IS-ENES3 Milestone MS8/M2.3

Sustainability Scoping Report

Reporting period: 01/07/2020 – 31/12/2021

Authors: Fanny Adloff (UREAD-NCAS), Michael Lautenschlager (DKRZ)

Release date:10 November 2021

ABSTRACT

The activities of the IS-ENES3 sustainability task are articulated in three phases, to occur sequentially during the lifetime of IS-ENES3, namely the scoping, design and implementation phases. In this milestone, we give an overview of the achievements from the scoping phase.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824084

Table of contents

1. Introduction to the sustainability process

The objective of the sustainability task within IS-ENES3 is to build an ENES Research Infrastructure (ENES-RI) that guarantees long-term services to the ENES community in the first place. Fig.1 depicts the domains of the ENES-RI and their missions. To accomplish this goal, an agreement needs to be defined to ensure continuity in development, deployment, maintenance, technology watch, update of the infrastructure, provision of services, resilience, compliance with user needs, governance and funding.

Considering the legacy of past initiatives, the ongoing activities, the reliance of the users on the existing services, the scales of the known challenges ahead, and the demonstrated added value of the European cooperation, the effort of building a long-term infrastructure providing sustained services to the Earth system modelling community in Europe needs to integrate existing partnerships and projects, and to strengthen existing governance and networking activities.

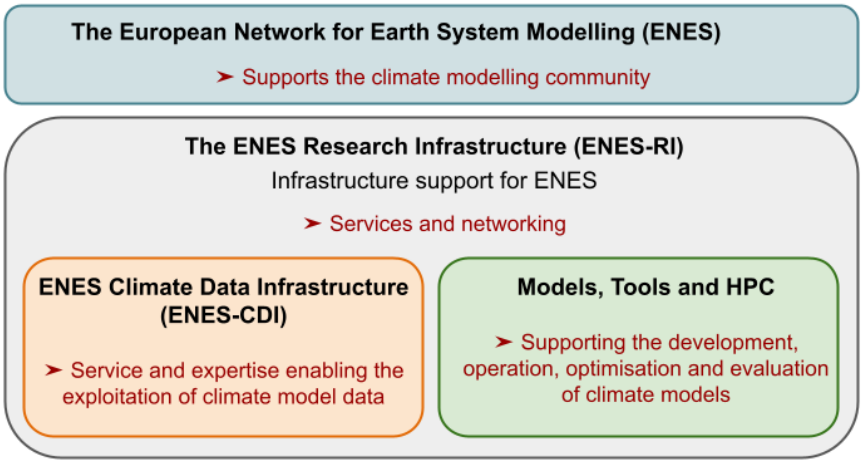

Fig. 1: The ENES Research Infrastructure.

As per the IS-ENES3 DoW, the activities of the sustainability task are articulated in three phases, to occur sequentially during the lifetime of IS-ENES3, namely the scoping, design and implementation phases (Fig. 2).

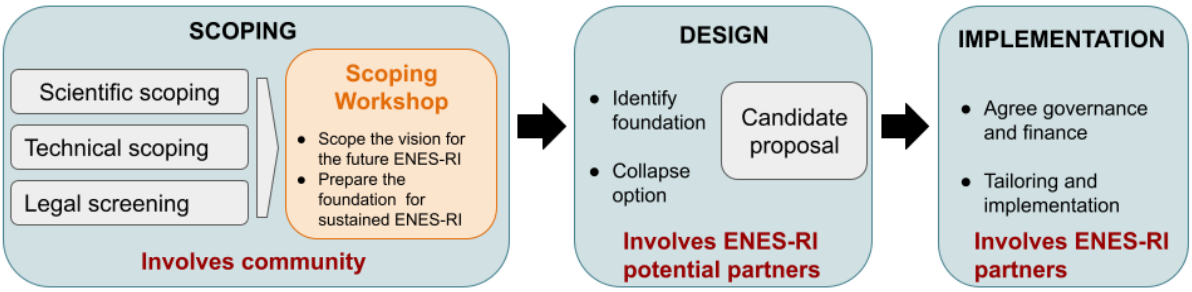

Fig. 2: The three consecutive phases of the Sustainability process in IS-ENES3.

In this milestone, we give an overview of the achievements from the scoping phase.

