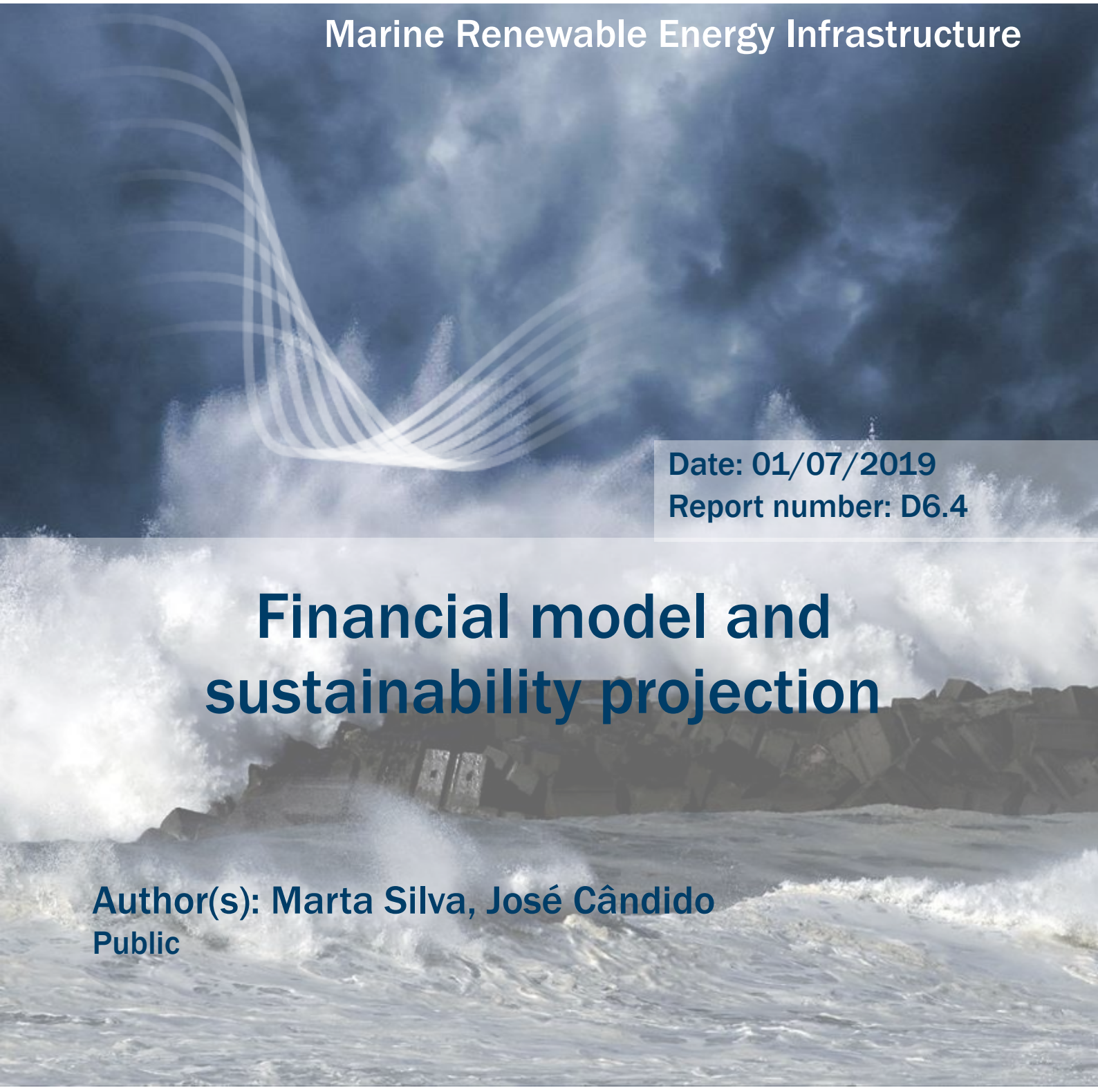
marinerg-i

Marine Renewable Energy Infrastructure



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Financial model and sustainability projection

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Document Information

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Abbreviations

DRI	Distributed research infrastructure
ESFRI	European Strategy Forum on Research Infrastructures
RI	Research infrastructure

Table of Contents

1. Introduction

Research Infrastructures (RI) have been long recognized as crucial to fostering research and innovation in Europe, and across various fields of study there has been an increasing number of new RIs. The long-term sustainability of these RIs has been a priority of the European Commission and the European Strategy Forum on Research Infrastructures (ESFRI), with consultations in 2016 [1] and a report with recommendations in 2018 [2]. The main recommendations established in the latter are:

1. Establish and maintain excellence through the entire lifecycle of RIs by all appropriate means, by securing adequate framework conditions, and by opening the RIs up to the world.
2. Ensure that RIs have the right people in the right place at the right time by strengthening and harmonising national research and educational systems to make sure that all essential skills are available.
3. Harmonise and integrate a vision for convergent operation of RIs and e-Infrastructures in Europe to ensure cost-effective service provision to the user communities.
4. Fully exploit the potential of RIs as innovation hubs by incorporating strategies for their development into national and European innovation policies.
5. Set up effective means of determining the economic and wider social value of RIs and incorporate these benefits into science-policy-society dialogues.
6. Establish adequate framework conditions for effective governance and sustainable long-term funding for RIs at every stage in their lifecycle, together with effective management.
7. Foster broader coordination at National and European levels when designing processes for planning and supporting national and pan European RIs and so enhance their strategic value. [1]

MARINERG-i proposes to establish a modern, efficient, high-quality, state-of-the-art ecosystem of different members and stakeholders for cutting-edge research in ocean and offshore wind energy, in a distributed research infrastructure. It will exist in the ESFRI context and so, will need to prove its viability and long-term sustainability.

In order to assess the viability and the long-term sustainability of the distributed research infrastructure (DRI), a financial model was built, with basis in the chosen governance framework, detailed in D5.6 [3], and coordinated with the business model developed in WP8.

The financial model assesses the costs of implementing and operating the DRI, and estimates the revenues based on the business model, detailed in D8.2 [4]. The financial model is also used identify and quantify the possible risks to the long-term sustainability,

This deliverable is a guide to the financial model built for MARINERG-i. It also provides an overview of the analysis of the long-term sustainability of the distributed research infrastructure, which is articulated with the final business plan presented in D8.2 [4].

2. Methodology

In order to estimate the viability of the MARINERG-i distributed research infrastructure, a financial model was built. The model follows a standard methodology of estimating costs, both for implementation and operation of the DRI, and estimating revenues, and summarising theses values into a balance sheet. Different cost assumptions can be modelled allowing the impact on the feasibility of the distributed research infrastructure to be seen.

The model also includes a sensitivity analysis of the main inputs and sources of risk for the long-term sustainability of the DRI.

The MARINERG-i financial model is built using Microsoft Excel[1], which is a familiar tool, available to the consortium, and allows for easy expandability in the future as needs arise and decisions are made regarding the makeup of the DRI.

The cost assumptions in the model were established during the Financial & Business model workshop in Cork, and are articulated with those presented in the final business model [4]. It is structured to match the governance model detailed in D5.6 [3].

3. Model description

3.1. Overview

The model is built using different sheets to provide modularity. The initial tab (Figure 1) shows the details of the version of the model and provides a legend for the different types of fields.

Fields with an orange background are required inputs and are needed to make calculations within the model. Calculated inputs have orange text and grey background. These fields have formulas, but the values can be replaced by user inputs. However, ***overriding fields with formulas breaks the link with the previous cells***. It is suggested that any edits done to the model are done in a new save, in order to preserve these links. Outputs and other information data are formatted with black text.

[1] The model can also be opened in freeware alternatives such as Google Sheets, OpenOffice Calc or LibreOffice Calc. The model should be fully functional in these tools, but it has not been tested extensively. There might be differences in formatting in software other than Microsoft Excel.

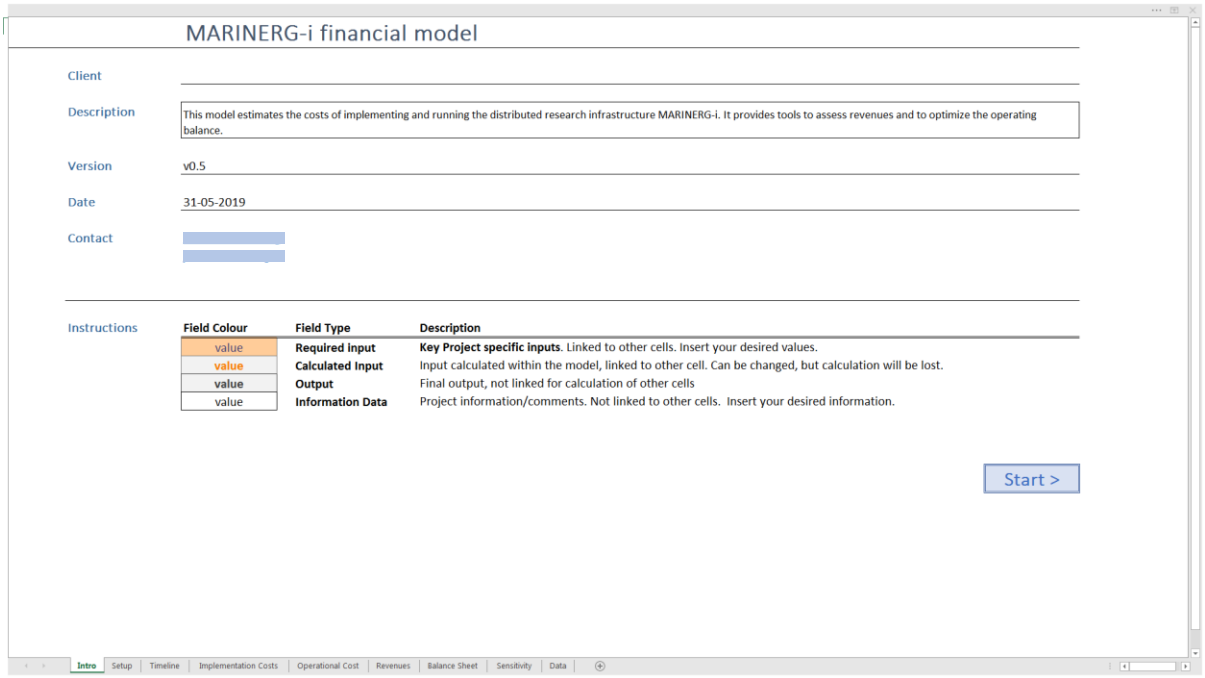

Figure 1 'Intro' tab

3.2. Setup

The initial setup tab allows the user to define the member list (Figure 2) for the MARINERG-i DRI, the mode of participation, and the infrastructures present (Figure 3).

