



Europlanet 2024 RI Evaluation Report

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Europlanet 2024 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149.

Europlanet 2024 RI – Impact Evaluation

Executive Summary

This evaluation report provides a summary of the impact of the Europlanet 2024 Research Infrastructure (RI) project. The purpose of the evaluation is to assess the effectiveness of the RI for its user community. Although the analyses have been broadly structured around the five impact areas identified by the OECD's Reference Framework for Assessing the Scientific and Socio-Economic Impact of Research Infrastructures (2019), this report places particular emphasis on providing information that speaks to the sustainability of the RI. That is, the success of the RI is clear and this report aims to draw out what contributed to its impact, in order to support considerations of what would be needed to sustain as much of the impact as possible.

While evidence has been found for impact in all five impact areas (Scientific, Technological, Training and Education, Economic, Social and societal), evidence is particularly strong in the first three. There can be no doubt that the Transnational Access (TA) programme in particular has led to substantial scientific impact. This impact is ongoing, as the new lines of research and collaborations catalysed by the visits continue. In the area of technological impact, the Virtual Access (VA) activities have developed their capacity to provide high quality scientific data and services.

Across scientific and technological impact, the TA visits – which form the cornerstone of the RI in many ways – make possible impacts, particularly scientific, that simply would not be possible without the support of the RI, due to the access to facilities, both equipment and expertise, that it provides. These impacts are amplified due to the participation of early career researchers in the programme, ensuring impact into the future. Such impact is only enhanced and strengthened by other areas of scientific impact from VA (e.g. ML JRA activity, SPIDER's support for planetary exploration, VESPA's development of the EPN-TAP protocol) and Networking Activities (NA) e.g. the Expert Exchange programme and Telescope Network programmes.

Impact in the area of training and education is also substantial, via the Mentorship programme, GMAP Winter Schools and training workshops by VESPA, SPIDER and the Telescope Network. One distinguishing feature of the Europlanet 2024 RI project is the extensive support for students and early career researchers in particular, and amateur astronomers as well. In addition to the various programmes and workshops, the TA visits make a large contribution to this impact via the participation of early career researchers and students – the visits provide opportunities that are not otherwise available to them, thus accelerating their career development.

Economic impact of the RI is more challenging to evidence. However, the funding for early career researchers within the activities – particularly the TA visits – is noteworthy. In addition, some of the Joint Research Activities (JRAs) in particular have provided

increasing support for local infrastructure and associated employment, and there has been at least one SME company that was developed as a result of the TA programme.

The Social and Societal impact has also been considerable, albeit more challenging to measure. There has been substantial outreach activity undertaken by NA beneficiaries, TA facilities and TA visitors, and there has also been development of educational materials for school use. Both the management of the RI, as well as leaders of multiple TA facilities have engaged with policymakers and policy initiatives. Impact related to social responsibility is also notable. Targeted workshops, the mentorship programme and support provided for amateur astronomers widened the reach of those who could participate in and benefit from the activity of the RI. Direct support in the form of conference bursaries and training (e.g. to support applications to the TA programme) achieved similar goals. This highlights the multifaceted nature of the RI's support for the international community of planetary science researchers.

Across many of the RI activities, collaboration and networking emerges as key to impact, both as a pathway to impact and an indicator of its attainment. The network element provides support for researchers at all levels and strengthens the community, which in turn contributes to sustainability and improving the science. Put differently, the evaluation has identified not only the impact that the RI has achieved but also the way in which it does so - through its support of the community. In particular, the RI provides access - access to expertise, to equipment (labs, field sites) and to people. This access is supported by a host of interlocking activities that clearly impact on individuals - from doctoral students to amateur astronomers and beyond - and the science that they engage in, now and in the future. All of this, critically, does not just lead to good science, but the outward facing nature of much of the RI activity means the impacts will be broader than just on the scientists participating directly and their science, but vitally strengthens the planetary science community - and beyond.



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Introduction

This evaluation report provides a summary of the impact of Europlanet 2024 Research Infrastructure (RI) project. The purpose of the evaluation is to assess the effectiveness of the RI for its user community. Although the analyses have been broadly structured around the five impact areas identified by the OECD's Reference Framework for Assessing the Scientific and Socio-Economic Impact of Research Infrastructures (2019), this report places particular emphasis on providing information that speaks to the sustainability of the RI. That is, the success of the RI is clear and this report aims to draw out what contributed to its impact, in order to support considerations of what would be needed to sustain as much of the impact as possible.

In contrast to previous Europlanet RI projects, Europlanet 2024 RI had an Impact Evaluation Officer (the author of this report) who is a social scientist with many years of evaluation experience. It was decided to include a specific evaluator role within the 2024 RI at the proposal stage. Thus, the evaluation was planned from the beginning of the RI, starting with the kick off meeting in February 2020, to ensure that it would be as responsive as possible to the needs of the RI and its various strands. This has meant that data has been gathered systematically throughout the RI. In addition, the evaluator has also been able to adapt and extend the focus of the evaluation in response to emerging findings, to ensure that impact is captured as robustly as possible.

The evaluation has been structured around five overarching impact areas as outlined in the OECD Reference Framework for Assessing the Scientific and Socio-Economic Impact of Research Infrastructures (OECD, 2019):

- Scientific
- Technological
- Training & Education
- Economic
- Social & Societal.

These five areas, in turn, are cross-cut with seven strategic objectives:

1. Be a national or world scientific leading RI and an enabling facility to support science
2. Be an enabling facility to support innovation
3. Become integrated in a regional cluster/ in regional strategies/ facilitate regional collaboration
4. Promote education, outreach and knowledge dissemination
5. Provide scientific support to public policies
6. Provide high quality scientific data and associated services
7. Social responsibility.

These areas and objectives have multiple indicators mapped onto them. In the initial project meeting, and at points thereafter as needed, these indicators have been reviewed with the leaders of different work packages and RI strands, to ensure that we used those

most suitable to the activity of Europlanet 2024 RI. In this sense, the evaluation is a collaborative effort, which enables the fullest and most robust picture possible of the impact of the RI, within the resources available for the evaluation.

Data collection

Transnational Access (TA) activities

A range of data types were gathered to understand the impact of the TA programme, both from the facilities themselves and from the visitors. Each of the TA facilities (TA 1 and TA 2) were asked to complete a feedback form approximately semi-annually (<https://www.europlanet-society.org/indicators-for-transnational-access-impact/>) and most facilities complied. This form asked about the following activity related to the RI:

- Involvement in scientific meetings
- Collaborative activity around research or training
- Publications
- Engagement with industry
- Letters of support
- Engagement with policy/strategy development
- Outreach
- Research spinoffs and/or collaborations
- Registering intellectual property rights.

Note that these areas represented the impact indicators that were discussed and selected by TA leaders from the beginning of the project.

In addition, TA visitors were asked to complete feedback forms, in addition to their visit reports, after their visit. This was made a requirement for reimbursement, which led to a very high rate of compliance. On the first feedback form, visitors were also asked whether they would like to participate in a brief interview with the evaluator. In addition, visitors were also sent a second feedback form approximately 6-12 months after their visit (depending on whether they had done an interview), and a third approximately a year after that. Due to the pandemic, many visits started later than had been anticipated, so there are fewer long-term follow up forms, but they were a useful way to gather information about later activity, particularly publications.

Data type	Numbers collected
Post-visit evaluation form	192 (40 TA1, including 25 ECS; 152 TA2, including 86 ECS)
Interview	62
Long-term follow-up 1	65
Long-term follow-up 2	19

Virtual Access (VA) activities

Data collection for the VA programme was generally more focused on metrics. Initially, data was compiled into a spreadsheet with indicators for each of the four VA activities (VESPA, GMAP, SPIDER and ML), such as visits, services available and publications. This was compiled roughly 3 or 4 times annually until April 2023. Semi-annually (through autumn 2022), further data was compiled related to other impact indicators, including number of accessible datasets (where relevant), links with industry and other collaborations. In addition, GMAP collected evaluation data from each of its Winter Schools.

Towards the end of the project, each of the four activity strands contributed to an overall impact spreadsheet and three of the four participated in interviews with the evaluator to better understand the most important impacts of the activities.

Networking Activity (NA)

Metrics related to much of the networking activity was collected and maintained by the NA1 and NA2 Work Package leads. In addition, interviews and feedback forms were used in specific areas of NA activity.

