

## IS-ENES3 Deliverable D6.3

### Second periodical report on service statistics for models and tools

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

Authors: Eric Maisonnave (CERFACS), Uwe Fladrich (SMHI)

Reviewer(s): Sylvie Joussaume (CNRS-IPSL), Fanny Adloff (DKRZ)

Release date: 10/02/2022

#### ABSTRACT

IS-ENES services for European ESMs (Earth System Models) and Software Tools have been provided to the user community from the month 18 to month 36 of the IS-ENES3 project. The services are continuously monitored and KPIs are collected every 6 month from the groups that run the service endpoints.

This deliverable compiles the results of the first 6 KPI reporting periods and evaluates the outreach of services based on these findings.

Revision table			
Version	Date	Name	Comments
0	12/01/2022	Initial draft	
1	13/01/2022	Revised version	
2	17/01/2022	Release for review	
3	02/02/2022	Final version	

Dissemination Level	
PU	Public



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.	Objectives.....	4
2.	Methodology and Results.....	4
2.1	Key Performance Indicators (KPIs) for VA1/WP6 .....	4
2.2	Fourth half-year collection of KPIs (M19-M24) .....	6
2.3	Fifth half-year collection of KPIs (M25-M30) .....	7
2.4	Third half-year collection of KPIs (M31-M36) .....	8
2.5	Other service activities.....	10
2.6	KPI Summary and overview.....	10
3.	Conclusions and recommendations .....	13

## Executive Summary

IS-ENES services for European ESMs (Earth System Models) and Software Tools have been provided to the user community from the month 18 to month 36 of the IS-ENES3 project. This is a continuation of the first part of the IS-ENES3 project and an extension of services provided in earlier phases of IS-ENES. The current phase includes a set of installations, in particular the central service access point (the ENES Portal, level 1 service), the individual services provided by the modelling and tool development groups (level 2 services and active user support), as well as the dedicated user support (TNA) for OASIS.

These installations constitute the service endpoints for the user communities. The main objective for the services is the easy access to information, the provision of interfaces between ESM/tool developers and users, and the definition of interfaces for feedback from user communities.

All services are continuously monitored using key performance indicators (number of released versions, active contributors, issues opened/closed, mails or forum messages exchanged). KPIs are gathered every 6 months from all service providers. Three KPI reporting periods (i.e. 18 months in total, from month 18 to month 36) are covered in this report, but to have a better picture of the overall activity, we also provide indicators for the first 18 months. The evaluation shows that all services have maintained an active level. The KPIs cover in particular the provision of updated software to the user (KPI1), the activities to maintain momentum in the development (KPI2), the quantitative uptake of the services by users (KPI3+4) and the quantitative response activities by service providing groups (also KPI3+4).

## 1. Objectives

The overarching objective for VA1/WP6 is to maintain, extend, and improve the services around the main European ESMs, the NEMO ocean model, and related critical infrastructure software tools. These services help to efficiently connect the respective development and user communities and thus support the usage and development of European ESMs as well as the exploitation of climate model data. Level 2 services (up-to-date model versions and documentation, and efficient help channels for questions and issues that may arise in the user community) are provided on ESMs and tools:

- HadGEM/UKESM (ESM) by MetO
- EC-Earth (ESM) by the EC-Earth consortium
- NorESM (ESM) by met.no and UniRes
- OASIS (infrastructure tool) by CERFACS
- XIOS (infrastructure tool) by CNRS-IPSL and CERFACS
- Cytc/Rose (infrastructure tools) by the MetO
- ESMValTool (infrastructure tool) by DLR, BSC and NleSC

IPSL also provides a level 2 service for the NEMO ocean model.

In order to monitor the effectiveness of level 2 services for European ESMs (cf. task 2) and for European infrastructure tools (task 3), KPIs have been set up at the beginning of the project period. This deliverable describes the KPIs that were identified for the work package, reports the collected KPIs for the first reporting period, and other service activities in tasks 2 and 3.

