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OPEN ASIA
UNIFYING SCIENCE, EMPOWERING INNOVATION

Survey Report on Open Science Skills Gap in Malaysia and India

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

An Open Science skills gap assessment is a foundational component of the OPEN-ASIA, Erasmus+ project reference number: 101128493, aiming to contributing the achievement of the project goal, which is to enhance institutional capacity in mainstreaming OS values and practices into curricula, research systems and practices, and governance structures. This report presents the findings of the survey conducted in Malaysia and India, focusing on understanding the current state of OS awareness, infrastructure, and training, while identifying gaps and opportunities across five stakeholder groups:

1. Administrative staff
2. Public administrators and private sector representatives
3. Technical and support staff
4. Academics and researchers
5. Postgraduate students

The objectives of the study were to:

1. Identify priority training needs tailored to the five target groups.
2. Assess institutional bottlenecks in OS adoption (e.g., data stewardship, policy frameworks, OS-aligned curricula).
3. Inform curriculum and training design by aligning with actual OS skill gaps.
4. Provide baseline data for monitoring progress and shaping future OS strategies.

The survey was conducted via structured online questionnaires between March–August 2025, yielding 111 responses from Malaysia and 136 from India. Both quantitative and qualitative data were analyzed to capture the state of OS adoption. Several key findings are:

1. Awareness & Culture: Respondents acknowledge OS as critical for transparency and collaboration, yet cultural acceptance and institutional readiness remain limited.
2. Training & Skills: Training is inconsistent, often ad hoc, and rarely mandatory. Monitoring and evaluation of OS capacity-building programmes are weak.
3. Infrastructure: Institutional repositories, DOI services, and Open Access platforms exist but are underdeveloped, with interoperability and FAIR-aligned systems still emerging.
4. Incentives: Rewards or recognition for OS engagement are minimal, limiting motivation for staff and students.
5. Citizen Science & Engagement: This remains the least developed pillar across both countries due to limited expertise, resources, and institutional prioritisation.

Based on the findings, several high-level recommendations are proposed:

1. Strengthen Institutional Policy & Governance: Formalize OS policies, align with FAIR principles, and integrate into research integrity frameworks.
2. Capacity Building: Develop structured training tailored to stakeholder groups, make OS training mandatory for key roles, and integrate OS into postgraduate curricula.
3. Incentives & Recognition: Establish reward systems (grants, CPD credits, promotion points) and embed OS into performance evaluations.
4. Infrastructure Development: Enhance repositories, data management systems, and Open Access platforms; provide technical support for interoperability.
5. Awareness & Engagement: Launch advocacy campaigns, strengthen Citizen Science initiatives, and foster partnerships with government and private sector actors.
6. Sustainability & Monitoring: Secure long-term funding, implement systematic evaluation frameworks, and use survey results as a baseline for progress tracking.

As a conclusion, this survey provides an evidence-based roadmap for advancing OS in Malaysia and India. By addressing skills gaps, strengthening institutional frameworks, and embedding OS into teaching, research, and governance, both countries can accelerate their transition towards a transparent, inclusive, and globally aligned Open Science ecosystem.

CHAPTER 1. INTRODUCTION AND SURVEY OBJECTIVES

Open Science (OS) represents a transformative approach to conducting and communicating research, grounded in principles of transparency, accessibility, collaboration, and reproducibility. With the advancement in digital technologies and increasing global connections, the traditional models of knowledge production and dissemination are undergoing a paradigm shift. OS has emerged as a response to the need for more equitable and inclusive access to scientific knowledge, particularly in the context of addressing global challenges such as climate change, public health, food security, and digital inequality. Nurturing a vibrant Open Science eocsystem necessitates for researchers, educators, and research managers to acquire the competencies required to navigate and contribute effectively to the evolving OS ecosystem. Therefore, assessing existing capabilities and identifying skill gaps becomes critical for enabling institutional readiness and shaping responsive capacity-building strategies.

Rationale for assessing skills gap in OS

To enable an effective and sustainable integration of Open Science (OS) in higher education institutions in Malaysia and India, this OPEN ASIA project requires an evidence-based understanding of the existing competencies, gaps, and readiness across key stakeholder groups within each Partner Country Higher Education Institution (PC HEI).

The objectives of conducting the OS skills gap survey are to: (1) Identify priority training needs tailored to the different groups, (2) Assess institutional bottlenecks in implementing OS (e.g., weak data stewardship capacity or lack of OS-aligned teaching content), (3) Inform curriculum design by aligning course content with actual gaps in OS literacy, technical skills (e.g., FAIR data, repositories), and OS awareness, and (4) Support long-term OS strategy by offering baseline data to measure progress and design targeted interventions such as workshops, policy dialogues, and pilot courses.

Furthermore, the survey findings will also contribute into broader capacity-building and governance efforts, including curriculum development, staff training, and institutional policy development.

CHAPTER 2. METHODOLOGY

The survey was conducted using Google Forms as the primary tool, designed as a combination of structured and open-ended online questionnaire. The survey ran for a period of five months, from 27 March to 27 August 2025.

The target respondents were divided into five target groups. The **first target group (TG1)** included administrative staff such as top managerial leaders such as rectors, vice-rectors, directors and vice-directors of research centres, faculties, doctoral and master schools, as well as research coordinators, heads of departments, and university research officers. The **second target group (TG2)** consisted of public administrators, including policymakers and civil servants in local, regional, or national administrations who worked on research-related issues and required both theoretical and practical training on project matters. This group also included private representatives who were interested in benefitting from higher education institutions' research outputs. The **third target group (TG3)** referred to technical and support staff such as IT specialists, programmers, and librarians who were responsible for creating and maintaining operational research and open science infrastructure, as well as providing informational support to research practitioners. The **fourth target group (TG4)** represented academics, teaching staff, researchers, and scientific personnel who were engaged in day-to-day research activities, including designing and teaching training courses, developing research methodologies, and other scientific undertakings. Finally, the **fifth target group (TG5**) referred to students at the master's and doctoral levels who were actively involved in study and research programmes.

The sampling strategy for the survey covered all five target groups. Survey distribution was carried out primarily through emails and social media to ensure broad reach and participation across the identified target groups.

