INTEGRATING OPEN AND CITIZEN SCIENCE INTO
ACTIVE LEARNING APPROACHES IN HIGHER EDUCATION

Report on Stakeholder Consultation Workshop

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Abstract:	The INOS Stakeholder Consultation Workshop was an opportunity to consult with Open and Citizen Science experts, practitioners and policymakers regarding recommendations for integrating OS/CS into HEI learning approaches. This report summarises their response and offers a basis for future vision and policy recommendations.
Keyword list:	Open Science, Citizen Science, stakeholders, report, engagement
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List of Abbreviations

The following table presents the acronyms used in the deliverable.

Abbreviations	Description
OS	Open Science
CS	Citizen Science
HEIs	Higher Education Institutions
HE	Higher Education
SDGs	Sustainable Development Goals
EU	European Union
ECTS	European Credit Transfer System
EC	European Commission
UN	United Nations

Executive Summary

Since the beginning of the project in 2019, INOS (Integrating Open and Citizen science into active learning approaches in Higher Education curricula) has been working to integrate and mainstream Open Science (OS) and Citizen Science (CS) in HE curricula and teaching practices. Successful dissemination of project results and engagement of stakeholders plays a big role in achieving these objectives. Over the three years of the INOS project, partners have sought to raise awareness of project goals and outputs and seek feedback from stakeholders to help facilitate the adoption and implementation of project results and contribute to a policy and mindset change in the community. INOS has strived to create a two-way interaction with key stakeholders by giving them opportunities to connect, engage and contribute to project outputs.

The Stakeholder Consultation Workshop was envisioned as an opportunity for project members to gather key stakeholders in the field of OS/CS in Higher Education Institutions (HEIs) and discuss the following topics:

a) HE curricula development for academic staff, library staff and researchers taking into account interdisciplinarity,

b) alternative learning and training models

c) synergies and gaps in skills building for different groups and

d) incentives for cultural and policy change.

This event aimed to create a knowledge base from which to write the forthcoming Vision and Policy Recommendations document, which aims to a) potentially be adopted by HEIs (including academic libraries) and b) encourage policy change by raising awareness of the societal impact of OS and CS inside and outside HEIs.

The event, therefore, targeted stakeholders with a high level of interest and influence in the fields of OS and CS in Higher Education and asked them to give their thoughts and feedback on the current recommendations coming out of the INOS project. These recommendations were collected through two stakeholder vision-building workshops that took place in the spring of 2021:

1) Citizen & Open Science in Higher Education: Co-Creating a Shared Vision
2) Shakers & Makers: Key Stakeholders in Open Science & Citizen Science

The outcomes of these two workshops can be read in the report, *Co-Creating a Shared Vision for Citizen Science in Higher Education: Pitfalls and Recommendations Report on two Vision-Building Workshops* (O6A1[1]). Also considered were the findings developed in the INOS report, *Roadmap for Capacity Building on Open Science and Citizen Science for Research Libraries*[2]. This report was created following consultations with INOS stakeholders from the academic library sector.

Participants of the Stakeholder Consultation Workshop described in this report were asked to reflect and discuss the importance of OS/CS integration in HE, the potential for resource creation to enable capacity building and communication methodologies that could help foster this change, and the implementation of training to address skills gaps amongst key implementors within HEIs. The workshop began with some introductory talks laying the foundation for the discussion and giving inspiration by displaying current best practices in the field to stimulate the discussion.

The following report depicts the methodology used to design this workshop, the initial outcomes and the main recommendations derived from the discussion. It lays the foundation for the forthcoming Vision and Policy Recommendations (O6A4) report.

[1] Kalaitzi, Vasso, Yankelevich, Tatsiana, & Buunk, Iris. (2021). Co-Creating a Shared Vision for Citizen Science in Higher Education: Pitfalls and Recommendations Report on two Vision-Building Workshops. Zenodo. https://doi.org/10.5281/zenodo.4837243

[2] Yankelevich, Tatsiana. (2021). Roadmap for Capacity Building on Open Science and Citizen Science for Research Libraries. Zenodo. https://doi.org/10.5281/zenodo.5636187

Introduction

Scope

This report will present the framework, methodology and outcomes of the **INOS Stakeholder Consultation Workshop – Strategies For Cultural And Policy Change** which took place online in June of 2022**.** It begins with a discussion of the framework and methodology for the workshop design. It then discusses the initial outcomes from a first analysis of the workshop discussion, culminating in some conclusions and recommendations that will be built upon in the forthcoming Vision and Policy Recommendations report. Therefore, this report should be treated as an outline of the 'raw' discussion points developed from the workshop and built upon in the forthcoming recommendations document. Although making claims for policy change is beyond the scope of this report, it will, however, provide some interesting insights into the real challenges that are being faced by key stakeholders and experts in the field of OS/CS in HEIs, and provide a sound basis for the need for policy and cultural (mindset) change to overcome these barriers.

Audience

The workshop generally targeted three stakeholder groups: 1) Higher level library/university staff, 2) policymakers, and 3) members of OS/CS projects and initiatives. The methodology section of this report will explain the logic and methods for procuring the participants for the workshop. However, this report is aimed at all those involved (or potentially involved) in implementing or taking part in OS/CS activities in HEIs. The outcomes of the discussion are useful for anyone who is looking for guidelines and recommendations on how to help their institution advocate for OS/CS practices, integrate open innovation and open knowledge learning activities or simply understand better the barriers that practitioners face in the integration of OS/CS at HEIs, and the potential tools that could be used to overcome these barriers.