## 2. Methodology and Results

### 2.1 Key Performance Indicators (KPIs) for VA1/WP6

The KPIs for this work package have been discussed among VA1/WP6 partners and have been chosen to match the following criteria:

- support sustainability for services w.r.t. the previous project IS-ENES2
- ensure ability for all partners to deliver the KPIs for ESM and software tools services

In particular, the following KPIs are gathered every six months, starting in June 2019:

### **KPI 1: Number of released versions**

The number of releases and the respective version numbers that were published (through channels chosen by the respective group, e.g. public software repositories) during the reporting period. Used to track activity related to provision of improved software.

### **KPI 2: Active contributors**

The number of people that have actively contributed to the development of the ESM/software tool during the reporting period. Could be retrieved from the version control system. Used to track development resources dedicated to serve the user community.

### **KPI 3: Issues opened/closed**

The number of issues that were (i) opened, and the number of issues (ii) closed, in the issue tracking system of the ESM/software during the reporting period. Used to track (i) the level of service usage by the community, and (ii) the response by the development groups.

### **KPI 4: Mails or forum messages exchanged**

Either the number of mail exchanges between developers and users or the number of messages exchanged in dedicated discussion forums concerning the ESM/software tool, accumulated during the reporting period. Used to track the service usage and interactions between ESM/software tool developers and users.

These KPIs reflect to a large degree the development cycle for large software development projects, which is in good agreement with the work flow of the participating institutes. Thus, all groups were able to regularly provide the KPIs without major overhead. However, this collection work requires the contribution of persons involved in the model or tool development process. Some kind of continuity is required in order to provide unbiased numbers, which is not compatible with regular staff replacements.

The KPIs reflect, on the other hand, the interaction between the modeling/development groups and their user community. KPI1 (releases), for example, indicates how users can rely on updated and improved versions of the software they need. Another example, KPI3, measures interactions both ways: The number of “issues opened” indicates how much users turn to the service providers, asking for help. Thus, this number provides an indication as to how much the service is used. The “issues closed” metric monitors the response of the service providers, as they answer the incoming questions or solve problems.

Even though a common set of KPIs is used for all models/tools, there are differences in the particular services individual groups offer. Some rely more on mails or forum messages, while others use their ticketing services much more extensively. Some use a more frequent release

schedule, while others package larger changes in infrequent releases. Thus, the actual quantities of the KPIs can have systematic differences between the service providers. This had to be taken into account when evaluating KPIs between groups. Another aspect is the temporal evaluation of KPIs. There may be phases with high activity alternating with periods of lower service usage. The pre-CMIP6 phase is an example of intensive development for the ESMs, which leads presumably to a higher service activity level.

The next three sections give a detailed list and evaluate the KPI collections for the following three periods of IS-ENES3: M19-M24, M25-M30, M31-M36. A summary in diagrams for all KPIs for all groups and collection periods, since the beginning of the project, is given in section 2.6.

## 2.2 Fourth half-year collection of KPIs (M19-M24)

The first KPI period described in this 6.3 deliverable covers 6 months from 01/07/2020 until 31/12/2020:

Institute	ESM/tool	KPI 1 (versions)	KPI 2 (contributors)	KPI 3 (issues)	KPI 4 (messages)
CERFACS	OASIS	0	7	2 opened, 3 closed	226
SMHI	EC-Earth	1	24	77 opened 39 closed	0
MetO	Cylc (core only)	3	8	122 opened 97 closed	27
	Rose	1	4	5 opened 2 closed	
MetO	HadGEM UK-ESM	2	64	195 closed	1100
CNRS-IPSL	XIOS	0	3	8 opened 8 closed	n/a
CNRS-IPSL	NEMO	1	44	101 opened 130 closed	78
UniRes, met.no	NorESM	1	40	35 opened 30 closed	5000

Institute	ESM/tool	KPI 1 (versions)	KPI 2 (contributors)	KPI 3 (issues)	KPI 4 (messages)
DLR, BSC, NleSC	ESMValTool	5	28	110 opened 126 closed	37 emails or forum messages, about 4000 messages exchanged on GitHub

Note that due to a change in the reporting system, the MetOffice is no longer able to provide KPI3-o for HadGEM-UKESM. Tickets get logged when they are committed to the version control system, and thereby “fixed”. This corresponds to KPI3-c.