The limitations of the survey included challenges such as varying response rates across target groups, potential bias due to self-selection, and limited accessibility for individuals who might not have actively used digital platforms or had restricted internet connectivity.

CHAPTER 3. RESEARCH VARIABLES

In this study, the research variables were structured according to the five target groups: administrative staff (TG1), public administrators and private sector representatives (TG2), technical/support staff (TG3), academics and researchers (TG4), and postgraduate students (TG5). For each group, the variables were designed to capture demographic profiles, educational levels and areas of specialization, as well as engagement in sustainability-relevant sectors.

TG1: Administrative Staff. For administrative staff, demographic variables included institutional affiliation and role (e.g., rectors, vice-rectors, directors, research coordinators, and university research officers). Educational background and professional experience were measured, along with involvement in sustainability-relevant sectors such as institutional policy-making, strategic governance, and research administration.

TG2: Public Administrators and Private Sector Representatives. In this group, variables covered demographic profiles such as institutional affiliation, type of organization (governmental or private), and years of service. Education level (Bachelor's, Master's, PhD) and field of expertise (health sciences, life sciences, physical sciences and engineering, computer science, social sciences, arts and humanities, or other) were also captured. Sustainability relevance was assessed through prior collaboration with universities and involvement in research-driven or policy-related initiatives impacting socio-economic or environmental sectors.

TG3: Technical and Support Staff. For technical and support staff, variables included demographic data (institutional affiliation, job role such as IT specialists, programmers, or librarians) and professional tenure. Education level and specialization were measured, focusing on fields such as information technology, physical sciences, or library science. Engagement in sustainability-relevant sectors was reflected through responsibilities in maintaining digital infrastructures, data stewardship, and open science platforms supporting sustainable research practices.

TG4: Academics and Researchers. Academics and researchers were profiled according to their institution, academic role, and years of research experience. Highest education level and specialization across broad disciplinary domains (health sciences, life sciences, physical

sciences, computer science, social sciences, and arts and humanities) were recorded. Sustainability relevance was assessed through their active participation in designing research methodologies, supervising postgraduate projects, publishing in open access formats, and contributing to citizen science and interdisciplinary sustainability initiatives.

TG5: Postgraduate Students. For postgraduate students, demographic variables captured institutional affiliation, current study level (Master's or Doctoral), and phase of study (proposal defense, data collection, candidature defense, or viva preparation). Educational specialization was measured within broad disciplinary clusters. Engagement with sustainability-relevant sectors was reflected in research focus, participation in open science training, and adoption of sustainable research practices within their theses or projects.

CHAPTER 4. QUESTIONNAIRE STRUCTURE

The survey instruments were designed with tailored questionnaires for five target groups: administrative staff (TG1), public administrators and private sector representatives (TG2), technical/support staff (TG3), academics and researchers (TG4), and postgraduate students (TG5). Each questionnaire was structured into sections that aligned with the specific roles, experiences, and training needs of the target group. The full version of the surveys are included in appendices.

TG1: Administrative Staff.

Sections	Sub-sections or key themes	Additional Remarks
1. Demographic Profile		
2. Open Science Progress and Monitoring	a. Open Science (OS) Culture b. Open Access (OA) c. Open Data d. Open Science Infrastructure e. Open Science Skills f. Open Science Evaluation g. Open Metrics h. Research Integrity i. Citizen Science	This section presents a set of questions, which organisations can use to monitor their progress in implementing OS principles, practices and policies at a local level
3. Open Science Training and Policy Development	a. Areas of leadership training programs b. Monitoring, evaluation and assessment for OS training programs c. Rewards or incentives for participation in OS training programs	This section presents a set of questions, which organisations can use to monitor and develop tailored training development focusing on skills in OS.
4. Concluding Questions	a. Most important change that could promote OS at your institution b. Suggestions or challenges related to adopting OS in your role	

TG2: Public Administrators and Private Sector Representatives.

Sections	Sub-sections or key themes	Additional Remarks
1. Demographic Profile		
2. Open Science Awareness and Engagement	a. Familiarity with OS principles and practices b. Implementation of OS policy, guidelines or initiatives at your organisation c. OS aspects relevant to your role d. Partnerships with universities to access research outputs, data or expertise e. Challenges in accessing and using OS resources	This section presents a set of questions, which aim to gauge OS awareness and engagement of the target group
3. Expectations and Needs	a. OS training topics b. Support or resources to help incorporate OS into your work	This section presents a set of questions, which aim to assess the expectations and resource needs of each target group regarding OS training
4. Concluding Questions	a. How can universities better support public administrators and private sector representatives in adopting OS b. Suggestions or challenges related to adopting OS in your work	

TG3: Technical and Support Staff.

Sections	Sub-sections or key themes	Additional Remarks
1. Demographic Profile		
2. Open Science Infrastructure and Stewardship	a. Institutional support or management of Open Science infrastructure and Research Data Management b. University's capacity to generate Digital Object Identifiers c. University support for publishing platform, platform to support Citizen Science or Public Engagement, Learning Management System (LMS) or Virtual Learning Environment (VLE) for Open Educational Resources d. University's providing tools or platform to support Research Data Management e. Roles of the target group in management of Research Data Management, Open Access, e-infrastructure, Citizen Science and Public Engagement, Open Educational Resources, Open Educational	This section presents a set of questions, which aim to gauge institutional support for Open Science practices and understand the role of the target group in supporting Open Science practices.
3. Training and education	a. Challenges related to support OS practitioners b. Necessary OS knowledge, resources, tools and skills to help improve your role in supporting OS initiatives c. Targeted training on OS related topics d. Promotion of Open Science principles to researchers e. Support needed to advocated for Open Science in your institution	This section assesses current status, expectation and needs related to training and education that supports duties and responsibilities for Open Science.
4. Concluding Questions	a. Suggestions or challenges related to adopting Open Science in your work	

TG4: Academics and Researchers.