<i>Activity area</i>	<i>Data collected</i>
Telescope Network	Feedback forms from 13 users (relatedly, we conducted one interview with amateur astronomers using the network)
Mentorship Programme	Feedback forms from 20 mentors and 19 mentees; Interviews with 6 mentors and 5 mentees
Expert Exchange Programme	7 interviews

Data/Results Overview

TA programme data overview

Post-visit evaluation form responses (responses from ECS only in brackets)

<i>Area</i>	<i>TA1 (N=40; ECS=25)</i>	<i>TA2 (N=152; ECS=86)</i>	<i>Overall (N=192; ECS=111)</i>
Planning future collaboration	83% (72%)	93% (92%)	91% (87%)
Interactions with hosts (out of 6)	5.65 (5.52)	5.92 (5.94)	5.86 (5.85)
Quality of lab/field environment (out of 6)	5.68 (5.52)	5.89 (5.90)	5.85 (5.90)
Overall visit rating (out of 6)	5.78 (5.68)	5.90 (5.90)	5.88 (5.85)
Interdisciplinary	65% (72%)	45% (41%)	49% (48%)
Data quality as expected	98% (96%)	95% (95%)	95% (95%)
New lines of research	83% (76%)	62% (58%)	66% (62%)
Number of expected publications	86 (55)	231 (127)	317 (182)
Number of expected conf. papers	104 (64)	319 (169)	423 (233)
Outreach planned	68% (72%)	41% (37%)	45% (43%)

Long-term follow-up 1 (1-2 years post-visit)

Area	TA1 (N=18; ECS=11)	TA2 (N=47; ECS=31)	Overall (N=65; ECS=42)
Publications planned	36 (25)	75 (46)	111 (71)
Publications submitted/accepted	4 (3)	6 (4)	10 (7)
Conference presentations planned	46 (26)	105 (54)	151 (80)
Conf presentations submitted/accepted	22 (11)	44 (19)	66 (30)
Outreach done	50% (64%)	38% (35%)	42% (43%)
Outreach planned	56% (45%)	40% (32%)	45% (36%)
Interactions with host facility	83% (73%)	85% (87%)	85% (83%)
Other impacts reported	78% (73%)	57% (45%)	63% (52%)

Long-term follow-up 2 (2-3 years post-visit)

Area	Overall (N=19)
Publications	19
Conference presentations	38
Outreach done	7 of 19
Other impacts reported (mostly collaborations)	10 of 19

Note: Because of small numbers, these numbers have not been separated out by TA or ECS. Note that there were 5 from TA 1 (2 ECS) and 14 from TA2 (11 ECS).

62 interviews (41 ECS) were conducted with TA visitors. The interviews supported and fleshed out the results from the feedback forms. A brief summary of the kinds of responses are below. Note that because of small numbers and because the questions were open-ended, these are not broken down by location (TA1 vs TA2) nor ECS. That said, as will be apparent later in the report, it is notable that ECS seemed to experience particularly positive outcomes from their visits and the visits seemed likely to have been more impactful for them than for more established scientists.

In the interviews, participants were asked about impact of the visits. Out of 62, 54 mentioned publications and conference papers (planned or in progress), and 38 made reference to scientific results. 13 reported having new bids underway or planned, arising from the visit. 22 also noted new research questions or directions that had arisen as a consequence of their visits. In addition, 21 interviews went beyond describing scientific

results to note more substantial impacts on the way they were doing science (e.g. new techniques or approaches that could be applied to other cases).

The visits also clearly supported collaboration and network-building. 47 interviews mentioned collaborations (including on research papers) as an outcome of the visit, and 33 also noted that they had made new connections/met new people, with many highlighting how helpful this was and how helpful the individuals they met were. In addition, when asked about what supported the success of their visits (and they all described their visits as successful), 49 interviewees credited the people at the facilities with being key to their success (while 34 credited the facilities available and 17 credited the logistics - facilities making the visit easy to organise).

In terms of other areas of impact, 27 interviews described outreach or public engagement activities that they had done since the visit or had planned. In addition to supporting the growth of professional networks and collaboration, it is notable that a number of visitors highlighted career-related impacts. 16 visitors remarked on the way the visit had advanced their careers, with 14 specifically describing its impact on their doctoral studies. A further 8 visitors (who were not PhD students) remarked on other ways it had contributed to their professional development.

Finally, interviewees were asked about ways the programme could be improved. A minority flagged areas for improvement, but it is notable that 19 of these related to logistics, most often related to budget and what was or was not covered (and communications around this), as well as speed of reimbursement, which was a particular concern for doctoral students.

Impact forms from TA facilities

Although there were inevitably some facilities that did not fill in the forms, the majority did. Aggregated responses are below.

	<i>Time point</i>					
<i>Impact area</i>	Summer 2021	Winter 2021	Winter 2022	Autumn 2022	Summer 2023	Summer 2024
Scientific meetings	3	4	9	19	9	(to come)
Collaborative activity	5	2	4	5	8	
Publications	16	21	9	12	18	
Engagement with industry	1 facility	2 facilities	3 facilities	7 facilities	5 facilities	
Letters of support	2 facilities	2 facilities	2 (3 letters)	2 facilities	6 facilities	
Engagement with policy/strategy development	4 facilities	1 facility	4 facilities	4 facilities	2 facilities	
Outreach	1 facility	3 facilities	7 facilities	10 facilities	7 facilities	
Research spinoffs and/or collaborations	1 facility	2 facilities	3 facilities	5 facilities	2 facilities	

VA programme data overview

As part of the evaluation of the VA activities, various indicators identified by the activities leaders were tracked over much of the project. Through April 2023, [indicators tracker spreadsheets](#) were used to capture key metrics related to the impact indicators for the VA programmes. However, as this information was also captured in the annual reports for the VAs, this was deemed redundant. Annual reports can be found [here](#) and highlight impacts such as:

- Publishing and upgrading of services
- Increasing numbers of service users (including organisations such as NASA and ESA, and contributions to space missions)
- Publications and conference papers
- Development of the EPN-TAP protocol (VESPA)
- Collaborations with other organisations, including industry (see especially SPIDER)
- Training sessions delivered (of varying lengths and intensities, from conference sessions to workshops to the annual GMAP Winter Schools)

GMAP Winter Schools

Evaluation feedback was collected from participants in each of the four GMAP Winter Schools (2021, 2022, 2023, 2024). All feedback was extremely positive, with over 95% feeling that they had learned something related to content and/or skills and many reporting other outcomes such as confidence and increasing their networks. It is also noteworthy that the numbers of participants from underrepresented states has increased year on year, and that the majority of participants have been early career scientists (as well as some outside the field entirely), highlighting the important role the Winter Schools play in supporting the current and future community of planetary mappers.

Impact summary across VA services

Each of the four VA services also provided an overview of what they felt were the most salient impacts across Europlanet 2024 RI. All four services included scientific impacts and technological impacts emerging from their work in this RI. All four services also described impact on the Europlanet community, primarily via training and education (e.g. GMAP Winter Schools), and both VESPA and GMAP engaged in activities with social impact (e.g. VESPA's applications for use by amateur astronomers).

Tables for each VA activity showing the [areas of impact](#) with a description and supporting information tables can also be found online, and details have been incorporated into the Impact Areas section of this report.

Interviews

Interviews were conducted with leads from GMAP, ML and SPIDER. In addition, a further interview was conducted with ACRI-ST, to explore industry relationships from the perspective of an SME beneficiary in the ML and NA1 tasks. Key points from the interviews are as follows:

- It is clear that all the VA tools support scientific research, leading to more robust findings.
- **Machine Learning (ML):** With the huge amount of data that is now collected in planetary science, the need for machine learning tools is clear.
 - The tools help to manage the large amount of data that has been collected, and can be deployed with other datasets than ones a scientist may currently be working with.
 - ML tools can also increase the effectiveness of scientific missions by providing insight into what data to collect, and then the very rapid analysis of data that is collected can provide further insight into what to collect next (e.g. while a mission is still ongoing, or even a small part of a mission – for instance, if there is a flyby window of an hour.)
 - The ML strand had some delays due to issues with staff turnover in beneficiaries but the potential impact of this line of work on the science that can be conducted is clear. In addition, although training was provided, more (and ongoing) training needs to happen to enable the ML tools to reach their full potential.
 - Somewhat relatedly, being able to work with big data/data science is a skill that will not only help individuals have more successful careers in science, but also is a transferable skill that can be useful in other fields, thus making ECS (in particular) more employable. Additionally, the availability of such tools and expertise can potentially strengthen relationships between planetary scientists (labs, facilities, etc) and industry.
- **GMAP:** This is a clear support for the planetary mapping community. The tools developed are useful in supporting scientific research, enabling planetary scientists (and others – beyond planetary scientists) to expand what they do. That is, they extend the reach of planetary mapping to other related scientific areas.
 - The GMAP tools also support standardisation in this area and have supported the establishing of a relationship with USGS.
 - The other clear success/impact of GMAP is the Winter School, which has achieved a large and broad reach. This is, of course, helped by it being online and free, but if there can be a way to continue funding for it, it will be an excellent contribution to sustainability. The Winter School has been highly visible and has strengthened, diversified and expanded the planetary mapping community.
- **SPIDER:** This has impact on scientific missions, in that the services are being taken up by the Bepi Colombo and JUICE communities/teams. Their work is also disseminated via publications, which help make scientists aware of their services and this can lead to new insights on research questions.
 - There is also impact on early career researchers, via training, and there seems to have been concerted efforts on making students aware of the services and data available to them via SPIDER.
 - A small public-private company contributed to SPIDER to develop software and link academia/research institutes (and the datasets they have) to

- industry. All of this, in turn, can impact on the science by stimulating new studies and will position SPIDER to be involved in future missions.
- SPIDER's attendance at ERIM and the European Space Weather Week has also helped increase awareness of – and likely ultimately uptake of – their services, thus further increasing impact, particularly among early career scientists.
 - Many of the SPIDER services use the protocols developed by VESPA.
 - **ACRI-ST (industry link):** this is a model for how industry can collaborate with academia/research. The scientists provide the research/knowledge/tools and the company provides a platform to distribute this information/tools to organisations that would be interested in using it.
 - A good model for industry-academia collaboration involves identifying niches that academic research can fill – which, in turn, relies on networking. There are certainly industry partners who are interested in, and who are, part of EC bids and projects. Relationships are key.
 - Industry (ACRI in this instance) collaborate because it benefits them directly (e.g. increases their visibility). Important to have a smaller number of industry partners (or possible partners) who Europlanet knows well (i.e. has a direct contact) than many who are just a list of organisations that might be interested. Likewise, SMEs are probably a better target than very large companies.
 - There is also an important link between doctoral students/post docs and industry that needs to be nurtured. Links with industry also have good potential for economic impact – synergy is important.