All services have been active under the reporting period. As already observed, the actual range of KPI values varies between the services, which indicates that groups prefer different service activities. Nevertheless, all groups are continuously (i) showing development activity, indicated by releases (KPI1) or number of contributors to the code enhancement (KPI2) and (ii) providing help to the users (KPI3 and KPI4). Notice that KPI3 (closed tickets) can also be seen as an indicator of the model/tool development, toward a better fit to user needs.

Compared to the first 3 RP1 measures, the collected numbers shows that the services have been delivered with a good regularity, despite the bad sanitary conditions and associated restrictions in force during the period. In addition, this period corresponds to the end of the CMIP6 inter-comparison project production and analysis phases. These periods are usually more active with respect to model modifications. But our services, and particularly those in link with developments, seems to remains constant.

## 2.3 Fifth half-year collection of KPIs (M25-M30)

The second KPI period described in this 6.3 deliverable covers 6 months from 1/1/2021 until 30/06/2021:

Institute	ESM/tool	KPI 1 (versions)	KPI 2 (contributors)	KPI 3 (issues)	KPI 4 (messages)
CERFACS	OASIS	0	8	1 opened, 2 closed	154
SMHI	EC-Earth	0	23	59 opened, 35 closed	1
MetO	Cylc (core only)	4	9	79 opened, 59 closed	39

Institute	ESM/tool	KPI 1 (versions)	KPI 2 (contributors)	KPI 3 (issues)	KPI 4 (messages)
	Rose	2	3	17 opened, 16 closed	
MetO	HadGEM UK-ESM	2	65	201 closed	1100
CNRS-IPSL	XIOS	0	5	4 opened, 0 closed	N/a
CNRS-IPSL	NEMO	1 (intermedia te release)	33	46 opened, 67 closed	45
UniRes, met.no	NorESM	N/a	N/a	N/a	N/a
DLR, BSC, NleSC	ESMValTool	3 : 1 ESMValTo ol + 2 ESMValCo re	24	98 opened, 135 closed	16 emails or forum messages, about 4000 messages exchanged on GitHub

There was a problem in this reporting period for the NorESM team to provide the KPIs, because people normally involved in the KPI collection were not available and the group was not able to organise replacement. However, the KPI reporting was resumed for NorESM in the following reporting period, so the missing of information has been accepted. Despite the few missing values, mainly due to discontinuity in monitoring, the collected numbers prove the service continuity.

## 2.4 Third half-year collection of KPIs (M31-M36)

The third KPI period described in this 6.3 deliverable covers 6 months from 1/7/2021 until 31/12/2021:

Institute	ESM/tool	KPI 1 (versions)	KPI 2 (contributors)	KPI 3 (issues)	KPI 4 (messages)
CERFACS	OASIS	1 (v5)	5	2 opened, 6 closed	52

Institute	ESM/tool	KPI 1 (versions)	KPI 2 (contributors)	KPI 3 (issues)	KPI 4 (messages)
SMHI	EC-Earth	1	20	42 opened 32 closed	0
MetO	Cylc (core only)	6 (7.8.9, 7.8.10, 7.9.4, 7.9.5, 8.0b2, 8.0b3)	8 (core cylc-flow repository only)	94 opened, 115 closed (core cylc- flow repository only)	40 (forum only)
	Rose	2 (2.0b2, 2.0b3)	5	19 opened, 26 closed	
MetO	HadGEM UK-ESM	2 (12.0 and 12.1)	60	245 closed	950
CNRS-IPSL	XIOS	0	4	1 opened, 0 closed	n/a
CNRS-IPSL	NEMO	1 (4.0.7)	48	47 opened, 56 closed	114 messages (Discourse) + 270 (Zulip)
UniRes, met.no	NorESM	1	35	65	5000
DLR, BSC, NleSC	ESMValTool	4 (2 for ESMValTool and 2 for ESMValCore)	25	71 (32 + 39) opened, 106 (48 + 58) closed	17 emails, 4000 Github