2. The scoping phase

The sustainability scoping phase as described in the DoW encompassed four steps preceded by the creation of a sustainability WG: scientific scoping, technical scoping, legal screening and proposition of governance options. We decided to leave the governance options for the design phase as this partly depends on the type of entity chosen and needs to be defined with the partners.

a. Legal screening

The legal scoping consisted in browsing and analysing a large panel of potential legal options (types of agreements and funding models) on which the ENES infrastructure could be built upon. In this perspective, the legal options likely to meet the ENES infrastructure needs and expectations were pre-selected (Table 1). To optimally inform the upcoming choice of type of entity to be made in the design phase, all dependencies, and the associated timelines were analysed based on selected criteria as listed in the first column of Table 1.

At first, these categories were completed with information sought online, mainly through websites describing the overall features of these legal agreements or legal entities. For each option, we also listed examples of research infrastructures built on it, and analysed the legal document enacting their creation, when available on their official website.
In a second phase, for some legal options such as AISBL, we interviewed the responsibles from some of these research infrastructures in order to collect feedback on their own experience in implementing their legal structure.

Table 1 provides an overview of the implications of the possible options.

	Letter of Intent/ Letter of Commitment	Memorandum of Understanding	Consortium Agreement	AISBL, Belgian Law (EUFAR, PRACE, SeaDataNet)	ERIC
Legal entity	no	no	no	yes	yes
Binding agreement	Yes	Yes	Yes	Yes	Yes
Signatory parties	Partner Institutions	Partner Institutions	Partner Institutions	Partner Institutions	Ministries of member countries.
Governance implications	None	None	Consortium leader	Governing body, Administrative Body	Assembly of Members, Director/Board of Directors
Formal Bookkeeping required	No	No	No, but advisable (light tbc)	Yes (level of complexity depending on financial size)	Yes (heavy, assimilable to an EU project, tbc)
Access to EU funding scheme	No	No	No	Yes	Yes
Liability (who and range tbc)	Depends on the agreement	Depends on the agreement	Depends on specific agreement	Limited liability - liability limited to their respective contributions	Liable for debts, can be limited to members contributions.
Costs to establish (e.g. lawyers)	Low	Low	Low	Likely high (might involve external consultancy)	Low, when established from an ESFRI, Likely higherwhen established "from scratch"
Timeline to establish (necessary stages)	Time for negotiation process and signature	Time for negotiation process and signature	Time for negotiation process and signature	Time for negotiation process and signature / 5-6 months upon submission to obtain Royal Decree. e.g. EUFAR: 4 years of work total	Step 1: 3 months starting from the submission of the application; Step 2: 6 months starting from the submission of the formal request to the Commission. (incl. translation of the decision in all official languages of the EU)

Table 1: Overview of the legal screening detailing possible options for the future ENES-RI entity.

The type of entity (or level of engagement) will be decided in the design phase by consensus among the institutions involved in the sustained ENES-RI. This process will be iterative and the partner institutions will need to liaise with their respective legal departments and stakeholders.

b. Technical scoping

Running alongside the scientific scoping, the technical scoping aimed to provide an estimate of the size and costs of the current infrastructure (at component, software and/or service level). This was achieved by preparing tailored Business Model Canvases for each service, tool or component provided in IS-ENES3.

The ensemble of business model canvases filled for the technical scoping has provided rich and exhaustive information that has been compiled in a structured way in the technical scoping synthesis. Services and tools for climate models and data at their different stages of development have been considered as part of the ENES-RI.

A summary of the technical scoping process is presented in Table 2.

Activity Class	Service Classification	Service Names	Availability	Funding
Data Services and Data Systems (ENES-CDI)	Remote at infrastructure sites	ESGF Data Service (ESGF-UI, Identity Management & Access Control, Search, Pub Service, ESGF Index)	24/7 SLA	Inst. + Nat. + EU
		Compute/Analysis Service, IPCC-DDC	24/7 Best Effort	Inst. + Nat. + EU
		Errata Service, ES-DOC, SYNDA Data Replication/Staging, C4I Portal, ESGF Data Statistics Service (Data Metrics UI, Data Metrics Collector)	24/7 Best Effort	Inst. + EU
		Citation Service, PID Service	24/7 Best Effort	Inst.
	Data management	Data Request Service	24/7 Best Effort	Inst.+ Nat. + EU
		CF Convention Support	Best Effort	Inst. + EU
Models, Tools and HPC	Provision of software	Cylc	24/7 Best Effort	Inst. + EU
		OASIS, XIOS	Best Effort	Inst. + EU
Scientific Evaluation and Data Analysis		CDO	Best Effort	Inst.
		ESMVal	Best Effort	Nat. + EU

Table 2: Technical scoping matrix.