Networking Activities data overview

As part of the evaluation of the Networking Activities (NA1 – Dissemination and Community Support, NA2 – Ground-based Observations in Support of Space Missions), various indicators identified by the activities leaders were tracked over much of the project.

NA1 Key Performance Indicators ('In the numbers...')

- 53 conference presentations reaching 2.4K participants
- 250 bursaries supported
- 50+ workshops, conference sessions and training sessions organised, with 2.5K participants
- 8 exhibitions, with 47K visitors
- 10 outreach resources with 10K accesses
- Most social media followings at least doubled over the project (X: 2 > 4K, LinkedIn 0.1K > 1K+)
- YouTube videos with 164K views

Conferences

This RI saw progress made in virtual and hybrid conferences, which can support cost savings and widening participation. In particular:

- Redesign of the Europlanet Science Congress (EPSC) as a fully virtual meeting during Covid in 2020 and 2021 – created a successful technical and financial model for holding large-scale fully virtual meetings.
- ERIM 2023 – successful implementation of a hybrid meeting and discussion forum for the Europlanet community, with active involvement of 200+ participants

Industry Collaborations

Progress was also made in this RI around relationships with industry, in order to support collaborations with industry. Specifically:

- Survey (n~40) of understanding what the barriers are to collaboration between industry and academia (main findings: less a lack of interest, more not knowing how to go about it and/or what the relevance is)
- Regular industry-policy splinter sessions at EPSC and ERIM and participation in industry events (e.g. Space Tech Expo, UK Space Conference) have raised awareness of industry of opportunities in planetary science, and developed good relations with a core group of industry, including industry clusters (e.g. HUNSPACE, who have shared a stand with Europlanet at events)
- Development of a database of industry across Europe to enable researchers a clearer overview of companies and commercial services that are relevant to their research.
- Industry-focused events hosted by embassies have proved a good platform for discussions, with at least 1 new contract coming out of contacts made at the events.

Widening Participation

Substantial progress has been made around access and inclusion during this RI. Some activities, listed below, can be considered as ‘traditional’ widening participation activities, but there are many other activities (e.g. Expert Exchange, Mentorship Programme, TA visits by individuals from backgrounds/countries underrepresented in planetary science, GMAP Winter Schools) that were also aligned with these goals. Among the activities directly included as ‘Widening Participation’ are:

- Establishing collaborations with URS research institutions and universities
 - ATOMKI has become a major Hub for planetary science and astrochemistry through Europlanet investment
 - Diversity and inclusion round tables and splinter sessions (e.g. CE Hub meetings)
- Providing funding opportunities and bursaries specifically targeted at researchers from these regions
- Organising workshops in URS countries (e.g. ERIM in Bratislava) increased participation from <10% average at EPSC to 29%.
- Successful programme to support researchers in Ukraine. 13 visits have resulted in at least 6 papers published, with several more in preparation.

Global Collaboration

The 2024 RI significantly extended the reach of Europlanet activity beyond Europe. Some highlights of this global expansion include:

- Successful pilot TA programme of reciprocal access between Europlanet and Korean Basic Science Institute for European researchers to visit Korean facilities and Korean researchers to visit Europlanet facilities (Strategic Plan Goal 4)
- Series of 6 workshops (Strategic Plan Goals 1 & 2), very successful in introducing planetary science, astrobiology and space-related topics, consolidating and networking communities in:
 - Africa:
 - Botswana (EP WS 1: Satellite for Space Science and Technology in Africa)
 - Ethiopia (EP WS 2: Applications of Earth Observation Satellite Data, EP WS 5: Exploring the Field of Astrobiology)
 - Morocco (EP WS 3: Rocks from Space and Planetary Defence)
 - South America
 - Argentina (EP WS 4: First Europlanet Latin America Workshop)
 - Bolivia EP (WS 6: 1st Bolivian Planetary Science Workshop)
- Ambassador's programme (Strategic Plan Goal 3) widening reach across society and citizens:
 - Exhibition in Casablanca shopping mall
 - SpaceBus Togo
 - Astro-educational laboratories in primary and secondary schools in Addis Ababa, Ethiopia.
- Conference sessions at EPSC 2021, EPSC 2022 and ERIM focused on collaboration with Africa (Strategic Plan Goal 5)

Media and Social Media

There was substantial activity in this area in RI 2024:

- 52 press releases issued, with at least 180K views of coverage
- 5 press briefings held at EPSC, including the first planetary images from JWST, first results from Cheops mission
- Press releases from the Ariel consortium on mission adoption
- 7 magazine issues released, with 2.5 K average views of online and printed copies
- 3 media training sessions, with participants from 11 countries
- 13 media and social media interns, of which 5 have subsequently been employed part time on the project
- Social media followings on Twitter/X doubled, Instagram increased ~x10
- Active and growing Discord community, currently with ~50% of Europlanet Society membership

Policy Engagement

The NA strand continued to make efforts to engage with policymakers throughout this RI. In particular:

- Dinner Debate at European Parliament attended by 2 MEPs, EUSPA Director, ESA DG and around 30 representatives of industry and planetary science community
- Policy and Industry sessions at EPSC
- Policy workshop at ERIM 2023

- Joint event and exhibition in European Parliament co-organised with ESO, ESA and European Astronomical Society
- Agency nights at EPSC
- Regular online briefings, reports and advisories of upcoming events

Outreach

Consistent with the outward-facing nature of the Europlanet 2024 RI, in addition to outreach efforts by a substantial number of TA visitors (and facilities), the NA strand also engaged in outreach:

- 13 Conference presentations (~200 audience)
- 8 workshops (242 participants) covering all aspects of outreach and education, including making outreach activity into a business.
- ~120 schools engaged.
- Survey to understand teachers' requirements and any changes in use of online resources after Covid, and stakeholders views of Europlanet outreach.
- 10 outreach resources released in up to 7 languages, ~10K views on web and YouTube
- 4 contests with 200
- Livestreams with 7K-27K views, and creation of an astronomy live-stream community to share best practice

Expert Exchange

The Expert Exchange programme received 57 applications, of which 30 were funded, with 29 being completed by June 2024. 67% of applications and 50% of participants (either visitors or hosts) were from URS (both EU and non-EU countries). 23% of all applications were from females, with 35% of all participants (either visitors or hosts) in completed visits identifying as female.

All seven of the individuals interviewed for the evaluation about the Expert Exchange programme reported very positive experiences with the programme. There was quite a diverse range of activity within the programme, from learning to use a particular technique (or training others) to public engagement or outreach experience. In essence, the programme lives up to its label – it brings individuals together to exchange expertise, often leading to synergies that would not happen otherwise. Because individuals can apply easily and for such a wide range of activity, funds often support very targeted high impact activities, for relatively small costs. The programme also supports professional development, often of early career scientists, who often do not have access to funding for this kind of career – and field – advancing activity, particularly when it leads to careers outside of academia (e.g. public engagement). In several cases, the 'expert' sharing their knowledge (e.g. Raman spectrometry) also felt there were benefits to their own career/professional development (e.g. providing teaching experience), and the opportunity to meet other researchers was also beneficial in expanding professional networks (similar to the outcomes of the TA programme): "It's the presence, the personal meeting with people. Communication was much more effective than by email. That's one

thing and for us, for Hungarian researchers and Eastern European researchers. It's to see how those guys are working."

The programme clearly leads to scientific impacts, such as publications and research collaborations, technological impacts (in terms of sharing expertise around particular tools and techniques), as well as education and training-related impacts, and social impacts (e.g. via outreach and activity in underrepresented states).

Moreover, the ease of the application (and reporting) process would seem to support a particularly wide range of activity, including engagement with individuals and groups from underrepresented states, including in Central America and Africa. Indeed, in an exchange in Bolivia, where the recipient held a series of workshops he was able to disseminate knowledge about and of planetary science (a field with very limited presence in Central and South America) and establish a community in this field, connecting it to the Europlanet network, essentially acting as a catalyst for planetary science in South/Central America.

The value of such an exchange was expressed eloquently by the recipient:

"I really like to bring something back to my, to my continent let's say, so for me, was really important to also go back to go back to Latin America and to kind of spread the knowledge... in Latin America, we have this big problem that we have a lot of people that are interested in these topics. But we don't have many people prepared to do it. So with these kinds of small workshops, is something really helpful."

In sum, the Expert Exchange programme can lead to transformative impacts on participating individuals, by providing access to funds (which are relatively small) many simply would not have access to otherwise.

