved	9.35	0.17	9.51
C.2. km transportation saved	0.001	0	0.001
C.3. Energy savings	0.03	0	0.03
C.4. Bioenergy sold	3.77	1.04	4.81
D.1. Mother and side project R&D	0.01	0.28	0.29

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

KPI	Total executed [M€]	Total to be executed [M€]	Total [M€]
D.2. Induced project R&D	0.004	0	0.004
D.3. Mother and side project IP, licenses and certifications	0	0	0

In terms of total investments (KPIs A), **all executed projects realised an investment (A.1+A.5+A.6) that totalises EUR 124.42 million, while the projects not executed until March 2025 totalises an investment of EUR 37.13 million. Mother and side-mother projects (A.1+A.5) represent the significant contribution for the execution, with EUR 80.01 million, i.e., 64% (about 2/3) of total investment executed for all UCBE projects**. Nevertheless, the total UCBE investment executed or planned to be executed will reach EUR 161.55 million, which EUR 37.13 million of that not executed is expected to be invested in the short-term.

Those executed mother and side-mother projects received EUR 2.91 million of grants (A.3) and EUR 11 million of loans (A.4), totalising EUR 13.91 million, meaning that about 17% of the total investment (A.1+A.5) was funded or financed. However, the revenues will cover in the future those investments, considering that the projects will generate annually EUR 9.75 million of sales in material (biochar, P3HB, protein, functional ingredients, etc.) and energy (biofuels, heat and electricity) bioproducts and services, however this value was only estimated for some projects. Therefore, the total net revenues (A.2), grants (A.3) and financing (A.4) should be considered as minimum values. In short-term it is expected to increase these values, considering the funding and financing proposal submissions and the tenders to identify technology providers and respective accurate estimation of revenues.

The following **Figure 4** illustrates the UCBE investments executed during the HOOP PDA and expected to be executed at short-term after HOOP. As commented previously, all results linked to project investments to be executed, funding, financing and estimated revenues are only indicative, being expected to increase them with the development of the projects and tenders.

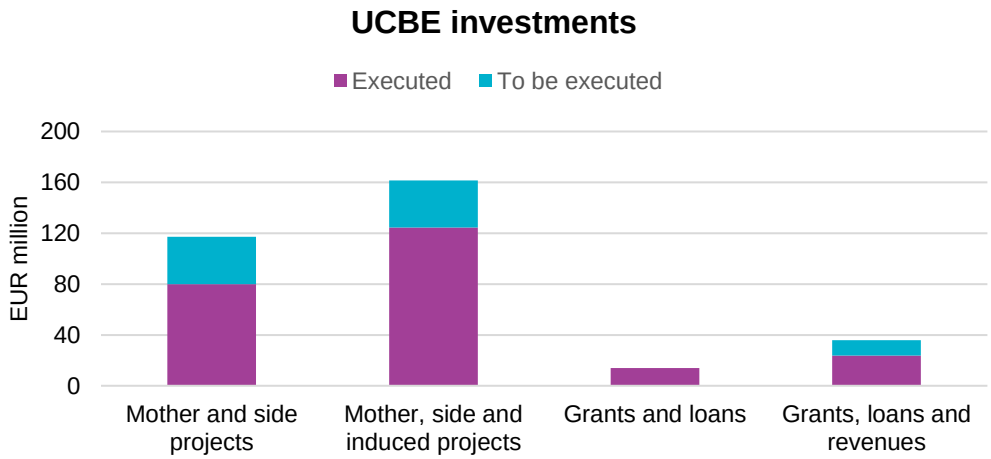

Figure 4 – HOOP economic impact on UCBE investments.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

In terms of impacts on job creation (KPIs B), the KPIs B.1 and B.2 from **Table 14** account the costs (salary and social security contributions) associated to the job positions created by the UCBE investments. However, these indicators should be converted to their contribution for economic growth on each Lighthouse. For that, the nominal labour productivity per person was considered.

The data for nominal labour productivity per person are available for 2023, in EUR, for European regions [21]. This indicator is defined as a value of output (value added) produced by one employed person over a period of time. This value is often used to measure the efficiency and performance of the workforce within a country's economy or a particular business.

The following **Table 15** exhibits the contribution of the jobs generated, by the UCBE investments executed or under implementation in each Lighthouse, for the economic value added introduced into the Lighthouse's regions. The calculation was based on the nominal labour productivity per region and number of job positions created.

Table 15. Labour productivity input by the job positions created in each Lighthouse.

Lighthouse's region	Nominal labour productivity per person [21]	B.1. Mother and side project jobs		B.2. Induced project jobs	
	€/pp	No. jobs	M€	No. jobs	M€
Flevoland region (Almere)	74,900	0	0	8	0.6
Lazio region (Albano L.)	86,700	0	0	0	0
Vestland region (Bergen)	84,800	8	0.7	8	0.7
Münster province	80,500	1	0.08	0	0
Murcia region	60,500	0	0	0	0
North region (Porto)	45,300	37	1.7	5	0.2
Pohjois-Savo region (Kuopio)	92,900	2	0.2	0	0
Western Macedonia region	42,500	1	0.04	6	0.3
Total	-	**49**	**2.7**	**27**	**1.8**

The new 76 job positions, created by mother, side-mother and induced UCBE projects, have generated EUR 4.5 million of economic impact on the growth of those European regions.