Methodology

Stakeholder engagement

Intellectual Output 6 (IO6) of the INOS project is related to engagement, raising awareness and fostering policy change for integrating OS/CS into HE learning approaches. This process began with the creation and implementation of a structured Engagement and Outreach Plan, describing the INOS project's objectives, approach and activities to engage with its key stakeholders and disseminate project-related outputs and information effectively. It provided a plan for outreach and engagement activities intending to help partners collaborate and contribute to the dissemination and engagement efforts in a structured and coordinated way. In this plan, Higher Education (HE) staff, students and those working in libraries were identified as key stakeholders ranking highly on the interest scale of the interest/influence matrix. However, the stakeholders ranked highest on the matrix when influence was considered were libraries, HEIs, policymakers, and OS/CS projects and initiatives (see *Figure 1*).

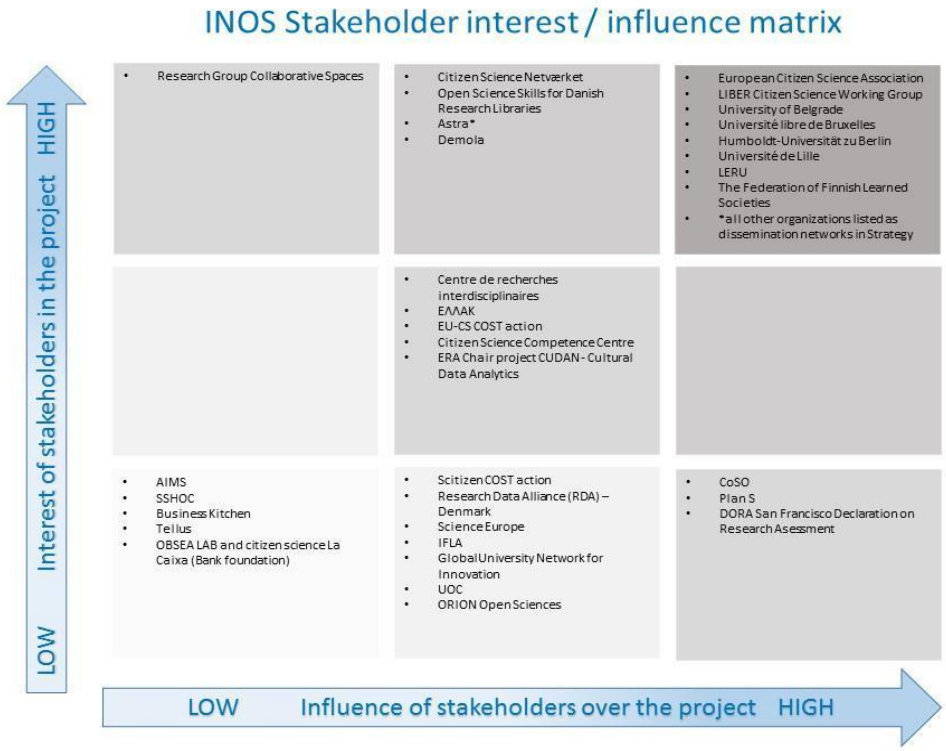

Figure 1 – INOS Stakeholder matrix

In light of this analysis, the Stakeholder Consultation workshop aimed to attract stakeholders with a high level of interest, influence, and crucially, expertise in the field of OS/CS in HE.

Therefore, a targeted invitation process occurred to ensure the participants in the workshop were members of three key stakeholder groups as outlined by the stakeholder landscape analysis performed at the beginning of the project. These stakeholders were: 1) Higher level library/university staff, 2) policymakers and 3) members of OS/CS projects and initiatives.

Participants were found using the contacts from the LIBER CS working group, internet research of local Dutch OS and CS communities, project partners networks and international professional organisations like ESCA and SciStarter. A special effort was made to include policymakers, especially European Commission (EC) representatives. In addition, we gave special attention to attracting participants from similar Erasmus+ projects such as eCHOing, LibOCS and CeOS_SE.

Structure of workshop

The design of the workshop was developed following a similar structure to the highly fruitful O6A1 workshops[3], which began with introductory talks to inspire the subsequent discussion-based breakout groups, guided with prepared questions and talking points. The topics and presenters of the introductory talks were as follows:

1) Katerina Zourou (Web2Learn): An introduction to the INOS project
2) Rosie Allison (LIBER): INOS Roadmap and Shared Vision for Capacity Building in OS/CS in HEIs
3) Margaret Gold (Leiden University): The Citizen Science Lab at Leiden University

The first two talks were designed to overview the INOS project, its goals, structure, and work done so far. Katerina Zourou (Web2Learn) presented INOS and its intimate goal of developing a framework for integrating OS/CS into higher education learning approaches.

[3] Kalaitzi, Vasso, Yankelevich, Tatsiana, & Buunk, Iris. (2021). Co-Creating a Shared Vision for Citizen Science in Higher Education: Pitfalls and Recommendations Report on two Vision-Building Workshops. Zenodo. https://doi.org/10.5281/zenodo.4837243

In the second talk, Rosie Allison (LIBER Europe) focused on the outcomes of previous stakeholder workshops conducted in 2021, which led to the creation of two reports: **Co-creating a Shared Vision for Citizen Science in Higher Education: Pitfalls and Recommendations**[4] and the **Roadmap for Capacity Building on OS and CS for HEI Library Staff**[5]**.** A factsheet summarising the main points from these two deliverables was sent to participants to prepare before the event and can be found in Annexe 1.