Early Careers Support

Support for early career scientists is at the heart of this RI, as reflected in the large proportion of TA visitors who were ECS. Substantial support was also part of the NA strand:

- Successful training programmes held online, in-person and Hybrid (Summer Schools in 2022 and 2023, EPEC Annual Week)
- 71 Mentor-Mentee pairs matched [See also below]
- 221 early career bursaries supported for EPSC
- Over 100 early career jobs and PhD positions published on Early Career Portal, newsletter and (more recently Discord)
- 10+ conference presentations on mentorship and early career programmes

Mentorship Programme

A total of 71 Mentor-Mentee pairs were matched. Evaluation forms were sent to all and were received back from 20 mentors and 19 mentees. This feedback is summarised below.

The main objectives reported by mentors were: Supporting the community (18 of 20), Developing leadership skills (7) and personal satisfaction (5); and 17 felt they had received sufficient information and training materials to prepare them for their role. The most popular topics discussed with mentees were career pathways, developing collaborations,

networking, increasing visibility in the community, work/life balance and managing research. The majority (18) felt they had been able to support their mentee to work towards their goals, and only 3 (one of whose mentees never responded) felt they had not gained something, themselves, from the experience of being a mentor. Of the others, multiple mentees enjoyed being able to support someone new to the field. Over half (11) planned to keep in touch with their mentees. 18 rated the programme overall as 'Excellent' or 'Good' but several felt that the platform would be improved by additional information about the programme and training materials. Perhaps not surprisingly, several also felt an opportunity to meet in person would be welcomed.

The main objective of the mentees was general career guidance, although seven also mentioned gaining advice about a research project. By far, the most frequently discussed topic was that of career pathways, followed by networking and communication skills. 14 felt that their mentors helped them achieve their goals or objectives. For those who responded that they did not, there seem to have been issues around either the match itself or with a lack of clarity around expectations for the programme. Those individuals did not report a positive outcomes, but this contrasted with the others, who felt they had achieved positive outcomes as a result of the programme, and 15 planned to maintain contact with their mentors. 14 rated the programme overall as 'Excellent' or 'Good'. Overall, it appears that a bit more support throughout – particularly with mentors who are new to mentoring – could be beneficial.

Despite a few challenges, most mentors and mentees alike reported positive experiences of the programme, and this was echoed in the interviews. For the mentors, it was gratifying to be able to offer support to newcomers in the field and over half planned to maintain contact with their mentees in the future. They remarked in particular on the opportunity to connect with new astronomers, which helps them understand their field better and the direction in which it is headed.

"While there is no financial compensation, the personal satisfaction derived from assisting someone on their journey is immeasurable. It also provides a unique opportunity to connect with the next generation of astronomers, gaining insight into their aspirations. Additionally, it expands my network, introducing me to talented and motivated individuals who could potentially become future collaborators."

"It certainly expands your horizons as to what the goals of different people are, because only when you talk to people, especially people who are junior to me, only then I understand as to what the new aspirations and the new goals and new ambitions of these youngsters are."

Likewise, the mentees also felt they gained a lot from the programme, particularly around networking and professional development. Not only were the mentors able to support with things like applications and career advice, but they were importantly able to support their networking including but beyond the mentor-mentee relationship. It was also an opportunity to have someone they could discuss things with beyond their supervisors,

which is important due to the power dynamics in a student (or post-doc)-supervisor relationship.

“I would say that maybe the main things that I’m getting from this mentorship programme is that I feel support. I mean I also feel support from the group I’m working and from the PI, but there are some things and some questions that I’m not comfortable to ask the PI or I feel I need support from another view, another thing. So I really feel I am supported from someone who is more experienced than me, from someone who may be, like had these challenges before, so I do feel support. And I feel I have someone I can ask, because sometimes in academic you have some questions that you think maybe they are silly to ask or I am shy to ask to I am shy to talk about this concern. But with the mentor, I feel quite myself and I ask all the questions I have. I think as an early carer in my first postdoc right after my PhD, I feel a good support from this mentorship programme.”

Overall, the mentorship programme has achieved broad geographical reach of over 20 countries (including Georgia, Lebanon and Romania). This type of initiative is also key in addressing some of the diversity and inclusion issues facing planetary science as a field.

Amateur Astronomy/Telescope Network

There have been at least 19 [papers that reference the Telescope Network](#).

Of the 13 users who provided feedback, the value provided by the telescope network is clear. It is distinctive in the ease of application and the location and number of the telescopes, and the trainings are highly valued. For most/many respondents, they would not be able to collect their data in any other way. For amateur astronomers in particular, the access to expertise (including particular mention of access to professional astronomers and the opportunity to learn about new research and conduct joint observations), access to high quality telescopes and the general support provided by the Europlanet community is highly valued and unique. Some simply would not have access to these facilities at all without Europlanet support and connections (from one amateur: “personal contact with telescope professionals, who now know us and with whom we can collaborate”). The network is also unique in requiring that data be made publicly accessible within a year, which may also contribute to the numbers of papers produced that involve amateur astronomers. [So it does appear that the Telescope Network does fill a niche that is not occupied by others, particularly for amateur astronomers.]

Impact areas

This section organises the data to pull out the impact that the various activity strands of the RI have had in the key areas of impact.

Scientific impact

The scientific impact of Europlanet 2024 RI is indisputable.

Publications

[This is particularly connected to objective 1: Be a national or world scientific leading RI and an enabling facility to support science]

- 317 planned publications from TA visits (182 from ECS)
- 423 planned conference presentations drawing on TA visits (233 from ECS)
- Longer term follow up forms reflect that publications are starting to be submitted and accepted (including in high-impact journals) and conference presentations delivered
- 80 publications and conference presentations from TA facilities (see tables on page 8, though these should also be represented in the Europlanet publications database: https://www.zotero.org/groups/2778310/europlanet_2024_ri/library)
- Over 70 VESPA presentations, 25 peer-reviewed articles by the VESPA team and over 30 publications citing VESPA. (<https://voparis-wiki.atlassian.net/wiki/spaces/VES/pages/56901929/Publications>)
- 48 GMAP publications
- SPIDER - 23 peer-reviewed publications on use of planetary space services in high-impact international publications (e.g in Nature: Persson et al., 2021; Aizawa et al., 2022, 2023; Hadid et al., 2024).
- ML tools/services have led to six papers and over 15 conference presentations.
- Telescope Network has also led to over 20 conference papers and publications (including at least two in Astronomy and Astrophysics), several involving amateur astronomers as authors. We note here that involvement of and support for amateur astronomers is quite important, as it can contribute to the sustainability of the RI, as well as reflecting the outward-facing nature of the RI. Additionally, research from social sciences highlights that outside perspectives can enhance the science that is done as well.
- The Telescope Network's requirement to publish data within a year also supports publications.

Users

- Ultimately there were 325 applications to the TA programme, of which 306 were eligible, 208 were funded and 197 took place.
- Although gathering data on the VAs was complicated, and the picture is not fully comprehensive, some information about users is available:
 - VESPA users (to March 2024): Portal users (200/mo), EPNTAP services (1500-2000 visits/mo from 600-800 unique visitors), for all with a regular growth of 50% in the three years following lockdown (until March 2024). From the spring of 2024, we clearly see a sharp and consistent increase of both visits and visitors from professional institutes that is not due to changes in monitoring tools
 - .SSHADE registered users (650), visitors (2800/mo) and visits (6600/mo); PVOL (500 registered contributors at the end of the project)
 - GMAP users: Portal (~ 1000/mo, with substantial variability depending on closeness to Winter School); Tools (Over 900 users); Tutorials (Over 1000 users)
 - SPIDER: over 12,543 connections since the start of the project

- A total of 52 proposals were submitted to Europlanet Telescope Network, of which 44 were funded, and 256.5 observation nights were granted from 335.5 requested (exceeding the target of 200 nights). Of the PIs, 21 were females, 23 males and 1 non-binary; nine were senior researchers, eight were early careers, five were students and 23 were amateurs.
 - Also related to NA2, GaiaGOSA had more than 200 registered users (i.e., mostly amateur astronomers) and about 50 nights of observations were uploaded to the system in the final year of the project. In total, more than 1000 nights of observations were submitted to GaiaGOSA

Research collaborations

[Objective1a: Structuring effect of RI on scientific community]

This is an area in which the RI really comes into its own. All of the strands of activity have led to successful research collaborations, particularly related to TA visits and the networking those visits support, but other areas as well, such as pro-am collaborations emerging from the Telescope Network and collaborations from the VA facilities. These collaborations are often around publications and bids for research funding, but have also included support for space missions and doctoral students. Some highlights include:

- The expansion of the TA network (e.g. with KBSI) during the course of the RI
- Collaborative research bids across the RI and with other universities and research institutes
- Funding granted for collaborative projects (successful bids) from EC/ERC (e.g. EXPLORE – VA & NA1; RoadMap – TA & VA; LaSciL) and others
- Funding for (collaborative) doctoral students
- Establishing collaborations with URS research institutions and universities
 - ATOMKI has become a major Hub for planetary science and astrochemistry through Europlanet investment
 - Diversity and inclusion round tables and splinter sessions (e.g. CE Hub meetings)
- TA visits – 91% of TA visitors (87% of ECS) plan to collaborate with their hosts in the future and in follow up forms, 85% (83% of ECS) reported that they have had further interactions with their host facilities. It is also worth highlighting the importance of networking on TA visits, which can ultimately lead to scientific impact:
 - “Meeting people is you get much more of a connection with them, you know, people don’t collaborate with strangers, right, they collaborate with people that they know. And it’s like you have to get the ball rolling and I feel like part of Europlanet is one of these great things and it helps gets the ball rolling with meeting people and building networks.” (TA visitor to Botswana)
- VA collaborations
 - Developing ML tools tailored to planetary science, Europlanet has cemented collaborations, started to build new user communities and developed services that are already resulting in publications; We have collaborations with national (FWF project at IWF) as well as international (EU Horizon 2020 EXPLORE project) research projects and started a series of fireballs workshops together with NA2.