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

However, more than 49 job positions are expected to be created at short-term with the implementation of some projects, with a local impact of more than EUR 2.9 million, considering the following estimations: 6 jobs for P3HB project from Lazio, 1 for biochar project from Münster, 27 for biowaste collection and composting plant from Murcia, 2 for biochar project from Porto, 13 for UCO and SCG projects from Western Macedonia. As commented previously, all results linked to projects to be implemented after HOOP are only indicative as a minimum number of positions to be created, being expected to increase them with the development of the UCBE investments.

The following **Figure 5** illustrates the HOOP economic impact on the number of job positions generated by the UCBE investments, during the HOOP PDA, and the minimum expected to be generated at short-term after HOOP. The graph on the right corresponds to the total number of job positions and the graph on the left to the respective local economic impact, in EUR million, based on country's labour productivity.

Figure 5 – HOOP economic impact on jobs.

In terms of impacts on environmental savings (KPIs C), most of the investment projects executed or to be implemented in the future did not estimate the economic impact on the environmental savings. However, **the quantity of waste management fees saved (KPI C.1) and the total bioenergy (biofuels, heat and electricity) sold (KPI C.4) represent the higher impact within this category, totalising EUR 9.4 and 3.8 million respectively from the execution of the UCBE investments. And at least, a total amount of EUR 1.2 million will be impacted by the future investments.**

As the UCBE investments executed from mother, side-mother and induced projects are under implementation or beginning of operation, the saving impacts resulted from the total distance of biowaste transportation (KPI C.2) and the energy consumption (KPI C.3) totalise a minimum of EUR 0.03 million until March 2025.

The following **Figure 6Figure *4*** illustrates the minimum economic impact associated to the environmental savings resulted from the mother, side-mother and induced investments executed and expected to be executed at short-term after HOOP.

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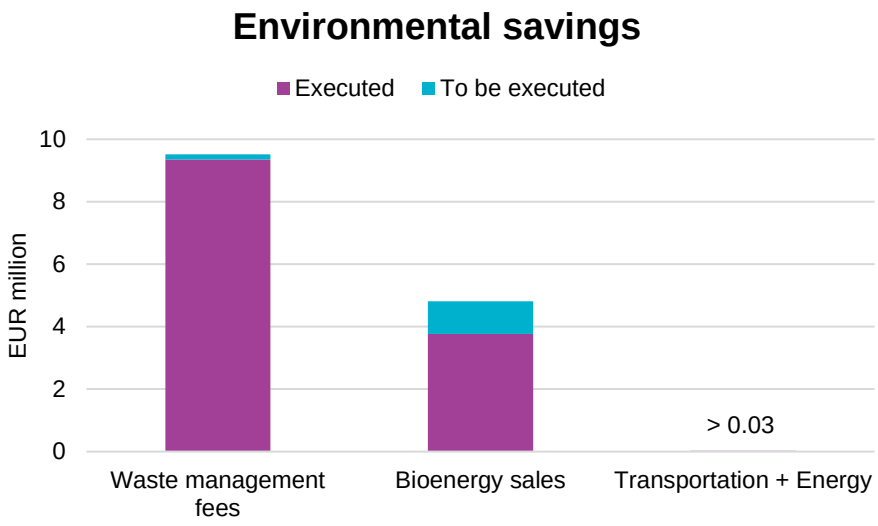

Figure 6 – HOOP economic impact on environmental savings.

In terms of impacts on R&D and certifications (KPIs D), **the mother, side-mother and induced investments foresee obtaining at least EUR 0.3 million of grants for R&D activities (KPIs D.1 and D.2). In fact, most of the projects are profit-target, excepting the R&D pilots as from Kuopio.** The grant obtained from Kuopio for its R&D pilot was included in KPI A.3, because the investment was mostly applied for acquisition of the technology (pyrolysis reactor). **Lighthouses have not reported any expense for IP, licenses and certifications from mother and side projects executed (KPI D.3) until March 2025**, as stated in **Table 14**.

The following **Figure 7Figure *4*** illustrates the minimum economic impact associated to the total amount of grants for R&D activities from the mother, side-mother and induced investments executed and expected to be executed at short-term after HOOP.