The third talk by Margaret Gold, Coordinator of the Citizen Science Lab at Leiden University, the Netherlands, was designed to showcase best practices for integrating OS/CS into traditional HEIs. The Leiden Citizen Science Lab was showcased as a prime example of how CS can be integrated into the workings of an institution through the library as a central hub, allowing for transdisciplinary practices that engage society in a meaningful and mutually beneficial way.

Workshop aims

The Stakeholder Consultation Workshop was designed to lay the foundations for a Vision and Policy Recommendations document (O6A4). This report will set out a list of final recommendations to a) potentially be adopted by HEIs (including academic libraries) and b) encourage policy change by raising awareness of the societal impact of OS/CS inside and outside HEIs.

Reaching a high number of stakeholders was not the aim of this workshop (this point will be readdressed in the final multiplier event that will take place at the end of the project). However, the intention was to gather a complementary group of stakeholders with high levels of interest, influence, and expertise in OS/CS in HEIs. The target number of participants was between 15-20, to allow for small groups of approximately five stakeholders (plus a moderator) to be formed. This size group was the optimum number to allow for a detailed and thorough discussion of the points of interest.

Points of discussion

Before the workshop, participants were sent a factsheet summarising the findings of two previous INOS IO6 reports and several discussion points that would frame the structure of the breakout sessions to ensure participants were well prepared and aware of their role as discussants.

[4] Ibid
[5] Yankelevich, Tatsiana. (2021). Roadmap for Capacity Building on Open Science and Citizen Science for Research Libraries. Zenodo. https://doi.org/10.5281/zenodo.5636187

The points were as follows:

1. Benefits of OS/CS
    - What are the societal benefits of OS and CS, inside and outside HEIs?
2. Resources to support capacity building on OS/CS in HEIs
    - What resources (programmes, collaborations, financial supports, platforms, tools etc.) are needed to support capacity building in OS/CS at HEIs?
3. Targeted OS communication to foster capacity building
    - What communicative resources are necessary to improve capacity building in OS and CS at HEIs?
4. Implementation of structured capacity building (training)
    - How do you envision implementing training programmes for OS/CS capacity building at HEIs?
5. Systematic change and advocacy
    - What cultural and/or policy changes could help move OS/CS up the list of priorities for Higher Education institutes?

The discussion points were created to build on the findings of the previous INOS stakeholder discussions, aiming to go one step further in asking participants how alteration in policy and mindset could bring about the changes they saw as necessary to foster the integration of OS/CS practices at HEIs. The questions, therefore, sought not only to ask *what* but *how* those with influence envision such change.

Following the three introductory talks, participants were split into groups of max 6 participants (to allow for an intimate discussion), joined by a moderator from the INOS project to help facilitate the discussion. Each group was requested to write their ideas on Jamboards to ensure their thoughts were recorded and to allocate a notetaker who would then give feedback on the group's thoughts during the final plenary session. Examples of the Jamboards used to collect participants' views can be seen in Annexe 2.

After approximately one hour of discussion, participants were brought back together for a plenary session, in which the allocated notetaker summarised the main discussion points of each group.

The decision was made not to record the Stakeholder Consultation Workshop to reassure participants that they could speak freely and without inhibitions when discussing policy change matters.

Participants

Table 5 summarises the participants and their stakeholder categories:

Table 1 - Participant breakdown

Stakeholder group	Number of participants
Policymakers	1
HE management	6
Academic and library staff	8
OS/CS training networks	2
Total	17

The workshop reached a good number of high-level HE and library management staff, as well as one policy officer from the European Commission.

Although it would have been desirable to reach more policymakers to get their perspective on the real changes that could be enacted in this field on a governmental level, the fact that one policymaker was engaged and made aware of the outcomes of the INOS project was a positive step for the project. This point will be built upon in the final multiplier event that will take place at the end of August 2022, when the project ends.

Outcomes

The Stakeholder Consultation Workshop produced a thorough set of outcomes that can be split into five main areas: 1) societal benefit of OS and CS, 2) resources needed to enable capacity building, 3) targeted OS communication to foster capacity building, 4) training needs and skills gaps and 5) systematic and cultural changes.

The societal benefits of Open and Citizen Science

The societal benefits of OS/CS integration at HEIs have been well documented and were a key talking point at previous INOS workshops[6]. Participants were asked during this discussion to go one step further in asking how these societal benefits could be increased and the cultural/policy changes necessary to facilitate this. Participants noted from their experiences that opening the scientific process and involving citizens is beneficial in the following ways:

Increase trust and transparency

A common point raised, particularly by stakeholders involved in the research process at HEIs, was that involving OS/CS practices at their institutes helped increase science transparency and an understanding of the scientific process, which, in turn, built societal trust around research.

Participants noted that this effect is good for citizens and HEIs, who experience more stable funding due to the acceptance of science in society. When researchers participate in OS/CS activities with citizens, they also gain valuable skills of collaboration, facilitation and teamwork that will benefit them in their future careers. Training materials can also be created from the open data sets produced when OS/CS occurs at HEIs.

In libraries, their role as trusted community hubs can be solidified through OS/CS activities, bringing a wider range of citizens into the library to participate in scientific processes.