- SPIDER – Development of services enhancing science return of planetary space weather for space mission currently in operations (Presentations of services during BepiColombo and Juno Scientific Working Group meetings; Participation of SPIDER during the Juno Analysis Workshop for Science Capacity Building in Rome in July 2023
(<https://junoworkshop.space.swri.edu/romejuly2023workshop/>)
- GMAP links with H2020 projects, Chinese MOST project
- The Europlanet Society has become a member of the IPDA steering committee in 2021, for VESPA activities.
- VESPA – Constant involvement in other international consortia: IVOA, IHDEA, EOSC-related bodies and new EOSC projects (FAIR-IMPACT and OSTRAILS)
- Collaborations also arise between amateur and professional astronomers via the Telescope Network.
- Global Collaborations Workshops
- Pan-Africa Planetary and Space Science Network (PAPSSN) [10 partners including BUIST and UniBo funded under the EC's Education, Audiovisual and Culture Executive Agency (EACEA) under the Intra-Africa Academic Mobility Scheme. Start date: December 2020; 1.4 million Euros.]

Other scientific impacts

The development of ML tools to handle complex planetary data more efficiently and provide opportunities to combine and visualise multiple diverse datasets.

- ML can explore the data to find a pattern or commonality. Out of these initial steps comes a hypothesis that can be tested through data analysis, which again – hopefully – leads to new understanding. Clustering or fusing datasets, moreover, can reveal connections or knowledge that are not recognizable in the individual datasets
- VESPA – The ability to search data based on specific observing or instrumental configurations, together with cross-search among data services from many institutes worldwide is a game-changer for cross-fertilisation in several fields, including space mission support and analyses.
- GMAP – Development of tools aiding science linked to mapping
- TA visits – 66% of visitors (83% of TA1 visitors) reporting that their visits have led them to consider new lines of research or research questions that they would not have otherwise considered and this is reinforced by interview data:
 - “So it’s definitely going in a new direction because of purpose was to test, to collect tests to collect sample to test a new technology, we are developing for space applications. So now that we got those samples, there is the characteristic we need to test our, our instrument or our prototype. We figured out that in order to optimize the use of a product we need to collaborate with people that have complementary instruments, they can look at the materials to make like comparisons, which works better, which was what was so definitely all the metal networking we are doing now and all

the research we are doing are completely different compared to what we've been doing until last summer.” (TA visitor to Iceland)

- “So we are collaborating and doing something that nobody achieved yet.... It’s a game changer - because it's completely new. Nobody has had data like this before, ever!” (TA visitor to GGIF)

Technological impact

Europlanet 2024 RI achieved substantial technological impact. Although much of this emerged from VA activities, TA facilities also had engagement with industry and industry engagement was also part of the NA strand.

Supporting innovation

[Objective 2: Be an enabling facility to support innovation]

Across the RI, multiple activities have supported innovation. These include:

- Two industry collaborators with the ML strand (Know, ACRI-ST)
- Isotoptech (part of a MSA company) and MATIS OHF (SME) also served as TA facilities
- JRA1 involved VuA with ThermoFischer and NHM with Brucker
- Impossible Sensing - a US-based SME expanding into Europe, catalysed by connections made during TA visits
- Survey (n~40) to understand barriers to collaboration between industry and academia (main findings: lack of interest is not a barrier, more not knowing how to go about it and/or what the relevance is)
- Regular industry-policy splinter sessions at EPSC and ERIM and participation in industry events (e.g. Space Tech Expo, UK Space Conference), which have raised awareness within industry of opportunities in planetary science, and developed of good relations with a core group related to industry, including industry clusters (e.g. HUNSPACE, who have shared a stand with Europlanet at events)
- Industry database covering Europe (developed by BSSL, ACRI-ST & ESF, as part of NA1) to provide researchers a clearer overview of companies and commercial services that are relevant to their research.
- Industry-focused events hosted by embassies have proved a good platform for discussions, with at least 1 new contract coming out of contacts made at the events.
- Multiple TA facilities (from 3-7 in each reporting period from 2022 onwards) have reported engagement with industry (e.g. AAC Space Africa in Fast4Future - BUIST; Paslab has had three projects involving industry collaboration: Belgian aerospace industry Steiger, Bruker Optics GmbH & Co, and German aerospace industry Innoventor)

Providing scientific data and services

[Objective 6: Provide high quality scientific data and associated services]

This is an area in which VA activity clearly excelled. Highlights include:

- ML tools for planetary science – the Europlanet ML tools were designed to be applicable for a large number of applications dealing with scientific databases; worked with exploration companies
- ML – collaboration with EXPLORE H2020 ML project and data challenge competition
- SPIDER – Development of planetary space weather services to help planning mission operations (Numerical simulations developed at Mercury and Ganymede by INAF and CNRS)
- SPIDER – promotion of services to planetary (BepiColombo, JUICE) and heliophysics (Solar Orbiter) missions
- SPIDER – Use of planetary space services to help understanding mission and instrument constraints (Updated radiation environment for the JUICE mission during the Ganymede orbital phase, Pelcener et al., JGR, in review; planned for presentation in the next JUICE Science Working Team meeting
 - <https://www.cosmos.esa.int/web/juice-swt-meeting/programme>
 - Linkages between the SPIS software at ONERA and the planetary plasma database at CNRS, Hess et al., A&C, in review, also presented during the SPINE workshop to spaced agencies and SMEs)
- VESPA – links with space agencies (NASA, ESA)
- VESPA – Impacts on standardisation
 - EPN-TAP protocol is an IVOA Recommendation (Aug 2022) and has been adopted by ESA/PSA, some NASA/PDS nodes, CNES and ASI data nodes.
 - Planetary Science use cases from VESPA provide inputs for improvement of generic IVOA standards, mainly: datalinks, MOC (footprints) and HiPS (multiresolution maps), vocabularies.
 - Progress on formal vocabularies (coordinate systems, target classes, etc) and ontologies provide the foundation for further interoperability across related science fields (astronomy, heliophysics, potentially Earth Observation, etc).
 - VESPA improves “FAIRization” in this field:
 - DMP template are available for all data services
 - Services are declared in the central IVOA registry (common to all fields of astronomy)
 - DOI may be attributed to data collections (in progress)
 - New ways to store and access data in the VO, workaround the complexity of relational databases syntax: Discovery portal (ElasticSearch database), Geospatial portal (both in dev) Sustainability procedures have been defined: preservation of metadata on GitLab (“VESPA hubs”) with AAI access designed by GEANT/ Eduteams (“VESPA-cloud” project); Europlanet communities in Zenodo and B2share to preserve data.
 - Feasibility study of a data management system for planetary space instruments based on VO tools and standards (on-going)
- GMAP – Adoption and dissemination of developments in the geospatial realm (e.g. Hare and Malapert, 2021), within the mapping workflow.

- GMAP – links with ESA’s ESOC & EAC facilities; links with Italian Space agency, working with exploration companies; interactions with USGS Astrogeology (maps on portal)
- Data from Europlanet Telescope Network (NA2), including from amateur astronomers, made publicly available

Training and education impact

[Objective 4: Promote education, outreach and knowledge dissemination]

The impact of the 2024 RI related to education is impressive, showing both breadth and depth. It is consistent with the outward-facing nature of this RI and education is an important way in which the RI engaged with and supported individuals from backgrounds underrepresented in planetary science.

Highlights related to this area of impact include:

- Social media internship programme
- Mentorship programme, with 71 pairs matched over broad geographical reach
- Expert Exchanges, with 29 completed, 50% of participants (visitors or hosts) coming from URS (EU and non-EU), 35% of participants identifying as female
- NA2 organised a total of 23 workshops and amateur training sessions with over 1,300 participants (including dedicated workshops, splinter meetings at EPSC, virtual workshops, ERIM sessions and summer schools)
- Support for students & early career scientists, including in particular the Mentorship programme, Expert Exchanges, and TA visits, as well as training programmes and bursaries:
 - Training programmes were held online, in-person and hybrid (Summer Schools in 2022 and 2023; EPEC Annual Week)
 - 221 early career bursaries supported for EPSC
 - Conference presentations on mentorship and early career programmes
- The VAs also supported substantial education and training activity:
 - ML – Machine learning trainings, conference sessions; Much of the development work for the ML tools has been performed by early career researchers, enabling them to build both their skills and experience and their professional profile within the scientific community; also contributed to fireballs workshops (NA2)
 - SPIDER – Presentation of planetary space weather services (workshops & trainings)
 - VESPA – Organisation of annual implementation workshops for data provider teams, and sessions at EPSC (and other conferences) for users, including amateur astronomers; Large services gathering observations by the amateur community: currently PVOL (continuous planetary imaging) and PARSEC (Europlanet Telescope network); several other applications to collect collaborative work in progress (LuckyStar ERC, Fireball networks, etc); contributions to NA2 workshops; Potential application to teaching and education (currently at Master level, could be generalised)

- GMAP – Winter schools (2021, 2022, 2023, 2024); Not only did the Winter Schools reach hundreds of participants, they also acted as a community builder and dissemination platform for Europlanet more widely. The GMAP team commented: “The Europlanet community, including those engaged with NA workshops, were exposed to GMAP and discovered the activities, knowledge base, and tools thanks to other Europlanet activities, and would have not without. This includes Winter School participants coming from other Europlanet workshops, and vice versa.”