The member list includes the following fields to describe the members:

- **Entity**: name of entity, which can be a country or an organization
- **Entity type**: as defined by the ERIC statutes. Members can be:
  - ***Member State:*** Member States of the European Union
  - ***Associated Country:*** not a Member State of the European Union, but a party to an International Agreement with the European Commission and makes a financial contribution to all or part of the European Commission's research, technological development and demonstration programmes.
  - ***Third country:*** Third countries other than Associated Countries
  - ***Intergovernmental organisation***

The following fields are used in relation to participation in the DRI:

- **Mode of participation:** as defined in D5.5 [5], participation in MARINERG-i can be as
  - A ***Participating Member***
  - An ***Observer Member***, which does not have voting rights
- **Host:** Yes/No field to determine if the entity will be the central hub host
- **Service Group Host:** Yes/No field to determine if the entity will be host to a service group
- **Service Group:** Name of the service group hosted
- **Regional Team Lead:** Yes/No field to determine if the entity will be the lead of a regional team
- **Regional Team:** Name of the regional team

The final fields of the table are calculated based on the infrastructure list but can be overridden[2] in this table. These fields are:

- Number of institutions/institutes participating
- Number of laboratories
- Number of access units from laboratories
- Number of test sites
- Number of access units from test sites
- Total number of RIs (labs + test sites)
- Total number of access units (labs + test sites)

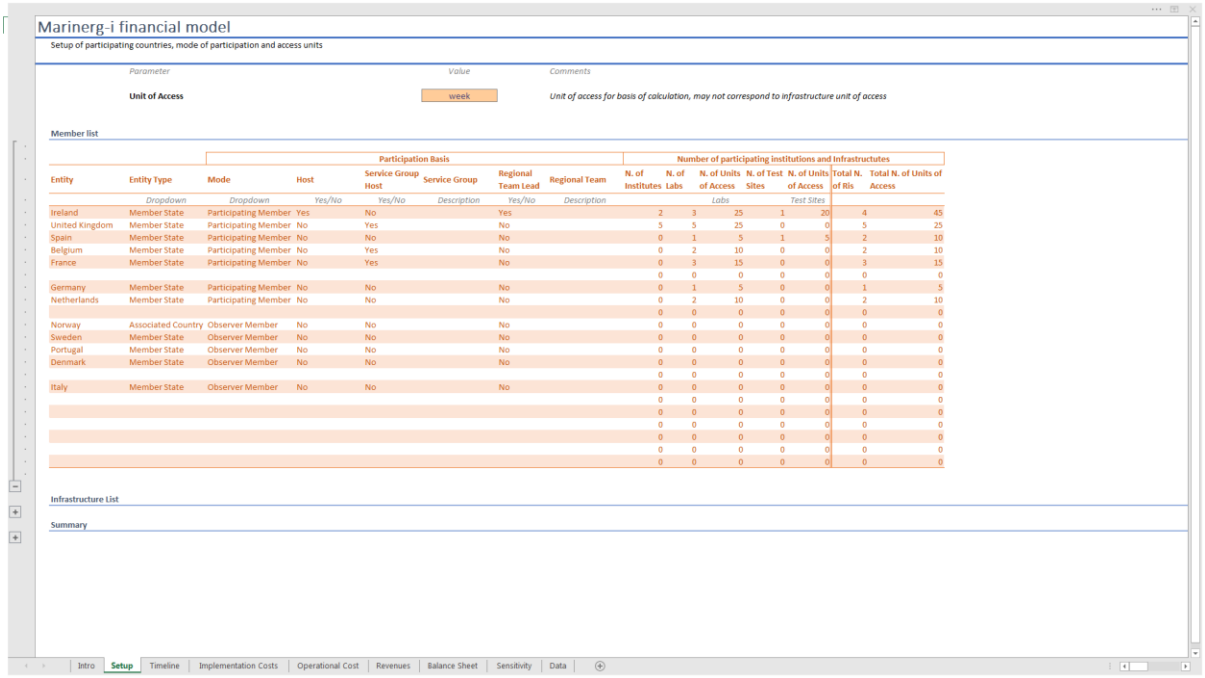

Figure 2 Member setup

The infrastructure list is used to detail all the infrastructures participating in the DRI. The values are summarised in member list table, and as mentioned previously, can be overridden by the user. This means that at an early stage, when there is uncertainty on which RIs will be included, this section can be ignored.

The infrastructure list has the following inputs:

- **Infrastructure**: name of the infrastructure
- **Type of infrastructure**: dropdown of the 5 types of RIs available in the DRI:
  - *Small lab*
  - *Large lab*
  - *Medium-scale site*
  - *Large-scale site*
  - *E-infrastructure*
- **Institute**: name of the institute/institution managing the RI
- **Country**: dropdown of the countries that were input on the member list.

[2] **NOTE:** overriding fields with formulas breaks the link with the previous cells. It is suggested that any edits done to the model are done in a new save.

- Number of units of access
- Unit of access: time-range of the unit of access, a choice between days, weeks and months
- Cost per unit: average cost per unit of access. At present, this field is merely informative, but it can be used to calculate the revenues for a commission-based business model.

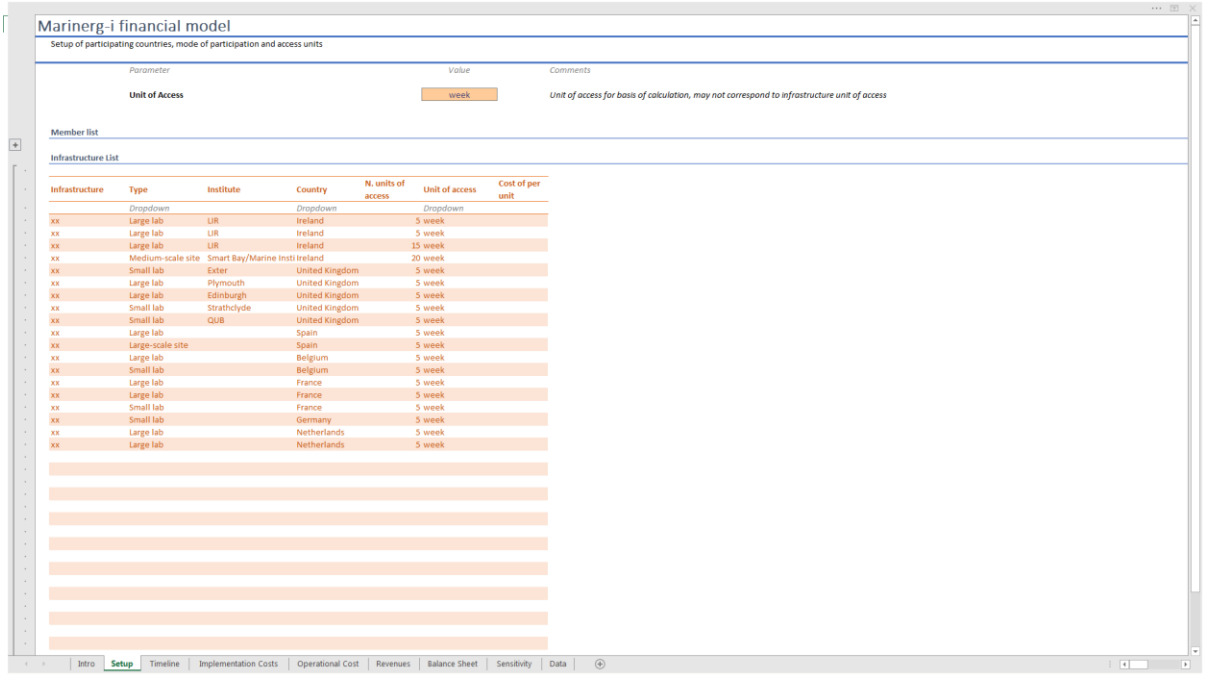

Figure 3 Infrastructure setup

At the end of the tab a small summary table is presented (*Figure 4*), with an overview of the number of members by participation mode, and the number of infrastructures and access units by type.

There is also a column for inputs for the long term-targets of the MARINERG-i DRI, which will be used in the cashflow analysis.

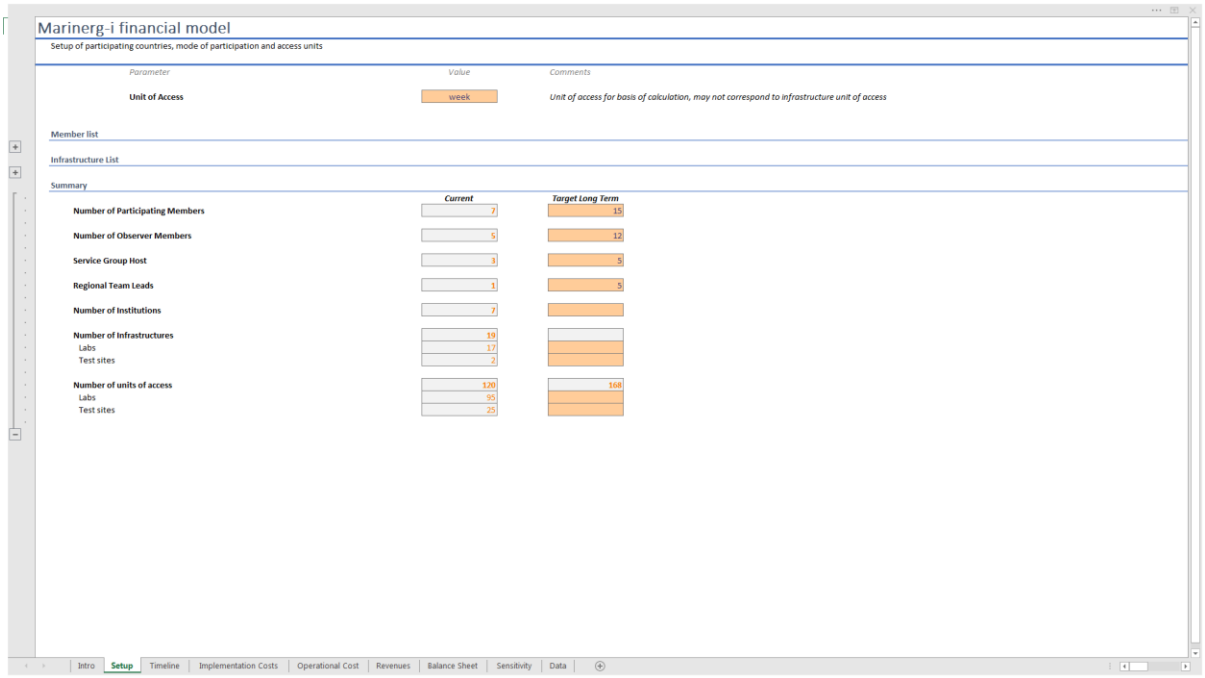

Figure 4 Setup summary and long-term targets

3.3. Timeline

The inputs on the Timeline tab (***Figure 5***) are the key dates for the implementation and establishment of the DRI:

- Preparation, submission and approval on the ESFRI roadmap
- Preparation, submission and approval of the ERIC statutes
- Preparatory, implementation and operational phases of the MARINERG-i DRI
- INFRADEV funding timeline

The information on this tab will be used for the cashflow analysis.

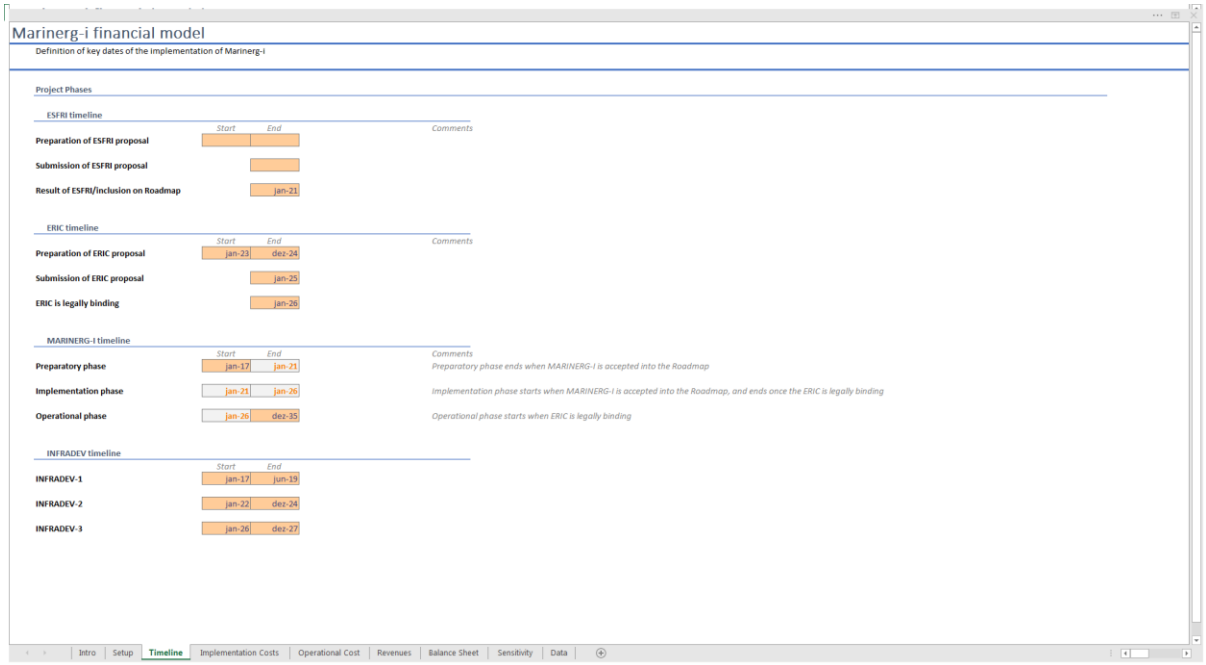

Figure 5 'Timeline' tab

3.4. Implementation Costs

In this tab the costs associated with the implementation phase of the MARINERG-i DRI are specified (***Figure 6***). These costs are related to the ERIC proposal preparation, and upgrading and standardising the participating RIs.

