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D6.2 : DISSEMINATION AND EXPLOITATION PLAN

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	PP: Restricted to other programme participants (including the Commission)
	RE: Restricted to a group specified by the consortium (including the Commission)
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Disclaimer

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Glossary

Term	Explanation
ASTERICS	Astronomy ESFRI & Research Infrastructure Cluster
ASTRON	The Netherlands Institute for Radio Astronomy
CNRS	Centre national de recherche scientifique
CTA	Cherenkov Telescope Array
CS	Citizen Science
EGO	European Gravitational Observatory
ELT	Extremely Large Telescope
ESCAPE	European Science Cluster of Astronomy & Particle Physics ESFRI research infrastructures
ESFRI	European Strategy Forum on Research Infrastructures
EST	European Solar Telescope
EOSC	European Open Science Cloud
FAIR	Findable, Accessible, Interoperable, reusable
FAIR	Facility for Antiproton and Ion Research
H-LHC	High Luminosity LHC
IVOA	International Virtual Observatory Alliance
KM3NeT	Cubic Kilometre Neutrino Telescope
LAPP	Laboratoire d'Annecy de Physique des Particules
JIVE	Joint Institute for VLBI ERIC
MPE	Mass participation experiment
SKA	Square Kilometre Array
WP	Work Package

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PROJECT SUMMARY

ESCAPE (European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures) addresses the Open Science challenges shared by ESFRI facilities (CTA, ELT, EST, FAIR, HL-LHC KM3NeT and SKA) as well as other pan-European research infrastructures (CERN, ESO, JIVE and EGO) in astronomy and particle physics. ESCAPE actions are focused on developing solutions for the FAIRness of large data sets handled by the ESFRI facilities.

These solutions shall: i) connect ESFRI projects to EOSC ensuring integration of data and tools; ii) foster common approaches to implement open-data stewardship; iii) establish interoperability within EOSC as an integrated multi-probe facility for fundamental science.

To accomplish these objectives, ESCAPE aims to unite astrophysics and particle physics communities with proven expertise in computing and data management by setting up a data infrastructure beyond the current state-of-the-art in support of the FAIR principles. These joint efforts are expected result into a data-lake infrastructure as cloud open-science analysis facility linked with the EOSC. ESCAPE supports already existing infrastructure such as astronomy Virtual Observatory to connect with the EOSC. With the commitment from various ESFRI projects in the cluster, ESCAPE will develop and integrate the EOSC catalogue with a dedicated catalogue of open-source analysis software. This catalogue will provide researchers across the disciplines with new software tools and services developed by astronomy and particle physics community. Through this catalogue ESCAPE will strive to cater researchers with consistent access to an integrated open-science platform for data-analysis workflows. As a result, a large community “foundation” approach for cross-fertilisation and continuous development will be strengthened. ESCAPE has the ambition to be a flagship for scientific and societal impact that the EOSC can deliver.

EXECUTIVE SUMMARY

The main focus of the ESCAPE Dissemination and Exploitation Plan is to ensure that the project’s outputs and results are widely disseminated to the appropriate target communities (scientists, other EOSC stakeholders including pan-European e-infrastructures and Research Organisations, other data Clusters, ESFRI, EOSC Governance, Policy Bodies and industry), at appropriate times along the project lifetime and particularly at key milestones, and that those who can contribute to the development, evaluation and uptake of the ESCAPE outputs can be identified and encouraged to participate. Finally, prospects for the project past its funded lifetime will be ensured by the proper elaboration of the dissemination and exploitation activities. During the project, this Dissemination and Exploitation Plan will be updated and adapted in line with progress and as per the feedback of the community and project office.

INTRODUCTION

The ESCAPE partners aim at being in the forefront of best practice for the dissemination and exploitation of all the results that flow from the project. The Dissemination and Exploitation Plan is dedicated to raising awareness, engaging stakeholders, promoting the project and its related results, achievements and knowledge generated, while also setting a solid basis for its future exploitation.

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1. ESCAPE Dissemination Strategy: Goals and Target Audiences

1.1 Goals of ESCAPE Dissemination Strategy

The ESCAPE project embraces the *Open Science* initiative and its main drivers. Specifically, we aim to ensure:

- open access to both ESCAPE publications, code and associated data, including early access to and open annotation of ESCAPE' research results, open research collaboration (open innovation) with other partners (e-Infrastructures, other thematic clusters, all EOSC projects and bodies, universities, industry, SMEs, general public etc.) that extend beyond the ESCAPE consortium;
- development of new techniques in a uniquely data intensive environment with the explicit goal of further advancing those that may represent viable solutions to the continuous implementation of EOSC and to societal challenges;
- dissemination impact metrics: definition of quantitative KPIs, monitoring of bibliometric impacts (e.g. project academic citations sorted by http://inspirehep.net and https://ui.adsabs.harvard.edu).
- preservation, curation and reuse of ESCAPE data wherever possible, adoption of "alternative metrics" that measure the wider impact and quality of the ESCAPE research output, in addition to the traditional (publication/press based) criteria. ESCAPE chief audience in terms of dissemination and exploitation will include (a) the scientific and technical community, academia, private industry, other public research centres, SMEs and policy makers, EC H2020 *etc*. and (b) the general public, including the media, schools, students, and citizen scientists (through the engagement with the Citizen Science programme). All WPs have a significant contribution to make in this area, in particular with respect to their respective training and workshops programmes.

The main priorities of the ESCAPE Dissemination and Exploitation Plan are:

- to seek opportunities to circulate information on the overall success of our programme;
- to provide extra attention to engaging with the general public;
- to develop and support an ambitious programme of MPEs associated with the ESCAPE ESFRI facilities and EOSC, augmented with machine learning for accelerating the reliable classification rate (following best practice in the state-of-the-art in citizen science, and in liaison with WP3).

1.2 ESCAPE Target Audiences

ESCAPE partners believe that disseminating project results to the widest possible audience, thus maximising their full exploitation is part of the commitment of the concerned ESFRI facilities in setting up EOSC.

Table 1 Communities that ESCAPE aims to engage with

Stakeholders	Description	Examples
Scientists	Pan-European research consortia such as APPEC, ASTRONET, NuPPEC, ECFA support the ESCAPE mission and endorse the Test Science Case initiatives to enhance the involvement in EOSC of researchers from the scientific domains encompassed within ESCAPE.	Joint international workshops and cooperative projects such as JENAS 2019.
e-infrastructures	e-Infrastructures will make every European researcher digital, increasing creativity and efficiency of research and bridging the divide between developed and less developed regions.	EGI, EUDAT, OpenAire, GEANT, PRACE, etc.
ESFRI projects	The ESFRI projects concerned by ESCAPE all have the mission in common to provide open access to their quality certified scientific data, including dedicated	Cherenkov Telescope Array (CTA), Extremely Large Telescope (ELT), European Solar Telescope (EST), Facility

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Stakeholders	Description	Examples
	analysis software stacks, and high-level science tools.	for Antiproton and Ion Research in Europe (FAIR), High Luminosity-Large Hadron Collider (HL-LHC), cubic-kilometre-sized Neutrino Telescope (KM3NeT), Square Kilometre Array (SKA), European Gravitational Observatory (EGO), Joint Institute for VLBI ERIC (JIVE) and the various RIs operated by CERN and ESO.
Other thematic Clusters	A collaboration among the five clusters coordinators (that include together 45 ESFRI RIs) has been set up. The coordinators started to meet initially within the EOSC-Hub Scientific Strategy Board and it has grown up to a platform with regular contacts for coordination and cross-fertilization purposes.	ENVRI-FAIR, ESCAPE, EOSC-Life, PANOSC, SSHOC
Industry, namely Small and Medium Enterprises	A network of industrial stakeholders already established by the different ESCAPE partners will be consolidated and considered for potential further cooperation on issues such as services and software developments, RIs data accessibility from commercial cloud services.	Pythonic.nl, VSI DARBO EIGOS (VIDE), Triopsys, S&T
European Open Science Cloud Governance	For the follow-up of governance and rules of engagement for users and providers that will be applicable within EOSC	EOSC working groups
Pan-European Research Organisations	These pan-European research infrastructures in astronomy and particle physics aim to address the Open Science challenges shared by ESFRI facilities involved in ESCAPE	European Organization for Nuclear Research (CERN), and European Southern Observatory (ESO)

1.3 ESCAPE Assets

The main focus of ESCAPE is to establish a single collaborative cluster of next generation ESFRI facilities in the area of astronomy- and accelerator-based particle physics in order to implement a functional link between the concerned ESFRI projects and EOSC. ESCAPE aims to produce versatile solutions, with great potential for discovery, to support the implementation of EOSC thanks to open data management, cross-border and multi-disciplinary open environment, according to FAIR (Findable, Accessible, Interoperable and Reusable) principles.

In order to serve ESCAPE stakeholders, a Big-Science domain-specific "EOSC cell" to be connected/integrated in the global EOSC infrastructure and to help setting up the related services. Such an EOSC cell is composed of six main components, as described in Table 2.