[6] Kalaitzi, Vasso, Yankelevich, Tatsiana, & Buunk, Iris. (2021). Co-Creating a Shared Vision for Citizen Science in Higher Education: Pitfalls and Recommendations Report on two Vision-Building Workshops. Zenodo. https://doi.org/10.5281/zenodo.4837243

Increases relevance, capacity for change and innovation

Participants emphasised how integrating OS/CS practices at HEIs produces scientific research that is more relevant to society and ultimately more likely to result in actual societal (or governmental) change. Partnerships between knowledge institutions and citizens help address local questions that are pressing to society, therefore increasing the relevance of scientific research. The results of this research are more likely to be adopted by local (or national) governments, as they are well backed up with real-life examples. When such practices are integrated at a curricula level, students are encouraged to use open practices in their studies and future careers, therefore, becoming OS/CS advocates and multiplying the positive benefits.

Innovation in the scientific process is also increased when the participation of citizens is encouraged, and results are shared openly. New perspectives can be found, but also the reproducibility of results increases commitment to scientific outputs, therefore increasing the capacity for change.

Libraries once more were noted as key to this effect, acting as facilitation hubs where society and science can meet.

Creates an open knowledge base accessible to all

Particularly concerning CS, the scientific participants noted that the scientific results produced are often presented in a way that is more accessible to non-experts. This approach increases transparency and enables a wider audience to read and understand the research results and the scientific process.

As a result, scientific results are shared more widely, understood and re-used by a larger proportion of society, and are ultimately more likely to enact real social change. Scientific literacy can also be improved, driving scientific engagement and involving citizens who may previously have been excluded from the scientific process.

Enabling wider access to knowledge through OS/CS integration at HEIs was noted to be a key method through which institutions can help achieve the United Nations Sustainable Development Goals (SDGs)[7]. By advocating for societal involvement, issues such as climate change, poverty, health and wellbeing and gender equality can be addressed from the bottom-up.

[7] *Take action today*. (2022, February 21). The Global Goals. Retrieved July 22, 2022, from https://www.globalgoals.org/take-action/?id=17

Resources to support capacity building*[8]

The next point addressed by participants focused more on the actual resources needed for HEIs to continue to, or begin to, integrate OS/CS into their learning approaches. Capacity building was understood to develop and strengthen skills, instincts, abilities, processes and resources necessary to advance the OS/CS movement at HEIs and their libraries. The following recommendations were brought forward:

Open Science should be made a strategic priority by management

Participants lamented the lack of structured guidance for integrating OS/CS in HE, stating that it should be a strategic aim at the institutional level and, therefore, a priority of HE management staff. For this to happen, there needs to be more advocacy for OS/CS at a national level to feed down to institutional strategies.

Making OS/CS a strategic priority would encourage citizen science approaches within academia, making it a natural part of the scientific process. This point would ensure a more long-term perspective rather than creating short-term projects with benefits often lost when funding ends.

Addressing the lack of labour capacity

Intrinsically linked to the idea of making OS/CS a strategic priority is the need for increased labour capacity within HEIs to integrate OS/CS practices fully. Participants noted that specific roles should be created to enable this integration, rather than adding to the current workload of already-overstretched researchers, administrators, professors and librarians.

One way of overcoming this (suggested by participants) is to break down the traditional, rigid structure of the university and create specialised hubs or labs where OS/CS training, advocacy and ideas can be created and shared. Crucially, these labs should be specifically funded and run by specialist staff, rather than already existing labourers who do not have the time, resources or skills necessary to make such labs/hubs sustainable.

[8] * Capacity building was explained to participants as the ability to develop and strengthen skills, instincts, abilities, processes and resources necessary to advance the OS/CS movement at HEIs and their libraries.

Many participants suggested that the library is the ideal location for such a lab to be created, as libraries can act as a bridge between academic staff and wider society[9]. Yet the issue remains that these activities must be specially funded, and labour capacity must be increased to staff them sustainably.

Creation of infrastructure to bridge the cultural gap between stakeholders

A wide array of stakeholders are involved in implementing OS/CS activities[10]. However, it is not always easy to connect these stakeholders to ensure clarity on the benefits to each stakeholder. Participants suggested the creation of infrastructures (platforms, a community of practice, tools) to bridge this gap and ensure that all stakeholders are aware of the benefits of OS/CS participation and integration in HEIs.

The creation of such infrastructures and what exactly they should look like was unclear to participants. However, there was a strong suggestion that mapping techniques need to take place to evaluate what resources are missing in this regard.

Methodological frameworks to evaluate the impact of OS/CS activities in HEIs

A key issue raised during the workshop was the importance of knowledge transfer. Participants noted that since OS/CS is often advanced through short-term projects, there is the risk that the practical knowledge and skills needed to run OC/CS projects/activities are lost when these projects come to an end. There is, therefore, a need for methodological frameworks to evaluate the impact of OS/CS activities in HEIs so that lessons can be learned and practical knowledge effectively transferred.

A further issue was the need to think on a national level regarding OS/CS knowledge transfer and impact evaluation. Programmes often exist on an EU level but are less likely to be adopted nationally. Creating large, visible projects would further advocate for OS/CS integration and allow for larger-scale evaluation of impacts and the subsequent transfer of this knowledge.