The costs are divided into the central hub, the service groups, the regional team lead and the country nodes.

For the implementation and operating costs, selecting from a dropdown in each subsection defines who will burden the costs (the DRI, the country node or the RI).

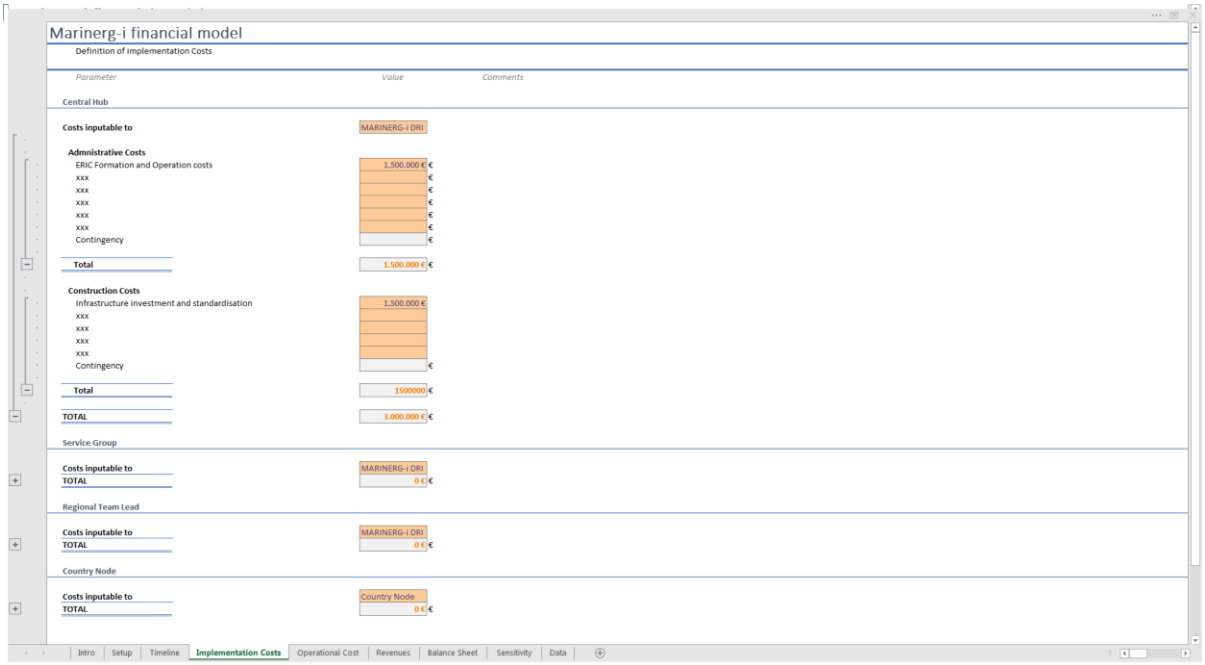

Figure 6 'Implementation Costs' tab

3.5. Operating Costs

The operating costs (***Figure 7***) are also separated into different sections:

- Central Hub
- 6 Service Groups
- Country Node

For the service groups a dropdown list is used to select the corresponding service group[3].

Furthermore, for each section, it is possible to define a pre-filled scenario by using the corresponding dropdown (***Figure 8***). Five options are available:

- Full
- Medium
- Lean
- None/Custom
- Global

The Full, Medium and Lean options relate to the different scenarios (or modes of operation).

The None/Custom option allows the user to specify the percentage of the base costs to be considered, or, in the absence of values, to consider them as null.

The Global option sets the choice to the option selected from the dropdown at the top of the sheet.

[3] The definition of service groups is done on the data tab

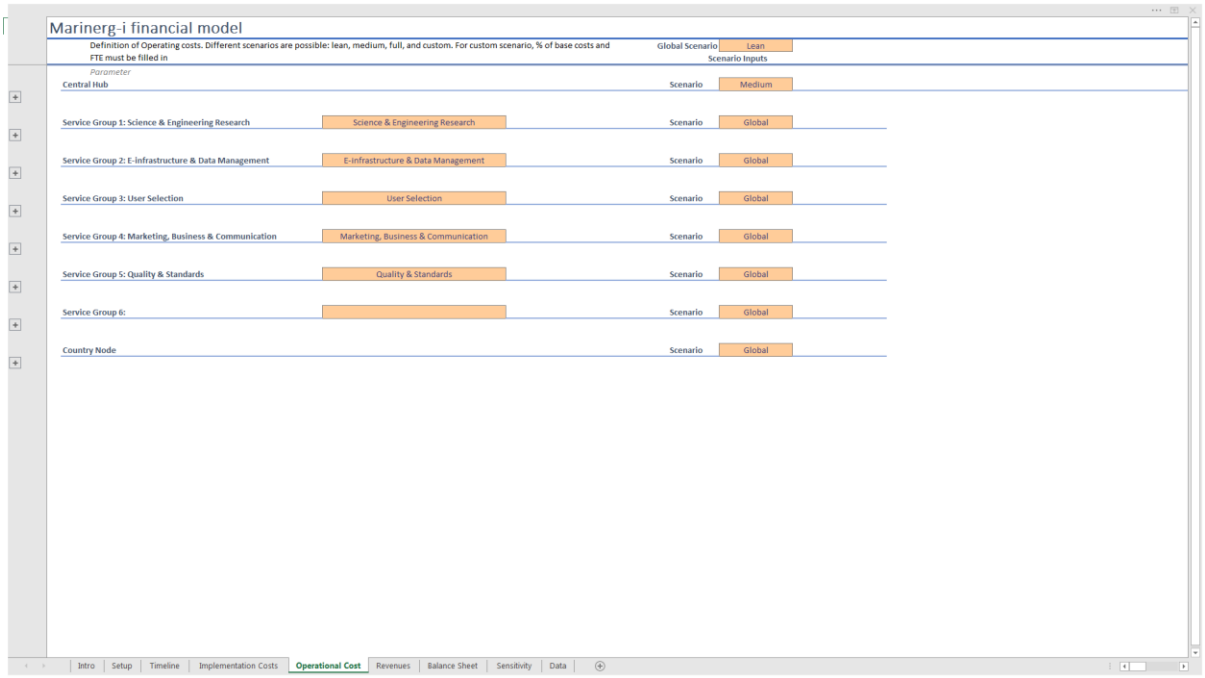

Figure 7 'Operational Cost' tab

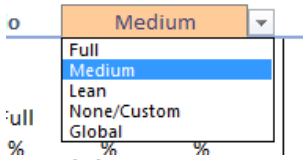

Figure 8 Scenario dropdown

The operating costs related to the central hub (***Figure 9***) are divided into administrative costs and staff costs. In both sections, the following fields exist:

- **%/FTE**: percentage or full-time equivalent. This value is only used if the scenario is set to None/Custom; otherwise, it is not used.
- **Base Costs**: This is the annual base cost for the item.
- **€/annum**: This is a calculated field, that accounts for the %/FTE.
- **€/month**: Similar to the previous field, but with a monthly resolution.

The user only needs to specify the ***Base Costs***, and in the case of a None/Custom scenario the ***%/FTE***.

The assumptions for each scenario are present on a box to the side of the inputs and can be changed by the user.

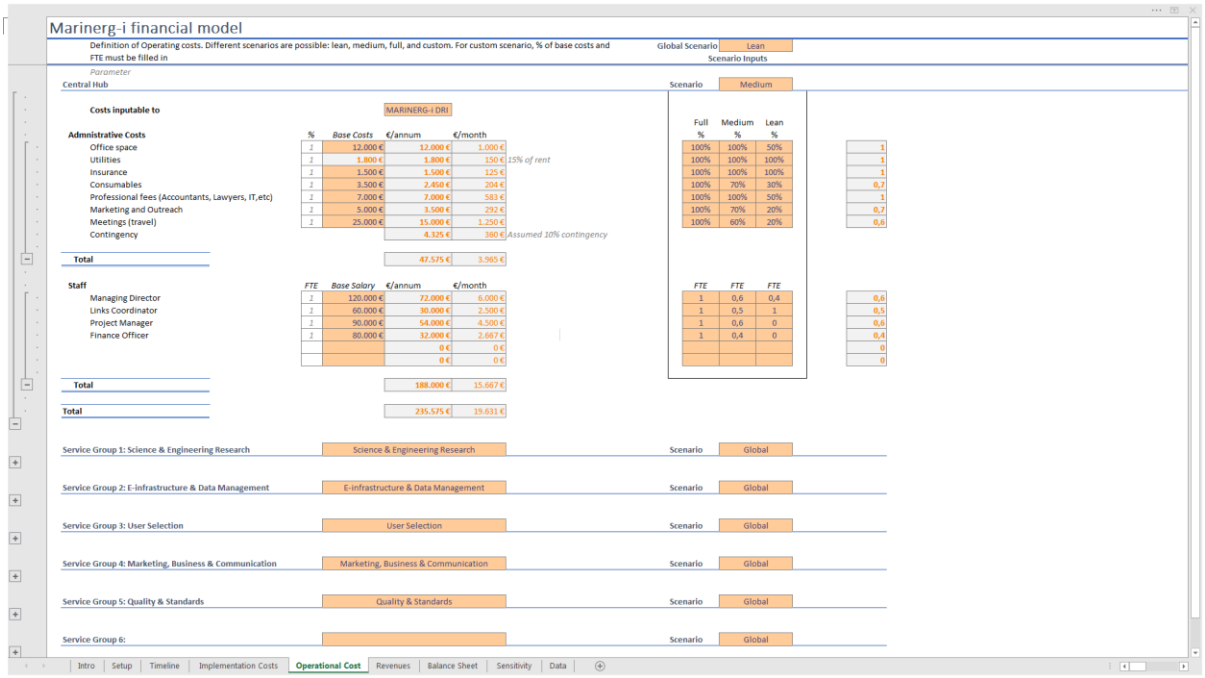

Figure 9 Central hub operating costs

For the service groups (***Figure 10***), the rationale is the same as for the central hub, but there is also a subsection for activities-related costs.

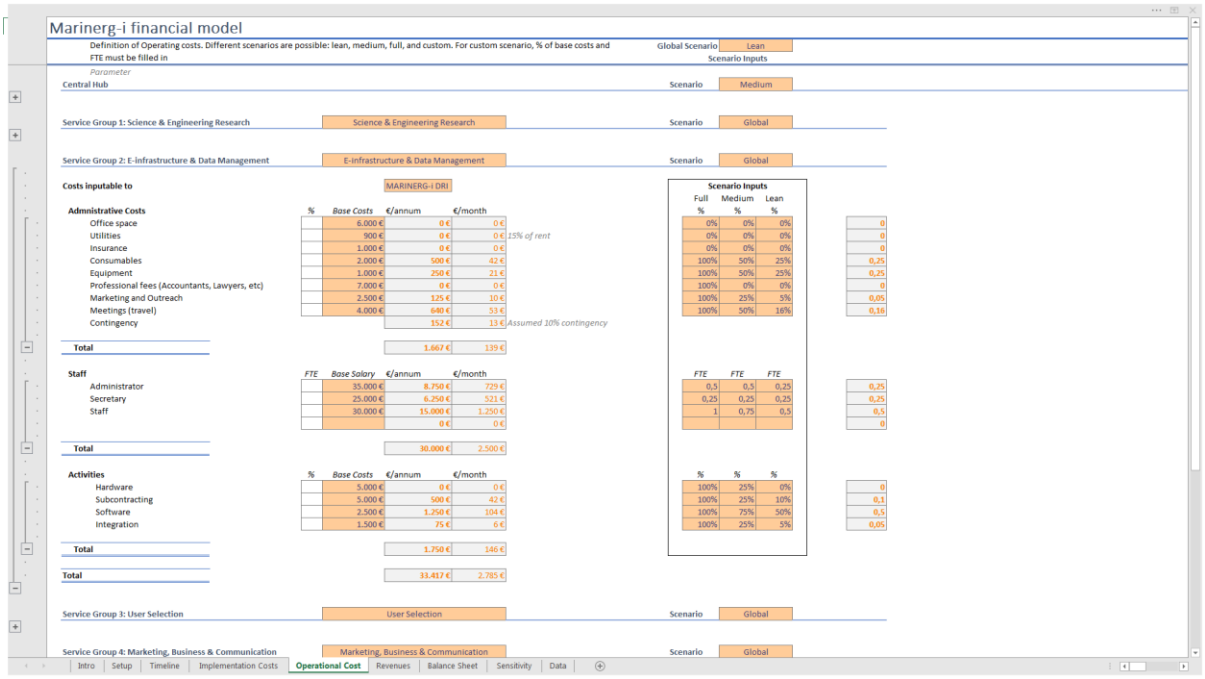

Figure 10 Service group operating costs

Finally, for the country nodes (***Figure 11***), the cost breakdown and rationale are the same as for the central hub.