Table 2 ESCAPE components building the "EOSC cell"

Service	Description	The novelty / value-add
ESCAPE CS Citizen Science	A harmonised suite of citizen science experiments, improving the transparency of the scientific process, while bringing the science-inclined public directly and genuinely into the processes of scientific discovery	Getting the general public genuinely involved in the scientific discoveries of the astronomy and physics facilities. It has an excellent track record for finding unexpected features missed by automated data processing, being therefore the best approach for many complex scientific data mining problems
ESCAPE DIOS Data Infrastructure for Open Science	A federated data infrastructure of open access data that enables large national research data centres to work together and build a robust cloud-like service to curate and scale up to multi-Exabyte needs, while following FAIR principles	The service provides capabilities for managing large volumes of data and making them accessible to very distributed communities, while optimizing the cost of storage, "hiding" the complexities of data management and data access
ESCAPE SAP Science Analysis Platform	A platform-service gateway with the capability to access and combine data from multiple collections and stage for subsequent processing and analysis. It allows data discovery and handling of large and distributed data collections	It combines data, from many different physical locations, from different but related scientific disciplines, into a unique multi-messenger, transparent, user friendly way and cross-domain Open Science Cloud for fundamental science.

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Service	Description	The novelty / value-add
ESCAPE OSSR | Open-source Scientific Software and Service Repository	A sustainable open-access repository to share scientific software and services to the science community and enable open science. It allows users to access multi-messenger and multi-domain software to mine open-access datasets, guaranteeing cross-fertilisation and an open innovation environment for science interoperability and software re-usage.	There is no single repository available for the closely related scientific field of astrophysics, astroparticle physics and particle physics. This new repository will allow easy access to algorithms, software packages and services developed in this field that can be used also to address other scientific problems.
ESCAPE VO | Virtual Observatory	It is the integration of distributed infrastructures into one single virtual astronomy facility. It aims to become a key for discovery and reuse, using common disciplinary IVOA standards and fostering good practices for data access, deposition and sharing of data, data management curation and preservation.	It is a pioneer of data sharing with a well-established alliance of international partners who cooperate to build the necessary interoperability standards. It will be an essential component for the astronomy data landscape, it facilitates interoperability and re-use of data

These services will be developed specially during the first and second year of ESCAPE project and dissemination efforts will be put in place to support the pre-release and release of assets. More detailed info about each ESCAPE service is indicate in the following chapters.

1.3.1 ESCAPE Citizen Science

Citizen Science (CS) is the practice of public participation and collaboration in scientific research to increase scientific knowledge. Through citizen science, people share and contribute to data monitoring and collection programs. The Mass Participation Experiments (MPEs) and educational resources target the science-inclined public and the expert specialist science communities.

The MPEs aim specifically at engaging with the public - driving societal engagement in the ESFRI facilities open science goals through EOSC. The MPEs provide curated open access to research data to a much wider community than the technical specialist user base of each facility. ESCAPE objective in providing mass participation experiments (MPE) is to create interfaces to enable the use EOSC and the science of ESFRI facilities for education and public services, while attracting the public (particularly young people) to science by networking facilities via citizen science and through the provision of open educational resources for citizen science participants to develop their interests still further.

MPEs provide the science-inclined public with the most accessible way to get genuinely involved in the scientific discoveries of the astronomy and physics ESFRI facilities in the EOSC. The benefits to the scientific communities are that volunteer crowdsourcing is the best approach for many complex scientific data mining problems, and it has an excellent track record for finding unexpected features missed by automated data processing.

The ESCAPE Citizen Science (CS) brings the science-inclined public directly and genuinely into the processes of scientific discovery, through a harmonised suite of citizen science experiments, improving the transparency of the scientific process. The ESCAPE CS also gives the public the opportunity to have a direct two-way dialogue with the professional science teams and a tangible connection with the ESFRI projects facilitated by the EOSC framework. In parallel, machine learning tools will be developed, trained initially on crowdsourced data, to accelerate volunteer classifications during the operation of the citizen science projects.

ESCAPE CS | Citizen Science

Figure 1 ESCAPE Citizen Science logo

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ESCAPE CS project will be promoted by commissioning the creation of sixty-second promotional animations, modelled on the "Sixty Second Adventures in Astronomy" series (using an independent video production company), highlighting the data-science for the ESFRI facilities opened-up by the implementation of EOSC and inviting the viewer to participate in a related mass participation experiment. For these CS project videos and other ESCAPE promotional videos, ESCAPE will adopt the same methodologies for monitoring "click- through rates" and sign-ups for further study used in the prior research infrastructure cluster ASTERICS.

The Novelty of ESCAPE Citizen Science
The best approach for getting the general public genuinely involved in the scientific discoveries of the astronomy and physics facilities in the EOSC, well suited to many data mining challenges faced by the ESFRIs in the EOSC.

1.3.2 ESCAPE Data Infrastructure for Open Science

The ESCAPE Data Infrastructure for Open Science (DIOS) is a federated data infrastructure of open access data that enables large national research data centres to work together and build a robust cloud-like service to curate and scale up to multi-Exabyte needs. The ESCAPE DIOS is a cloud of data services that follows FAIR data management principles at the bases level while serving global user communities in a scalable and performing way.

Figure 2 ESCAPE Data Infrastructure for Open Science logo

The ESCAPE DIOS is a flexible and robust data lake in terms of storage, security, safety and transfer, as well as basic orchestration machinery, which enables the combination of technology with high quality data from different communities and, therefore, the exploration of new areas in science.

Individual physical data stores are now in a coherent virtualized data infrastructure that manages extremely large data volumes and the user does not necessarily have to know the physical location of the data but accesses it in the cloud via standard interfaces or through their science platforms.

The ESCAPE DIOS for astronomy and physics is a pillar infrastructure to be connected to EOSC, address the next decades' data challenges and serve the international user communities. The service will be available to the users of the escape science projects to store and organize their data. It will be accessible to all users to read the data, conform with the policies of the science projects.

The Novelty of ESCAPE Data Infrastructure for Open Science
The ESCAPE DLCS will hide the complexities of data management and data access in a distributed environment from the end users. The service provides capabilities for managing large volumes of data and making them accessible to very distributed communities, while optimizing the cost of storage.

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1.3.3 ESCAPE Science Analysis Platform

Data volumes are increasing rapidly, making it more difficult for users to process, analyse and visualise data. The ESCAPE project seeks to provide infrastructure (both hardware and software) to support data discovery, processing and analysis of data from research infrastructures in the fields of particle physics and astronomy which are at the cutting edge in terms of the amount of data that is collected each year.

The ESCAPE Science Analysis Platform (SAP) is a platform-service gateway with the capability to access and combine data from multiple collections and stage for subsequent processing and analysis. It allows data discovery and handling of large and distributed data collections. It is a flexible science platform for the analysis of open access data available through EOSC, giving the users the possibility to identify and stage existing data collections for analysis, tap into a wide-range of software tools and packages developed by and in support of the ESFRIs, bring their own custom workflows to the platform, and take advantage of the underlying high performance computing infrastructure to execute those workflows.

Figure 3 ESCAPE Science Analysis Platform

The ESCAPE SAP is tailored to the requirements and the users' needs of each of the ESFRI and other research infrastructure members of ESCAPE. The ESCAPE SAP targets predominantly scientists but also developers interested in extending the functionality of the science analysis platform.

The Novelty of ESCAPE Science Analysis Platform
Combination of data from different but related scientific disciplines, into a unique multi-messenger and cross-domain Open Science Cloud for fundamental science. It will also support multi-messenger science and provide access to data, software and tools stored in many different physical locations, in a transparent and user-friendly way.

1.3.4 ESCAPE Open-source scientific Software and Service Repository

The ESCAPE Open-source scientific Software and Service Repository (OSSR) is a sustainable open-access repository to share scientific software and services to the science community and enable open science. It will house astro-particle-physics-related scientific software and services for data processing and analysis, as well as test data sets, user-support documentation, tutorials, presentations and training activities.

Figure 4 ESCAPE Open-source Scientific Software and Service Repository logo

It will enable a true multi-messenger data-driven cooperative approach based on the FAIR principle requirements and will become part of the EOSC global catalogue of services. In a collaborative effort

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of all ESCAPE partners, common and innovative approaches will be fostered.

The software, science tools & other services available on ESCAPE OSSR are openly available to all and allow users to access multi-messenger and multi-domain software to mine open-access datasets. This guarantees cross-fertilisation and an open innovation environment for science interoperability and software re-usage.

The ESCAPE OSSR will be set up in a way that everyone in the scientific community will be able to use the software and services. Beyond the main aim of re-use, spreading existing solutions will foster the creation of new solutions in the astro-particle-physics community and adjacent scientific fields. End users are mostly identified as individuals and institutions willing to innovate.

Currently, there is no single repository available for the closely related scientific field of astrophysics, astroparticle physics and particle physics. ESCAPE OSSR will generate this repository, allowing for easy access to algorithms, software packages and services developed in this field that – however – can be used also to address other scientific problems.

For the first time, ESCAPE OSSR combines the expertise of world-leading research infrastructures and institutions in the fields of astrophysics, astroparticle physics and particle physics. They strive together to share high-quality, well documented, and easy-to-use software solutions in a harmonised way using a well-defined interface.

The main output of Open Science Software and Service Repository will be the means for dissemination itself: the collection of software and services will be linked to the EOSC portal and thus be made public using the dissemination means of the full EOSC infrastructure. In addition, the standard ways of dissemination (web page, talks, posters, workshops, tutorials, webinars) will be used.

The Novelty of ESCAPE Open-source scientific Software and Service Repository
Combination of the expertise of world-leading research infrastructures and institutions in the fields of astrophysics, astroparticle physics and particle physics. They strive together to share high-quality, well documented, and easy-to-use software solutions in a harmonised way using a well-defined interface.

1.3.5 ESCAPE Virtual Observatory

The ESCAPE Virtual Observatory (VO) for astronomy integrates distributed infrastructures into one single virtual astronomy facility. ESCAPE supports the integration of the various multi-messenger ESFRI facilities and other research infrastructures into the EOSC through the VO framework, to ensure that their high-level scientific products and big data sets are openly accessible.