Sections	Sub-sections or key themes	Additional Remarks
1. Demographic Profile		
2. Awareness and perceived benefits	a. Openess of science (research outputs) b. Openess of different aspects of the scientific process to the research community c. Openess of different aspects of the scientific process to the society d. Openess of different aspects of the scientific process to the research funders and policy makers e. Reasons why Science should be open and should NOT be open f. Barriers to OS g. Participation in OS activities h. Advantages and disadvantages of publishing papers as OA i. The extent and reasons of making data openly available, and NOT openly available j. Training related to OS k. Support and incentives related to OS l. Views on OS	This section presents a set of questions, which aim to gauge OS awareness and perceived benefits of OS of the target group
3. Education and skills	a. Training Programs on OS b. Monitoring, evaluation and assessment of OS training programs c. Rewards or incentives to engage in OS training programs d. Specific needs of OS training programs e. Incorporating of integrating OS informal curriculum	This section presents a set of questions, which aim to assess the topics of training programs on OS, monitoring and integration of OS curriculum
f. Concluding Questions	a. Suggestions or challenges related to adopting OS in your work	

TG5: Postgraduate Students.

Sections	Sub-sections or key themes	Additional Remarks
1. Demographic Profile		
2. Awareness and perceived benefits	a. Openess of science (research outputs) b. Openess of different aspects of the scientific process to the research community c. Openess of different aspects of the scientific process to the society d. Openess of different aspects of the scientific process to the research funders and policy makers e. Reasons why Science should be open and should NOT be open f. Barriers to OS g. Participation in OS activities h. Advantages and disadvantages of publishing papers as OA i. The extent and reasons of making data openly available, and NOT openly available j. Training related to OS k. Support and incentives related to OS l. Views on OS	This section presents a set of questions, which aim to gauge OS awareness and perceived benefits of OS of the target group
3. Education and skills	a. Training Programs on OS b. Monitoring, evaluation and assessment of OS training programs c. Rewards or incentives to engage in OS training programs d. Specific needs of OS training programs e. Incorporating of integrating OS informal curriculum	This section presents a set of questions, which aim to assess the topics of training programs on OS, monitoring and integration of OS curriculum
4. Concluding Questions	a. Suggestions or challenges related to adopting OS in your work	

CHAPTER 5. DATA ANALYSIS, RESULTS AND FINDINGS

This chapter presents the key findings from the survey conducted among five target groups: administrative staff (TG1), public administrators and private sector representatives (TG2), technical and support staff (TG3), academics and researchers (TG4), and postgraduate students (TG5). The survey aimed to capture the current state of Open Science awareness, institutional progress, training needs, and perceived challenges in Malaysia and India.

5.1 MALAYSIA

A total of 111 responses were received across the five target groups. The analysis integrates both quantitative, as illustrated in charts, and qualitative data that are summarised thematically and supported with selected illustrative statements from respondents.

Table 1. Distribution of respondents by target groups - Malaysia

Target groups (TG)	**TG1**	**TG2**	**TG3**	**TG4**	**TG5**
Number of respondents	13	26	21	30	21

TG1: Administrative Staff.

Demographic background. A total of 13 respondents participated in this round of the survey. Respondents comprised a range of roles aligned to the target groups defined in the study, such as deputy vice chancellors, directors, deans and deputy deans.

Open Science progress and monitoring. This section presented respondents with forty-two questions designed to capture institutional progress in implementing Open Science (OS) principles, practices, and policies. Each item represented a specific required action, ranging from the appointment of senior personnel to lead Open Science initiatives, to long-term commitments for infrastructures and repositories to support citizen science. Respondents were asked to indicate the current status of each action using a five-point scale, where 1 = No plan at all, 2 = Starting, 3 = Partially, 4 = Largely, and 5 = Fully implemented. In addition, they were invited to provide information on the challenges associated with each action, allowing a more nuanced understanding of barriers to adoption.

Open Science Culture

Institutions reported that efforts to build an OS culture were at an early to partial stage. The appointment of senior personnel (Q1) had started, but respondents highlighted limited awareness and understanding of OS at leadership levels. Cultural change programmes (Q2) and advocacy efforts (Q3) were underway, though uptake was slowed by low readiness and acceptance within the research community. Communication strategies (Q4) and stakeholder forums (Q5) were developing but hindered by inconsistent institutional messaging and diverse stakeholder interests, with some perceiving OS as a foreign concept. Mandates to support Open Access (Q6) had been introduced to a certain extent, yet respondents cited financial support remain limited.

Open Access

Open Access progress was generally partial. Roadmaps for Open Access publishing (Q7) were still at a formative stage (except for Universiti Malaya), with difficulties linked to resource constraints and the absence of coordinated strategies. The adoption of author identifier systems such as ORCID (Q8) showed partial progress in certain universities, but uptake remained uneven due to limited researcher buy-in. Similarly, support for new forms of scholarly publishing (Q9) and mechanisms for Open Access publishing (Q10) were constrained by misalignment with the national research assessment, uncertainty over sustainable models and institutional readiness.

Open Data

Progress on Open Data was reported as partial to moderate. Institutions had begun formulating research data policies aligned with FAIR principles (Q11) and providing stewardship services (Q12), but challenges included skills shortages in data curation. Infrastructure for storing and publishing data (Q13) was emerging, though respondents noted funding constraints remain as an issue. Awareness-raising about FAIR-aligned infrastructures (Q14) was hampered by knowledge gaps among researchers despite efforts to improve researchers' awareness towards FAIR principles. Efforts to gather information about archived and published data, as well as metadata (Q15–Q16) and to include data as a valued research output in research assessments (Q17) were underway, but were slowed by technical readiness issues and lack of integration into evaluation frameworks.

Open Science Infrastructure

Some institutions have established infrastructure but some were in the process of building infrastructure. Challenges to establishing institutional repositories (Q18) and access to third-party repositories (Q19) include technical and cost barriers. Discovery services to locate datasets (Q20) were limited, and commitments to engage with research clouds (Q21–Q22) were reported as minimal, reflecting uncertainty around governance models and long-term sustainability.

Open Science Skills

Skills development was identified as a critical gap. Respondents indicated that OS skills training (Q23) was starting but inconsistent, and career paths for data-related professions (Q24) were poorly defined, reflecting unclear role frameworks. Mandatory training requirements (Q25) existed in some institutions but were absent in others, resulting in fragmented uptake. Monitoring and assessment of OS training (Q26) were largely lacking, pointing to weak institutional mechanisms for evaluating impact.