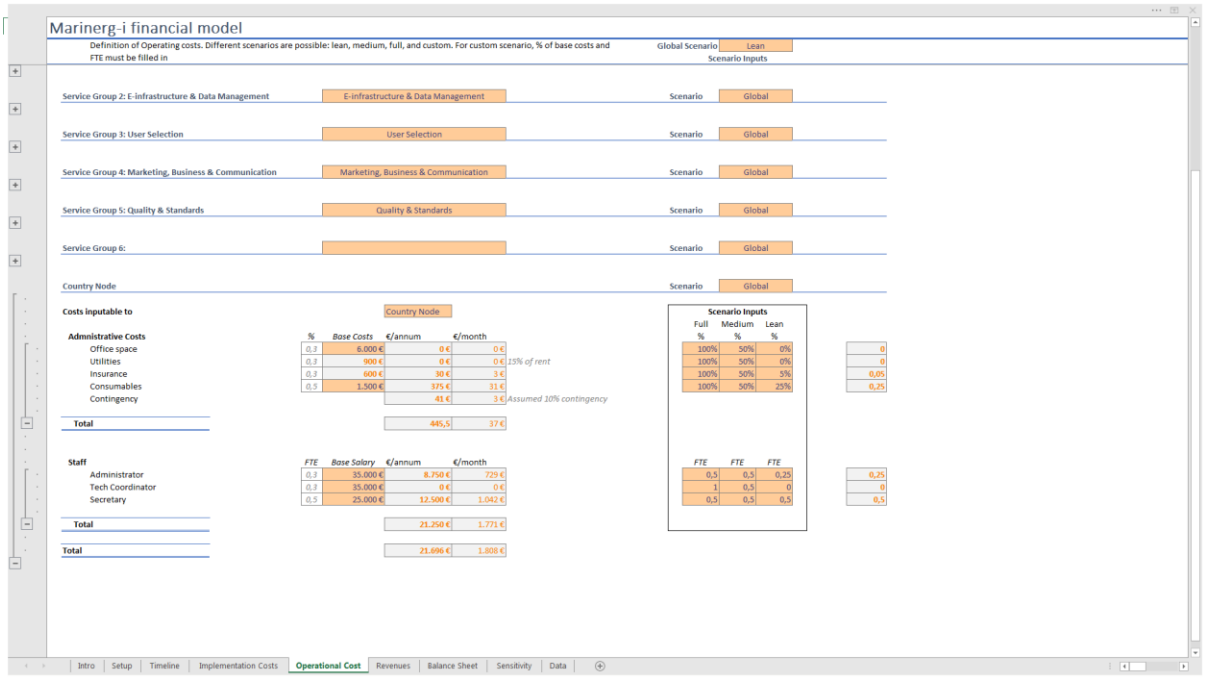

Figure 11 Country node operating costs

3.6. Revenues

The revenues tab is split into the following sources of revenue:

- Membership fees
- Access fees
- Revenues from other services
- Other revenues and funding

While the revenue generation and philosophy are detailed in the business model, in order to analyse the financial viability and sustainability of the DRI, it is necessary to include them in the model.

The membership fees section (***Figure* 12**) presents a more complex calculation of fees than what was used in the business model, in order to allow for more flexibility in the scenarios being explored.

The formula used in the financial model is:

```
Membership Fee = (Base Fee * Participation Mode modifier * Entity type modifier)
               + Host premium fee
               + Service Group premium fee
               + Regional Team Lead premium fee
               + (Infrastructure Fee * N. Infrastructures)
               + (Access Units Fee * N. Access Units)
```

The different premiums can be set to zero in order to not consider them. The fee for the host member is treated as a premium over the base fee, while in the business model it is considered as a separate value. For the purposes of the model, the corresponding premium is the difference between both fees.

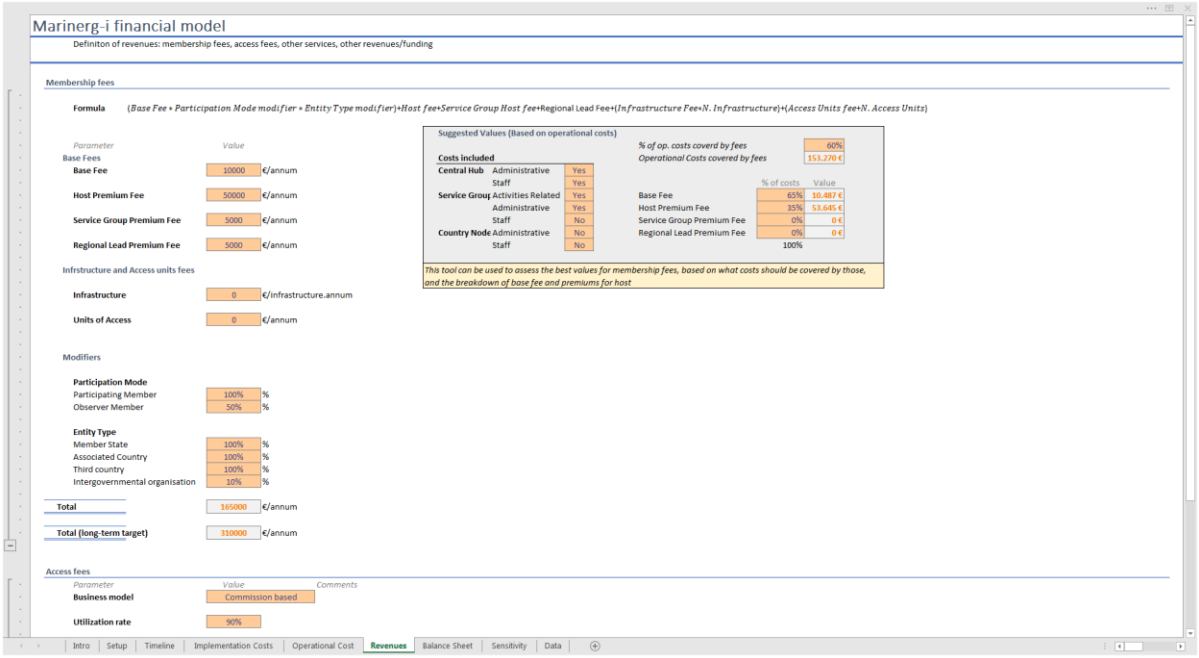

Figure 12 Membership fees inputs

In the 'Membership fees' subsection there is a box that can guide the user to choose the values for the different fees based on the operational costs (***Figure* 13**). In this box the user selects which costs should be covered by the membership fees (1, in the figure), at which percentage (2, in the figure), and the breakdown among the different premiums (3, in the figure).

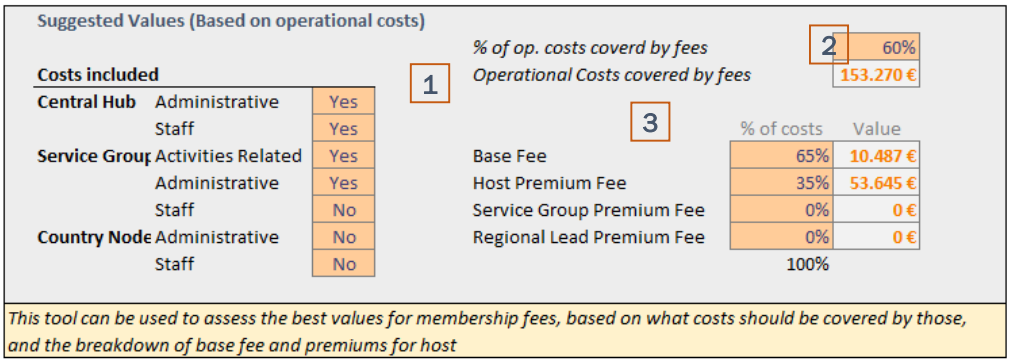

Figure 13 Membership fees guidance tool

For the 'Access fees' inputs (***Figure* 14**), the tool considers two methods proposed in the draft business plan: commission based, and levy based. The commission-based revenue uses a commission percentage and the average cost per unit. For the levy-based approach, a fixed levy is used.

A utilization rate can also be defined in order to assess the risks of the DRI underperforming in terms of securing clients.

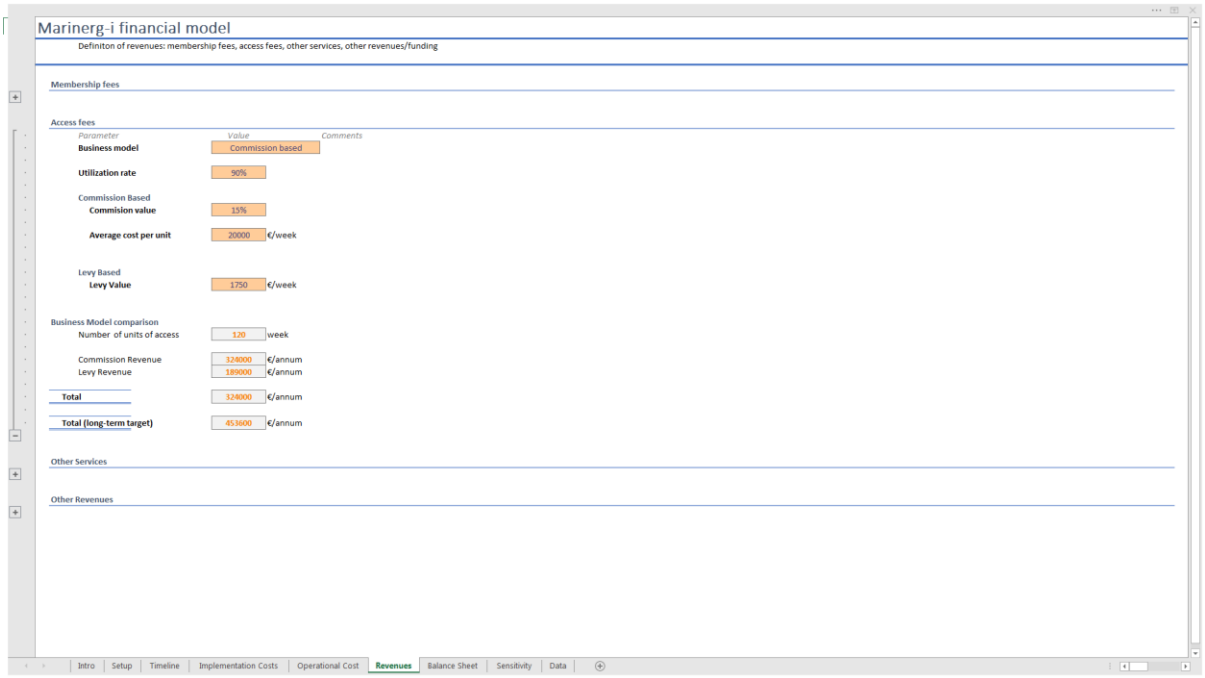

Figure 14 'Access fees' inputs

The 'Other Services' subsection (***Figure* 15**) provides guidance on other services that the DRI may offer and commercialise, such as the ones identified in D6.3 [6]. As access is intended as the core business, these other activities are unlikely to provide a significant revenue contribution. Three different services have been included: training, data access, and certification. These can have different pricing policies for members and non-members.