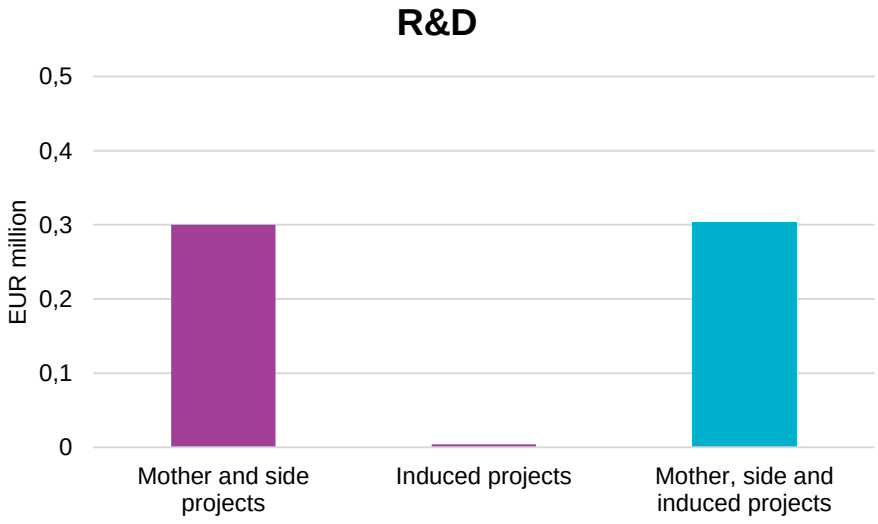

Figure 7 – HOOP economic impact on R&D.

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In accordance with the data described in detail for each Lighthouse in the previous chapter, the **Table 16** summarises all KPIs distributed within 4 categories for the total of UCBE expenses/investments executed and to be executed until March 2025 by each Lighthouse. Values X / Y in EUR million, in the table, means executed / to be executed.

Table 16. Summary of total UCBE investments and costs, in EUR million, executed / to be executed by each Lighthouse.

KPI	Almere	Albano / Lazio	Bergen	Münster	Murcia	Porto	Kuopio	W. Macedonia
A.1.	**0 / -**	**0 / 24.8**	**8 / 1.5**	**0 / 3**	**7 / 0.7**	**53 / 2**	**0.8 / -**	**0 / 5.1**
A.2.	0 / -	0 / 9	9.7 / 1	0 / 0.8	0 / 0.2	0.1 / 1.1	N/A	0 / 0.2
A.3.	0 / -	0 / -	2.1 / -	0 / -	0 / -	0 / -	0.8 / -	0 / -
A.4.	0 / -	N/A	1 / -	0 / -	N/A	10 / -	N/A	0 / -
A.5.	**0 / -**	**0.2 / -**	**0 / -**	**0 / -**	**7.1 / -**	**3.8 / -**	**0 / -**	**0.1 / -**
A.6.	**4.5 / -**	**0.9 / -**	**33.8 / -**	**0.1 / -**	**0.6 / -**	**3.5 / -**	**0 / -**	**1.1 / -**
B.1.	0 / ?	0 / 0.7	0.8 / ?	0.1 / ?	0 / 1.0	1.2 / 0.1	?	0.02 /0.2
B.2.	0.7 / ?	?	0.7 / ?	?	?	0.1 / ?	?	0.1 / ?
C.1.	?	?	?	?	?	6.1 / 0.2	N/A	3.2 / ?
C.2.	?	?	?	?	?	< 0.1 / ?	N/A	?
C.3.	N/A	N/A	?	?	?	< 0.1 / ?	N/A	N/A
C.4.	N/A	N/A	?	0 / 0.3	?	3.8 / 0.7	N/A	N/A
D.1.	0 / ?	0 / ?	0 / ?	< 0.1 / 0.3	0 / ?	< 0.1 / ?	-	0 / ?
D.2.	0 / ?	0 / ?	0 / ?	0 / ?	0 / ?	< 0.1 / ?	0 / ?	0 / ?

Regarding the UCBE investments and funding (KPIs A), **Porto and Bergen were responsible respectively for 49 and 34 % of all executed investment (A.1+A.5+A.6), while Albano/Lazio is responsible for 67% of all investments from the projects not executed until March 2025. The total amount of grants obtained for mother and side investments (A.3) was distributed in 72 and 28 % for Bergen (insect protein and microalgae production) and Kuopio (biochar reactor) respectively. The total amount of loans got for mother and side investments (A.4) was distributed among Porto (91%), for AD plant, and Bergen (9%) for microalgae plant.**

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As established in the methodology (**chapter 3**) and in accordance with the **Table 5**, that sets the key financial indicators and the math formulas for the calculation of the 4 financial leverage factors, LHT, LHP, LHIT and LHIP, the following **Table 17** illustrates the results for the HOOP economic impact on total investments realised and respective financial leverage factors.

The calculation of the financial leverage factors was based on the total UCBE investments executed by the Lighthouses, which include mother, side-mother and induced projects, in comparison with the total HOOP grant (EUR 7,999,063.69) and respective amount allocated to the PDA (EUR 3,972,669.36). The total investments correspond to the sum of "total LH investments" (A.1 + A.5), i.e., mother and side-mother projects, and "total induced investments" (A.6), i.e., englobe all kind of projects under HOOP scope.

Table 17. HOOP economic impact on total investments and financial leverage factors.