Open Science Evaluation

Progress on evaluation mechanisms was somewhat stronger. Assessing integration of OS in daily practice (Q27) and recognising OS engagement (Q29) were reported as emerging, though challenges included absence of incentives. The openness of researcher evaluation policies (Q30) remained inconsistent, with some institutions lacking transparent frameworks. Overall, evaluation efforts were developing but hampered by reliance on traditional metrics.

Open Metrics

Metrics reform was an area of relative strength. Some institutions had started to develop bibliometric policies aligned with OS principles (Q31), though uptake was limited. Integrating new forms of evaluation into promotion and reward processes (Q32–Q33) was constrained by resistance to cultural change and lack of detailed guidance. Training and awareness for early-career researchers (Q34) had been initiated, but respondents pointed to capacity gaps and the need for greater institutional support.

Research Integrity

Institutions reported moderate progress in embedding OS into research integrity. Awareness campaigns (Q35) and alignment with codes of research integrity (Q36–Q37) had been initiated,

but respondents highlighted fragmented implementation and capacity gaps in ensuring that integrity principles were consistently observed across the research community.

Citizen Science

Citizen Science remained the least developed cluster. While some recognition of its potential benefits existed (Q38), activities such as researcher–citizen dialogues (Q39) and awareness of good practice (Q40) were limited by low readiness and lack of expertise. Assessing citizen science contributions (Q41) and embedding long-term commitments for infrastructures in proposals (Q42) were rarely observed, with respondents citing sustainability concerns, competing funding priorities, and the perception of citizen science as marginal to mainstream research.

Open Science training and policy development. The survey also explored the extent to which universities have integrated Open Science (OS) training and policy development into their institutional frameworks. Respondents were asked whether their institutions currently provide training programmes dedicated to Open Science, whether participation in such training is mandatory, and the extent to which delivery and participation are monitored. They were further invited to identify whether rewards or incentives are provided to staff, researchers, or students who engage in Open Science training.

Across responses, the provision of formal Open Science training programmes was limited. Several respondents indicated that no structured programmes currently exist, while others suggested that training may be offered in partial or ad hoc formats, without comprehensive coverage of all Open Science pillars. This variability highlights the lack of a coordinated and systematic approach to building institutional OS capacity.

On the question of mandatory participation, responses revealed inconsistency. Some institutions required specific groups, such as administrative officers, academics, or researchers to undergo OS training, while others reported no compulsory requirements. This indicates that Open Science training remains optional and unevenly distributed, often depending on local leadership or departmental priorities rather than institutional policy.

The monitoring and evaluation of OS training was similarly reported as weak or absent. Respondents consistently indicated that their universities do not formally assess participation,

delivery, or the impact of Open Science training programmes. This lack of evaluation mechanisms makes it difficult to measure effectiveness, identify skills gaps, or track progress in developing Open Science competencies.

Finally, rewards and incentives for engaging in OS training were generally minimal. Most respondents reported that lack recognition, financial support, or career-related incentives were offered to individuals who participated in such initiatives.

Taken together, the findings reveal that institutional arrangements for Open Science training and policy development remain at an early stage. Although some universities have begun to introduce training opportunities, these efforts are fragmented, rarely mandatory, and largely unmonitored. Moreover, the absence of rewards or incentives further weakens motivation and undermines sustainability. Strengthening Open Science training will therefore require the development of formalised programmes, clear participation requirements, systematic monitoring, and recognition mechanisms that reinforce institutional commitment to OS skills development.

TG2: Public Administrators and Private Sector Representatives.

Demographic background. 26 respondents have participated in the survey and most respondents have a minimum bachelor's degree while the highest education level is PhD.

Open Science Awareness and Engagement. The respondents indicated a moderate level of familiarity with Open Science principles and practices. Regarding institutional adoption, the responses were mixed with some respondents indicated that their organisations had formal Open Science policies, while others reported that their organisation was exploring initiatives but had not yet formalised policies. When asked about which Open Science aspects are most relevant to their role as administrators in their organisation, the responses cited Open Access to research publications, Open Data and Research Data Management, Citizen Science and public pngagement, Open Educational Resources and research integrity and ethics as important topics to them. Some organisations have confirmed that they have established partnerships with universities to access research outputs, data, or expertise however there remain challenges your organisation in accessing and using Open Science resources at their organisation, such as concerns about data quality and reliability, limited awareness of available Open Science resources, lack of technical capacity to access/use research data and legal or policy restrictions.

Expectations and Needs. Most responses believed that organising Open Science training will benefit their role in policymaking, research administration, or private sector innovation. Among the important topics that will require training are understanding Open Science policies and strategies, using Open Data for policy and decision-making and implementing Open Science principles in governmental or corporate settings. Besides training, access to Open Science tools and platforms is another valuable resources that they need to help incorporate Open Science into their work. Through partnerships with universities, the public sector organisations and businesses can leverage on trainings offered by the university, as well as data repositories where they can can access and deposit data.

Nonetheless, there remain challenges for the public sector organisations and businesses to adopt Open Science in their work, such as data privacy and security concerns, clearer policy and legal framework for Open Science, data integrity and data reliability.

TG3: Technical and Support Staff.

Demographic background. The respondents identified their roles as Data Custodian, Information Resources Officer or Manager, Librarian, Laboratory Assistant and Data Stewards. All respondents have a minimum Diploma or Bachelor'degree in fields such as Computer Sciences and Library Sciences. Their years of experience varies, with several experienced staffs have served more than 15 years in their respective roles.