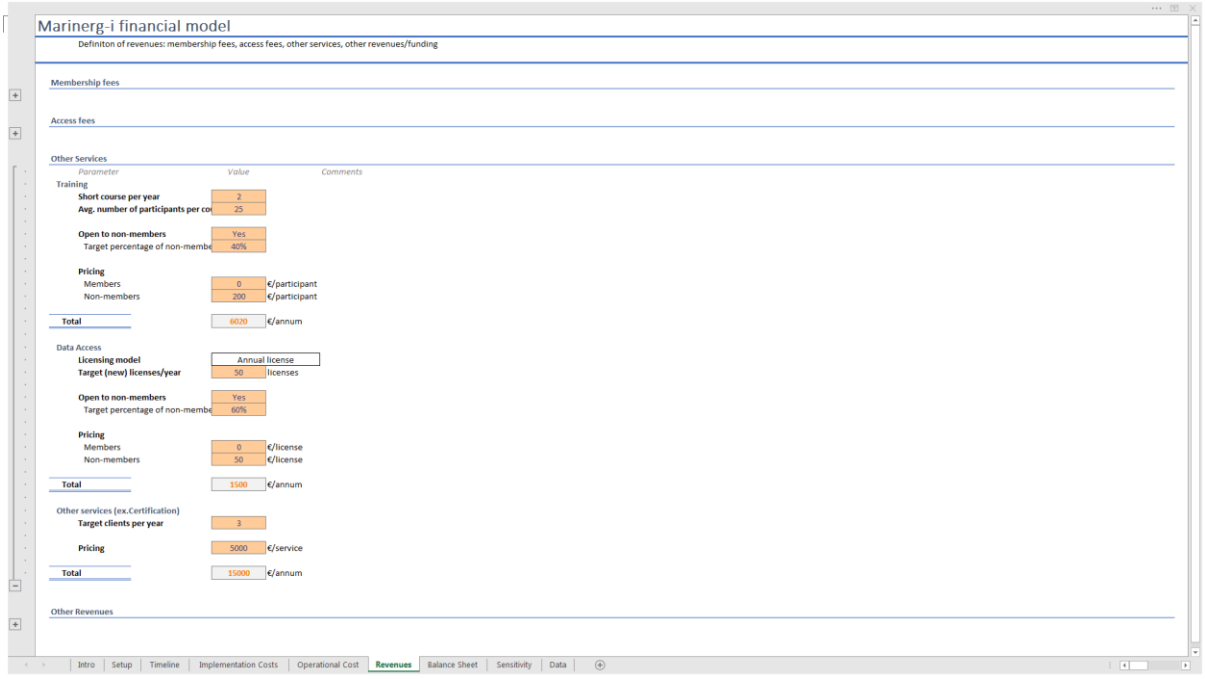

Figure 15 'Other Services' inputs

The final subsection on the Revenues tab relates to 'Other revenues' (***Figure* 16**), including third party grants and sponsoring.

A table for the implementation phase grants is also included in this section, with the dates connected to the timeline tab.

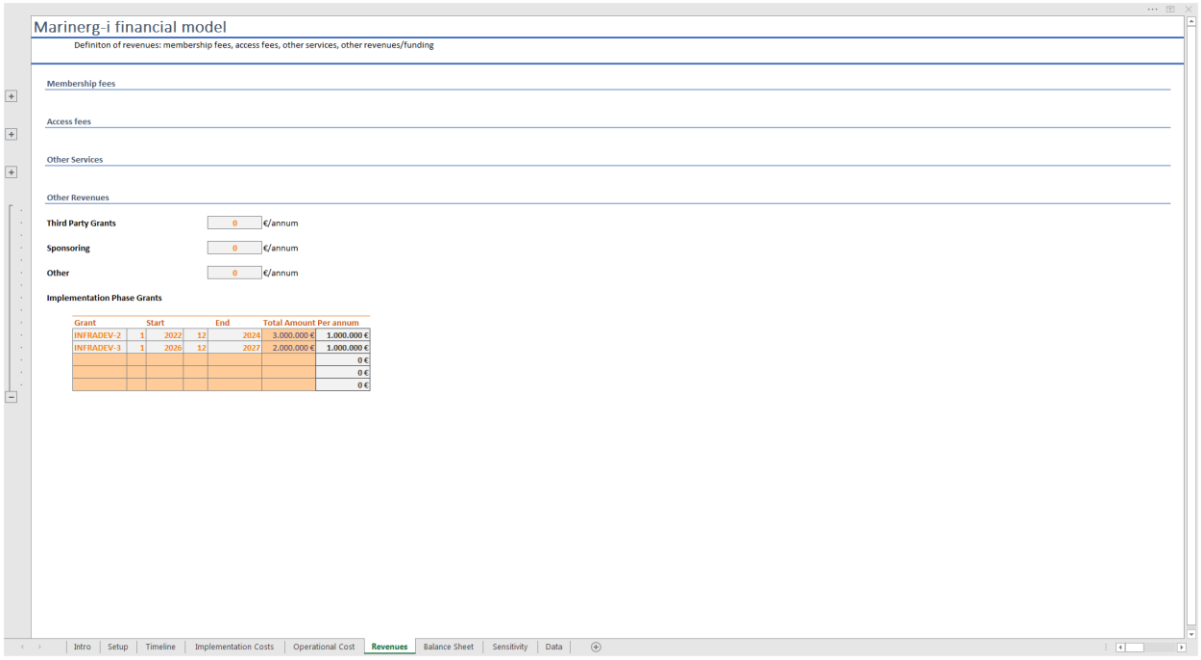

Figure 16 'Other revenues' inputs

3.7. Balance Sheet

The balance sheet tab provides a summary of the previous tabs and aggregates the results to produce a financial analysis. It presents the summary for implementation and operating costs, and for revenues.

Figure 17 shows the operating costs summary based on the current selection of scenarios, as well as the total costs for all scenarios.

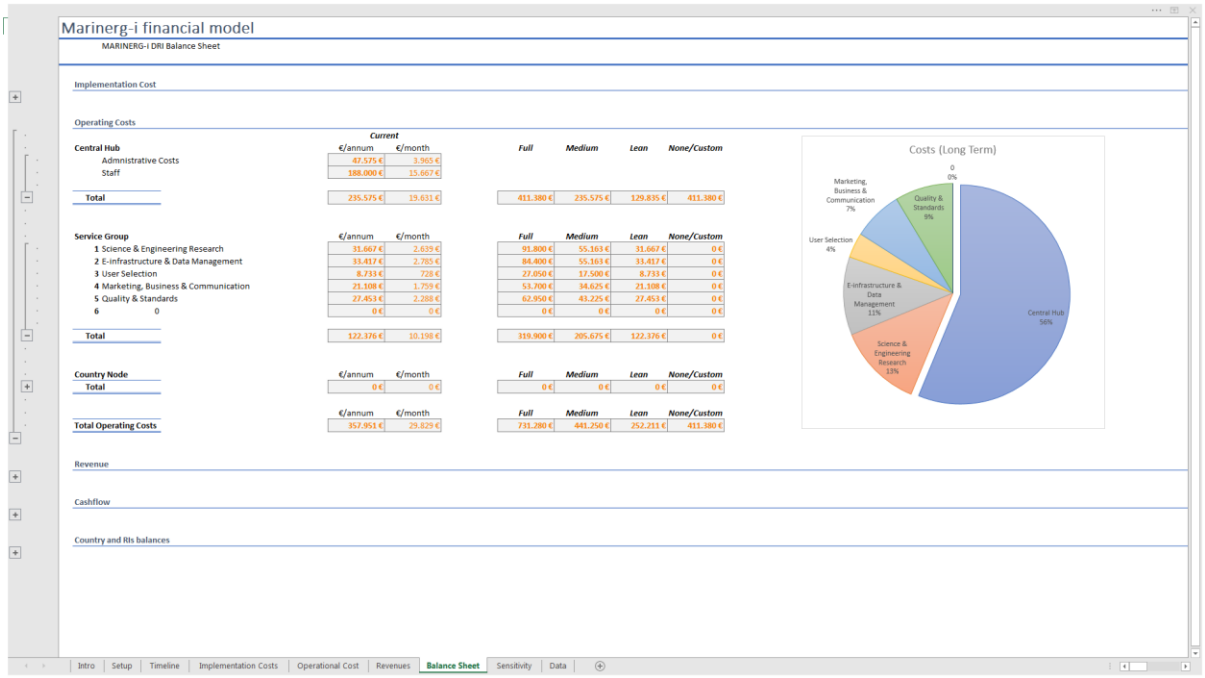

Figure 17 Operating costs summary

Likewise, the revenues summary (***Figure* 18**) shows the revenues based on the current makeup of the DRI as well as the long-term target revenues.

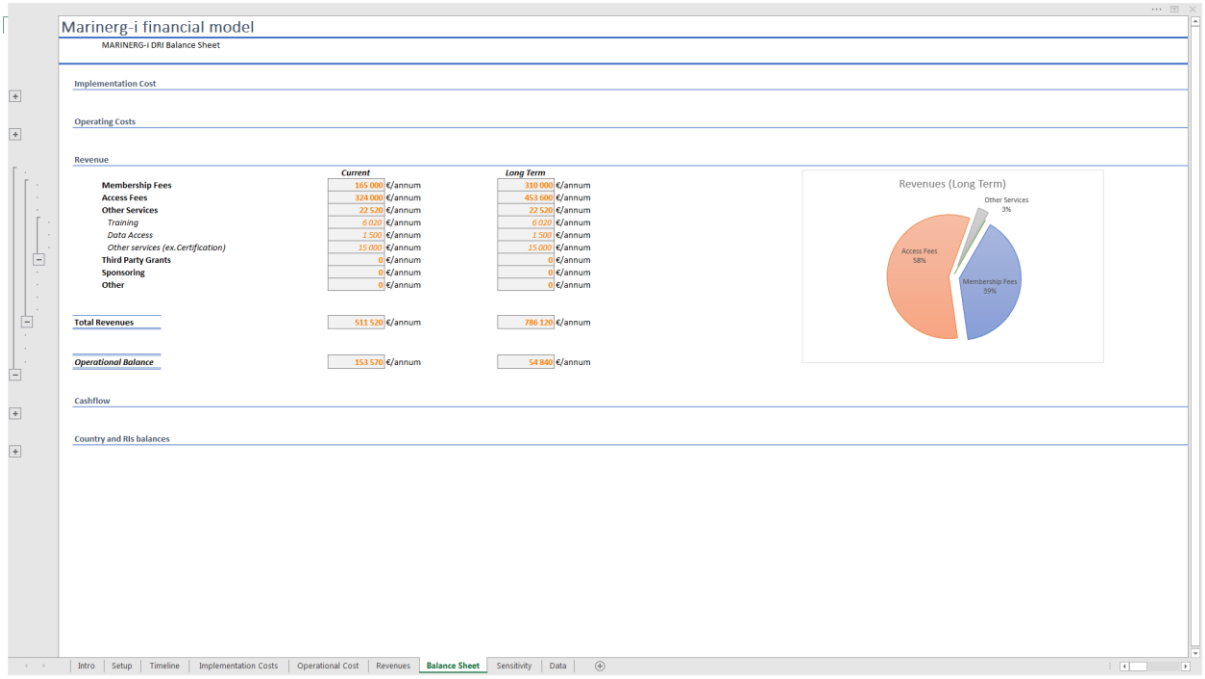

Figure 18 Revenues summary

The cashflow analysis includes options that require user input (***Figure* 19**).

To update values for inflation, the user needs to specify the average annual inflation rate, and the reference year of all the values in the model.

In relation to the implementation phase, the user can specify the number of years over which the implementation costs will be spread, and whether funding is available from INFRADEV-2 towards the implementation costs, and therefore, match the timeline to that of INFRADEV-2.

Both the current and long-term revenues are analysed, based on the inputs supplied in the Setup tab. The table of the inputs to the Business Model [4] aims to fully capture the first years of operation.

Furthermore, the table of the Ramp-up of operating costs (see ***Figure 19***) enables flexibility in the modelling of the costs in first years of operation and allows the user to simulate a staggered creation of the different service groups. In this table, for the first 6 years of operation, the user can specify the scenario of operation (lean, medium, full, none/custom) for the central hub, each of the service groups and for the country nodes.