Caveats

On the issue of the resources needed to increase capacity building on OS/CS in HEIs, the caveat of the importance of emphasis on scientific ethics and the quality of scientific research was raised by several

[9] Ayris, Paul and Ignat, Tiberius. "Defining the role of libraries in the Open Science landscape: a reflection on current European practice" *Open Information Science*, vol. 2, no. 1, 2018, pp. 1-22. https://doi.org/10.1515/opis-2018-0001

[10] Vohland, K., Land-Zandstra, A., Ceccaroni, L., Lemmens, R., Perelló, J., Ponti, M., ... & Wagenknecht, K. (2021). *The science of citizen science* (p. 529). Springer Nature.

participants. Open Science (and Citizen Science) should be a method of creating ethical, reliable, and replicable scientific research rather than a goal in itself.

Targeted Open Science communication to foster capacity building

A concurrent issue in the mainstreaming of OS/CS is the need for better communicative resources and channels so that the benefits of OS/CS, the skills needed, and the knowledge it creates can be transmitted effectively and efficiently to the large array of stakeholders involved[11]. Participants made concrete recommendations for improving OS/CS communication and the cultural and policy changes needed to get there.

OS/CS communication experts

Concurring with the above point regarding the lack of specialised labour to enable OS/CS integration into HEIs, participants noted that communication experts are needed to accurately communicate the benefits and outcomes of OS/CS activities to HE stakeholders. Participants noted that inexpert staff, often in the library, are usually tasked with communicating such activities, and therefore communication can be less effective.

The recommendation was to develop positions for trained communications staff who understand how to communicate in the target group's language. This point would first require an understanding of each group's needs/aims/visions, which could be obtained through mapping exercises, as previously suggested.

Libraries once more were noted as the natural home for such communicative efforts. They have a unique position at the heart of the community to act as communicators, translating the research findings into easy-to-digest information[12]. Participants noted certain practical recommendations that could be integrated into

[11] Ayris, D. P., de San Román, A. L., Maes, K., & Labastida, I. (2018, May). *Open Science and its role in universities: A roadmap for cultural change* (No. 24). Retrieved from: https://www.leru.org/publications/open-science-and-its-role-in-universities-a-roadmap-for-cultural-change#

[12] Ayris, Paul and Ignat, Tiberius. "Defining the role of libraries in the Open Science landscape: a reflection on current European practice" *Open Information Science*, vol. 2, no. 1, 2018, pp. 1-22. https://doi.org/10.1515/opis-2018-0001

the library structure, such as building training kits to explain the main values of OS/CS and creating interactive guidelines.

Involving other institutions to multiply results

Most participants agreed that communication efforts regarding OS/CS implementation should be multiplied and spread more widely to ensure proper recognition of societal benefits and increased advocacy. Sharing benefits through external events with other institutions such as public libraries, NGOs, schools and government agencies were recommended to achieve this goal.

Some participants recommended wide communication campaigns on the importance of OS that begin with high school students, so that cultural changes can begin to be felt as future generations enter the academic field with an appreciation of OS principles.

As well as OS/CS communication in schools, participants advocated strengthening the connection between public and academic libraries. Public libraries hold an important role within communities, but cooperation between academic and public libraries was noted to be often scarce. Involving public libraries could aid in translating OS/CS benefits, increase knowledge transfer amongst key stakeholders and offer places where 'kits' and other tools/services for implementing OS/CS activities could be accessible.

Training programmes and recognition/rewards

A key issue raised was the need to clarify the terms, concepts and values of OC/CS through cohesive training programmes for all stakeholders. Communicative devices such as infographics, factsheets and tutorials were suggested to share this knowledge in an accessible manner. These methods should be cohesive and centralised across all institutions, in 'knowledge hubs' or 'labs' where stakeholders can be trained in OS/CS best practices.

Participants emphasised that such training must be accompanied by correct recognition and rewards for the integration of OC/CS to be sustainable. A system of recognition for current OS/CS activities should be established to help knowledge transfer procedures and motivate others to uptake these activities.

As a practical example, recognition and reward systems could be altered to incentivise research that furthers the UN SDGs. This point would add a politic of research *impact* to evaluation procedures – e.g. recognising and celebrating impactful research in that it works towards societal goals. This process should

be widely communicated to encourage other practitioners to work towards similar goals. As such, a cultural and mindset shift could be achieved in the academic and HE sphere towards a greater appreciation of Open research that celebrates and encourages citizen engagement.

Training needs and skills gaps

Running horizontally through all recommendations regarding the cultural and policy changes required to cement the integration of OS/CS into HE learning approaches is the need to close skills gaps on key competencies through structured and coherent training. Participants were asked how they envisioned such training schemes and what political and mindset changes could be instrumental in ensuring the sustainability of such programmes:

Lifelong learning programmes outside of the university community

For most participants, OS/CS awareness should start before higher education and should continue in all aspects of academic training. Lifelong learning programmes were suggested, starting from high school pupils and extending to all interested citizens. These programmes could be situated in libraries (public and academic) to ensure they are accessible to all.

Such programmes should include the importance of all aspects of OS, not only CS. They should clarify the scientific process for those people outside of academia to increase scientific literacy, trust, and understanding in scientific research. They should be co-created with different target groups and target the upcoming researchers and teachers who are the future of the OS movement.

In terms of the policy change that could aid the creation of such programmes, once more, a system of rewards was proposed as a key tool. Calls for projects that fulfil these aims on a European level could incentivise their creation, but correct reward procedures were noted as crucial for the sustainability of OS training.