Figure 5 ESCAPE Virtual Observatory logo

The ESCAPE VO is an essential component for the astronomy data landscape, it facilitates interoperability and re-use of data. ESCAPE will ensure that VO data are accessible to the European and international communities through EOSC. It sets the path for a new era of cross-disciplinary interoperability and connections to the necessary computing resources, as well as enabling the use of

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VO data in scientific analysis platforms. The ESCAPE enabled VO services aim to be a key for discovery and reuse, using common disciplinary IVOA standards and fostering good practices for data access, deposition and sharing of data, as well as for data management curation and preservation.

The VO targets ESFRI, Research Infrastructures and other data providers, Research scientists, and Virtual Observatory builders.

The Novelty of ESCAPE Virtual Observatory
A pioneer of data sharing with a well-established alliance of international partners who cooperate to build the necessary interoperability standards that allow interoperable access to European and international astronomical data and services.

1.4 Unique Value Propositions: The ESCAPE targets vs assets

Each target defined has specific needs and can be met through the ESCAPE assets.

Coordination and networking.

Coordinate with the ESFRI projects to develop and adopt procedures, to establish good practices for data stewardships, to disseminate the results of ESCAPE, to engage with EOSC Working Groups, to work with other cluster projects on interoperability issues, to establish network with industries, e-infrastructures, policy bodies and all other EOSC projects.

Data and tools exposure.

Support community-foundation approach for continuous development, deployment, exposure and preservation of domain specific scientific data/software/services in the global context of the EOSC catalogue of services based on *FAIR* principles.

Data interoperability and sustainability.

Foster archived data access, interoperability and long-term sustainability in coordination with national and international concerned infrastructures. *FAIR* access to the large astronomical data archives collecting observations from multi-wavelength telescopes is built upon the Virtual Observatory (VO) framework. ESCAPE will promote the exposure of the VO archives within the EOSC catalogue.

Skills.

Engage the scientific community in EOSC, train and educate the community in the usage and implementation of the ESCAPE products, data, software, services and methods in line with the *FAIR* principles, and engage the society at large in the process of knowledge discovery through citizen science and education.

ESFRI RIs data infrastructure federation.

Promote a pan-European collaboration of major shareholders of the ESFRI projects for a new paradigm of distributed data factories of extremely large volumes at the tens-of-Exabyte level for Big Science that will be part of the EOSC federated cloud.

ESFRI RIs community analysis service.

Implement a flexible platform for the analysis of open access data allowing EOSC and ESCAPE researchers to identify and stage existing data collections for analysis, tap into a wide range of software tools and packages developed by the ESFRIs, bring their own custom workflows to the platform, and take advantage of the underlying HPC and HTC computing infrastructure to execute those workflows.

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2. Dissemination Plan: Enabling the use and uptake of ESCAPE results

2.1 Scientific Publications

ESCAPE articles will be published in scientific and technical peer-reviewed journals, conference proceedings, monographs, etc.

Consistent with the requirements of the Horizon 2020 programme, all ESCAPE publications will be released in the public domain. As far as possible, this will be "green" open access with full-text publications indexed and available via the web portal. The web portal will also permit open annotation of individual ESCAPE products –permitting comments on articles to be made. Associations to other links and to other relevant information can also be archived there. To a greater extent, we will be using ArXiv.org as a global repository of ESCAPE publications –as the standard server for all astronomy, computing, maths and physics papers, we expect at least 80% of ESCAPE publications to be openly available there. For articles with content that falls outside of these domains, papers will be placed in the public domain by publishing in open access journals or by directly procuring "gold" open access rights.

2.2 ESCAPE Capacity Building Programme

Training and educating the next generation of facility staff and users is essential in securing the success of this and many other aspects of the ESCAPE programme as well as the effective link between ESFRI facilities and the EOSC. Extending the concept of open access and open innovation to their logical next steps, ESCAPE also places significant emphasis in directly involving the wider society in the scientific process through citizen science, public engagement and communication of research outcomes. These activities increase the potential for innovation, including social innovation, and open up the ESFRI facilities to the widest possible audience, thus maximising their full (potential) breadth and depth of impact.

Each work package within ESCAPE has a strong component of training – the aim is to attract and educate young scientists towards the Open Science and data stewardship, in using the newly developed tools and methodologies. The training includes workshops, schools, online tutorials and collaboration with other science projects. Such programmes are essential in order to ensure that the results of ESCAPE will proliferate beyond the project partners, and can help ensure a long-term legacy for the project that will endure long beyond the formal contractual period.

Trainings programs were already put in place during the first year of the project (see Table 3) . Most of the trainings will be organized from the second year of the project, aiming to provide first skills to stakeholders' communities on ESCAPE early results, collect feedback and test services usage. Several internal workshops are also planned, to make a quality check regarding the development of the assets (see Table 4**Erreur ! Source du renvoi introuvable.**).

Table 3 ESCAPE events organised during Y1

What	When & Where	Audience
MS27 First WP5 workshop on Science Platform design and requirements 4	16-17 April 2019, Groningen (The Netherlands)	ESFRI Partners, UEDIN, DESY and JIVE
Workshop: Data Infrastructure and Analysis Platform: defining architecture and implementation plan (MS7)	1-3 July 2019 Amsterdam (The Netherlands)	ESCAPE consortium and GEANT and EGI representatives

Table 4 ESCAPE events planned from Y2 onwards

What	When	Audience
First Science with interoperable data school (D4.3)	May 2020 (M16)	External

What	When	Audience
First Citizen Science workshop (MS36)	July 2020 (M18)	External
Thematic training event - first school for software development and deployment in the EOSC (D3.5)	September 2020 (M20)	External
Second WP2 workshop to analyse the performance of the pilot, prepare D2.2 (MS9)	November 2020 (M22)	Internal
Second WP5 workshop to analyse prototype performance (MS31)	November 2020 (M22)	Internal
Hands-on workshop for data providers (MS24)	July 2021 (M30)	External
Second Citizen Science workshop (MS37)	July 2021 (M30)	External
Second Science with interoperable data school (D4.6)	December 2021 (M35)	External
Thematic training event - second school for software development and deployment in the EOSC (D3.8)	January 2022 (M36)	External
Final WP5 ESFRI user training workshop on the Science Platform (MS35)	March 2022 (M38)	External
Third WP2 workshop to review performance of the full prototypes, and to explore future directions, prepare D2.3 (MS13)	March 2022 (M38)	Internal
Final workshop to evaluate the outcome of WP3 with respects to the main objectives of the call and define the necessary future steps (MS18)	May 2022 (M40)	Internal

2.5 Participation at 3rd-party events

Various events organised by third-party organisations have been identified for possible submission of papers, conducting workshops and exhibitions, joining a panel, poster session, demonstrations, networking activities, amongst others. Presence at these events will allow:

- The promotion of ESCAPE solutions and results to different target stakeholders;
- Engage directly with potential ESCAPE service users;
- Identification of win-win synergies with different organisations and initiatives, for potential collaboration and knowledge transfer;
- Dissemination of scientific results and engage with scientific community.

Events will be selected based on the audiences expected, while well targeted presentations and promotional material will be generated for focused and effective communication, dissemination and engagement outcomes. An initial list of relevant potential events, to promote ESCAPE, has been defined. *Table 5* gives a limited and non-exhaustive sample of events, for the next year of the project, while **Erreur ! Source du renvoi introuvable.**lists events where ESCAPE was already showcased.

A dedicated page has been set up[1] to collect all the relevant details to track and monitor ESCAPE event participation. In addition, the ESCAPE event participation is highlighted on the web platform's Events section, to inform beforehand the audience that they can meet ESCAPE partners there: https://projectescape.eu/events?tid=2

Table 5 ESCAPE events planned from Y2 onwards

Date, Location	Event	Target Audience	Type of participation
21-22 Nov 2018 Vienna (Austria)	EOSCpilot Stakeholder Forum	Research Organisations, Academic Institutions and Research, Libraries, E-infrastructures, H2020 projects, Enterprise, General Public, Government Agencies, Research Funding Bodies, Research Infrastructures, Research, Communities, Scientific Associations, Service Providers, European policy and decision makers	Presentation at Plenary Session 2: A community-empowered EOSC
30 Jan 2019 London (UK)	ESFRI RIs and EOSC Workshop	ESFRI, ESFRI RIs and EOSC stakeholders	Presentation at plenary session

[1] Link: https://docs.google.com/spreadsheets/d/1gRjH7Ca_QVNdHv1HQHP2_WSZUXA2oNTh_B2tGBVdX8w/edit#gid=145131489