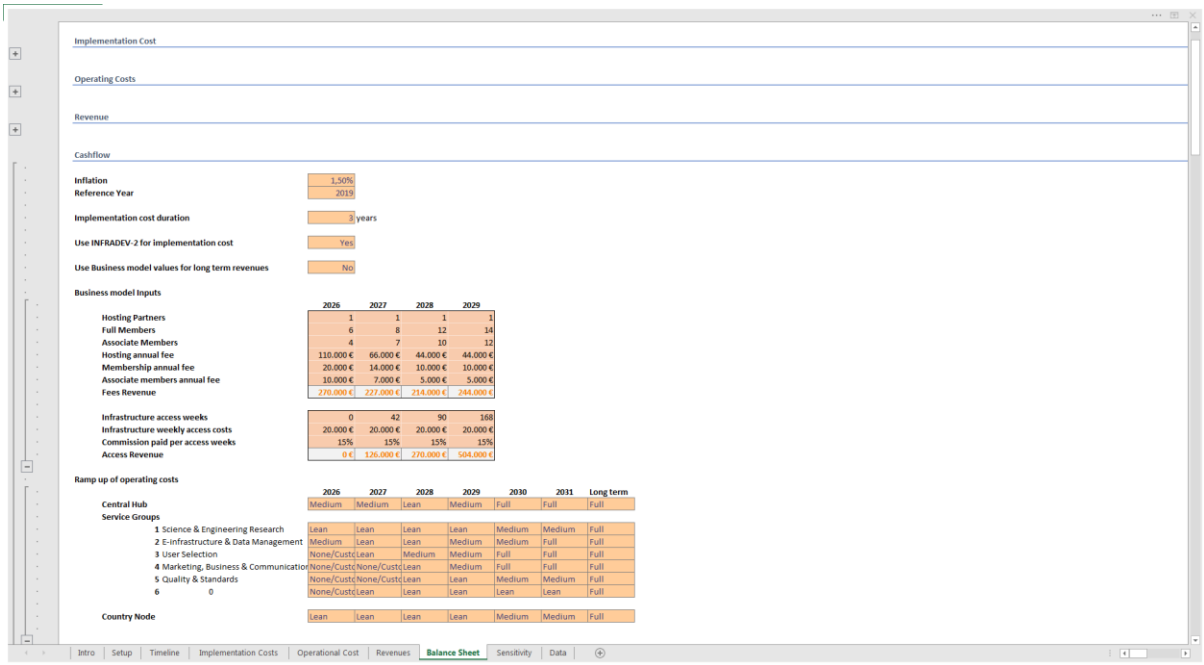

Figure 19 Cash flow options

Connected to the inputs in the timeline tab, a timeline for the different processes associated with establishing the MARINERG-i DRI is presented in the 'Balance Sheet' tab in order to illustrate the different stages (***Figure 20***).

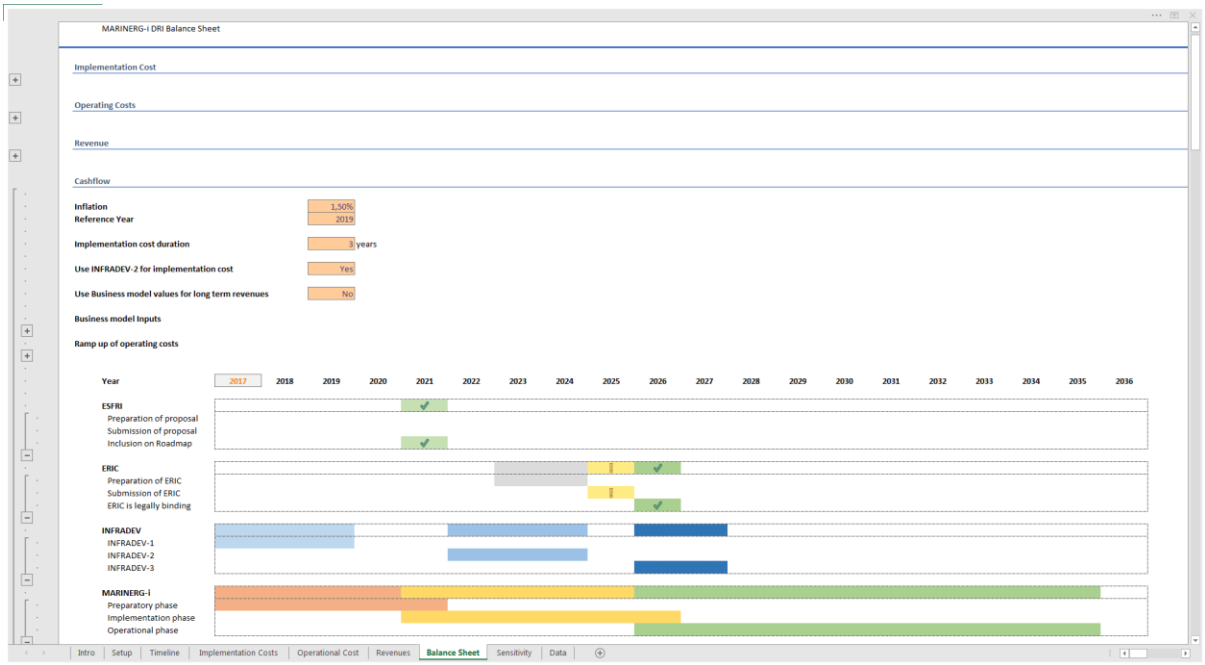

Figure 20 Timeline visualization

The cash flow analysis is presented below the timeline, separated into Costs and Revenues for the different categories shown in ***Figure* 21**. These can be expanded and collapsed as the user sees fit.

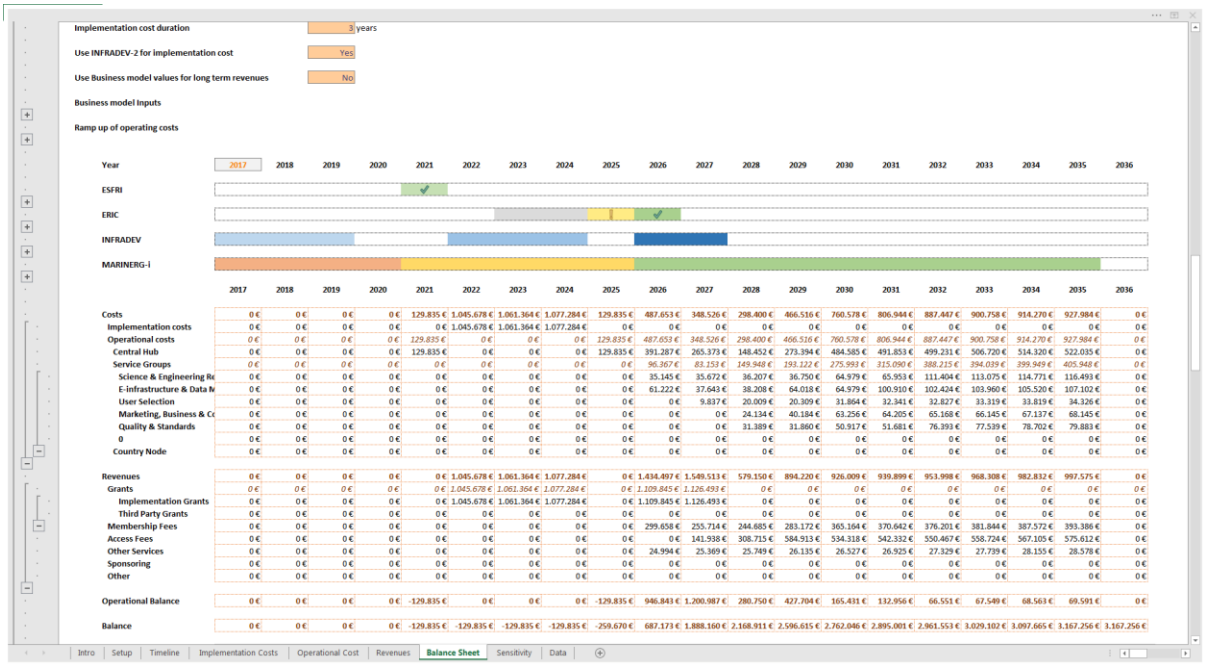

Figure 21 Cashflow

Visualisations of the cashflow are provided in the form of a balance over time chart and a comparison between costs and revenues by category (***Figure* 22**).

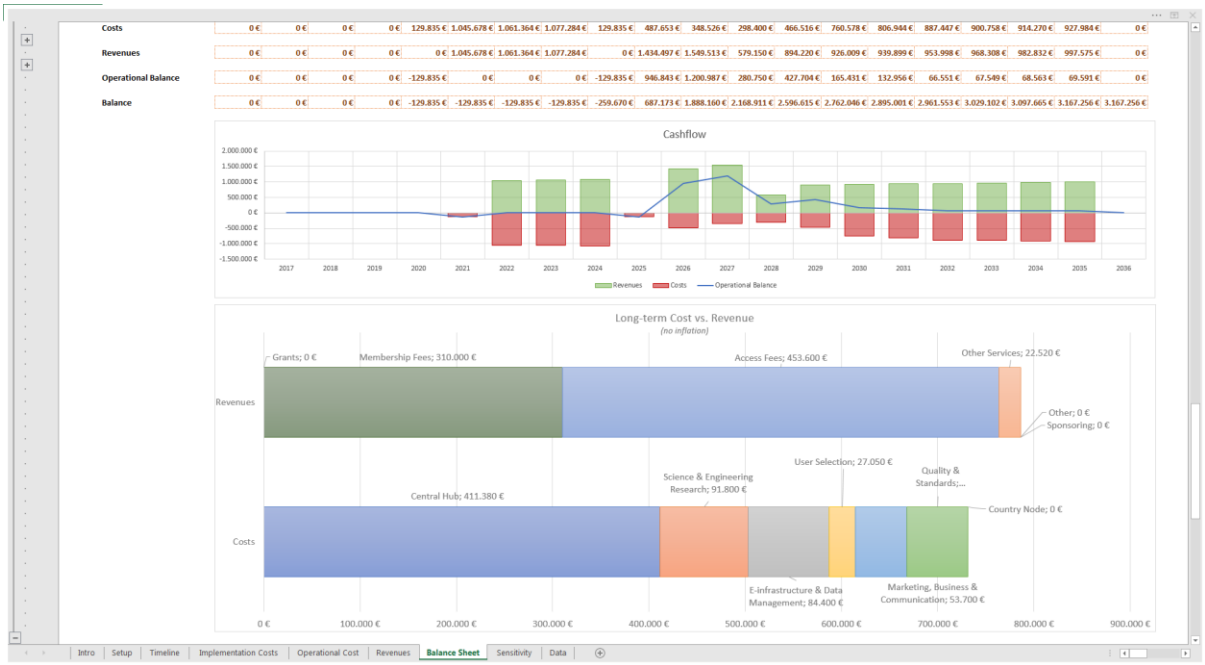

Figure 22 Cashflow charts

The final section of the balance sheet tab examines the costs that are inputable to the countries (***Figure 23***), with the option for the country to then pass on the costs to the different RIs. This helps illustrate the added burden to each country or RI, and can be later compared to the benefits that come from participating in MARINERG-i.

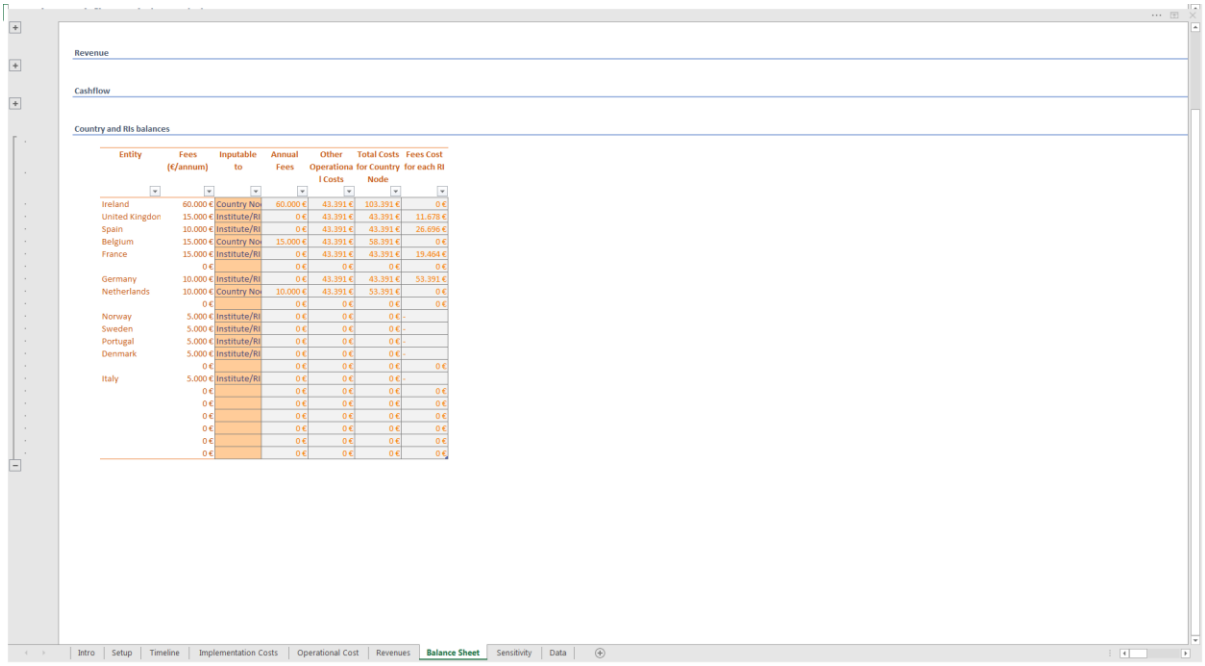

Figure 23 Country and RIs balances

3.8. Sensitivity Analysis

Sensitivity analysis of key inputs is presented in the 'Sensitivity' tab (***Figure 24***).