Economic impact

Europlanet 2024 RI achieved a number of achievements that broadly fall under the category of economic impact.

There was a successful redesign the Europlanet Science Congress (EPSC) as a fully virtual meeting in 2020 and 2021. Thus, there is now a successful technical and financial model for holding large-scale fully virtual meetings.

When necessitated by the pandemic, a number of TA visits happened online. Although not ideal from both a scientific and collaborative standpoint, in some circumstances they are a cost-effective way of supporting some visits. In particular, when a visit primarily involves researchers more advanced in their careers and has the purpose of running some further experiments or otherwise building on existing work (and even more so if there is an existing collaboration), TA visits can be a cost-effective way of getting needed data.

Collaborations stimulated through Europlanet 2024 RI, and involving its beneficiaries, led to several successful proposals for new projects funded through the European Commission and national agencies. These included:

- MAUVE – UV satellite Construction
- Fast4Future – Capacity Building
- EXPLORE – Machine Learning
- RoadMap – Laboratory experiments / modelling / space data analysis
- MOST – Key Technologies & Demonstration of Standardised Planetary Geologic Mapping
- PAPSSN – Mobility
- Erasmus + LaSciL – Virtual educational tools
- Erasmus+ CliC-PoLiT – Climate change / dark skies
- Erasmus+ StAnD – meteorites / Astro-Journeys
- Erasmus+ ICM Unibo UBA

Total funds: €7.78M++

There was business-related economic impact, with the launch of the Impossible Sensing SME (<https://www.impossiblesensing.com/>). Europlanet itself established a non-profit association (Europlanet AISBL) that is continuing the legacy of Europlanet 2024 RI, as well as the FTP-Europlanet gUG spin-out for educational activities.

In addition, there was increasing support for local infrastructure and associated employment by some of the TA facilities (e.g. VuA and Atomki). There was also economic impact at a more individual level, with 221 early career bursaries provided for EPSC, as well as the support for early career scientists for TA visits.

Social and societal impact

Europlanet 2024 RI demonstrated substantial social and societal impact, particularly from the NA strand but other areas as well. This is indicative of and consistent with the outward-facing nature of this RI, which seems a particularly strong way in which it goes far beyond the scientific impact. The social and societal impact is linked to three objectives, which organise the information below.

Promote (education,) outreach and knowledge dissemination

- TA facilities (& visitors) engaged in substantive outreach and media engagement activities
 - Range of activities from TAs -public talks, media engagement (including with New Scientist – SGRIF; NHM around the fall of the Winchcombe meteorite); stalls and/or talks at public exhibitions and science festivals, open days at universities; virtual exhibition (NHM); [Vrije: allowing people to bring Roman metal archaeological finds for sampling with a laser for subsequent isotopic analysis. 30+ attendees at the Museum Hoge Woerd. Those present included teachers but mainly general public. Journalists attended and 2 articles in local press.]
 - Just under half of TA visitors claimed they planned to do outreach connected to their visits; similar proportion (around 42%) reported having done so in long-term follow up feedback
- Media and social media – substantial presence, and increasing over the course of the RI. Of particular note are the 7 issues of Europlanet magazine released, with 2.5K average views online and printed copies and YouTube videos with 164K views.
- The Europlanet Evaluation Toolkit continued to be available and visible, with presentations at EPSC and other conferences
- Collaboration with education partners (EduINAF, Lecturers without Borders; very popular planetary science resources)
- Teacher training programmes
- Other NA activity around education (schools) and outreach, including workshops, outreach resources, live streams and contests.
-

Provide scientific support for public policies

- TA facilities have reported substantial engagement with policymakers and strategic initiatives, at national and European levels
 - DLR – visit with minister (Belgian?)
 - Fulvio Franchi (BUIST) – in addition to PAPSSN, Fulvio participated as an expert in drafting the "2030 National Space Science and Technology

Strategy" for Botswana, Ministry of Tertiary Education, Research Science and Technology.

- Also BUIST - One of the deliverables of their CBHE project FAST4Future (<https://fast4future.cesst.org>) is the preparation of 2 white papers: "Gender and disadvantaged groups crosscutting issues in the member countries and institutions" and "Standardization of STEM curricula and credit transferability in African HEIs"
- KBSI - when Korea was negotiating to join Horizon Europe as an associate member, Keewok Yi gave advice in three meetings with the Korean National Research Foundation, two of which included a participant from EC including Ms. Signe RATSO, Deputy Director-General of Research and Innovation, European Commission.
- PJW and MJB (Kent) are members of the ESA's Active Sensors for Telemetry of Extraterrestrial Impactors At Gateway (ASTERIA) Facility Definition Team.
- Aarhus - continued involvement in Danish space partnership initiative (mtg arranged by Danish ministry of research and education)
- Lulea - part of regional strategy to strengthen space infrastructure in northern Sweden.
- Mickael Baque (DLR) is part of ESA Facility design team for Gateway experiments in astrobiology.
- VU High Pressure Laboratory (WVW) - engagement in discussions with the Netherlands Space Office (national level) about coordinating a national Knowledge Network on planetary science, specifically a network on planetary habitability indicators. [This led to a successful application for funding a 5 year national network (680K Euro funding.) Involvement of NL-based facilities in Europlanet was of course mentioned in the discussions and the proposal. WMW has also continued coordinating, on behalf of the Dutch geoscience field, the Dutch Planetary and Exoplanetary Science (PEPSci) network (national level, network running since about 2013). This involves repeated discussions with Netherlands Research Council, stressing the importance of planetary science and exploration.
- OU Flow through Simulation Chambers - Karen is the UK representative on COPSAR Planetary Protection Panel and is the chair of the UKSA Panel for Planetary Protection. Both are international (worldwide) policy and strategy engagements
- AstrobiologyOU hosted the Inaugural International COSPAR Planetary Protection Week (IICPPW) 21-25th April 2024 with 17 space agencies represented including China, Japan, UAE, NASA, ESA, etc. 12 Industry including Airbus, Blue Origin and International SMEs, and over 40 different academic and research institutions attending. Over 100 people both in person and online.
- Engagement with European Parliament and other policy-related activities, much of which was in collaboration with agencies and other organisations, including a Dinner Debate, invited presentations to EC DG on Research Infrastructures (with

Opticon), policy and industry conference sessions and workshops; agency nights and other joint events.

- Supporting regional hubs to engage with policy at a local/national level.

Social responsibility

- Support for amateur astronomers [workshops, access to telescopes and associated experts/expertise] (See pp 16-17 of this report for more detail around the impact of this for amateur astronomers.)
 - ML and VESPA also contributed to fireballs workshops (NA2)
 - VESPA also noted - large services gathering observations by the amateur community: currently PVOL (continuous planetary imaging) and PARSEC (Europlanet Telescope network); several other applications to collect collaborative work in progress (LuckyStar ERC, Fireball networks, etc)
- Mentorship programme [Particularly speaks to issues around gender & diversity; see p 15]
- Widening participation efforts, often involving collaboration and work with researchers and institutions from URS (See p 12 for more detail)
- Expert Exchange programme - some of these are particularly strong in terms of social responsibility (e.g. Colin Clarke's work with Travelling Telescope in Africa; Suarez Valencia's workshops in Bolivia)
- EDI initiatives within Europlanet activities, including accessibility guidelines for pre
- Mentorship programme but also Expert Exchange, Telescope Network and TA visits (involving students and other ECS) - giving people access to expertise (equipment and people) they wouldn't otherwise have access to (see pp 15-16 of this report)
- Efforts to develop virtual meetings can also contribute to social responsibility by decreasing carbon footprint and widening participation
- GMAP - The Winter School has been, despite its target of geoscience graduate students, very accessible for a wide range of backgrounds and seniorities. Throughout the series of schools, individuals ranging from high school students to retired individuals have learned the basics of planetary geological mapping
- Tools and services from VAs are also available to a global audience
 - Global reach of GMAP and its training activities beyond the EU. The Winter School is reaching a global audience. The open-source approach is suited for countries and institutions of any financial means
 - VESPA also noted that any data produced in the Europlanet context can be made accessible as EPN-TAP service, and are conversely available to the whole community. This is of particular importance for derived data and reference data (e.g., laboratory measurements such as SSHADE).

Conclusions

Looking across all the evaluation data collected throughout Europlanet 2024 RI, it is abundantly clear that its most substantial and meaningful impact is on - and through - its user community. While the scientific (and technological) impact of the project is

indisputable, this impact is achieved because of the opportunities it provides to individual – and emerging – scientists, not just in terms of access to facilities, but access to the expertise of individuals and the connections and networks that often emerged. Moreover, this support for the planetary science community – particularly early career scientists, as well as amateur astronomers – not only provides important professional development often not available elsewhere but also means the community is well positioned to continue to produce innovative and world-leading science into the future. This support that is so often unavailable to ECS and amateur astronomers, particularly those from URS, can be regarded as something not only impactful but also distinctive about Europlanet 2024 RI and should be something that is given prominence in conversations about sustainability.