Open Science Infrastructure and Stewardship. The surveyed respondents mostly have experience in managing or providing supports for Open Science infrastructure. For example, Universiti Malaya provided services through Dataverse platform for data archiving repository and the DMP Roadmap for data management plan functions. The institution subscribed to Crossref to generate Digital Object Identifiers (DOIs) and the institutional repository supports Creative Commons licensing. The University also provide technical support platforms for Open Educational Resources (OERs) through OpenCourseWare (OCW) but the University did not provide specific technical support platforms for Citizen Science and Public Engagement. At Universiti Malaya, data custodian supports and manage e-infrastructure, while data stewards support and manage Research Data Management and Open Access activities. However, none of them support or manage Citizen Science and Public Engagement, and Open Educational Resources activities. In terms of FTE, the data custodian does technical maintenance for RDM

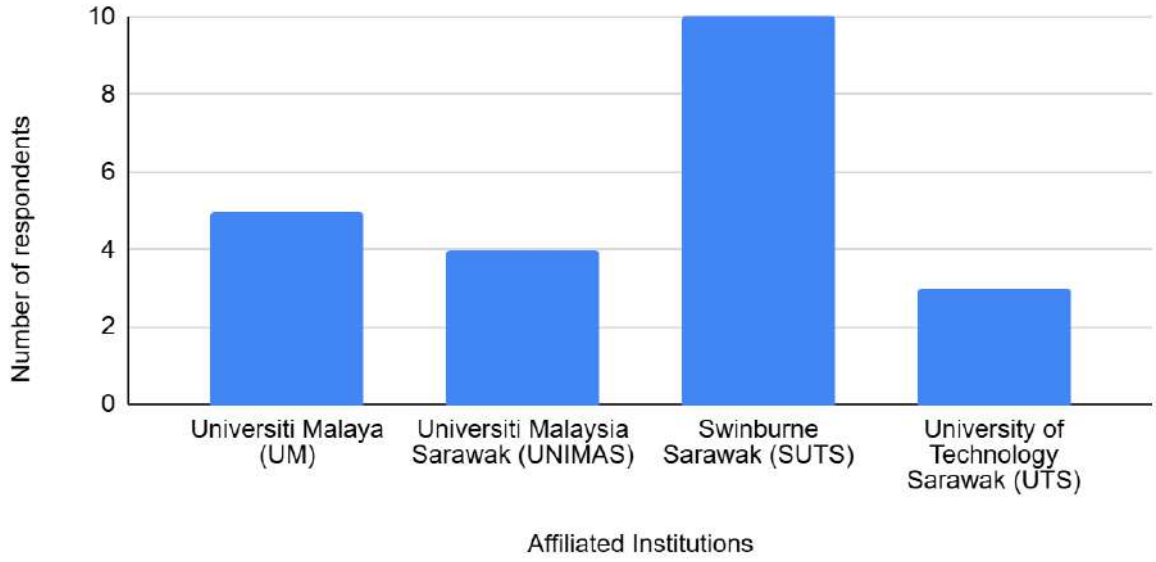
from time to time, support Open access activities (on-demand basis) and is usually 3 days per session, and e-infrastructure (3 days per week). For a data steward, they spend about one to two days per month on Research Data Management. Other universities, such as University Malaysia Sarawak (UNIMAS) and Universiti Malaysia Sabah (UMS) also offered various Open Science services through their systems (UNIMAS: PeTARY for Open Access publications, dataverse for Research Data Sharing and an e-learning system for education; UMS: ePrint system and ITEL as Learning Management System (LMS) or Virtual Learning Environment (VLE) supporting Open Education practices).

Training and Education. Data stewards and data custodian received formal training in Open Science through their participations in workshops that were held within institution (e.g. UM Open Science Research Data Management for Researchers Workshops for Universiti Malaya; "Borneo Adventure: Citizen Science in Action!" at Pustaka Negeri Sarawak for University Technology Sarawak) or externally (e.g. the Training of Trainers on Data Stewardship for Open Science workshop organised by the Academy of Sciences Malaysia). However, further training in areas such as legal and ethical considerations in Open Science (e.g., licensing, GDPR compliance), and advanced metadata standards and interoperability tools (e.g., Dublin Core, DataCite, data preservation and reuse strategies) can support their role in Open Science initiatives. Through their roles as data stewards and data custodians, they promoted Open Science practices through the organisation of workshops, individual and group consultations, and provision of online resources. Despite these efforts, uptake by researchers was reported to be inconsistent. To address the challenge, there needs to be clear institutional policies and guidelines for Open Science at the University, forge expanded collaboration opportunities with researchers, and establish enhanced IT infrastructure to support data management and sharing. Finally, from the technical perspective, an important challenge is the difficulties in translating technical IT knowledge into practical formats accessible to non-IT researchers.

TG4: Academics and Researchers

Demographic background. A total of 30 respondents participated in this round of the survey. Respondents were academics and researchers from various research disciplines including health sciences, physical sciences and social sciences. Most of them are PhD holders and have served at respective universities at least one year. The distribution of respondents by institutions is as followed:

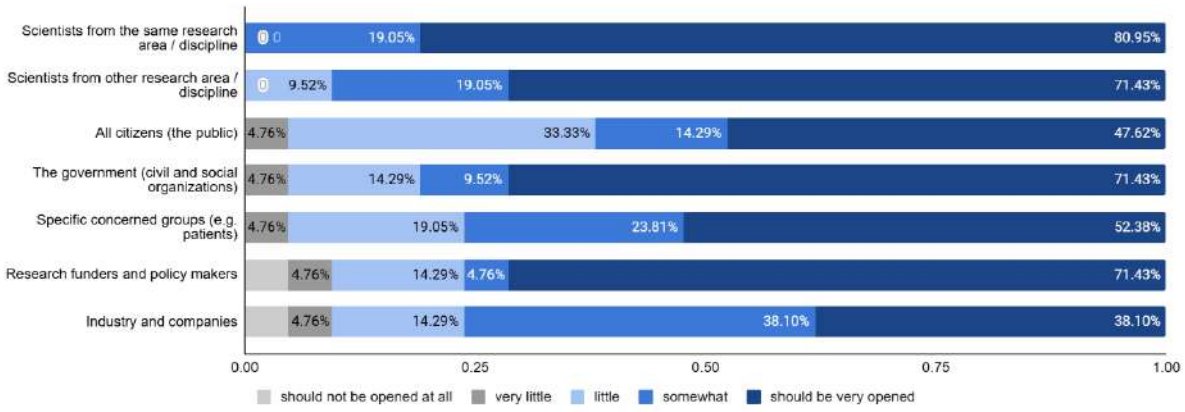
Figure 1. Distribution of respondents for TG4 by institutions - Malaysia



Awareness and perceived benefits.