The sensitivity analysis can be univariate or bivariate and looks at changes to the operational balance resulting from changes to the inputs. The user can change the inputs range in order to analyse different options. The operational balance affected by this analysis is based on the DRI configuration defined in the setup table, considering the operational costs and revenues. It is not the long-term operational balance.

The sensitivity/variation of operational balance is based on:

- Number of participating members
- Number of participating members and number of observing members
- Number of service groups[4]
- Number of infrastructures and number of units of access
- Base Fee and Host Premium
- Utilisation rate
- Commission rate
- Levy values

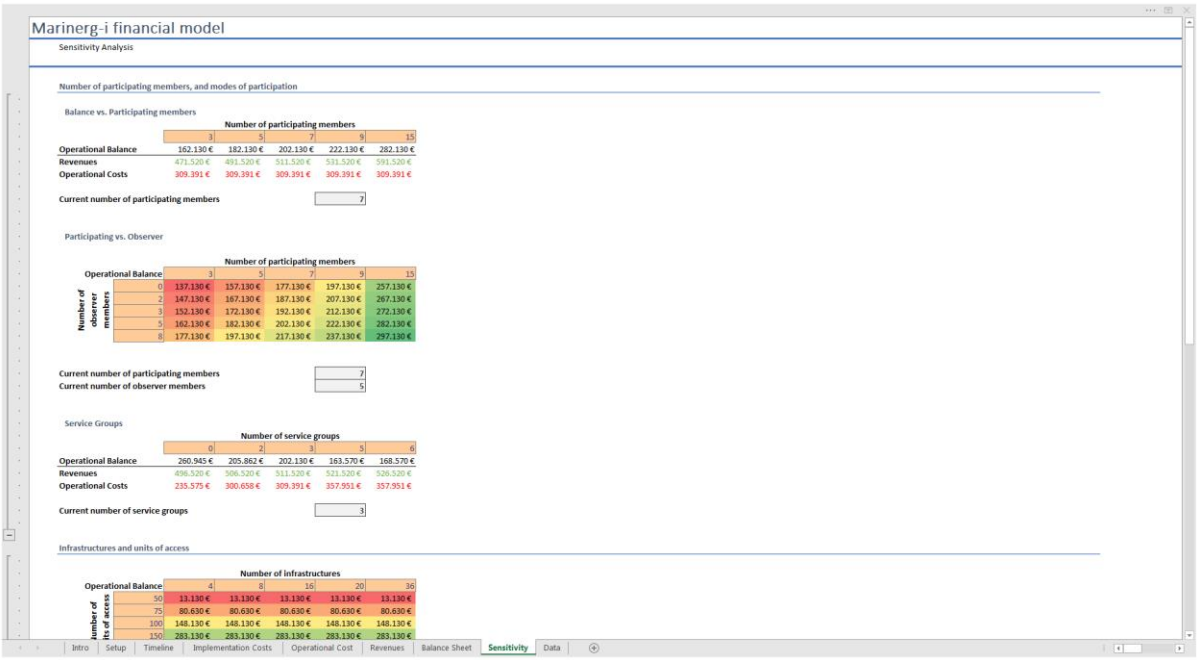

Figure 24 'Sensitivity' tab

[4] This is a simplistic approach and simply adjusts the membership revenue, and adds/removes the operating costs in the presented order to match the selected number. An in-depth analysis should match the detailed operational costs to the number of service groups defined on the Setup.

3.9. Data

The final tab includes the data used for the dropdown lists (***Figure* 25**). This tab is merely informative; however, the user can change the values if necessary.

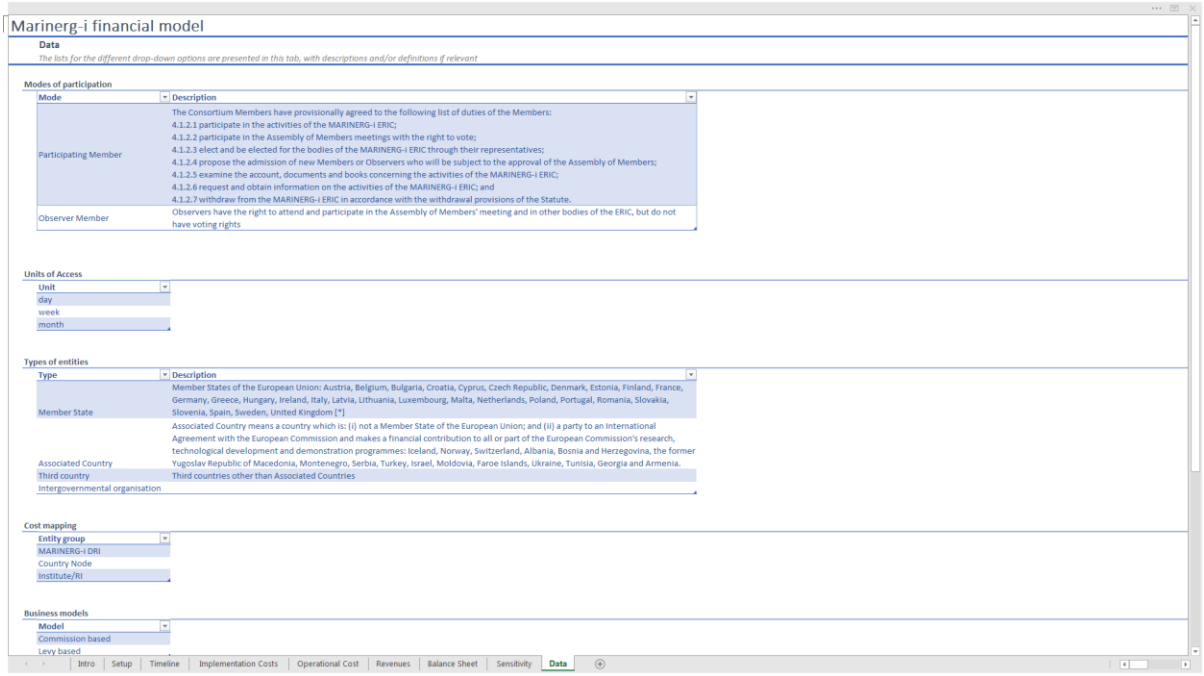

Figure 25 'Data' tab

4. Analysis

4.1. Implementation phase

The implementation phase starts with the inclusion of MARINERG-i in the ESFRI roadmap. During this phase, a legal entity will need to be established as well as the required contracts between participants. These have associated costs related to human resources and services.

The inclusion on the ESFRI roadmap also gives access to other sources of funding (i.e. INFRADEV-2), which can be used to establish the ERIC and upgrade the participating RIs to the MARINERG-i standard. ***Figure 26*** below presents the ESFRI/ERIC timeline for MARINERG-i, identifying sources of funding.

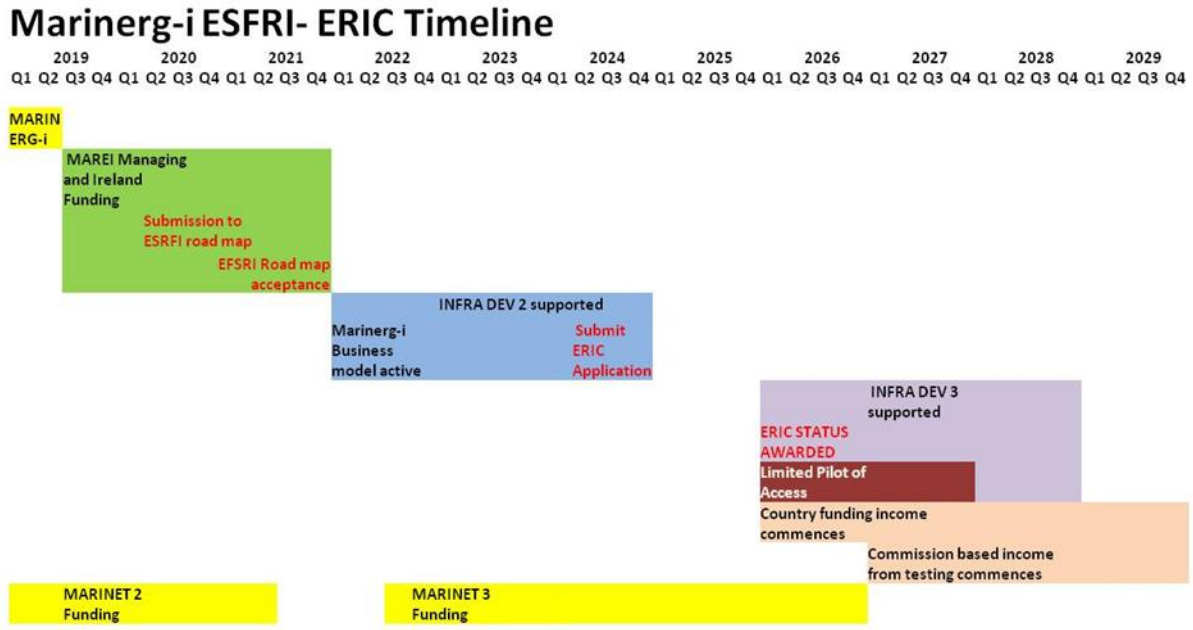

Figure 26 MARINERG-i ESFRI operational plan towards sustainability, from D8.2 [4]

During the implementation phase, the costs associated with the central hub will follow the lean scenario. The INFRADEV support will cover operational costs, costs associated with the ERIC formation and upgrades to infrastructures.

4.2. Operational phase

Once the ERIC is established, MARINERG-i will be a legal entity and the operational phase will begin. As detailed in the business plan [4], the initial operational period will be supported by investment funding from grant support mechanisms available for initiating ESFRI formation initiatives, as no revenue generating activities will be occurring. A lean operation will be adopted, with low overheads and operational costs. The contributions from members (in-kind or cash) will be maximized in order to establish the MARINERG-i DRI quickly and enable it to become business operational at the earliest opportunity.

The individual contributions from members are envisaged to decrease as the number of members increase. The business models of other ESFRI projects typically use the running costs of the DRI as a measure for the membership fees and divide them among the participating members. The weights given to each member contribution varies from project

to project, varying from a simple fixed fee to more complex fee structures based on population, GDP and/or number of participating infrastructures (*Table 1*). For simplicity, and based on the similarity of operation, a similar business model to that of the EMSO and ECCSEL ERICs was adopted for MARINERG-i.

Table 1 Membership fees components for different DRI ESFRI projects

		BBMRI [7]	EMBRC [8]	AnaEE [9]	EMSO [10]	CLARIN [11]	SHARE [12]	MIRRI [13]	ECCSEL [14]
Fixed Fee					x				x
Variable Fee	**Other**								
	Based on population								
	Based on GDP					x		x	
	Based on infrastructures								
Fixed Base Fee			x	x			x		
Variable Base Fee	**Other**								
	Based on population	x	x						
	Based on GDP		x	x					
	Based on infrastructures			x					
Fixed add-on fee									
Variable add-on fee	**Other**						x		
	Based on population								
	Based on GDP	x							
	Based on infrastructures								
Premium for Host			x	x	x	x	x		x
Different for organizations		x				x			
Different for observers		x			x	x			
Cap on maximum		x				x			x
Cap on minimum						x			

Assuming that no major changes to the operation of the ERIC are required (i.e. no changes to operational costs), any increase in membership will increase revenues and the operational balance (

Table 2). This increase in the balance can be used to invest in the infrastructures, or reduce the contributions of the members.