Indicator	Value	Ref. Value
Total LH investments	80.01 M€	N/A
Total induced investments	44.41 M€	N/A
Total investments	124.42 M€	N/A
Leverage Factor LHT	10.0	6 (min)
Leverage Factor LHP	20.1	12 (min)
Leverage Factor LHIT	15.6	6 (min)
Leverage Factor LHIP	31.3	12 (min)

HOOP consortium has set a minimum leverage factor of 6€ investment for each 1€ of HOOP grant provided to the Lighthouses. As stated in **Table 17**, **the leverage factor LHT complies totally with that statement with the value of 10. Regarding the LHP factor, the result of 20 complies and surpass 68% of the minimum reference.**

Regarding the financial leverage factors LHIT and LHIP, the HOOP economic impact complies and surpass again by more than twice of the minimum references, as observed in the following **Figure 8**.

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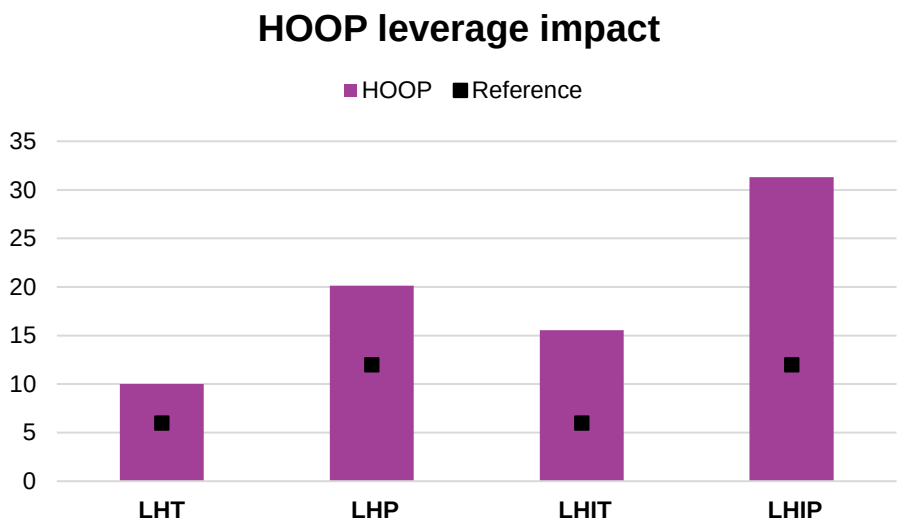

Figure 8 – HOOP economic leverage impact.

The leverage factor LHT, according to HOOP Grant Agreement, should be into the range 6 to 10, meaning that each million EUR invested by the Lighthouses will trigger EUR 6-10 million of additional investment, totalling up to a leverage factor of 20 times in 4.5 years. The economic impact measured by the end of the HOOP project complies and surpass the minimum values committed.

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6. Discussion

The economic impact assessment of the HOOP PDA reveals a range of project outcomes across the eight Lighthouse Cities and Regions. The PDA focuses on a variety of projects within the cities and regions with different investment volumes planned that are expected to be complemented by public and private investments. While some projects have successfully transitioned into implementation, others remain in the planning phase due to financial, regulatory, or operational barriers.

The eight HOOP Lighthouses selected the most suitable UCBE projects to be developed and implemented over their territories. The list of projects was summarised in D3.1 “Report on the selection of the investment projects for the Lighthouse Cities and Regions”. This list had initially 16 projects, but decreased to 13 due to the following reasons:

- Strategic decisions driven by the project promoters, such as merging of projects, scope changing;
- Low economic feasibility, and this aspect was the key factor;
- Compliance and competition issues that some projects faced due to the introduction of new innovative bioproducts into the markets very regulated and competitive;
- Lack of political commitment due to the lack of investors and/or funders;
- Low maturity of some technologies and processes and/or lack of technology providers in the market.

► Comparison of implemented vs. planned projects

Among the implemented projects, Bergen, Kuopio, Murcia and Porto stand out as strong examples of successful PDA-supported investments. These cities benefited from a combination of strong stakeholder engagement, well-structured financial strategies, and policy alignment that facilitated smoother project execution.

Bergen effectively leveraged a mix of public and private funding, securing investment in sustainable insect protein and microalgae feed production. Kuopio’s success was largely attributed to its early stakeholder involvement and its biochar pilot project’s high technology readiness level, which helped attract financial backing. Porto, on the other hand, demonstrated the impact of effective governance structures and investment matchmaking tools, securing both public grants and private loans to advance its anaerobic digestion full-scale plant. The Municipality of Murcia is a good example of pro-active mediator between public administration, waste and wastewater management companies for funding proposals and establishment of consortiums to improve the biowaste and wastewater management in the city and region.