The overview of the ENES-RI is provided in Fig. 3. The ENES-RI is structured in climate model related services and tools, data services and data analysis tool. It is a compilation from both EU-projects, ESiWACE and IS-ENES.

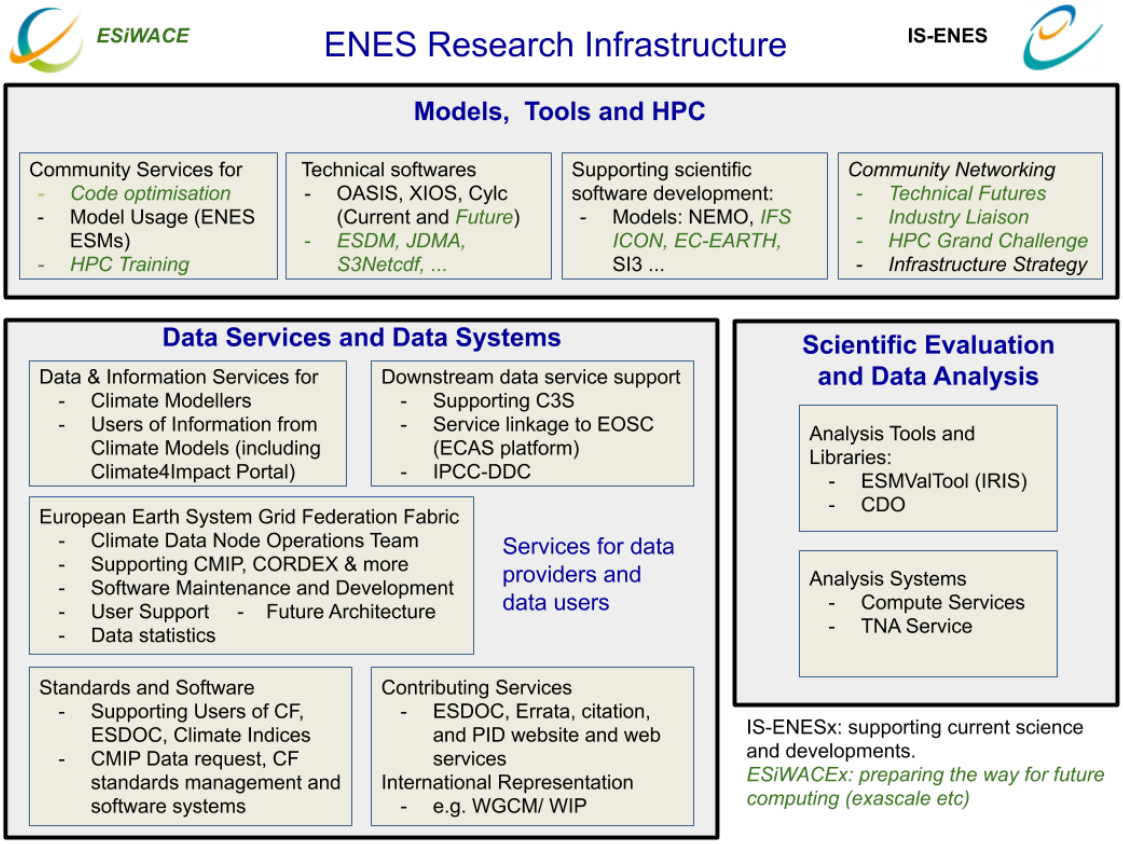

Fig. 3: ENES-RI at the end of the technical scoping.

c. Scientific scoping

The outcome of the scientific scoping is crucial to formulate the vision for infrastructure to come. It aims to address the following strategic questions: where do we want to be in 10 years and what can we achieve (and maintain), based on the demand (and on its foreseen evolution) starting with what we have?