The third period for KPI reporting similarly shows regular service activities for all groups and user communities. As already observed, developments and associated services go on even during the post-CMIP6 period, emphasizing the need for a continuous working force dedicated to these tasks. Noticed that CNRS-IPSL has opened two new collaborative tools for NEMO during the period, one for forums with Discourse (<https://www.discourse.org>), dedicated to exchanges within the user community and another one for chats Zulip (<https://zulip.com/>), for exchanges within the developer community. Both are now listed in the KPI4 of NEMO, leading to its substantially increase.

## 2.5 Other service activities

The ENES Portal, Models&Tools section, has been updated in complementary service actions related to level 1 services (Task 1). Two update rounds have been done, in September 2020 and November 2021, and a total of 21 pages have been updated. A number of minor updates have been implemented in between the main rounds, when approached by modelling/tool groups or portal users.

Most of the ES-DOC links on the model pages have been recently updated, as model information on ES-DOC became available. Some technical support has been provided to modelling groups that needed it for the ES-DOC publication process. Overall, 16 model configurations from European groups are now available on ES-DOC and links are provided on the ENES Portal, the full list being:

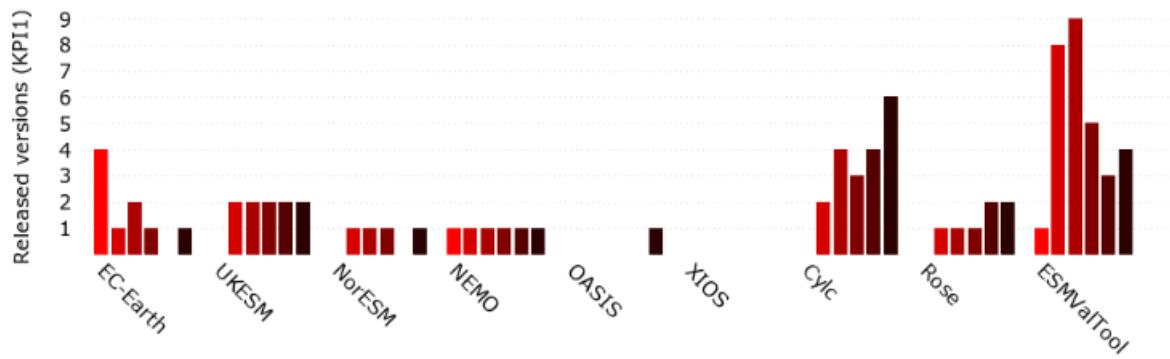
- CMCC-CM2-SR5
- CNRM-CM6-1, CNRM-ESM2-1
- EC-Earth3, EC-Earth3-Veg, EC-Earth3-AerChem, EC-Earth3-CC, EC-Earth3-LR, EC-Earth3-HR, EC-Earth3-Veg-LR, EC-Earth3-GrIS
- IPSL-CM6A-LR
- MPI-ESM1.2-HAM
- UKESM1-0-LL, HadGEM3-GC31-LL, HadGEM3-GC31-MM

Note that CMIP5 configurations (e.g. NorESM) are not listed above, as these model configurations have not been updated.