In contrast, Münster, Western Macedonia, Albano Laziale and Almere have faced challenges in securing the necessary investment and regulatory approvals. Münster and Western Macedonia, in particular, have struggled with policy uncertainties and difficulties in attracting private capital. Münster has faced delays due to complex permitting procedures and evolving waste management regulations, making it difficult to secure long-term

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commitments from investors. Western Macedonia, on the other hand, has encountered administrative hurdles linked to national-level policy changes and a lack of structured financial incentives for circular economy initiatives, further deterring private sector participation. Münster has, however, submitted funding applications under the EFRE/JTF program and ZiBi national program, but approvals are still pending. Almere's biowaste optimisation project has seen investment (EUR 4.5 million) but remains classified as an induced project rather than a fully developed initiative, despite the clear influence of HOOP in the new biowaste collection system. Albano Laziale leveraged PDA insights to refine grant applications, securing partial public funding for biowaste digitalisation and smart collection.

► Financial overview: public vs. private funding and financing sources

The financial landscape across the Lighthouse projects demonstrates a mix of public grants, private investment, and self-funded contributions. The final financial data confirms that while Bergen, Kuopio, and Porto secured a combination of public and private funding and financing, other regions remained fully dependent on external grant approvals. The funding and financing disparities across these cities highlight the critical need for tailored financing strategies and structured investment dialogues to bridge funding gaps and ensure the long-term viability of circular bioeconomy projects. Addressing these financial gaps through more structured investment strategies and stakeholder engagements will be crucial for advancing these projects.

The Lighthouse projects are typically dependent on equity, regional subsidies and grants. Given the investment volume required in terms of CAPEX for full-scale plants, grants may not be eligible or feasible for those projects. Therefore, loans, debt, bonds and guarantees may be needed or, if applicable, applying to National Recovery and Resilience Funds and to the most recent European Regional Development Funds for 2021-2027 period. For start-ups' projects from Bergen, crowdfunding and guarantees are an alternative to be coupled with other schemes like equity and grants.

► Impact and effectiveness of the PDA process

The HOOP PDA has played a crucial role in guiding project development, but its impact has varied depending on local circumstances. In cities like Bergen, Porto and Kuopio, where existing stakeholder networks and market readiness were strong, the PDA effectively accelerated project maturity. The structured financial tools, investment matchmaking, and project maturity assessments provided under HOOP supported these cities in securing the necessary capital for implementation.

The HOOP matchmaking procedures were particularly effective in linking project developers with investors, a critical factor in Bergen and Porto's success. Furthermore, the Project Maturity Level tool helped evaluate financial and technical feasibility, particularly for Porto's nutrient recovery initiative. Murcia and Western Macedonia also leveraged PDA insights to refine their grant applications, leading to partial public funding success.

Conversely, in locations where regulatory uncertainties, technological immaturity, or financial constraints persisted, such as Münster and Western Macedonia, the PDA process faced limitations. While the PDA process provided valuable guidance, further regulatory alignment, risk mitigation strategies, and long-term financial planning are necessary to bring these projects closer to implementation.

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Additionally, the Circular Investors Board (CIB) was intended to facilitate investment opportunities and bridge financing gaps for circular economy initiatives. The CIB was initially launched as part of the HOOP initiative's financial engagement strategy, with key activities taking place between 2021 and 2024. While the board itself faced challenges in becoming fully operational, its members contributed valuable insights into the investment landscape. The engagement with the CIB helped shape certain aspects of the PDA process, particularly by supporting the development of tools, refining the financial structuring of projects and enhancing investor matchmaking strategies.

All UCBE technologies and processes developed or under development by the Lighthouses may be replicated or scaled-up, which is also a strong advantage. These positive aspects are very attractive for investors, but a particular barrier for funders given that, in general, grant programmes have low budget available to cover the CAPEX of full-scale projects. Most of the projects exhibit TRL 6 and 8-9, which is also an added value, positioning the projects in good conditions to benchmarking, risk management, funding and financing decisions, and exploitation and replication for other territories and larger markets, i.e., a potential higher economic impact of HOOP in the future.

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7. Conclusion

All data and information collected for this report were performed until March 2025 for UCBE mother, side-mother and induced projects. During the HOOP PDA, data and scope of the projects constantly changed as the technical studies (e.g., techno-economic feasibility) and laboratory tests evolved, or in some cases for financial or regulatory reasons. Therefore, there are several projects that will be completely implemented after the end of HOOP project.

The economic impact analysis of the HOOP PDA highlights both successes and challenges in advancing urban circular bioeconomy projects. The experiences of Bergen, Kuopio, and Porto demonstrate that securing a balanced mix of public and private funding and financing, coupled with strong stakeholder engagement, is key to project success. Meanwhile, the slower progress in Münster, Western Macedonia, and other regions underscores the persistent financial and regulatory barriers that need to be addressed.

The projects have evolved significantly since HOOP PDA began. Initially, most of the projects had PML of 1, however, the HOOP PDA with the state-of-art of the technologies, technical studies, tailored business models and estimation of relevant data for availability of feedstocks and feasibility studies, market and risk studies, was fundamental to increase the maturity and bankability of the projects.