When the researchers asked about their opinion about question, *to whom should science (research output) be opened?* **(Figure 2)**, the majority researchers agreed that research output should be opened to scientists from the same or other research area or discipline, but less than half of the respondents agreed that the research output should be opened to the public, industry or companies.

Figure 2. Percentage (%) of TG4 respondents – Malaysia, for *Question: In your opinion, to whom should science (research output) be opened?*



When asked about whether they think that different aspects of the scientific process should be opened to the research community (all scientists) (**Figure 3**), majority voted for all parts of research processes are somewhat or should be very opened to the research community. Similar patterns were observed when asked whether different aspects of the scientific process should be opened to the society (all citizens / general public) (**Figure 4**), or to research funders and policy makers (**Figure 5**).

Figure 3. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your opinion, how open do you think the different aspects of the scientific process should be to the research community (all scientists)?*

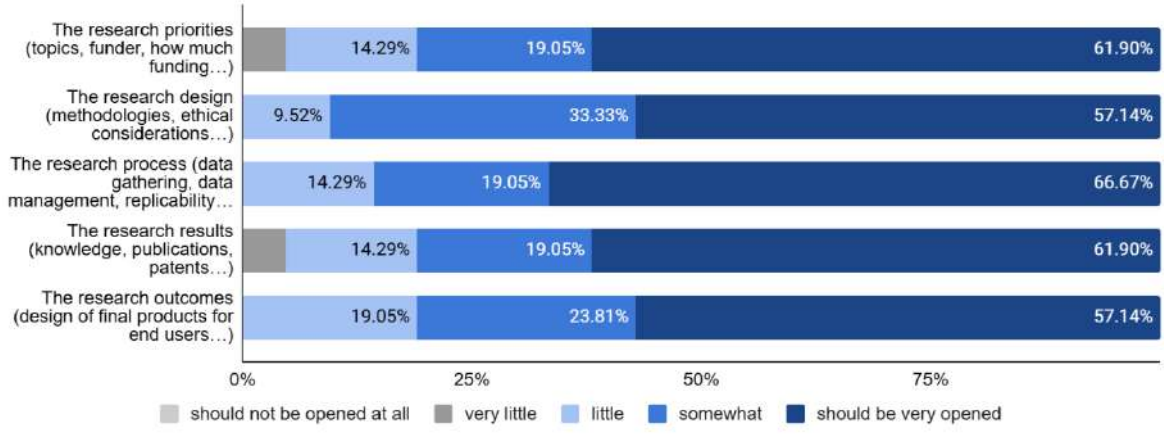


Figure 4. Percentage (%) of TG4 respondents – Malaysia, for *Question: In your opinion, how open do you think the different aspects of the scientific process should be to the society (all citizens / general public)?*

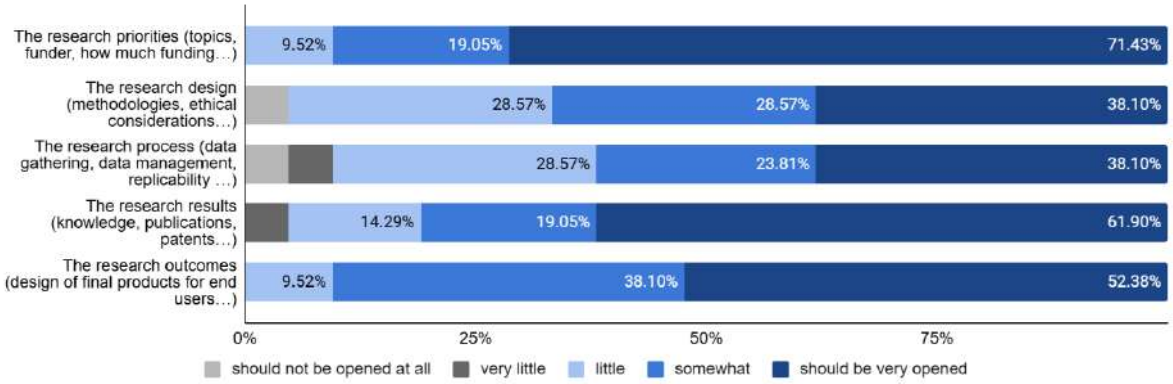
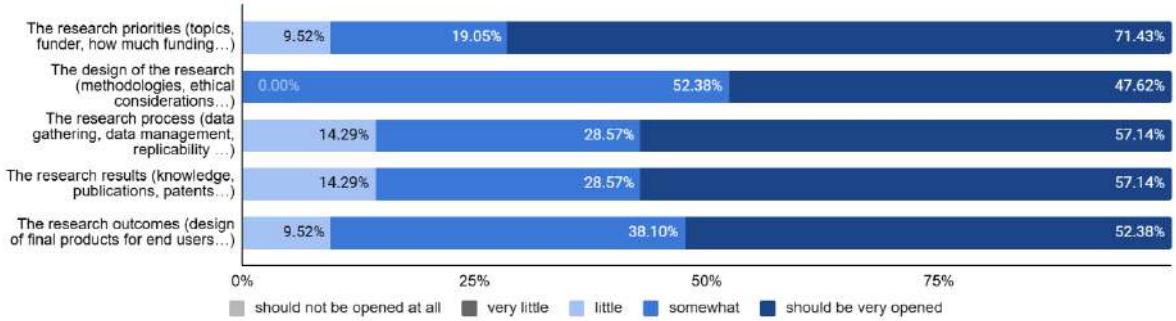
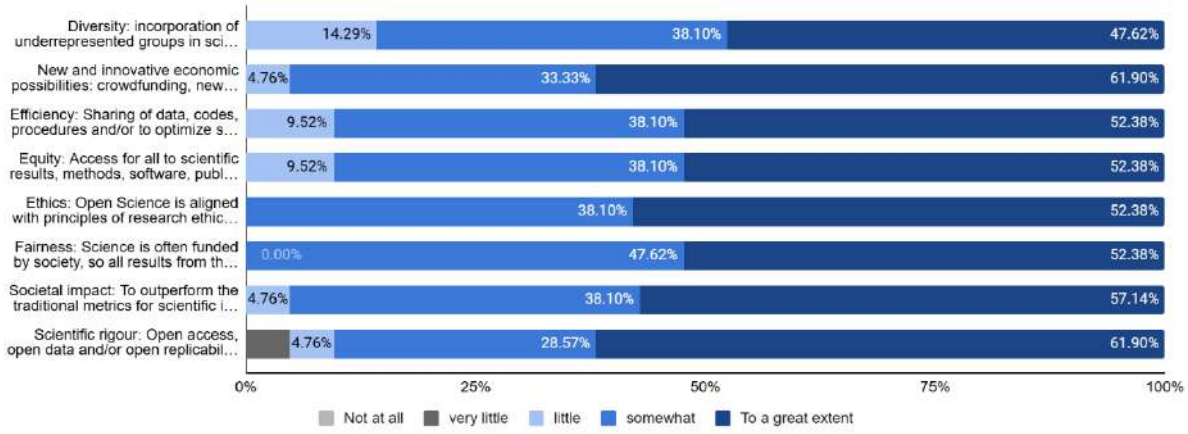