Incentives for students within HEIs

Participants recommended that incentives should also be given within HEIs to students who take courses regarding implementing OS approaches, which could be implemented through the allocation of ECTS (European Credit Transfer System) points, or by connecting students' practice hours to CS projects.

The courses offered to students could be standalone courses on OS/CS competencies or could be integrated into other courses as obligatory modules. They should focus not only on technical issues and tools needed for OS/CS practices but also on soft skills such as communication techniques and community building.

It was also suggested that academic staff could assist in training students in OS/CS practices by allocating tasks around current OS/CS activities to students, giving them practical experience and helping solve the shortage of staff available for such activities.

Evaluation of teaching methods on OS/CS

Participants noted that the training methods for teaching OS/CS should be evaluated to check for effectiveness. There were several recommendations for practical examples of training programmes; online modules co-created with PhD students, websites with practical examples of how to start a CS project, webinars to share knowledge on OS/CS practices and public education programmes performed together with popular media sources. But several participants emphasised that these programmes should be developed using evidenced pedagogical processes to ensure their effectiveness. Furthermore, the teaching methods should reflect the group's training targets and be tailored to their specific needs. Participants concluded that regardless of the target group or formality of the OS/CS training, tested and evidenced pedagogical processes should be used to implement any and all programmes created.

Systematic and cultural changes

All of the above recommendations suggest practical, political and cultural changes that could ensure the sustainable integration of OS/CS practices into HE learning approaches. As a final thought, participants were asked to summarise the systematic and cultural changes they foresee as necessary to see real changes in this field.

Change in the evaluation of research integrity

A recurring theme throughout the discussion was the need for proper and correct recognition and reward for using open principles when conducting scientific research, from students to professors. Whilst research integrity is still based on metrics such as impact factors. Participants argued that open collaboration and knowledge sharing (key values in OS/CS) will always be secondary.

Engagement in OS/CS activities should be rewarded and promoted for researchers and students. Recruiting bodies should recognise OS/CS activities as equal to other scientific work, motivating early career researchers and students to partake in such activities to improve their career prospects.

Therefore, a cultural shift in how research is evaluated and appreciated by the scientific community was considered crucial in the sustainability of OS/CS practices at HEIs.

Advocate for OS/CS needs on all levels

The aforementioned shift in mindset toward open principles is well underway from the bottom up. However, at a governmental level, the lack of offered incentives means that HEIs still rely on individual advocates to drive the movement in their institutions[13]. Participants noted that implementation is, therefore, piecemeal and disjointed on an institutional level.

Advocating for OS/CS must occur on all levels, including ministerial levels. This point could be achieved through EU funding strategies, which should focus more on OS/CS projects. Although there has been a movement towards this in recent years, participants felt an acceleration in such funding practices was necessary through the EC's Horizon 2020 programme and other funding initiatives.

Reform of HEI structure

As discussed, participants emphasised the need for a change in labour structure within HEIs to create more specialised positions, focusing on OS/CS implementation. Participants felt that the rigid structure of HEIs needed to be reformed to become open to societal involvement. The current structure relies too heavily on academic staff performing 'extra' duties to implement OS/CS activities at their institutions rather than having specialised roles for those trained in OS competencies.

Once more, such a structural change can be leveraged from the bottom-up, but real change can only be ratified from the top-down.

[13] van der Deijl, Emma. 2021. *The only way forward.* Retrieved from https://www.nwo.nl/en/only-way-forward

Conclusion

The INOS Stakeholder Consultation Workshop was a valuable opportunity to gather key players in the field of OS and CS in HEIs, as well as those involved in policy decisions on a high level, to create a clear picture of the changes that are needed to facilitate OS/CS capacity building in HEIs, but also possible scenarios in which these changes could be realised. The many points of concurrence between participants highlight the clear need for change in areas such as the evaluation of research integrity, labour capacity, reward systems and OS/CS advocacy at ministerial levels.

The shifting mindset amongst the academic community regarding the importance of OS/CS practices is clear, with a huge rise in CS projects and publications over the past decade[14]. Yet the discussion amongst stakeholders showed clearly that this rise would not be sustainably integrated into higher education learning approaches without systematic change from the top-down to complement the bottom-up surge in OS/CS interest.

The final INOS deliverable, Vision and Policy Recommendations (O6A4), will use the findings of this report to suggest some policy recommendations for cultural and policy change. It is the aim that these recommendations could be adopted by HEIs and governing bodies to capitalise upon the rising interest in OS/CS principles and secure the future of their integration in HEIs.

[14] Michael J. O. Pocock, J. C. (2017). *The diversity and evolution of ecological and environmental citizen science.* PLoS ONE, 1-17.