Date, Location	Event	Target Audience	Type of participation
6-7 Jun 2019 Turin (Italy)	EOSC Jam Session	EOSC projects and EOSC ESFRI Cluster projects.	Attended as an observer & contributed to the discussions
24-28 Jun 2019 Lyon (France)	EWAAS - European Week of Astronomy and Space Science	Astrophysicists from all over Europe and beyond	Presentation about ESCAPE
5-8 August 2019 Sydney (Australia)	Astronomical Data Archives Meeting 2019	Astronomers & data managers	Presentation about ESCAPE
12 Sep 2019 Online event (UK)	Open Talks at Open University	University students & general public	Presentation about ESCAPE
24 Sep 2019 Compostela (Spain)	IBERGRID 2019	Software developers, data managers & computing professionals	Presentation about ESCAPE
6-10 Oct 2019 Groningen (The Netherlands)	2nd IVOA - ADASS Astronomical Data Analysis Software and Systems	Astronomical Data Analysis and Software Systems	ESCAPE posters (Abstract 1 | Abstract 2 | Poster 1)
9-10 Sep 2019 Brussels (The Netherlands)	Building EOSC through the H2020 projects current status and future directions	EOSC-related projects	Showcase project roll-up banner and flyer were distributed
14-16 Oct 2019 Orsay (France)	Joint ECFA-NuPECC-ApPEC Seminar	Data science and astroparticle physics professionals	
21 Oct 2019 Helsinki (Finland)	EOSC Services, Collaborations, and the RDA	EOSC and Research Data Communities	ESCAPE presentation
4-8 Nov 2019 Adelaide (Australia)	24th International Conference on Computing in High-Energy and Nuclear Physics	Computing professionals from High Energy and Nuclear Physics.	ESCAPE presentation
19-22 Nov 2019 Madrid (Spain)	ESA/ESO SCIOPS workshop 2019	ESA and ESO communities concerned with "cross-facility coordination in the multi-messenger era".	2 ESCAPE presentations
26-28 Nov 2019 Budapest (Hungary)	EOSC Symposium	EOSC community, Research & Academic institution, Research Communities, Business organisations, EU eInfrastructures, Research Infrastructures, policy makers, funding agencies, industry, HPC centers, SDOs, citizen scientists, publishers, Data service providers.	Poster presentation
8-9 Dec 2019 Pisa (Italy)	REINFORCE kick-off meeting	Academia and citizen science professionals	ESCAPE Citizen Science Presentation

Table 6 Events where ESCAPE was showcased

Date, Location	Event	Target Audience	Type of participation
30 Mar 2020 Patras (Greece)	PHAROS Conference 2020: The multi messenger physics and astrophysics of neutron stars	Neutron star experts	Paper submission
8-9 Apr 2020 Rome (Italy)	International Conference on Physics, Cosmology and Astronomy	Academic scientists, researchers and research scholars	Paper or poster
4-5 May 2020	2nd International Physics Conference	Experts, professionals, academicians and researchers from all over the world from physics	Paper submission
18-19 May 2020 Karlsruhe (Germany)	EOSC-hub week 2020		
20-21 May 2020 Berlin (Germany)	4th International Conference on Astronomy and Space Technology	Scientists, professors, engineers, researchers, scholars, students and market leaders from all areas of Physics, Chemistry, Mathematics, Computer Science, Geology and Biology	Exhibition, poster, presentation

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Date, Location	Event	Target Audience	Type of participation
21-22 May 2020 London (UK)	ICAPP 2020: 14. International Conference on Astrophysics and Particle Physics	leading academic scientists, researchers and research scholars of Astrophysics and Particle Physics	Paper or poster
15-20 Jun 2020 Tbilisi (Georgia)	International Astrophysics and Space Conference 2020	Space exploration mission specialists, ground-based observational project developers and related astrophysics researchers, academicians, PIs and industrial professionals from all over the world	Paper or poster presentation
18-19 Jun 2020 Vienna (Austria)	International Conference on Advances in Astronomical Computing	academic scientists, researchers and research scholars in the fields of Advances in Astronomical Computing	Paper or poster presentation
22-24 Jun Madrid (Spain)	Planetary Science Informatics and Data Analytics 2020 Conference	Big data managers from astronomy	Paper presentation
29 Jun 2020 Leiden (The Netherlands)	European Astronomical Society Annual Meeting	Astrophysicists from all over the world	Presentation
14-18 Sep 2020 Munich (Germany)	ESO-ESA Joint 2020 Science Workshop. New Science in the multi-messenger era.	Multi-messenger astronomy professionals	More info soon

2.6 ESCAPE final event

The ESCAPE final event, to be organized by the end of the project, will showcase the final assets of ESCAPE that compose the EOSC cell, as well as the ESCAPE final blue print, indicating overall project achievements, lessons learnt and recommendations. It is also planned to collect feedback/ input from targeted stakeholders and related activities/projects. The Table 7 provides a more detailed description of the event.

Table 7 ESCAPE final event motivation (draft)

ESCAPE final event motivation	
Expected Results	**Communication activities**
- Disseminate ESCAPE core values to larger audiences **- Create engagement over ESCAPE assets and it contribution for EOSC and support to FAIR principles implementation** - Demonstrate how ESCAPE: • Improved access to data and tools for interdisciplinary research • Support the creation of an open innovation environment for research data • Fostered the establishment of global standards for scientific data • Established synergies with key initiatives on open science and FAIR data	- 1 ESCAPE stand-alone workshop - Flyers with ESCAPE final results - Presentations of ESCAPE ESOC cell and individual assets - Presentation of use-cases with Science Projects - Interview with ESCAPE asset managers & end-users - Prepare an agenda covering astronomy/astrophysics, as well as EOSC and open science - Social media set-up with specific communication and marketing activities, namely a specific hashtag which will be provided 2/3 months before the event.
Example of messages	ESCAPE final event is coming: get to know how ESCAPE services facilitate open-data management from astronomy, astroparticle and particle physics and beyond. Join ESCAPE final event. Get to know how ESCAPE five services that follow FAIR principles & compose the EOSC Cell towards a transversal adoption of services across disciplines

ESCAPE final event motivation	
Expected Results	**Communication activities**
	See how ESCAPE is helping today research infrastructures across the world to perform interdisciplinary research between different sciences

2.7 Communication Strategy supporting dissemination

The ESCAPE Communication Strategy aims to support the project dissemination during the whole project time-frame (42-months) and was prepared based on a careful strategy. Initially, the main goal is to **communicate** the ESCAPE goals to multiple audiences, beyond the project's own community. Later on, the project will start to **disseminate** ESCAPE early results, through stakeholder engagement, collection of feedback and capacity building initiatives, concluding with the final dissemination and exploitation of ESCAPE final results by the end of the project.

The plan will be updated and adapted to community reality, during the whole time-frame of the project. In addition, the plan will also support the exploitation and sustainability efforts, which will define the short and long-term vision for ESCAPE beyond the project. The plan aims to answer three main questions, described in Table 8

Table 8 Main aspects of ESCAPE communication and outreach efforts

Question	Goal
The Whom	The target audiences for the promotion of ESCAPE's results and ensure the uptake of ESCAPE results by the Astronomy and Particle Physics communities, as well as by the other stakeholders identified.
The What	Identify the assets and key results that will be developed during the development of the project, in close collaboration with the technical work packages
The How	How the communication activities will be implemented and how their effectiveness will be measured.

The communication, marketing and engagement plan will concentrate its efforts around copywriting and producing engaging, stimulating and impactful content. Our editorial planning includes the publication of news pieces and articles to widely promote the innovation and benefits of ESCAPE to its targeted stakeholders. The main objective of ESCAPE's communication strategy is to engage with the general public to promote the innovation of ESCAPE's work, maximise visibility, activate and engage the end-user community, disseminate results, and demonstrate impact.

The communication strategy will try to give a "human face" to the science and technology behind ESCAPE, therefore emphasising the role of individual scientists and highlighting their personalities via profile pages and video interviews. To achieve the above, ESCAPE communication strategy will include:

- Online web platform (https://projectescape.eu/);
- Social network channels;
- Articles and news pieces;
- Branded promotional material;
- Multimedia content;
- Attendance at high-level events and meetings where ESCAPE results can be showcased to external stakeholders;
- Creation of MPE online resources.

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The communication and outreach activities explained in this document will ensure that ESCAPE's mission and vision are spread to the target audience through traditional, online, social communication and marketing activities.

2.7.1 Website

ESCAPE has a strong "online" presence, with a public responsive website[2] (see Figure 6) in all of its sections (i.e. usable from all major devices such as smartphones, tablets and laptops), aimed at target all potential stakeholders and present the full scope of the project and its key objectives and results.

The portal is used for internal coordination, and internal and external dissemination of ESCAPE results, including the gateway to the catalogue of services. It was officially launched at M5 (July 2019) and will be progressively improved along with the evolution of the project.

The web platform is the main hinge for the project's outcomes and as such it has a primary importance in the communication strategy. It aims specifically at engaging with the public - driving societal engagement in the ESFRI facilities open science goals through EOSC. For this reason, many of the efforts carried out by the other communication channels are made in order to address and attract target stakeholders to the website itself. The website will feature both "push and pull" marketing strategies:

- Links to the ESCAPE social media accounts, e.g. on LinkedIn and Twitter;
- Popular features such as event calendar, news, public resources area;
- Links to the ESCAPE repository of results (data, software and services).

In addition to having a public web portal, the same infrastructure also hosts an internal area reserved for project staff (see Table 9**Erreur ! Source du renvoi introuvable.**). This area serves as the ESCAPE-internal information archive and is password-protected. Here, all information related to the implementation of the work description is available, such as: meeting minutes, reports, agenda, and the data and software archive.

Table 9 ESCAPE internal tools for project management

Platform	Link	Function
Rocket.Chat	https://chat.escape2020.de	Chat server
Own Cloud	https://cloud.escape2020.de	Collaborative cloud document storage and calendar
OpenProject	https://project.escape2020.de	Project platform with deliverables, milestones and wiki
Indico	https://indico.in2p3.fr	Event organiser tool

For more information about the website, please refer to "D6.1. ESCAPE project website live".