The scientific scoping was achieved through chronological steps: a preliminary scientific consultation, a series of brainstorming workshops, and a scientific scoping workshop.

Preliminary scientific consultation

Preliminary informal scientific consultations were led with users and providers of our infrastructure as a first step towards defining the scope of the infrastructure and its vision. For that, we targeted the modelling groups at WG members' institutions to "test the waters" and help us to formulate adequate questions for the brainstorming.

A significant number of users have reported to have dependencies on OASIS, XIOS, ESGF data services, ESMValTool and NEMO which are developed in Europe through consortiums of users.

Generally, the respondents tend to see more advantages than disadvantages in sharing tools or expertise. The most popular advantages were the gain of time and efficiency, the improvement of service quality through enhanced expert knowledge and larger feedback as well as the adoption of a single standard and a better inter-comparability of data. Also it was raised that these collaborations allow to develop products which couldn't be developed by a single group. In terms of disadvantages, it was often mentioned that a shared tool or expertise is less responsive to institutional needs and that there is little control over its design and direction. Also, it creates strong local dependencies.

According to the respondents, the current European climate modelling infrastructure needs more standards and quality control. The information and communication about the existing services should be improved and the access to data should be more intuitive. A common governance seems necessary to keep a common single focus and a single technical vision and to help address the issue of sustainability of the components of the infrastructure. Finally, it seems more appropriate to keep a bottom-up approach when looking for IS solutions.

A more exhaustive synthesis of the scientific consultations can be found there.

Brainstorming workshops

Community brainstorming workshops were held in November 2020 to understand to what extent users and providers would be affected by the absence of services currently offered through IS-ENES. The workshops were articulated around the following set of questions:

1. Which are the most important ENES tools/services?
2. How would the absence of specific services affect science? For you, for your institution and for your community.
3. Future funding options are complex, but in principle, do you think your institution could or would be open to contributing (in kind or with a subscription) to ensuring the financial stability of these services? If not, would you expect to stop using the services?

Fig. 4 and Fig. 5 were used to present the implications of the ending of EC funding from IS-ENES3 and ESiWACE2 for the services and tools supported in our research infrastructure.

The impact of the EC funding cessation is very different among the broad range of services and tools, some of them potentially disappearing whereas others could maintain a level of activities close to the current one thanks to other sources of funding. Fig. 5 also highlights potential threats on the ENES-CDI core mission with the criticality dots.