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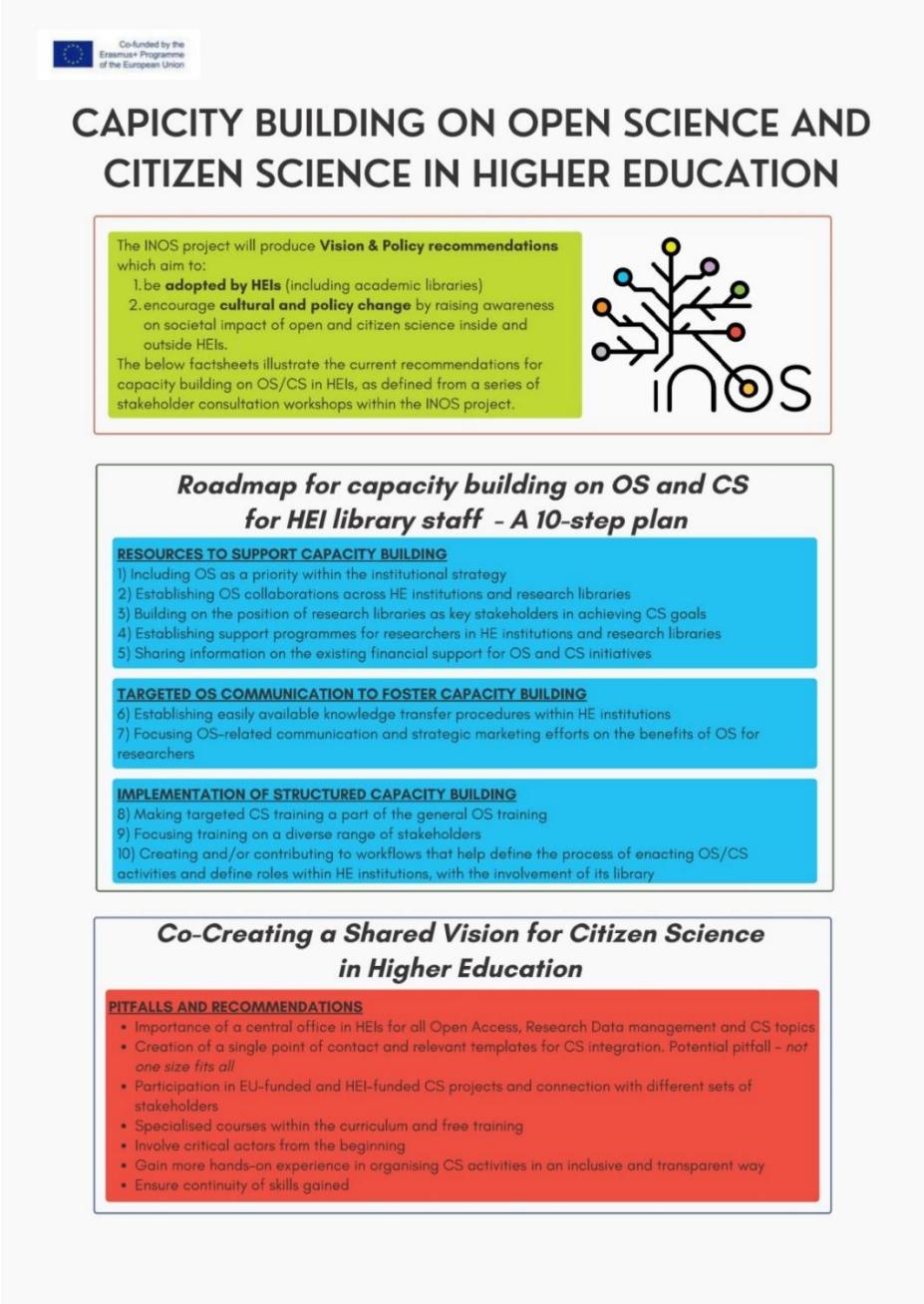
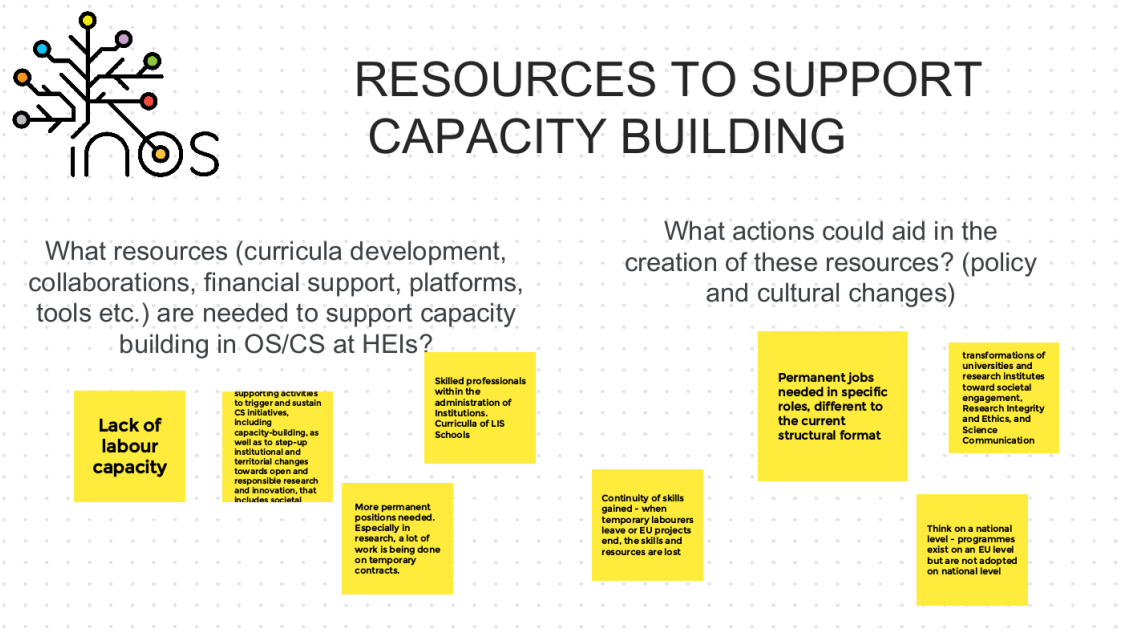
Annexe 1