Figure 5. Percentage (%) of TG4 respondents – Malaysia, for *Question: In your opinion, how open do you think the different aspects of the scientific process to research funders and policy makers?*



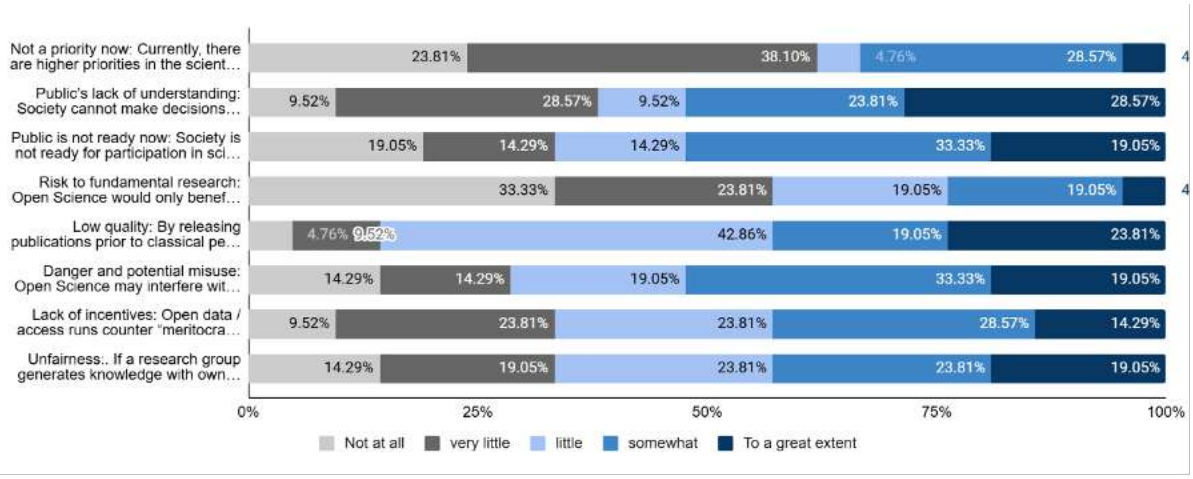
In addition, the survey findings reported interesting views on the reasons why science should be open (**Figure 6**). Among the primary reasons are (1) new and innovative economic possibilities, such as crowdfunding, new types of founders, etc. and (2) to achieve scientific rigour through open access, open data and/or open replicability that makes science easier to be reviewed.

Figure 6. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should be open?*



On the other hand, the respondents described that the key reasons why science should not be open (**Figure 7**) is due to public's lack of understanding, as the society cannot make decisions or have a useful input without an understanding of science/the scientific process. Another important reason is because of low quality of research outputs since by releasing publications prior to classical peer review, the veracity of papers will be difficult to assess by individual researchers; quality is not guaranteed by preprint servers/digital repositories.

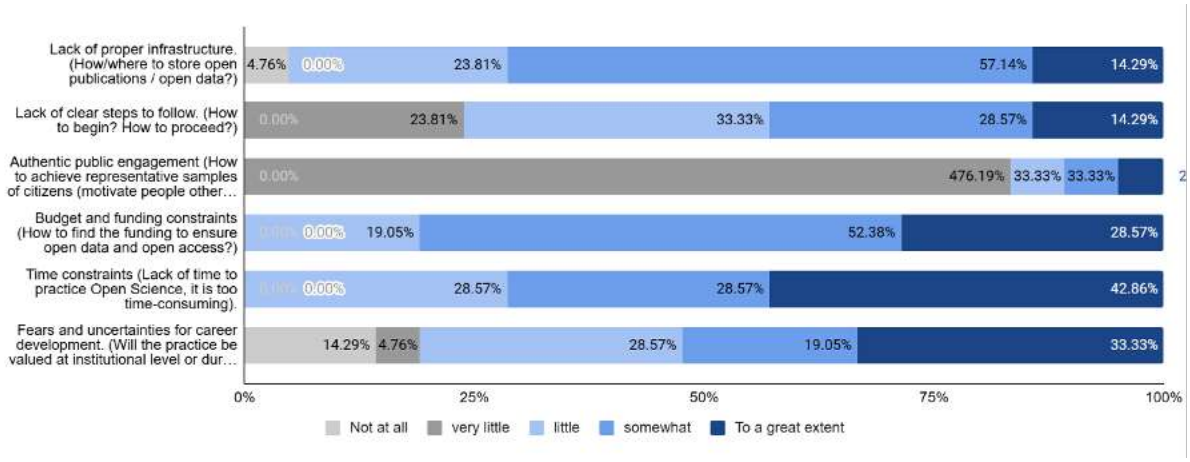
Figure 7. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should NOT be open?*



In addition, the respondents perceived time (e.g. Lack of time to practice Open Science, it is too time-consuming) and budget (e.g. How to find the funding to ensure open data and open access?)) constraint, as well as fears and uncertainties for career development (e.g. researchers