[2] Website: https://projectescape.eu/

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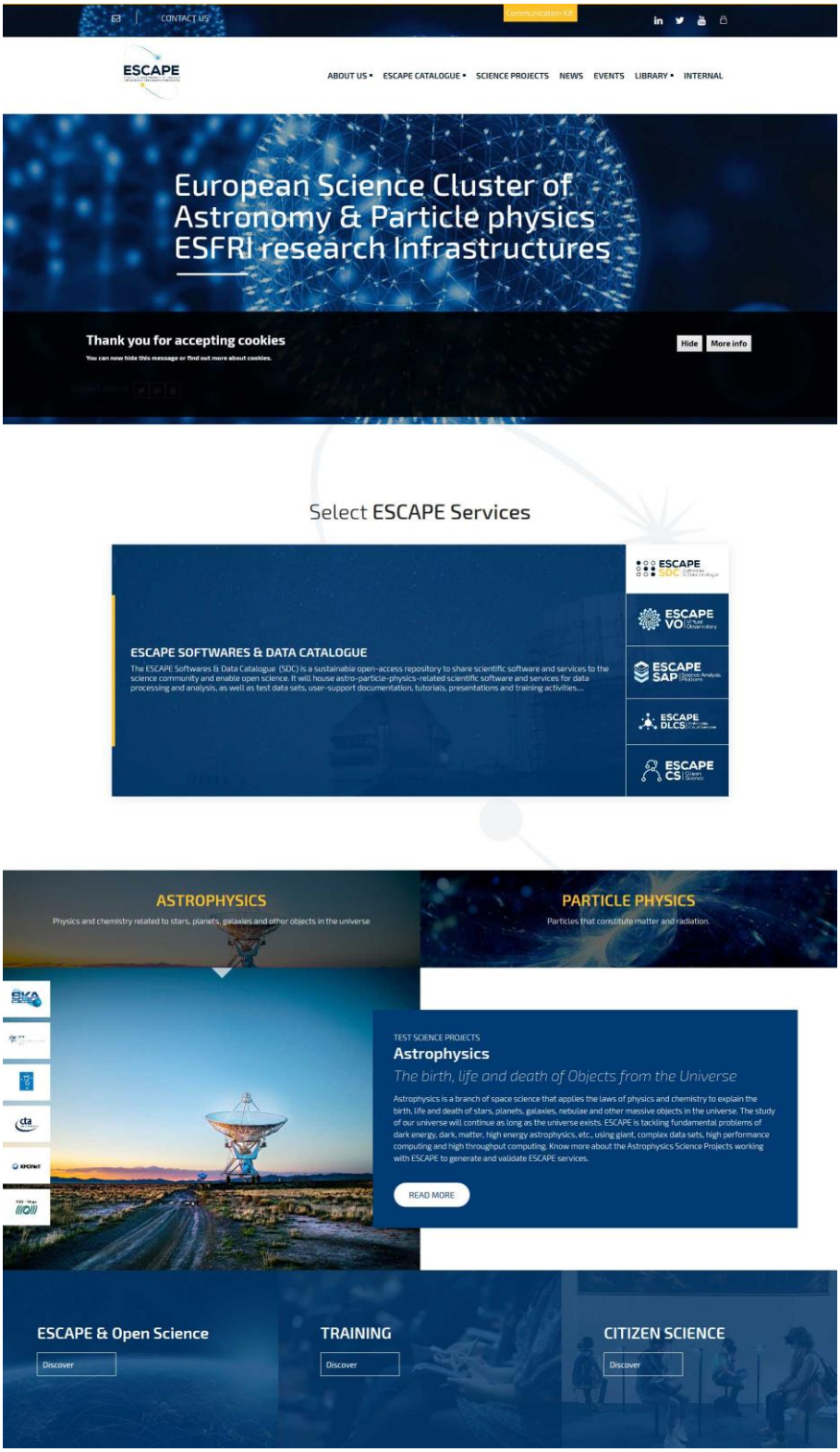

Figure 6 ESCAPE Website Home Page

2.7.2 Social Media

Social media is a useful tool in getting the ESCAPE message home – this permits our approach to be active as well as passive – this "push and pull" communications strategy permits us to broadcast our results to tailor made audiences.

ESCAPE uses several social media platforms to build its community and drawn attention to the project and its outcomes, achievements and updates. Each social media platforms have a specific set of functionalities that are used in different ways to reach their intended goal. ESCAPE is active on 3 social media networks (see Table 10**Erreur ! Source du renvoi introuvable.**).

Table 10 ESCAPE Social Media Channels

Social Media	Link
Twitter	@ESCAPE_EU
LinkedIn	https://www.linkedin.com/company/projectescape
YouTube	https://www.youtube.com/channel/UC05braEQdP2rCSUamHm9I_Q/featured

ESCAPE social media channels are used to provide an instant form of communication with community members and potentially interested people or organisations out of the community. Through frequent activity and interaction, the outreach team will ensure continual visibility of the project's efforts such as events, seminars, news posts, and announcements. Social media channels especially support community building by providing a path from seeing the messages to potentially converting as an engaged stakeholder.

Twitter

ESCAPE's Twitter account is the main entrance point and content provider (together with the website) for our community. Twitter, by nature, is more geared for immediate updates and therefore, frequent posting is planned, especially since the "lifespan" of each post lasts anywhere from a few minutes to 24 hours. It is used to inform about relevant facts & figures, quick updates, promote events, share outcomes, news, and create awareness and curiosity of project's activities (Figure 7).

Figure 7 Sample of ESCAPE tweets

Several hashtags (see Table 11**Erreur ! Source du renvoi introuvable.**), related to astronomy, astroparticle and particle physics will be used, along with ones related to the stakeholder profiles, in order to increase the reach of the audience. They will increase the chance of gaining impressions from people that are not connected to the project but have an interest in areas that ESCAPE works in.

Table 11 Relevant hashtags used by stakeholders to be used in targeted tweets

e-infrastructure	Policy Bodies	ESFRI Projects	Pan-European Research Organisations
#science, #data, #dataexpert, #researchdata, #FAIR, #FAIRdata, #community, #EOSC, #research, #scientificdata, #EOSC, #Europe, #researchers, #Datainfrastructure, #datamanagement,	#SDO, #policymaker, #standards, #standardisation, #datastandardgggs	#openscience, #ResearchInfrastructure, #FAIRdata, #scientists, #Horizon2020, #research, #EOSC, #ESFRIFuture, #EUresearch,	#EUresearch, #astronomy, #astrophysics, #astroparticle, #astroparticlephysics, #particlephysics, #nuclearphysics, #science, #scientist, #ESFRI, #EOSC, #FAIRdata, #DataScience, #datainfrastructure, #OpenScience, #interoperability, #DataSharing, #datamanagement, #OpenData, #researchers, #data, #EU, #FAIRprinciples, #research, #bigdata, #datasets, #dataprovider, #telescopes, #astronomical, #CitizenScientists, #CitizenScience, #innovation, #repository, #datalake, #space, #H2020, #HorizonEU,
Astronomy, Astrophysics and Astroparticle physics			
#astrophotography; #space; #universe; #stars; #Comet; #telescope; #astrophoto; #Cosmos; #planet; #galaxy; #solarsystem; #universe; #sun; #research; #astronaut; #solarphysics; #neutrinophysics; #science; #physics; #cosmology; #Universe; #cosmology; #neutrino; #Neutron; #physics; #technology; #ParticleAccelerators; #theoreticalphysics; #physics; #highenergyphysics			

By producing social media content that's geared towards our identified stakeholders, it is expected the creation of a community of Twitter followers that come from those targets. Below is a list of current Twitter followers that fit the stakeholder classifications we are targeting.

Table 12 ESCAPE Audience Twitter Handles (examples)

e-infrastructure	Policy Bodies	ESFRI Projects	Other Pan-European Research Organisations
@AARC_Project, @GEANTnews, @EaPConnect_News, @EGI_eInfra, @Eudat_eu, @HelixNebulaSC, @RDA_Europe, @openplanetary	@RoyalAstroSoc	@estsolarnet, @km3net, @CTA_Observatory, @ELI_laser, @CERN, @SKA_telescope, @PRACE_RI	@jivevlbi, @ASTRON_NL, @CNRS, @ESO, @estsolarnet, @ego_virgo,

LinkedIn

LinkedIn, by nature is a more profession-based social media platform where members have a chance to showcase their professional accomplishments.

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ESCAPE LinkedIn page (see Figure 8) has been set-up to help build the community of stakeholders around the project. It reaches target representatives from target stakeholder groups, enterprises, research and policy groups.

Table 13 lists potential LinkedIn groups where ESCAPE may publish project updates. Being an active participant in a Group can help to connect to stakeholders, multipliers and potential end-users. These groups are channels to share content to those who will find it most valuable. This allows for not only higher engagement, but more quality interactions.