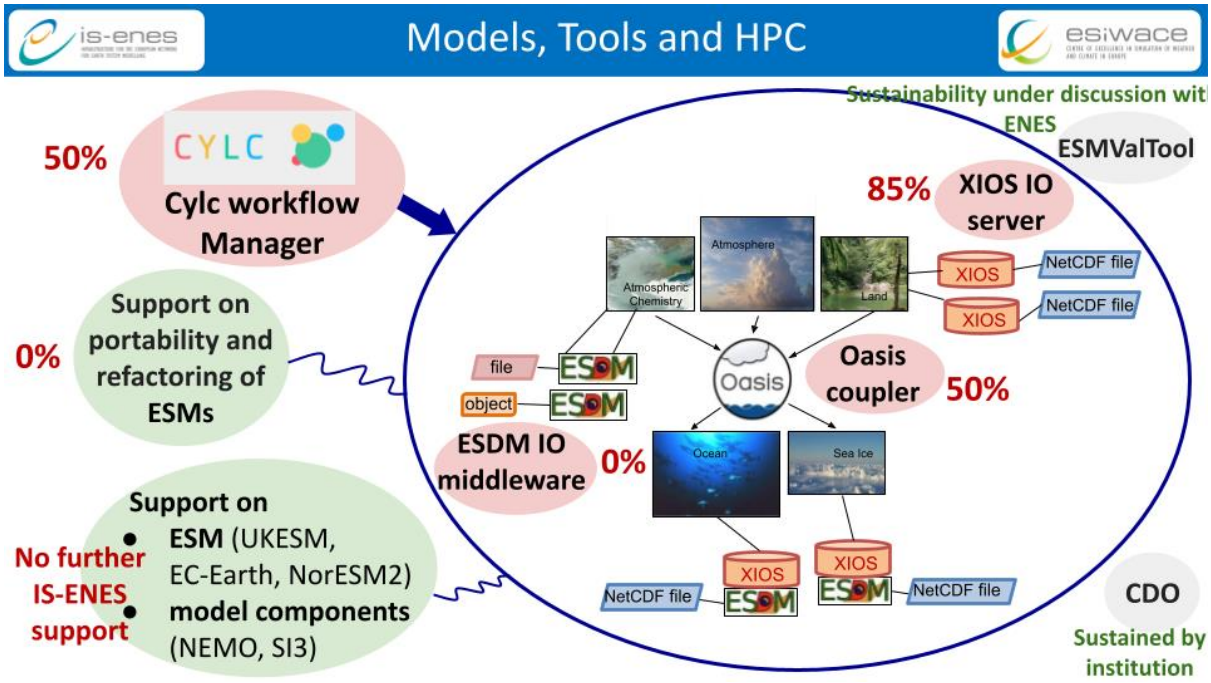

Fig. 4: Percentage of funding expected to remain after EC funding ends in Dec. 2022, for different services, components and tools in the "Models, Tools and HPC" part of the ENES Research infrastructure.

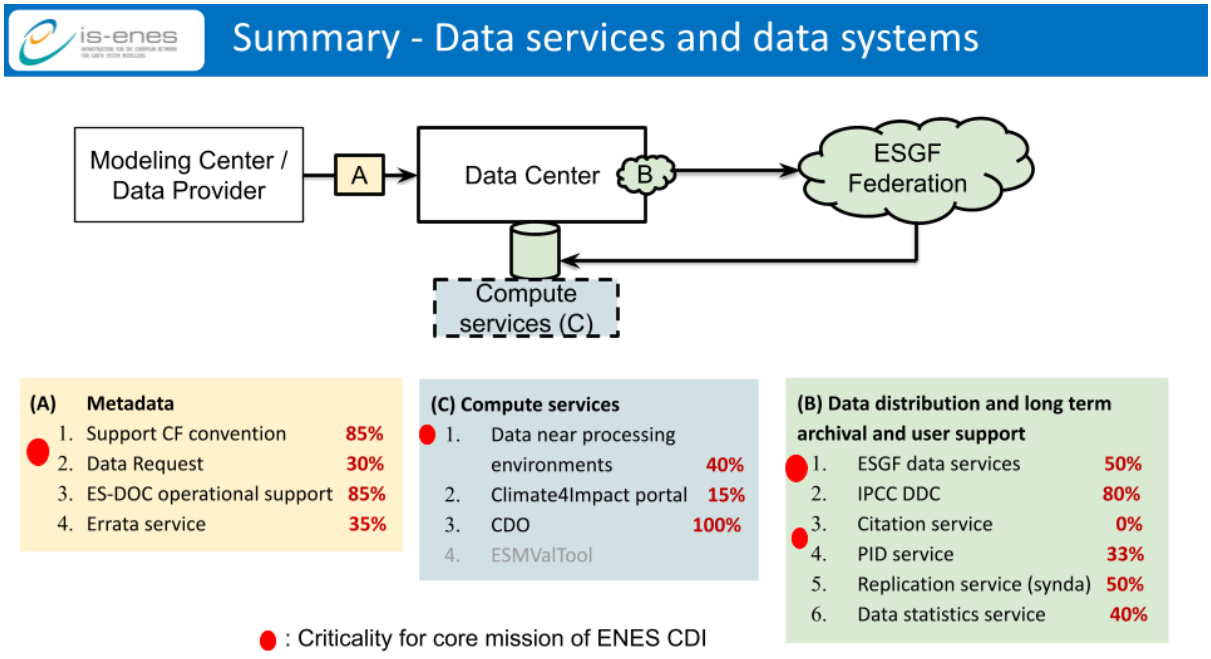

Fig. 5: Percentage of funding expected to remain after EC funding ends in Dec. 2022, for different services in the "ENES-CDI" part of the ENES Research infrastructure.