Furthermore, most of the projects exhibit TRL 6 and 8-9, which is an added value, positioning the projects in good conditions to benchmarking, risk management, funding and financing decisions, and exploitation and replication for other territories and larger markets.

► UCBE investment impact

All UCBE executed projects realised an investment that totalises EUR 124.4 million, while the projects not executed until March 2025 totalises an investment of EUR 37.1 million. Mother and side-mother projects represent the significant contribution for the execution, with EUR 80.0 million, i.e., about 2/3 of total investment executed for all UCBE projects. Nevertheless, the total UCBE investment executed or planned to be executed will reach EUR 161.6 million, which EUR 37.1 million of that not executed is expected to be invested in the short-term. Porto and Bergen were responsible respectively for 49 and 34 % of all executed investment, while Albano/Lazio is responsible for 67% of all investments from the projects not executed until March 2025.

► Funding and financing impact

Those executed mother and side-mother projects received EUR 2.9 million of grants and EUR 11 million of loans, totalising EUR 13.9 million, meaning that about 17% of the total investment was funded or financed. The total amount of grants obtained for mother and side investments was distributed in 72 and 28 % for Bergen (insect protein and microalgae production) and Kuopio (biochar reactor) respectively.

The total amount of loans got for mother and side investments was distributed among Porto (91%) for AD plant, and Bergen (9%) for microalgae plant. The AD plant from Porto got EUR 10 million of loans from European Investment Bank in 2022 and microalgae project got EUR 1 million of equity in 2023.

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However, the revenues will cover in the future those investments, considering that the projects will generate annually EUR 9.8 million of sales in material (biochar, P3HB, protein, functional ingredients, etc.) and energy (biofuels, heat and electricity) bioproducts and services, however this value was only estimated for some projects. Therefore, the total net revenues, grants and financing should be considered as minimum values. In short-term is expected to increase these values, considering the funding and financing proposal submissions and the tenders to identify technology providers and respective accurate estimation of revenues.

► Job impact

The new 76 job positions, created by mother, side-mother and induced UCBE projects, have generated EUR 4.5 million of economic impact on the growth of those European regions. However, more than 49 job positions are expected to be created at short-term with the implementation of some projects, with a local impact of more than EUR 2.9 million. All results linked to projects to be implemented after HOOP are only indicative as a minimum number of positions to be created, being expected to increase them with the development of the UCBE investments.

► Environmental saving impact

Most of the investment projects executed or to be implemented in the future did not estimate the economic impact on the environmental savings. However, the quantity of waste management fees saved, and the total bioenergy (biofuels, heat and electricity) sold represent the higher impact within this category, totalising EUR 9.4 and 3.8 million respectively from the execution of the UCBE investments. And at least, a total amount of EUR 1.2 million will be impacted by the future investments.

As the UCBE investments executed from mother, side-mother and induced projects are under implementation or beginning of operation, the saving impacts resulted from the total distance of biowaste transportation and energy consumption totalise a minimum of EUR 0.03 million until March 2025.

► R&D impact

The mother, side-mother and induced investments foresee obtaining at least EUR 0.3 million of grants for R&D activities. In fact, most of the projects are profit-target, excepting the R&D pilots as from Kuopio. The grant obtained from Kuopio for its R&D pilot was classified as KPI A.3, because the investment was mostly applied for acquisition of the technology (pyrolysis reactor). Lighthouses have not reported any expense for IP, licenses and certifications from mother and side projects executed until March 2025.

► HOOP economic leverage impact

The calculation of the financial leverage factors was based on the total UCBE investments executed by the Lighthouses, which include mother, side-mother and induced projects, in comparison with the total HOOP grant (EUR 7,999,063.69) and respective amount allocated to the PDA (EUR 3,972,669.36). HOOP consortium has set a minimum leverage factor of 6€ investment for each 1€ of HOOP grant provided to the Lighthouses.

All leverage factors, LHT, LHP, LHIT and LHIP, monitored for HOOP totally comply and surpass the minimum value references established. LHT and LHIT, ratio total investments (mother+side, and induced) on total HOOP grant, must comply a minimum leverage of 6, while LHP and LHIP, ratio total investments (mother+side, and

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induced) on PDA grant, must comply a minimum leverage of 12. For all leverage factors, the economic impact of HOOP successful surpass these minimums in 10, 20, 16 and 31 for LHT, LHP, LHIT and LHIP respectively.

Hence, the leverage factor LHT complies totally with that consortium commitment (min. 6) with the value of 10, while the LHP measured as 20 complies and surpasses 68% of the minimum reference. Regarding the financial leverage factors LHIT and LHIP, the HOOP economic impact complies and surpass again by more than twice of the minimum references.

We would like to highlight that the HOOP economic impact on the eight Lighthouse Cities and Regions has been a total success, despite the constraints and barriers that arose throughout the HOOP PDA. The impact of HOOP does not finish with the end of the project, but it expected to increase significantly over the next years with the full concretisation of all UCBE investments, influencing also the development of new projects in the scope of the circular bioeconomy.