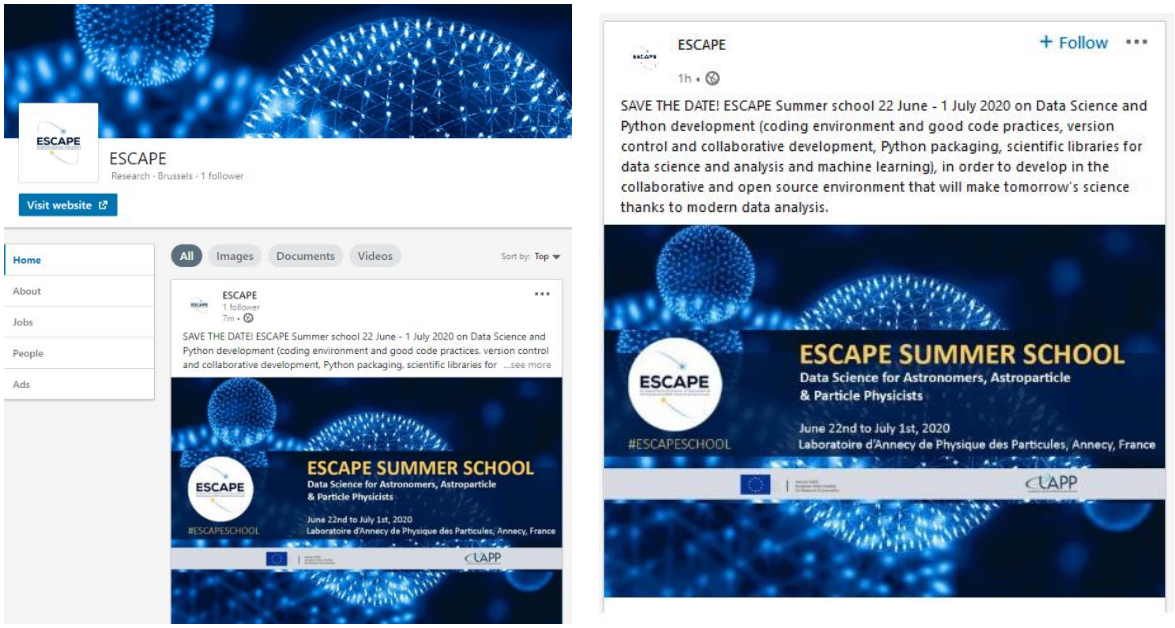

Figure 8 ESCAPE LinkedIn Profile (left) and post (right)

Table 13 ESCAPE Audience LinkedIn groups

e-infrastructure	Policies Bodies	Industry, namely Small and Medium Enterprises	Pan-European Research Organisations
• e-infrastructure, Reflection Group, • OpenAIRE • EGI • e-architect	• EU Policy Updates by European Views • European Innovation Policy • Policy Researchers	• "H2020 SME / COSME" Competitiveness of SMEs, Small Business, Growth & Innovation • EUREKA Network, Funds for Industrial Innovation, EuroStars Projects, Grants for SMEs and Clusters • Enterprise Europe Network: helping ambitious SMEs innovate and grow internationally • FP7 Research for the benefit of SMEs	• EAPRIL - European Association for Practitioner Research on Improving Learning • Horizon 2020, Framework Programme for Research and Innovation Group, • Global Research Forum • Horizon 2020 European Research Council - Excellent Science • EURO The Association of European Operational Research Societies • European Research Projects • European General Practice Research Network (EGPRN) • Space Science & Astrophysics

YouTube

YouTube presence was set-up to be able to take advantage of video as one of the most popular media used today for communication and dissemination. Videos produced by the project can be easily stored and shared through other social media channels or embedded in a website. Videos produced will provide a quick, easy to understand introduction to the ESCAPE project. Generally, content with videos get more interaction from users either on their own or they help retain attention and support other content.

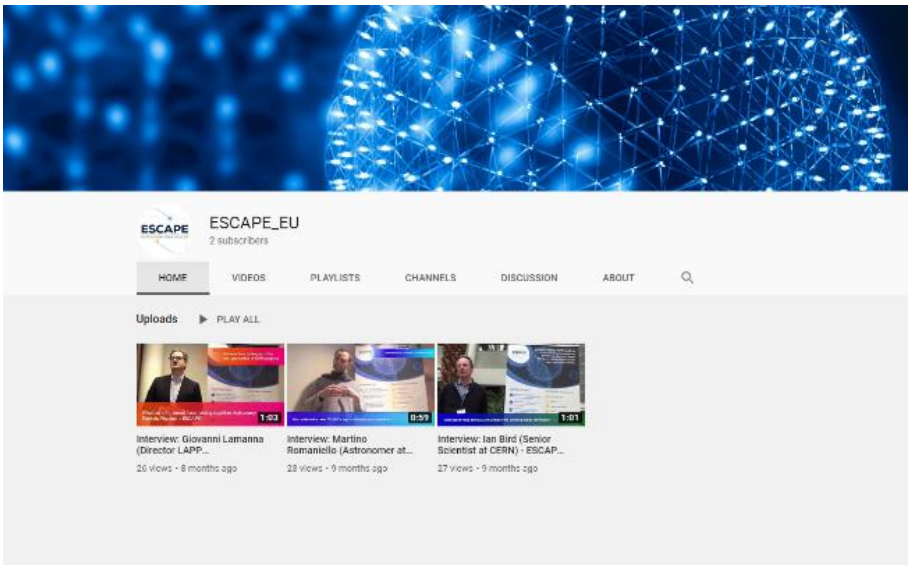

Figure 9 ESCAPE YouTube Home Page

2.7.3 Communication Material

Various communication materials have been and will be prepared for the project (see Table 14). The material will be developed based on a needs analysis during the project lifetime, to leverage priorities within the context of this plan.

They will be used to raise awareness and understanding of the ESCAPE offer and ESFRI facilities such as interviews from different stakeholders, presentation video, flyers, webinars, posters, rollup banners, use cases, PowerPoint presentations and other relevant ones. Most of these materials will be distributed at events in which ESCAPE is presented and they target informed decision-making communities, the commitment of ESFRI projects in building EOSC and leveraging the ESCAPE objectives for larger international as well as national coordinated initiatives.

Table 14 ESCAPE Communication Material

Type of material	Description	Created by M12	KPI M42 (End of project)[3]
Posters	Highlight ESCAPE objectives, introductory technical information and other key info customised to the event audience.	2 (Poster 1, Poster 2)	3
Flyers	Promote, at relevant events, the services and early achievements with images and key figures	1	3
Give-aways	Appropriate give-aways (note pads, pens, bags) to incentivise stakeholder engagement.	3	4
Press Releases	Get reach both traditional media and new media influencers, to reach new audiences	1	4
Position Papers	Profile documents describing experts point of view on a specific topic in occasion of specific events or important milestones achieved	1	3
Rollup banners	Showcase the interim results and give visibility to ESCAPE main message at events	1	2
Videos	Provide a quick, easy to understand introduction to the ESCAPE project	3 (Video 1, Video 2, Video 3)	20

All communication materials will be available in project's internal repository for the project's consortium benefit, and all public material will also be linked to the public website. All public materials

[3] Foreseen quantity over the project lifetime

will be available on ATMOSPHERE's website, for the benefit of external visitors, under the "Communication Kit" section.

2.8.4 Newsletters

ESCAPE will send newsletters with an easy-to-digest format, in order to better promote to the reference community its events, the main milestones achieved by the project, as well as to disseminate news and insights on Astronomy, Astroparticle and Particle physics, to those who subscribed to it.

Aside from informing potential subscribers through events, face-to-face meetings, consortium network and social media, we have also set up a way to sign up for newsletters through the website. Newsletters are only sent to those who specifically gave consent to receive them. This is done on the ESCAPE website, either when creating a user-account on the website or subscribing to the newsletters in a dedicated area available on the homepage.

2.8.5 Press Releases and Media Channels

Press Releases will be delivered to ensure timely communication of the progress of the WP. The table below gives an overview of the European press and media channels on which ESCAPE will leverage on during the project lifetime to maximize visibility. Non-European channels (US channels as well as national channels) may also be exploited.

The list is not exhaustive and targets may be added to or some removed over the lifetime of the project. At the same time, it is imperative to highlight that not all of these channels may be contacted, they will be selected on a case-by-case basis according to the communication content. Social media interaction with the magazine profiles will be explored, too. In addition, all the partners will be asked to exploit at their best also their own press offices and media channels in order to create the right visibility for the project outcomes.

Table 15 Media Channels

Media Channels	Description
CORDIS http://cordis.europa.eu/home_en.html	The European Commission's primary portal for results of EU-funded research projects.
Astronomy Now https://astronomynow.com/	The UK's biggest astronomy magazine
HPC Wire https://www.hpcwire.com	Supercomputing news and information focused on emerging HPC applications in science, engineering, financial modelling, virtual reality, databases and other compute intensive tasks
Astronomy.co.uk http://www.astronomy.co.uk/	This site aggregates astronomy news
Sky & Telescope http://www.skyandtelescope.com/	The Essential Guide to Astronomy. The world's leading compendium of information about the science and hobby of astronomy.
Science Node https://sciencenode.org/	A free online publication, developed in collaboration with organizations in the US and Europe. Its team writes for experts and non-experts alike, exploring the real-world impact of advanced computing and networks.
Digitalisation World https://digitalisationworld.com	Focus on the technologies and business issues that impact on the data centre hub
TechCrunch http://techcrunch.com/	Technology news, opinions, and analysis on tech companies from around the world
CNRS Le Journal https://lejournal.cnrs.fr/	Online news site of the French National Center for Scientific Research, one of the world's leading science agencies.
SuperComputing Online www.supercomputingonline.com	Supercomputing Online News is one of the only few newspapers covering the rapidly evolving supercomputer marketplace
l'Association française d'astronomie (AFA) www.afastronomie.fr	The French Association of Astronomy (AFA), editor of Ciel & Espace (French) magazine and First Light (English) Magazine

2.9 Impact Monitoring

ESCAPE is concerned with setting up a tailored monitoring service to track and measure the impact of the communication activities carried out. A shared dashboard will visually render all the relevant data from our communications and online activities. Necessary adjustments will be made during the course of the project. This enables identification of any deviations from KPIs in the early states, allowing adjustments to be created and contingency plans implemented.

Table 16 lists all the KPIs defined for ESCAPE Dissemination plan during the project timeframe.