Returning to the evaluation aims, the success of the access activities (Transnational and Virtual) and the networking activities is clear and the central element that drives this success is support for the planetary science community. While evidence has been found in all five impact areas (Scientific, Technological, Training and Education, Economic, Social and societal), evidence is particularly strong in the first three. There is also impressive evidence for the fifth, with social responsibility as an area in which this RI is likely distinctive from others. There can be no doubt that the TA programme in particular has led to substantial scientific impact. This impact is ongoing, as the new lines of research and, also importantly, collaborations catalysed by the visits continue. In the area of technological impact, the VAs have developed their capacity to provide high quality scientific data and services.

Across scientific and technological impact, the TA visits – which form the cornerstone of the RI in many ways – make possible impacts, particularly scientific, that simply would not be possible without the support of the RI, due to the access to facilities, both equipment and expertise, that it provides, especially for individuals (e.g. from URS) who would not have this access otherwise. The relative ease of applying for visits also contributes to this wide participation. Moreover, these impacts are amplified due to the participation of early career researchers in the programme, ensuring impact into the future. Such impact is only enhanced and strengthened by other areas of scientific impact from VA (e.g. ML JRA activity, SPIDER’s support for planetary exploration, VESPA’s development of the EPN-TAP protocol) and NA (e.g. Expert Exchange programme, Telescope Network) activities.

Impact in the area of training and education is also substantial, via the Mentorship programme, Expert Exchange programme, GMAP Winter Schools and training workshops by VESPA, SPIDER and the Telescope Network, and inherently strengthens the planetary science community. As noted previously, a distinguishing feature of the 2024 RI is its extensive support for students and early career researchers in particular, and amateur astronomers as well. In addition to the various programmes and workshops, the TA visits make a large contribution to this impact via the participation of early career researchers and students – the visits provide opportunities that are not otherwise available to them, thus accelerating their career development. When considering what aspects of the RI should be sustained – or where sustainability efforts should focus – continuing this support would seem to be key. The evaluation findings would suggest that it is likely better to move

forward with a TA programme that may be smaller (i.e. fewer visits) but that retains its accessibility (ease of application, welcoming ECS). Likewise, maintaining the Mentorship programme and Expert Exchanges should also be prioritised, as they would seem to offer value for money and can be quite bespoke to the individuals involved. Relatedly, the feedback we have received about the Telescope Network also highlights its unique value, with its accessibility to amateurs (including access to experts), relative to other telescope networks.

Finally, the emphasis on providing access to and support for individuals from backgrounds traditionally underrepresented in planetary science (and STEM more broadly) is something that has led to Training and Education impact, as well as Social and Societal. Indeed, activities like Expert Exchanges and the Mentorship programme, as well as widening participation and global collaboration activities and support for early career scientists, lead to impacts in both areas. Such success also dovetails with an increasing emphasis among funders (including the EC) and within science more broadly on diversity, equity, access and inclusion. Thus, the activity – and successes – of Europlanet 2024 RI fit well with these wider social trajectories and priorities, and increasingly, research highlights the benefits of more diverse teams and perspectives (e.g. McKinsey's Diversity Matters report; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9707800/>), further highlighting the importance of such efforts and suggesting their value for planetary science in the future.

In sum, across many of the RI activities, collaboration and networking has emerged as key to impact, both as a pathway to impact and an indicator of its attainment. The network element provides support for researchers at all levels and strengthens the community, which in turn contributes to sustainability and improving the science. Put differently, the evaluation has identified not only the impact that the RI has achieved but also the way in which it does so – through its support of the community. In particular, the RI provides access – access to expertise, to equipment (labs, field sites) and to people. This access is supported by a host of interlocking activities that clearly impact on individuals – from doctoral students to amateur astronomers and beyond – and the science that they engage in, now and in the future. All of this, critically, does not just lead to good science, but the outward facing nature of much of the RI activity means the impacts will be broader than just on the scientists participating directly and their science, but vitally strengthens the planetary science community – and beyond.

Appendix 1 - Evaluation Forms

1.1 Transnational Access Post-Visit Evaluation Form

Note: if you have been sent this link by mistake, and your visit did not happen, please let us know and do not fill in the form.

You will be required to upload your Scientific Reporting Form as part of this online survey. Please [download the template](#), fill in the form and get it checked and signed by your host facility before starting this survey.

Fields marked with an * are required. The personal information requested will enable us to reimburse you for your expenses and also to match your responses to future related activity (e.g. publications, conferences etc.), as well as to fulfil our reporting obligations to the European Commission.

If more than one person was funded by Europlanet for your TA visit, we encourage you to submit a combined response but use the text boxes to share or expand on any differences in experience.

If there are any questions that you are uncomfortable with or prefer to answer in confidence or anonymously, please contact our independent evaluation specialist, Jen DeWitt, at jennifer.dewitt@alumni.brown.edu.

Fields marked with an * are required

Section 1: About you

TA Project Number*:

Title: Dr / Prof / Mr / Ms

First Name:*

Last Name:*

Your nationality:*

Gender:* Female / Male / Non-binary / Provide own description / Prefer not to say

Your institution:*

Contact email:*

Country your institution is based in:*

What kind of institution do you work for?* UNI - University and other higher education organisation / RES - Public research organisation (including international and private research organisations controlled by a public authority) / SME - Small or Medium Enterprise / PRV - Other industrial and/or profit private organisation / OTH - Other organisation not fitting in one of the above categories

Career stage*: Industry - Management / Industry - R&D / Undergraduate / Postgraduate Master's Student / Postgraduate PhD Student / PostDoc or Senior PostDoc / Lecturer / Reader or Associate Prof / Professor / Other

Have you completed your last degree in the previous 7 years?* Yes / No

What is your general field of research / activity domain? * Physics / Chemistry / Life Sciences & Biotech / Earth Sciences & Environment / Mathematics / Energy / Material Sciences / Engineering & Technology / Social Sciences

Have you received funding for a Europlanet TA visit before (in any programme from 2009 to date)? * Yes/No

If so, give the grant number and / or project title (if known)

Would you would be willing to be contacted for a short interview to help us with our evaluation? *: Yes / No

The evaluation consultant working with Europlanet, Jen DeWitt, would like to conduct a brief interview, via Zoom or similar, with some researchers following their TA visits. These should take no longer than about 10-15 minutes.

How many people on your visit were funded by Europlanet?* One / Two

Did other researchers join the TA visit who were not funded by Europlanet?* Yes / No
If yes, give details (how many, their names & institutions).

Section 2 - About your visit

3. How did you hear about the TA programme?* Europlanet mailing list / Social media / Word of mouth / Through a facility / Participated in a previous TA call / Other

4. Did you travel to the TA facility, or was it a virtual visit?* Yes, I travelled there / No, it was a virtual visit

4a. What date did you depart for your TA visit?*

4c. What date did depart from the facility to travel home?*

4e. Did you travel more than once to the host lab/field site?

4f. If yes, please give dates of any additional trips.

5a. What date did you begin work on your TA project? *

5b. What date did you finish work on your TA project? *

5c. Did you work in the lab any days at the weekend during your visit?*: No / Saturday(s) / Sunday(s)

6. If you have any comments about pre-application discussions with the facility, please add them here.

7. Had you already had active collaborations with the host facility prior to your visit?*

Yes/No

7a. Please give details.

8. Do you plan future collaborations with researchers from the host facility? * Yes/No

8a. Please add any comments.

9. Did the technical facilities available at the host institution meet your expectations?*

Yes/No

9a. Please add any comments on interactions with facilities.

10. How would you rate the interactions with the researchers from the host institution / laboratory / facility? * 1 = very poor, 6 = excellent

10a. Please add any comments on the interactions with the researchers from the host institutions.

11. Please rate the quality of the laboratory environment. * 1 = very poor, 6 = excellent

11a. Please add any comments on the quality of the laboratory environment.

12. Please rate the visit overall. * 1 = very poor, 6 = excellent

12a. Please add any comments on the visit overall.

13. Please provide any further comments on visit application, selection and preparation.

14. Please provide any further comments on the practical aspects and logistics of the visit.

Section 3 - About your project

15. Please upload a copy of your summary report. *

Download the [template for the report](#).

16. Was your project interdisciplinary? *: Yes/No

17. Did the visit allow you to perform your project as foreseen and planned? *: Yes/No

17a. Please add any comments.

18. Did you use any Virtual Access (VA) services connected to Europlanet (e.g. VESPA, SPIDER, GMAP) in your project (i.e. [VESPA](#) (Virtual Observatory for planetary data), [SPIDER](#) (Sun Planet Interactions Digital Environment on Request), [GMAP](#) (Geological Mapping) or [Machine Learning](#) tools and services)? * Yes/No

19. Did your project involve a collaboration with another project, company or academic institution (other than the host facility)? * Yes/No

20. Were the data/results you collected in line with your expectations in terms of quantity, quality etc?* Yes/No

20a. Please add any comments.