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9. Annex 1: PDA docs and tools

Table 18. Key documentation and tools developed by HOOP PDA for economic baseline and assessment.

Doc n.º	Title	Type of doc.	Dissemination level	Year	Ref.
D2.2	State-of-the-art of technologies for the production of bioproducts from biowaste and wastewater	Manual	Confidential	2023	[22]
	Innovative Circular Biowaste Valorisation - State of the Art and Guidance for Cities and Regions	Article	Public	2024	[2]
D2.4 Vol. I	Investment Package Manual for European Cities and Regions. Volume I - EU Taxonomy applied to circular bio-based activities	Manual	Public	2022	[9]
D2.4 Vol. II	Investment Package Manual for European Cities and Regions. Volume II - European investment package on circular bioeconomy for European Member States, Regions and Cities	Manual	Public	2022	[10]
D2.4 Vol. III	Investment Package Manual for European Cities and Regions. Volume III - National and Regional investment package on circular bioeconomy for European Regions and Cities	Manual	Public	2022	[11]
D4.1	Novel Circular Business Models applied in the value chain of biowaste valorisation	Manual	Public	2022	[23]
D4.2	Circular Valuation Method	Tool	Public	2022	[12]
D4.3	Tailored Lighthouse Business Models (TLBM)	Report	Confidential	2022	[24]

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Doc n.º	Title	Type of doc.	Dissemination level	Year	Ref.
D4.4	Lessons learnt report from the Tailored Lighthouse Business Model	Financial model tool and Report	Confidential	2023	[3]
D4.5	PDA Business Models Report II	Report	Confidential	2024	[5]
D5.1	Circular Investors Board handbook	Manual	Public	2021	[25]
D5.2	Circular Investors Days reports	Report	Confidential	2024	[26]
D5.3	Circular Evaluation Framework Guidance report	Manual	Public	2023	[14]
D5.4	Online Project Maturity Level self-assessment tool	Tool	Public	2024	[13]
D5.5	Due Diligence Standard Procedure for Urban Circular Bioeconomy Projects	Manual	Public	2024	[7]
D5.6	Investment-Ready Project Pipeline	Report	Confidential	2024	[4]
D5.8	Open market consultations report	Report	Public	2024	[27]

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 101000836.

10. Annex 2: Questionnaire form

HOOP Economic Impact data collection

The HOOP Economic Impact data collection form aims at inventorying the data from the UCBE projects and other investments realised by the Lighthouses. **These data are crucial to evaluate the economic impact that the development of biowaste and sludge valorisation projects, through HOOP, will have on the Lighthouses Cities and Regions**. All contents and data will feed the deliverable D5.7 "HOOP economic impact in the lighthouse cities" with due date in March 2025. The report is under development by RdA Climate Solutions with support of Bax.

A. Investments

A.1. What is the total investment (CAPEX) estimated for the UCBE projects assisted by HOOP PDA? Please, identify the project.

Examples:

Project XY assisted by HOOP: CAPEX 10 M€

Project WZ assisted by HOOP: CAPEX 5 M€

A.2. What are the annual net revenues (goods and services) estimated for the UCBE projects assisted by HOOP PDA? Please, identify the project and source of revenues (e.g., bioproducts, bioenergy and services).

Examples:

Project XY assisted by HOOP: Revenues 10 M€/year, biochar + services xy

Project WZ assisted by HOOP: Revenues 5 M€/year, P3HB + biogas + services

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A.3. What is the total amount of grants allocated to the UCBE projects assisted by HOOP PDA? Please, identify the amount allocated to the project (total and to Lighthouse partner in case of consortium), funding programme and year of approval. In case you submitted any project, but it was not approved or waiting evaluation feedback, please indicate also the same previous type of data. Indicate a brief description or link for all projects mentioned.

Examples:

Project XY assisted by HOOP: 1 M€ grants approved from HE programme in 2022, link + 2 M€ grants from Interreg programme in 2024, waiting evaluation feedback, link + 3 M€ (total) and 1 M€ (for Lighthouse) from Life programme in 2024, not approved, link.

A.4. What is the total amount of financing (equity, loans, etc.) allocated to the UCBE projects assisted by HOOP PDA? Please, identify the financing provider, type of scheme and year of approval. In case you had any request refused by a bank or other financing provider, please indicate also the same previous type of data. Indicate a brief description or link for all projects mentioned.

Examples:

Project XY assisted by HOOP: 10 M€ loans approved from EIB in 2022, link + 2 M€ loans from Venture group in 2024, not approved, link.

A.5. What is the total amount of budget (municipal, regional or other entity) allocated to biowaste collection campaigns and other actions as environmental education and communication campaigns (from 2022 until 2024) related to UCBE projects assisted by HOOP PDA? Please, identify the activity and year. Indicate a brief description or link for all activities mentioned.