The brainstorming workshops have hosted fruitful discussions. It has been recognised that the science based on climate modelling would be severely impaired if the research infrastructure would no longer be funded. Crucial activities led by the research infrastructure have been highlighted. A range of possible actions to convince the scientific community and funders that the RI needs regular funding has been discussed. Some strategic important aspects to take into account regarding the future architecture have been considered. Finally, the participants mentioned that it would be easier for their institutions to position themselves and engage in a sustainable future RI once the sustainability contours have been clarified. Also, long-term commitments need a more thorough discussion at institutional level (and more accurate contours).
A more exhaustive synthesis from the workshops discussions and outcomes can be found there.

The scientific scoping workshop

Held in June 2021, the scientific workshop was meant as the closure event of the scoping phase. The aim was to define the scope of a new sustainable entity to ensure the service continuity after EC funding ends, and understand what is needed to maximise organisational involvement in that entity. Workshop attendees were expected to help define the scale and objectives of the new entity and be in a position to understand whether their organisation should engage, and if so, how and when.

The recently drafted documents on the "mission and objectives" of the ENES-RI were presented at the workshop for both the "Models, Tools and HPC" and the ENES-CDI.

Type A services: EU-funding (IS-ENES3 / ESiWACE2) funding < 50% (OASIS, XIOS, CYLC, IPCC-DDC, ESMVal, CDO)

Type B services: EU-funding (IS-ENES3 / ESiWACE2) funding ~ 50% (ESGF Data Services, C4I, Compute Services, SYNDA, Errata, ESDOC, Dashboard, CF-Convention, PID, MIP Data Request)

Type C services: EU-funding (IS-ENES3 / ESiWACE2) funding = 100% (ESiWACE services, Citation)

	Sustained activities post-IS-ENES3 & ESiWACE2 (1)	Potential issues
Type A service	operations, maintenance, minimum development, user support by current developers	No further development to adapt to new architectures and new user needs 3rd party requirement not being fulfilled **perspective without add. funding: 3 - 5years**
Type B service	operations, maintenance, user support, no development	Security issues leading to downtime, extended outage or complete withdrawal of services Difficulty attracting further funding as service become obsolete Inability to adapt and change to new requirements which arise, new models for delivery or technological opportunities Potential growing inconsistency of the distributed data services in the federation **perspective without add. funding: < 3 years**
Type C service	no operations and no user support	**no perspective without EU funding**

Table 3: Categorisation of our services and tools into 3 types, specifying the corresponding sustained activities when EC funding ceases, and the potential issues that might arise.

Table 3 was presented at the workshop introduction to draw the attention of participants on an estimated life expectancy of specific ENES services without EU funding (referred as "perspective" in Table 3). This service classification was discussed as a fair status summary with the recommendation that an ENES-RI entity should represent all types of services and support transition between classes.

Fig. 6: Possible contours for the future ENES-RI with increasing level of institutional engagement expected from left to right. The benefits are highlighted.

An informal proposition for the contours of the sustained ENES-RI was presented at the workshop (Fig. 6) to give an idea of what the future ENES-RI could look like, depending on the engagement of institutions.

An important part of the workshop consisted in breakout group sessions which were organised around the following set of questions:

(1) The European climate modelling infrastructure:
    (a) For the data
    (b) For the models, tools and HPC
    What are the strengths, weaknesses, opportunities and threats?
(2) What would a successful RI look like in 5 years?
    (a) In regards with European context
    (b) Looking inward: for data, models, tools, HPC, and other aspects.
(3) Institutional constraints - barriers?

Overall we had a very good response with most (if not all) of the participants willing to engage in the design phase. Workshop participants see the ENES-RI as key for European climate modeling and recommend working in the direction of a reliable, sustained infrastructure. Key partners of the ENES-RI signed at the end of the workshop for participation in the subsequent design phase.

An exhaustive synthesis of the workshop discussions and outcome can be found there.

3. Next steps

We are now starting the Design phase of the Sustainability process (Fig. 1) which aims at designing a candidate proposal to feed into the Implementation phase. For that, a working group has been newly created after the scientific scoping workshop, including representatives of all European climate modelling institutions a priori willing to engage in the design. This group will liaise on a regular basis with the sustainability executive committee in charge of piloting the design phase. The representatives will be responsible for ensuring the communication with their own institutions to feedback on the propositions elaborated by the executive committee.

The folder containing all relevant outcome documents from the scoping phase is available **there**.