Table 16 ESCAPE Dissemination KPIs

Subject	KPI Y2 (M24)	KPI Y3 (M36)	KPI end of project (M42)
WEBSITE			
Website visits/users	3.200 (KPI Y1 1.500)	4.700	6.000
Page views	15.000 (KPI Y1 8.000)	32.000	39.000
Registered Users	50	100	125
SOCIAL MEDIA & COMMUNITY			
Nº Tweets on Twitter	400	650	700
Nº Followers Twitter	300	400	420
Nº LinkedIn Followers	40	70	85
Nº videos on YouTube	10	15	20
OTHER COMMUNICATION KPIS			
Nº Newsletters	4	8	10
Communication Materials	See Table 14	See Table 14	See Table 14
THIRD-PARTY EVENTS			
Contributions to external events/year	20	35	37

Figure 10 presents the indicative time plan that will be followed to produce dissemination materials and content. Other news will be launched according to specific project updates, new activities the project will perform, and events where will have presence.

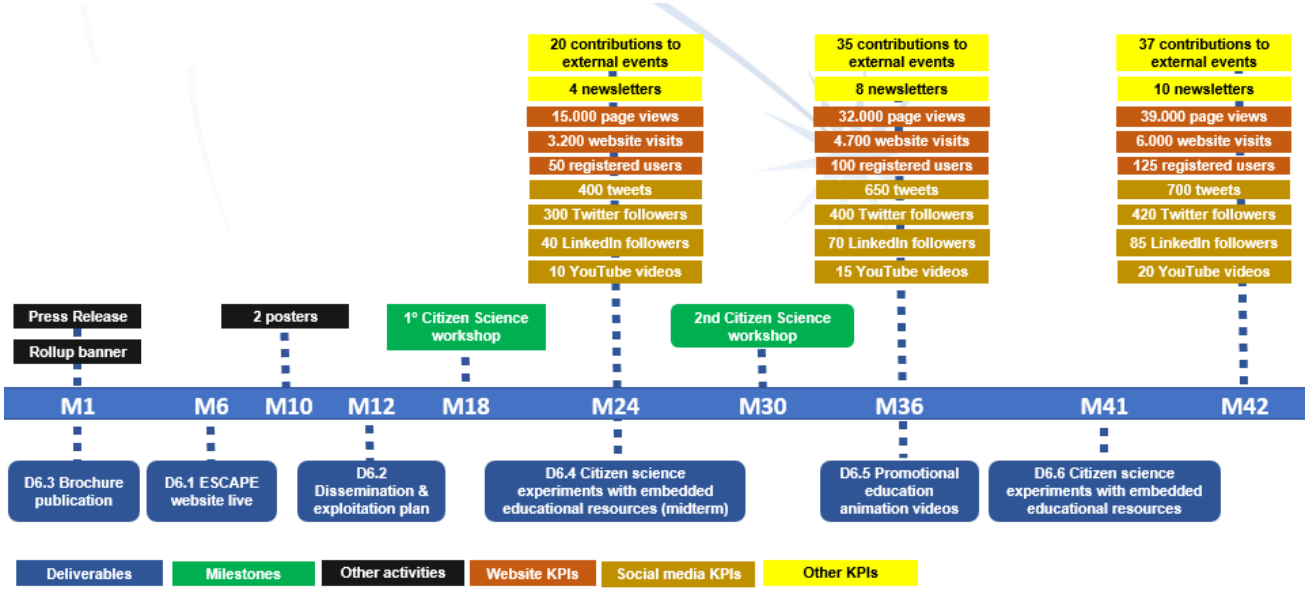

Figure 10 ESCAPE WP6 timeline of activities

3. Joint dissemination with ESFRI Projects

ESCAPE Test Science Projects (E-TSP) are scientific analysis projects organised in cooperation with the concerned research infrastructures in order to validate from the scientific point of view the achieved results by all the ESCAPE WPs. E-TSP will correspond to some multi-messenger key-science objectives of the concerned ESFRI facilities. The partners will address them by fully exploiting the "ESCAPE-EOSC cell" services demonstrating the innovative impact of the open-science data analysis in the EOSC framework and promoting the application of FAIR principles for data stewardship. Some of the potential E-TSPs currently proposed are:

- Multi-probe combined Dark Matter search with precursors' archived data and simulated data of ESFRI facilities.
- Fast Radio Burst monitoring and analysis through multi facilities.
- Multi-wavelength and multi-domain follow-ups of future Gravitation Wave event

ESCAPE counts on ESFRI projects to disseminate the results. Here are some more detailed examples of joint dissemination:

- **CTA** will be involved in the following dissemination and exploitation activities related to the ESCAPE project: establishing the link to the wider astrophysics community (incl. gamma-ray, X-ray, radio, optical) involved with CTA via presentations during CTA general meetings and regular reports in the CTA newsletter (>1500 physicists in >30 countries are participating in CTA), communicating the ESCAPE activities via CTA press releases and news in the social media and the CTA website (general public), engagement with the wider astrophysics and astronomy community via presentations and discussions of ESCAPE activities at international conferences (incl. ADASS and IVOA meetings), engagement with other ESFRIs and facilities at dedicated workshops focused on specific ESCAPE-related topics (e.g. on data management aspects) or collaborations (e.g. SKA-CTA joint activities) and, last but not least, participation in ESCAPE schools and training events and ESCAPE outreach activities. The activities of the CTA ESCAPE partners are regularly reported to the CTA Observatory Computing Department and in the CTA Project Committee.

- **EGO-Virgo** introduces ESCAPE results whenever relevant in technical and scientific conferences.
- **ESO** issued public announcements when they endorsed the EOSC and when ESCAPE was launched. ESO regularly reports to governing and advisory bodies and actively participates in technical and scientific conferences to demonstrate the work of ESCAPE.

- Worldwide LHC Computing Grid (WLCG) features the ESCAPE project in presentations describing the work in preparing for the **HL-LHC** upgrades of the LHC and experiments. WLCG regards ESCAPE, and in particular WP2 as a key mechanism for prototyping the FAIR data infrastructure that will be needed for HL-LHC. It is presented as a major development strategy fully aligned with the needs of the HEP community. ESCAPE is presented at international conferences (e.g. CHEP, HEPiX), at WLCG workshops, and at national e-infrastructure or HEP events. Achievements of major milestones will be published in CERN bulletins. There is collaboration with the HEP Software Foundation (HSF) concerning software and service catalogs, creating synergies and therefore dissemination across the HSF communities. There will be thematic participation from the HEP community to the ESCAPE Summer School.

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- **JIV ERIC** regularly participates in technical and scientific conferences in their field where their results are disseminated. In addition, they organise or provide teachers for training events in which their work are mentioned.

- The **KM3NeT** Collaboration will include references to ESCAPE whenever relevant and applicable in the process of communicating the Collaboration's activity, plans, methodologies and results. The usual channels for scientific communication and dissemination will be used, i.e. oral and poster presentations on conferences, seminars, social media, printed material, video and hypertext. In addition, KM3NeT will include mention and in-depth explanation for ESCAPE-related activities and results in the KM3NeT Virtual Education Centre and training events, whenever the subject is relevant to ESCAPE. The KM3NeT Collaboration will support ESCAPE communications mentioning KM3NeT, both in the preparation stage, by providing suggestions and input material, and in advertising/disseminating them.

- In **SKA**, ESCAPE activities are visible across the whole of their software development domain since they are carried out within their SW Scale Agile development framework - they therefore have active discussions with SKA SW lead teams and have ESCAPE-related roadmaps that are developed with SKAO teams and visible across the whole SW domain. They have demonstrated the work of ESCAPE within the SKA Science Operations group where they work, and have presented the plans at the large planning meetings, giving them high visibility. In addition, they have exposure within the global SKA Regional Centre Steering Committee and on the working groups reporting to this committee. Their activities there are reported to the SKA Board.

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4. ESCAPE Synergies and Joint Dissemination

Because projects are not isolated islands, ESCAPE aims to develop synergies in the domain of open data management and data systems of the ESFRI projects, exploring standards, prototyping and deploying advanced open data services, towards the development of a consistent European research infrastructure ecosystem.

Table 17 ESCAPE Synergies established by Y1

With whom?	To which purpose?	How?
EOSC Secretariat	To develop an EOSC as a large infrastructure to support and develop open science and open innovation in Europe and beyond, ESCAPE engages with the EOSC Secretariat	Release of an ESCAPE Position Statement
APPEC, NuPPEC, ECFA, ASTRONET and ESA	With a view on exploring synergies in research and organisation	Organizing seminars or events
2020 REINFORCE project	To create citizen science experiments, and some of these experiments also happen to have links to ESFRIs (KM3NeT, CERN, EGO/VIRGO)	ESCAPE funded role in REINFORCE is to chair the Advisory Board, to seek added value from collaborations and avoid duplications
Other clusters, (ENVRI-FAIR, PaNOSC, SSHOC, EOSC-Life) and FAIRsFAIR	Adopt common solutions for an even larger economy of scale as well as the roles of a federation of clusters in support of the EOSC effective governance.	Meetings on 3-month basis, to share best practices in communication and dissemination, create synergies, join forces. This process was begun during the Research Data Alliance Plenary Meeting in Helsinki (21 October 2019). At that meeting, **SSHOC** invited representatives from ESFRI cluster projects, the EOSC, as well as the RDA Working and Interest Groups, to discussions on collaborations and commonalities. The aspiration is to engage more widely at ESOF 2020, and to form a **Joint Stakeholder Forum.**
FAIRsFAIR	Explore synergies on cross-cluster work on FAIR data principles and practices via the dissemination and stakeholder engagement	ESCAPE will nominate a representative to apply the FAIRsFAIR EGFC call
CS3MESH	The CS3MESH project aims to provide a collaborative storage service to researchers, research institutions and universities and to deliver the initial and coherent implementation of the long-term CS3 collaborative infrastructure.	ESCAPE and CS3MESH will work together to these objectives.