Co-funded by the Erasmus+ Programme of the European Union
CAPICITY BUILDING ON OPEN SCIENCE AND CITIZEN SCIENCE IN HIGHER EDUCATION
The INOS project will produce Vision & Policy recommendations which aim to:
1. be adopted by HEIs (including academic libraries)
2. encourage cultural and policy change by raising awareness on societal impact of open and citizen science inside and outside HEIs.
The below factsheets illustrate the current recommendations for capacity building on OS/CS in HEIs, as defined from a series of stakeholder consultation workshops within the INOS project.
Roadmap for capacity building on OS and CS for HEI library staff - A 10-step plan
RESOURCES TO SUPPORT CAPACITY BUILDING
1) Including OS as a priority within the institutional strategy
2) Establishing OS collaborations across HE institutions and research libraries
3) Building on the position of research libraries as key stakeholders in achieving CS goals
4) Establishing support programmes for researchers in HE institutions and research libraries
5) Sharing information on the existing financial support for OS and CS initiatives
TARGETED OS COMMUNICATION TO FOSTER CAPACITY BUILDING
6) Establishing easily available knowledge transfer procedures within HE institutions
7) Focusing OS-related communication and strategic marketing efforts on the benefits of OS for researchers
IMPLEMENTATION OF STRUCTURED CAPACITY BUILDING
8) Making targeted CS training a part of the general OS training
9) Focusing training on a diverse range of stakeholders
10) Creating and/or contributing to workflows that help define the process of enacting OS/CS activities and define roles within HE institutions, with the involvement of its library
Co-Creating a Shared Vision for Citizen Science in Higher Education
PITFALLS AND RECOMMENDATIONS
• Importance of a central office in HEIs for all Open Access, Research Data management and CS topics
• Creation of a single point of contact and relevant templates for CS integration. Potential pitfall – not one size fits all
• Participation in EU-funded and HEI-funded CS projects and connection with different sets of stakeholders
• Specialised courses within the curriculum and free training
• Involve critical actors from the beginning
• Gain more hands-on experience in organising CS activities in an inclusive and transparent way
• Ensure continuity of skills gained

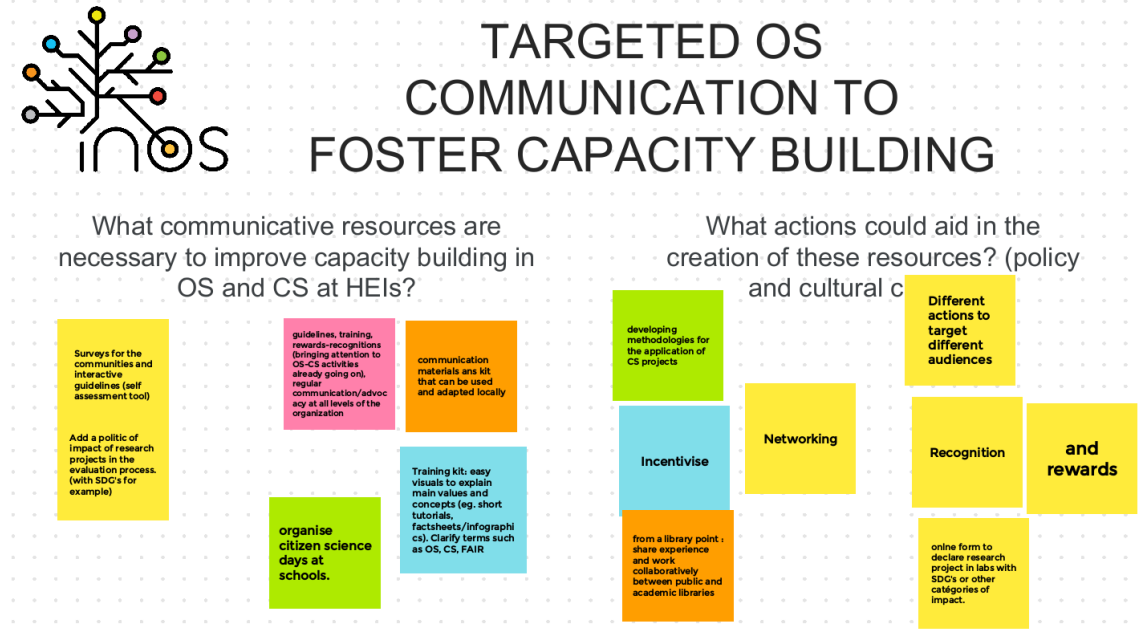
Annexe 2

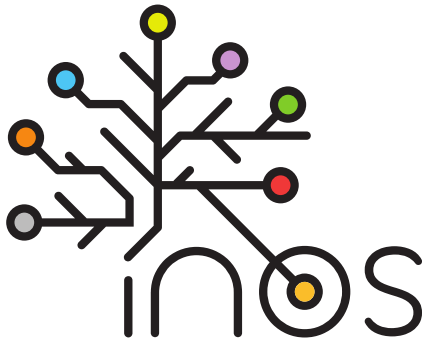
1) Example Jamboard slide – Breakout room 1



2) Example Jamboard slide – Breakout room 2

3) Example Jamboard slide – Breakout room 3





INTEGRATING OPEN AND CITIZEN SCIENCE INTO
ACTIVE LEARNING APPROACHES IN HIGHER EDUCATION

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