Examples:

Project XY assisted by HOOP: 500 k€ for biowaste collection campaign in 2023, link + 1 M€ for environmental education activities in 2024, link

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A.6. What is the total amount of budget allocated to induced circular projects (e.g., composting plants, extension or improvement of biowaste separation and collection) not assisted by HOOP PDA from 2022 until 2024? Please, identify for each investment project the promoter, sources of funding (e.g., grants, crowdfunding) and/or financing (equity, loans, subsidies, etc.), name of funding or financing provider and year. In case you had submitted any project, but it was not approved or waiting evaluation feedback, please indicate also the same previous type of data. Indicate a brief description or link for all projects mentioned.

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Examples:

Project WZ not assisted by HOOP:10 M€ from Municipality for improvement of biowaste collection in 2022, link + 1 M€ grants from Transition fund for digitalisation of collection points in 2024, link + 2 M€ loans from EIB in 2023, not approved, link

B. Jobs

B.1. What is the number of jobs created or estimated for the UCBE projects assisted by HOOP PDA? Please, identify the annual budget allocated/estimated for the jobs and respective project and year.

Examples:

Project XY assisted by HOOP: 2 jobs estimated, 25 k€/year

B.2. What is the number of jobs created or estimated for induced circular projects (e.g., biowaste separation and collection, composting plants) not assisted by HOOP PDA from 2022 until 2024? Please, identify the annual budget allocated/estimated for the jobs and respective project and year.

Examples:

Project WZ not assisted by HOOP: 2 jobs created in 2023, 25 k€/year

C. Environmental

C.1. What are the savings in landfill/incineration fees estimated with the implementation of UCBE projects assisted by HOOP PDA and for the induced circular projects not assisted by HOOP PDA from 2022 until 2024? Please, identify the type of fee, annual saving, project and year.

Examples:

Project XY assisted by HOOP: 5 €/ton of biowaste in 2023, 10 kton/year of biowaste, landfill fee saved

Project WZ not assisted by HOOP: 1 M€ saved in 2023 and 1.5 M€ saved in 2024, 10 kton/year of biowaste, incineration fee saved

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C.2. What are the total kilometres saved due to the implementation of UCBE projects assisted by HOOP PDA and for the induced circular projects not assisted by HOOP PDA from 2022 until 2024? Please, identify the type of fuel consumed, project and year.

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Examples:

Project XY assisted by HOOP: 11,000 km saved in 2023, diesel

Project WZ not assisted by HOOP: 12,000 km saved in 2024, natural gas

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C.3. What are the energy savings, if applicable, due to the implementation of UCBE projects assisted by HOOP PDA and for the induced circular projects not assisted by HOOP PDA from 2022 until 2024? Please, identify the tariff, type of energy (heat and/or electricity, fuel), project and year.

Examples:

Project XY assisted by HOOP: 500 GWh/year to be saved, 100 €/GWh for electricity, electricity

Project WZ not assisted by HOOP: 500 GWh/year saved in 2024, 100 €/GWh, heat

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C.4. What is the total bioenergy estimated to be sold, if applicable, due to the implementation of UCBE projects assisted by HOOP PDA) and for the induced circular projects not assisted by HOOP PDA from 2022 until 2024? Please, identify the tariff, type of bioenergy, project and year.

Examples:

Project XY assisted by HOOP: 500 GWh/year to be sold, 100 €/GWh for biogas, biogas into heat

Project WZ not assisted by HOOP: 500 GL/year sold in 2024, 1.1 €/L, biodiesel into transportation

D. R&D and others

D.1. What is the total amount of R&D (e.g., studies, facilities, equipment) investments allocated to UCBE projects assisted by HOOP PDA? Please, identify the project/expense, funder/financier/equity and year. In case you had submitted any project, but it was not approved or waiting evaluation feedback, please indicate also the same previous type of data. Indicate a brief description or link for the projects/expenses mentioned.

Examples:

Project XY assisted by HOOP: 100 k€ in 2023, project XY, Life programme + 200 k€ in 2024, lab equipment + 100 k€ from Interreg in 2024, waiting evaluation feedback, link.

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D.2. What is the total amount of R&D (e.g., studies, facilities, equipment) investments allocated to the induced circular projects not assisted by HOOP PDA from 2022 until 2024? Please, identify the project/expense, funder/financier/equity and year. In case you had submitted any project, but it was not approved or waiting evaluation feedback, please indicate also the same previous type of data. Indicate a brief description or link for the projects/expenses mentioned.

Examples:

Project WZ not assisted by HOOP: 100 k€ in 2023, project XY, Life programme + 200 k€ in 2024, lab equipment + 100 k€ from Interreg in 2024, waiting evaluation feedback, link.

D.3. What is the total amount of Intellectual Properties, Licenses and Certification investments allocated to UCBE projects assisted by HOOP PDA? Please, identify the type of service and year. Indicate a brief description or link for the expenses mentioned.

Examples:

Project XY assisted by HOOP: 20 k€ for IP in 2024 + 5 k€ for product certification in 2024

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