21. Did the work you performed produce unexpected results?* Yes / No / Not possible to say yet

22. Did the work you performed lead you to consider new research activities that you would not have envisaged without Europlanet support?* Yes / No

23. How many publications directly (or significantly) resulting from the visit do you intend to produce in the next three years?*: 0 / 1 / 2 / 3 / 4 / 5 / 5+

24. How many conference presentations/papers directly (or significantly) resulting from the visit do you expect to give in the next three years?*: 0 / 1 / 2 / 3 / 4 / 5 / 5+

25. What is/will be the main impact of the visit on your current/future work and investigations?*

26. Do you expect to engage in any outreach activity related to the research conducted on your visit (e.g. media or journalists; school visits, presentations, public workshops or sessions, interactions with teachers)?*: Yes / No

27. Please provide any further comments on your project and expected impact of your work during the visit.

This could be on your research, future collaborations, dissemination, etc.

28. Please provide any general comments on the Transnational Access (TA) scheme and specifically any improvements that you consider would help in the future operation of the scheme.

29. If there are any other materials (e.g. articles, blogs etc) relating to your visit, please give details, add any links here or upload a file below.

29a. File Upload

SUBMIT

1.2 Indicators for Transnational Access Impact

Why do we need this? As a condition of funding for Europlanet 2024 Research Infrastructure (RI), we must provide this information to the European Commission as part of our reporting. It will also help us make a case for future funding, and help us shape our sustainable TA programme, which we plan to run annually from 2025 onwards (fully funded by the Europlanet non-profit association). It is also critical for future applications for TA funding that outputs (such as publications) based on work from all TA programmes (current, Europlanet 2024 RI, 2020 RI etc) are included in the form. We do not expect that

every site or facility will have something to report for every type of activity but we need to ensure that we know about activity that does occur.

Instructions: Please fill in the form below with reference to activity since July 2024. If, however, there is activity from earlier phases of Europlanet 2024 RI and/or from Europlanet 2020 RI that has not been reported previously, please also include that here (you can find the listings of everything entered to date on the European Commission's CORDIS results pages for [Europlanet 2020 RI](#) or [Europlanet 2024 RI](#) projects). You also need to note which RI an output is most related to (e.g. 2020, 2024).

It is also key that each TA site or facility helps to collect feedback from visitors at the conclusion of their visits, by having them fill in an online feedback form. This form can be found [here](#) and we will also send the link to you and to the visitor via e-mail

Fields marked with an * are required

1. Select TA Programme: Europlanet 2024 RI Planetary Field Analogues (TA1) /Europlanet 2024 RI Distributed Planetary Laboratory Facility (TA2) / Europlanet 2020 RI TA programme (2015-2019) / Europlanet RI TA programme (2009-2012)

1a. Select Europlanet 2024 RI TA1 Field Site.

1b. Select Europlanet 2024 RI TA2 Laboratory Facility (Europe).

1c. Select Europlanet 2024 RI TA2 Facility (Korea).

1d. Other Europlanet TA site

If you can't see your TA site in the lists above, write here the name of your facility.

2. Have you been involved in scientific meetings of any nature outside your department that made reference to Europlanet activities (current programmes or past EC-funded RIs)? * Yes / No

Please report any relevant meetings that you have held since you last filled in this form.

3. Have you engaged in any sort of collaborative activity around research or training, related to Europlanet activities (current programmes or past EC-funded RIs)?* Yes / No

3a. Type of collaborative activity: Developing joint research proposal / Submitting joint research proposal / Supporting or advising on another individual's or group's research proposal / Organising or hosting a meeting or other joint event / Staff exchange / Initial Training Network (ITN) / Training-related application / Other training-related collaborative activity / Other (please give details)

Choose one. If your activity is a combination, please choose the main type and give additional details in the box below.

3b. Please give details of collaboration

Please describe the activity, who is involved (especially whether from academia, industry or other), stage (starting, ongoing, completed), and geographic range (whether it is

local/regional/national/international). Please also note whether these came about via a particular programme (e.g. RISE, MOST).

4. Have there been any publications related to Europlanet activities (current programmes or past EC-funded RIs)?* Yes / No

List any new publications, and/or conference proceedings, abstracts with DOI etc, since you last filled in this form (including ones relating to current or previous Europlanet projects). Please also indicate which RI the publications are most closely linked to (e.g. current activities or past EC-funded RIs (Europlanet RI 2009-2012, Europlanet 2020 RI 2015-2019, Europlanet 2024 RI 2020-2024).

5. Please describe any engagement with industry.

e.g. industrial use of TA sites or involvement in JRA activities or your facility; any other industrial collaborations or commercial developments not mentioned above. Please also indicate which RI these activities are most closely linked to (e.g. current activities or past EC-funded RIs (Europlanet RI 2009-2012, Europlanet 2020 RI 2015-2019, Europlanet 2024 RI 2020-2024).

6. Please list any letters of support you have written related to TA visits or Europlanet activities (current programmes or past EC-funded RIs).

This could include letters for TA visitors applying for PhDs or post-docs, for other jobs, or for funding bids that you have written since you last completed this form. Please also indicate when these letters of support were written (e.g. during current activities or past EC-funded RIs (Europlanet RI 2009-2012, Europlanet 2020 RI 2015-2019, Europlanet 2024 RI 2020-2024).

7. Please describe any policy engagement/strategy development at any level (worldwide, EU, national, institutional) you have been involved in.

Please give any details of any policy activity since you last completed this form e.g. writing or contributing to briefings; participating in policy events; contributing to consultations or briefing notes. Please note whether this is at local/regional/national/international level.

8. Please describe any outreach activity you have engaged in related to planetary science, even if not directly connected to a TA visit.

Please give details of any outreach activities since you last filled in this form e.g. engagement with the media or journalists; school visits, presentations, public workshops or sessions, interactions with teachers. Please note whether local, regional or national.

9. Please describe any new research spinoffs and/or collaborations in any scientific discipline resulting from current or previous Europlanet TA activity.

Please list any research spinoffs and collaborations from recent activities or past EC-funded programmes e.g. Europlanet 2024 RI (2020-2024), Europlanet 2020 RI (2015-2019) or Europlanet RI (2009-2012).

10. Have you registered any Intellectual Property Rights related to work funded by Europlanet activities (current programmes or past EC-funded RIs)? * None / Patent / Trademark / Registered design / Utility model / Other

Your name*:

Email*:

SUBMIT

1.3 Transnational Access Visit - Longterm Follow-Up Form 1

Title: Dr / Prof / Mr / Ms

First Name:*

Last Name:*

Your nationality:*

Gender:* Female / Male / Non-binary / Provide own description / Prefer not to say

Your institution:*

Contact email:

1. TA Project Number. *

2. Did you travel to the TA facility, or was it a virtual visit?* Yes, I travelled there / No, it was a virtual visit

3. Which Transnational Access Programme did you apply to?* Planetary Field Analogues (TA1) / Distributed Planetary Laboratory Facility (TA2) Europe / Distributed Planetary Laboratory Facility (TA2) Korea

4. How many publications directly (or significantly) resulting from the visit do you intend to produce in the next three years?*

4a. Have any been submitted/accepted?* Yes / No

5. How many conference presentations/papers directly (or significantly) resulting from the visit do you expect to give in the next three years?

5a. Have any been submitted/accepted/presented?* Yes / No

6. Have you engaged in any outreach activity related to the research conducted on your visit (e.g. media or journalists; school visits; presentations, public workshops or sessions, interactions with teachers)?* Yes / No

7. Do you expect to engage in any future outreach activity related to the research conducted on your visit (e.g. media or journalists; school visits, presentations, public workshops or sessions, interactions with teachers)?* Yes / No

8. Have there been any other outcomes or impacts from your visit (e.g. on your research, new potential collaborations, dissemination etc)?* Yes / No

9. Have you had any interactions (in person or online) with the host facility since your visit?*

This could include questions related to research conducted during your visit, future collaborations, or other forms of support for your research or your career, etc.

10. Reflecting back on your visit, what do you think will be the main impact of it on your current/future work and investigations?

11. Please provide any further comments on your visit that you think may help us improve the Transnational Access (TA) scheme.

SUBMIT

1.4 Transnational Access Visit - Longterm Follow-Up Form 2 (2 Year+ Post Visit)

Title: Dr / Prof / Mr / Ms

First Name:*

Last Name:*

Your nationality:*

Gender:* Female / Male / Non-binary / Provide own description / Prefer not to say

Your institution:*

Contact email:

1. TA Project Number.*

2. Did you travel to the TA facility, or was it a virtual visit?* Yes, I travelled there / No, it was a virtual visit

3. Which Transnational Access Programme did you apply to?* Planetary Field Analogues (TA1) / Distributed Planetary Laboratory Facility (TA2) Europe / Distributed Planetary Laboratory Facility (TA2) Korea

4. How many publications directly (or significantly) resulting from your TA project have you produced since your visit?*

4a. If one or more, please give details, including status (e.g. submitted, accepted/in press, published).

5. How many conference presentations/papers directly (or significantly) resulting from the have you given since your visit? Please also include any that have been accepted for upcoming conferences *

5b. If one or more, please give details.

6. Have you engaged in any outreach activity related to the research conducted on your visit (e.g. media or journalists; school visits; presentations, public workshops or sessions, interactions with teachers)?*

7. Please let us know about any other impacts from the visit (e.g. new research activity, collaborations, etc.)

SUBMIT