Table 2 Sensitivity of Operational Balance to number of participating members, considering only the central hub

	Number of participating members				
	3	5	7	9	15
Operational Balance	-13.860 €	6.140 €	26.140 €	46.140 €	106.140 €
Revenues	397.520 €	417.520 €	437.520 €	457.520 €	517.520 €
Operational Costs	411.380 €	411.380 €	411.380 €	411.380 €	411.380 €

The scope of services offered by the MARINERG-i ERIC in the early years will be limited, with the focus on the core business of access to RIs, but with a limited number of units of access. The number of access units and the number of participating infrastructures will be increased during the first few years, and other services will be added to the portfolio of the DRI.

Reduced numbers of access units and participating members will result in low revenues from access fees, and the need to increase the membership fees in order to cover the running costs.

At first, these services will be coordinated from the central hub, but as the DRI grows, the management of these services may be passed on to the different services groups. This will represent added costs to the DRI but will ultimately allow for a more dedicated service.

The different scenarios of operation (lean, medium, full) allow for a certain control of operational expenses. The lean scenario minimizes the overheads, and focuses on secondments of personnel of participating infrastructures in order secure the required human resources [4]. The following figures show the operational costs for the different scenarios of operation for the central hub (***Figure 27***) and the service groups (***Figure 28***).

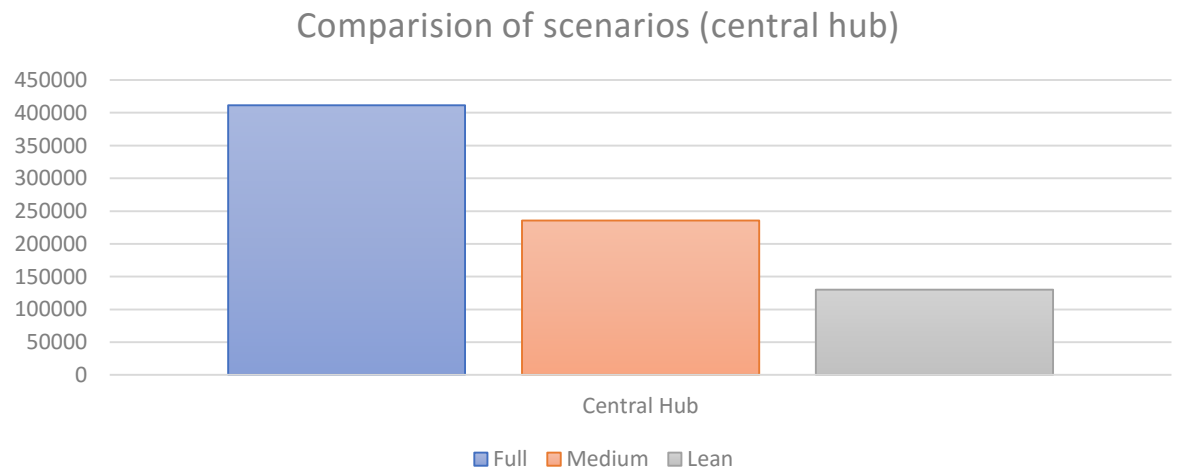

Figure 27 Comparison of scenarios of operation for the central hub

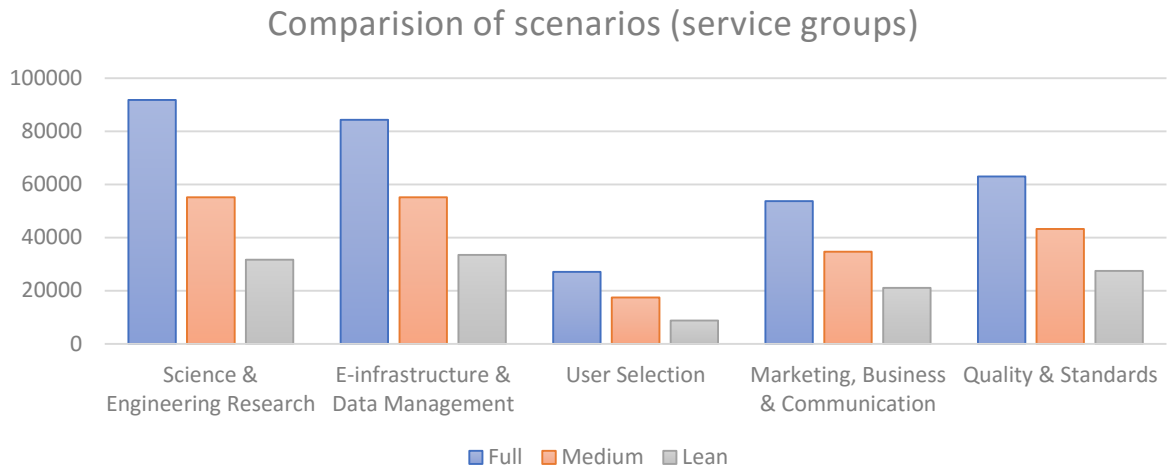

Figure 28 Comparison of scenarios of operation for the service groups

Throughout the operation of the DRI, one source of risk is the utilization rate of the RIs committed to MARINERG-i. Especially during the initial years, as the MARINERG-i brand is being created, there is the risk that not all units of access will be taken up by clients. The MaRINET and MaRINET2 projects have shown that there is a market for this type of initiative. However, even with trans-national access support, not all infrastructures achieved a 100% utilisation rate.

For the long-term scenario, the impact of different utilisation rates is show in ***Table 3*** and ***Figure 29*** below. The break-even utilisation rate is approximately 70%.

Table 3 Sensitivity of utilisation rate

	Utilisation rate				
	25%	50%	75%	90%	100%
Operational Balance	-224.535 €	-98.535 €	27.465 €	103.065 €	153.465 €

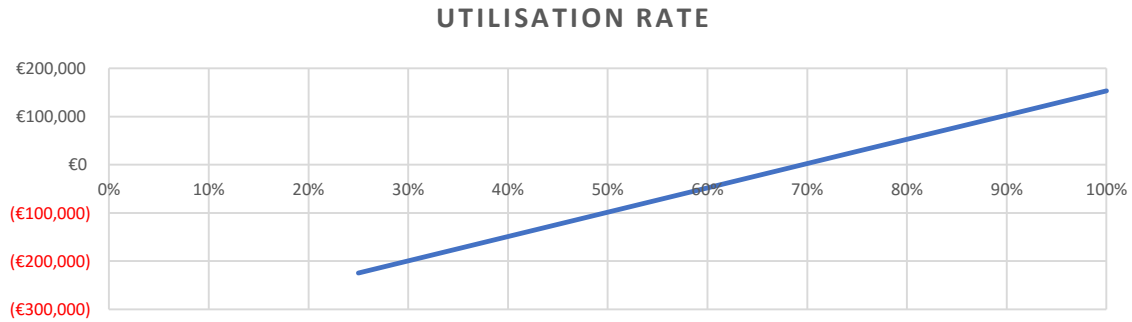

Figure 29 Variation of utilisation rate

However, once the DRI is in full operation, utilisation statistics will be available and the business model can be adapted to match the running costs, by changing the commission rate/levy or adjusting the member contributions.

In the long-term, in order to assure sustainability, the firm revenues (membership fees) should be set to fully account for fixed costs. However, considering the typical cost of

access to marine energy testing facilities and the chosen business model, the majority of the revenues will come from the access fees (*Figure 30*).

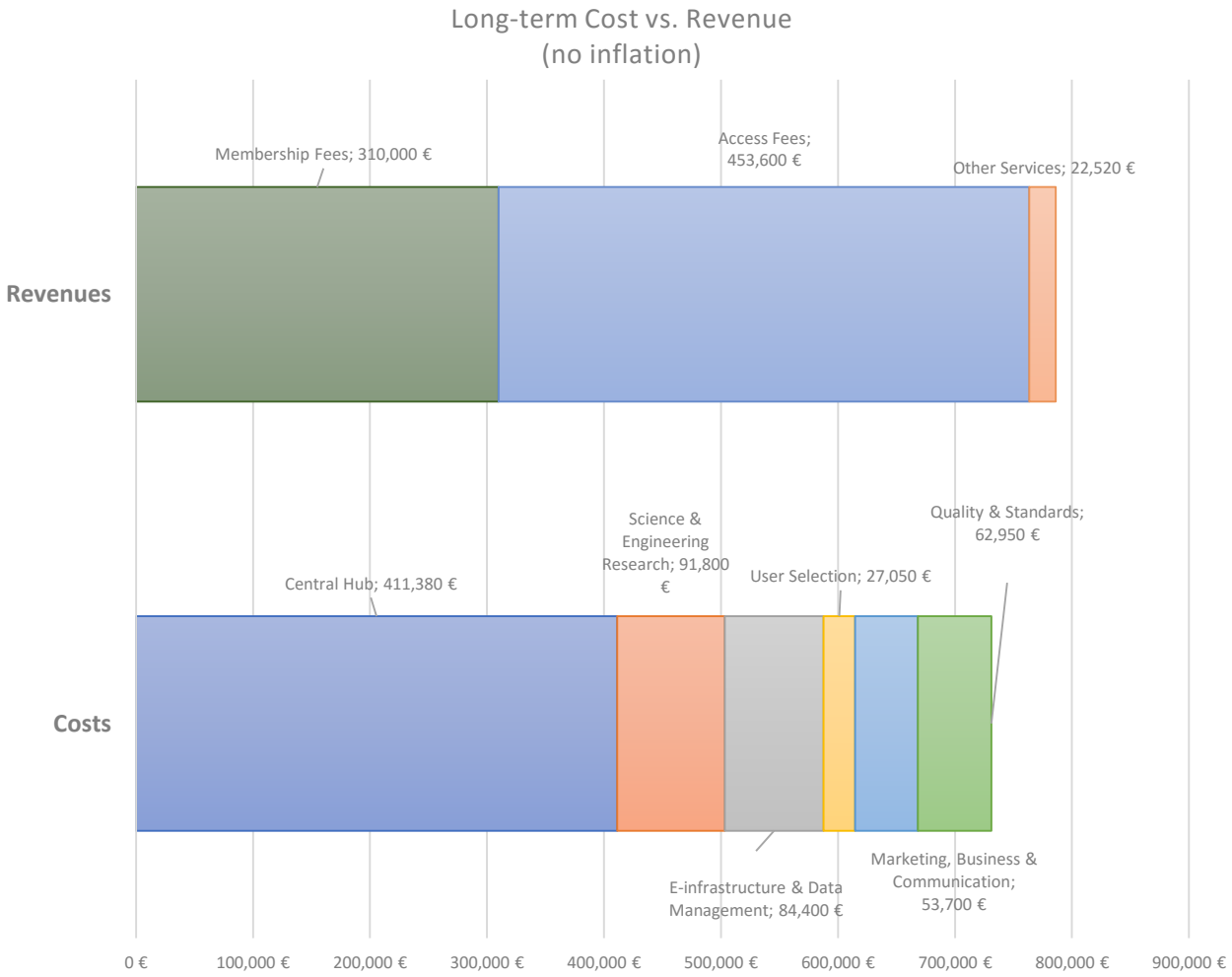

Figure 30 Long-term cost vs. revenue

5. Conclusions

The model allows the user to analyse different scenarios of operation of the MARINERG-i DRI and can be used to examine the different phases of the DRI implementation.

The tool can also be used identify the main areas of risk for the long-term sustainability of the MARINERG-i DRI.

During the preparatory and implementation phases when no legal entity is established and no revenues are being generated, the operational costs will need to be covered by other sources of funding. The INFRADEV-2 program can provide such support, and Ireland has committed to provide management and funding during the preparation of the application to ESFRI.

During the operation of the DRI, the number of participating members will affect the revenues. However, the number of members will be known, and the management of the central hub and the service groups can be adapted in order to match the costs to the incoming revenue.

The number of units of access will also affect the revenue; however, like the number of members, this will be set in the contracts between participants and the DRI, and the costs can be adjusted.

The highest source of risk during the operational phase will be the utilisation rate of the RIs on offer. However, the MaRINET and MaRINET2 programmes have shown that there is a demand for access to facilities, and the added-value provided by MARINERG-i will minimise the risk of not meeting the minimum utilisation rate needed for profitability.

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