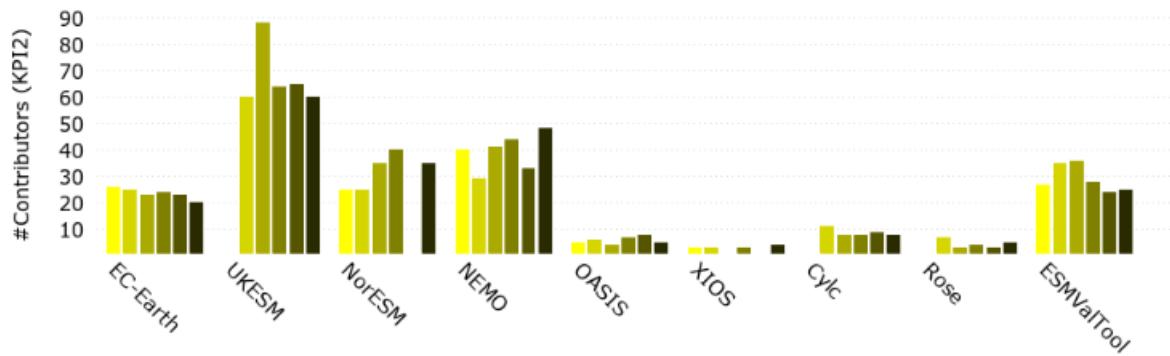
## 2.6 KPI Summary and overview

The following figures show a graphical summary for all KPIs for all models and tools, for the three 6-month periods within RP2 but also for the three 6-month periods within RP1, covering the full project. The values for the reporting periods are ordered from left till right, for each of the models/tools, and given color shades from light (period 1) to dark (period 6).

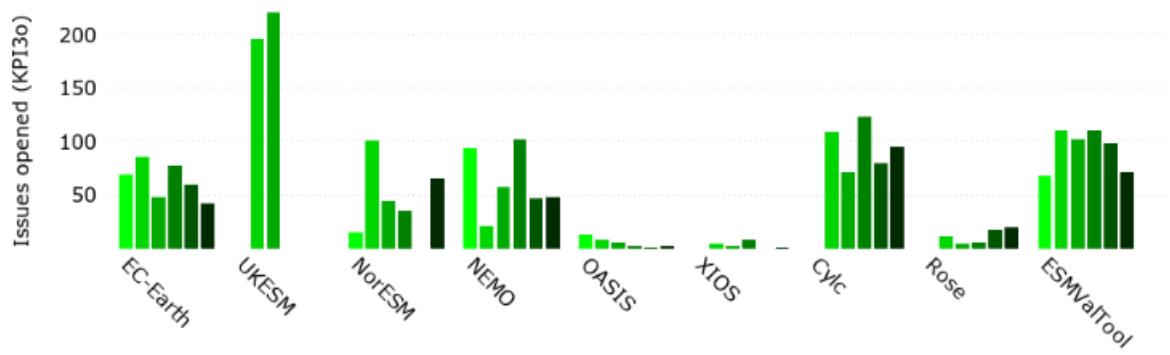
### KPI 1 – Released versions:



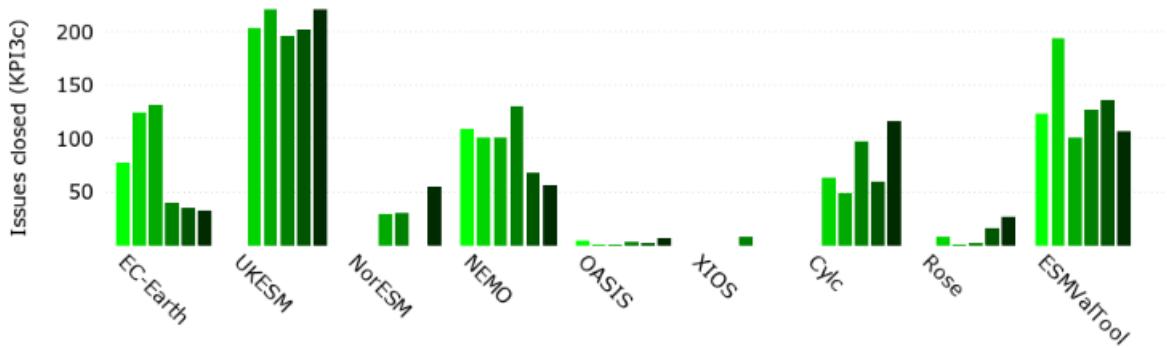
### KPI 2: Contributors:



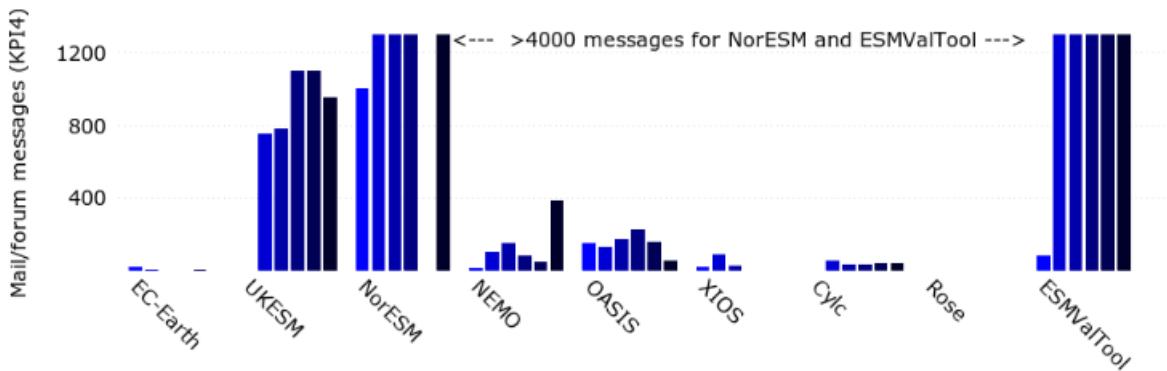
### KPI 3: Issues opened



### KPI 3: Issues closed:



### KPI 4: Mail/forum messages:



### 3. Conclusions and recommendations

IS-ENES3 Services on European ESMs and software tools have been maintained and substantially extended with respect to IS-ENES2. Three software tools (Cylc/Rose, XIOS, ESMValTool) and three ESMs (EC-Earth, HadGEM/UK-ESM, NorESM) are regularly reporting service KPIs, in addition to OASIS and NEMO, which have already done this in the previous IS-ENES2 phase.

All ESMs and tools have maintained a high level of service activities, as already proven by the KPIs of the RP1 reporting period. All groups have actively developed their software (KPI2) and practically all have provided new versions to their respective users (KPI1). Notice that a brand new XIOS version (not taken into account by the KPI1) was in preparation during the last two semesters, which explains the few number of modifications of the active branch. Developments or debugging on demand (KPI3, opened tickets) are still widely used by the community and the effort to address their issue is continuous (KPI3, closed tickets). If forums or emails are still widely used for user support, new communication tools are being adopted (e.g. Zulip chat and Discourse groups for NEMO).

No KPI seems to have been affected by the pandemic (missing numbers reflects discontinuity in measurement, not in service providing), and the usual post-CMIP production phase activity decrease has not been observed, which shows the good reliability of the service, in link with the motivation of the community to keep a link that is known to be essential for the quality of our scientific results.

The authors want to acknowledge David Matthews & Jean-Christophe Rioual (MetOffice), Remi Kazeroni (DLR), Pierre-Antoine Bretonnière (BSC), Nicolas Martin & Claire Levy (CNRS-IPSL), Sophie Valcke & Laure Coquart (CERFACS), Øyvind Seland (met.no) for their constant effort in monitoring and providing the KPI that were essential to the writing of this report. Thank you to Sylvie Joussaume (IPSL) and Fanny Adloff (NCAS) for their fruitful review, and Sophie Morellon (IPSL) for publication.