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5. Exploitation Plan: Making use of ESCAPE Results

Successful exploitation implies turning scientific results and prototypes into sustainable, user optimised, ready for use applications and services. Depending on the ESCAPE services considered, the results will be exploited at different levels: Go-to-Market Strategy, Scientific Exploitation, Commercial Exploitation or Open Source Exploitation.

The Exploitation Plan will be developed within the work packages in collaboration with the participating partners. We will also request the project partners to exploit these results and provide necessary feedbacks.

Table 18 Results exploitation depending on the ESCAPE services considered

Services/Exploitation	Go-to-Market Strategy	Scientific Exploitation	Commercial Exploitation	Open Source Exploitation
Data Infrastructure for Open Science		**A core infrastructure to manage scientific data**	**Possible for companies to build commercial products based on the software developed and integrated**	**Open source and of general interest**
Open-source scientific Software & Service Repository		**Primarily aimed at scientific exploitation**		**Most of the collect software and services will be open source**
Virtual Observatory		**Directly relevant to the wide astronomy and astroparticle community**		**Open source**
Science Analysis Platform	**TRL-3**	**Relevant to the wide astronomy and astroparticle community & for other research area's than astronomy and particle physics data**		**Open source and available on gitlab**
Citizen Science		**Science exploitation embedded within the crowdsourcing experiments**		

5.1 WP2 DIOS (Data Infrastructure for Open Science)

The Datalake reference implementation being developed in the context of WP2 is an ecosystem of services covering different functions: data orchestration, content delivering and caching, networking, Authentication and Authorization. Each service is open source and of general interest to function as building block of any system organising and managing large sets of scientific data. Most product are licensed with Apache licence and therefore it will be possible for companies to build commercial products based on the software developed and integrated. In terms of scientific exploitation, ESCAPE partners will define a deployment of the datalake leveraging the set of services in the WP2 reference implementation fitting their needs. This datalake will constitute their core infrastructure to manage scientific data.

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5.2 WP3 OSSR (Open-source scientific Software & Service Repository)

The software and service collection is primarily aimed at scientific exploitation, at cross-fertilisation of the community and economy of scale in common developments - most of the collect software and services will be open source, all will be made public.

As we are talking about an "Open-Source Software and Service Repository" in the European Open Science Cloud, there will be no market exploitation and IPRs for the solution. It is the explicit aim to make software and services openly available.

5.3 WP4 CEVO (Connecting ESFRI projects to EOSC through VO framework)

By design, Virtual Observatory results will be directly relevant to the wide astronomy and astroparticle community, and indeed the whole scientific community concerned by ESCAPE. This includes the research scientists themselves who will make use of the VO and EOSC infrastructures for use of FAIR data for pursuing research with the unique capabilities that these infrastructures enable. The primary focus is on the ESFRIs and RIs, but it also includes the community of data providers i.e. the archives and data centres, and the providers of tools for use of FAIR data, who will use the frameworks for the implementation of services and the use of common standards. Some of the results will also be relevant to a wider community of the public, citizen scientists and educators. Some visualisations and access to data in public tools for example.

The ESCAPE results are expected to be used by the partners of ESCAPE and others well beyond the lifetime of the project. This is expected to be mainly in terms of scientific exploitation, and follow-on use of tools, and training materials. The contributions to IVOA standards based on the ESFRI and RI needs will be long-lasting results that will continue to be built on.

5.4 WP5 ESAP (ESFRI Science Analysis Platform)

With the production of deliverable 5.2, the detailed project plan, WP5 dedicated to the construction of the ESAP, has progressed to TRL 3 and is now conducting further research. The construction of a first prototype has begun.

Research data and products will be published in scientific and technical peer-reviewed journals. This information will also be presented at conferences. The developed platform (software, workflows, interfaces) can be used and adapted for other research area's than astronomy and particle physics data. The source code will be open source and will be available on gitlab and can be further optimised.

5.5 WP6 ECO (Engagement & COmmunication)

Open-up the ESFRI facilities and the EOSC for open data science to the general public via a suite of Citizen Scientist Mass Participation experiments (MPEs) that will capture the interest of the general public and directly involve them in scientific discovery. The science exploitation of Citizen Science mass participation experiments will be embedded within the crowdsourcing experiments.

5.6 ESCAPE role in the EOSC initiative

The following picture summarizes the ESCAPE Work Packages (WP) activities and expected delivered components of what one could call “a thematic cell” of the global EOSC. Such a “cell” in Astronomy and Particle/Nuclear Physics will enable EOSC to adopt transversally some services and e-infrastructures that will be useful also in support of other disciplinary “cells”.

The added value that EOSC will bring to our community, through the ESCAPE commitments, is the formal opportunity to build upon the “cell” a “virtual research environment”. There, researchers can upload their analyses in a notebook-like, reproducible and shareable style. Through this they will co-

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develop software and add mining to data, as well as running and improving workflows, in a real-time collaboration.

The following sections describe the main ESCAPE contributions to ESOC through its six WPs.

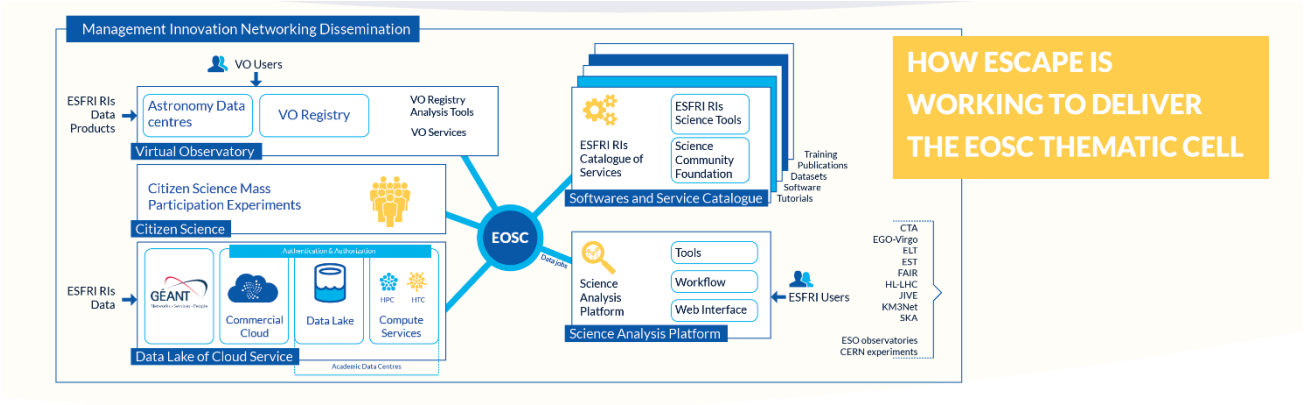

Figure 11 How ESCAPE is working to deliver the EOSC Thematic Cell

WP1 MIND (*Management, Innovation, Networking and Dissemination*) supports the networking with various EOSC stakeholders (EOSC governance, e-infrastructures, other H2020 projects, policy bodies, industries); implement the connection between EOSC and the ESCAPE RIs management boards. Operating a central competence support desk for application of FAIR-oriented standards and methods within the ESFRI facilities and providing the technical coordination and the scientific internal validation of the WPs results.

WP2 DIOS (*Data Infrastructure for Open Science*) will design, implement, and operate a prototype data lake – a federated data infrastructure that will form the basis of an open access data service for the ESFRI projects within the ESCAPE cluster. It will propose such a solution as a key component of a future EOSC framework.

WP3 OSSR (*Open-source scientific Software and Service Repository*) supports an open environment to guarantee cross-fertilisation and to develop community-specific data services that will be exposed under the EOSC catalogue of services under the *FAIR* principles.

WP4 CEVO (*Connecting ESFRI projects to EOSC through VO framework*) plans to make the seamless connection of ESFRI and other astronomy and astroparticle research infrastructures to the EOSC through the VO, actively contributing to the setting up of the EOSC services.

WP5 ESAP (*ESFRI Science Analysis Platform*) will focus on defining and implementing a platform-service for data analysis into EOSC and tailored to the requirements and the user needs of each of the ESFRI and other RI member of ESCAPE. It will be part of the EOSC catalogue.

WP6 ECO *(Engagement and COmmunication)* develop outreach material and support actions. Involve citizens directly in knowledge discovery with ESCAPE and the ESFRI facilities, improving transparency of the scientific process.

6. Conclusions and Next Steps

This document sets the framework for best disseminating and exploiting the ESCAPE results to the defined targeted audience. Ensuring a consistent dissemination and exploitation plan to the stakeholders as well as among users is of foremost importance. Collaboration among project partners for sharing of result and building on dynamicity and adaptability are key words for successful project dissemination and exploitation.

Some of the key elements established by the present document are:

- ESCAPE shall develop a vibrant community of astronomy, astroparticle and particle physics members. This will be achieved with the core services and values that the ESCAPE platform will actively communicate;
- Each Partner of the ESCAPE Consortium will leverage on their valuable network to contribute to effective implementation of the plan described in the present document;
- The impacts of ESCAPE communication activities will be monitored continuously, by means of a set of measurable KPIs, which have been indicated in the present document;
- The ESCAPE Dissemination and Exploitation Plan is effectively a “Living document”, which will be adapted according to the evolving context in which ESCAPE is positioned.

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