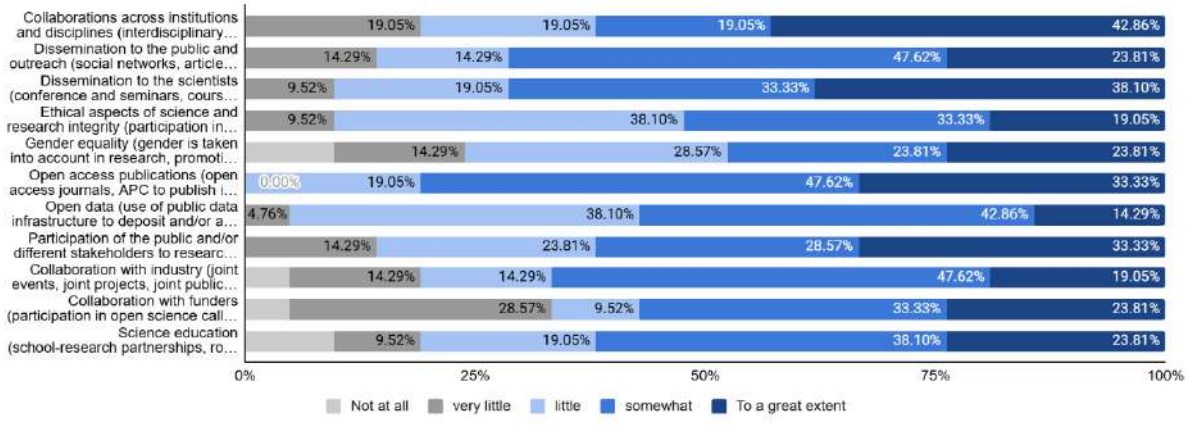
concern if the practice will be valued at institutional level or during career) as primary challenges to embrace Open Science (**Figure 8**).

Figure 8. Percentage (%) of TG4 respondents – Malaysia, for *Question: Imagine in your everyday work at your institution you decide to embrace (or you already have embraced) an Open Science perspective. In your experience, to what extent do you see each of the following as a barrier you will be facing.*



However, the researchers are actively involved in any types of Open Science activities **(Figure 9).** Among the mostly participated OS activities are collaborations across institutions and disciplines (e.g. interdisciplinary groups, projects or meetings, collaborative initiatives etc) , Open access publications (e.g. open access journals, APC to publish in open access, open peer review) and dissemination to the scientists (e.g. conference and seminars, courses, articles).

Figure 9. Percentage (%) of TG4 respondents – Malaysia, for *Question: In your experience, to what extent do you participate in any of the following open science activities?*



The survey respondents also agreed that publishing papers as Open Access gave them many advantages especially increased impact in terms of more downloads, reads, citations, social media mentions (**Figure 10**). On the contrary, they viewed the disadvantages of publishing papers as Open Access include the costs of OA publishing and the existence of many predatory journals (**Figure 11**).

Figure 10. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as advantage of publishing papers as open access*?

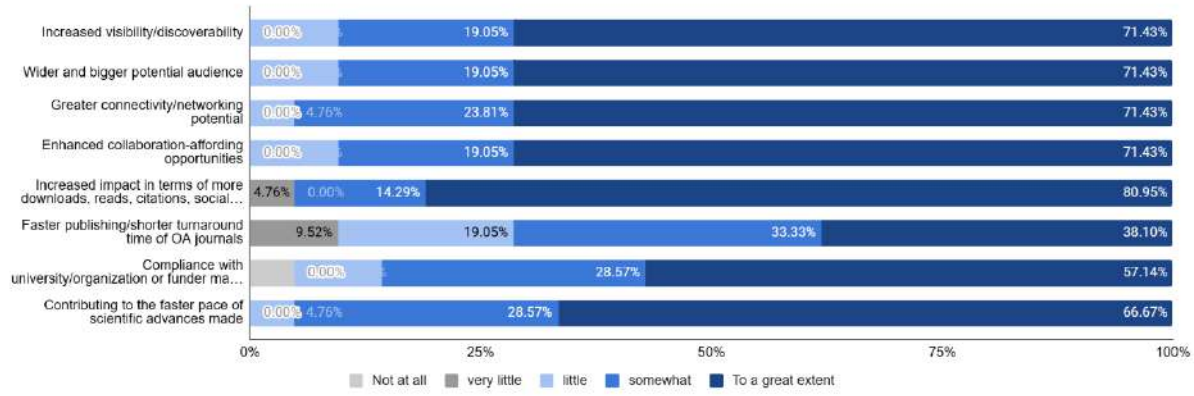
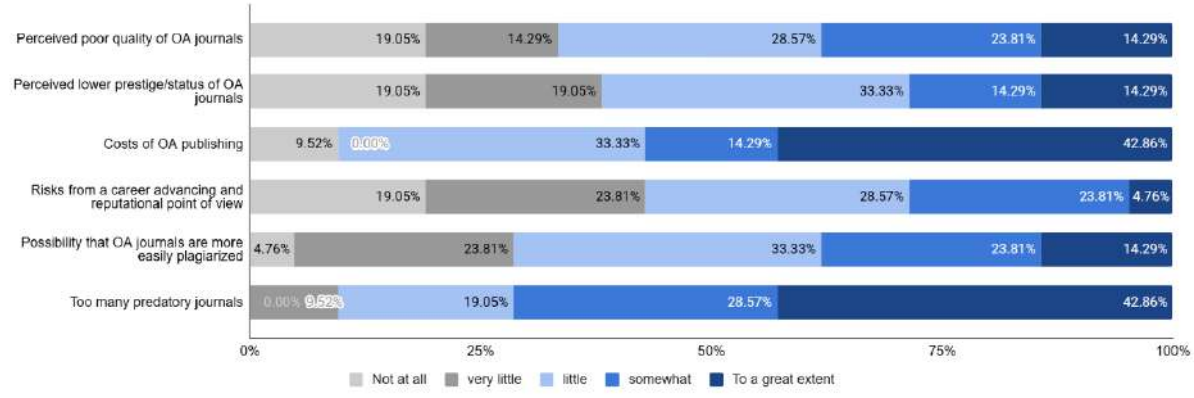
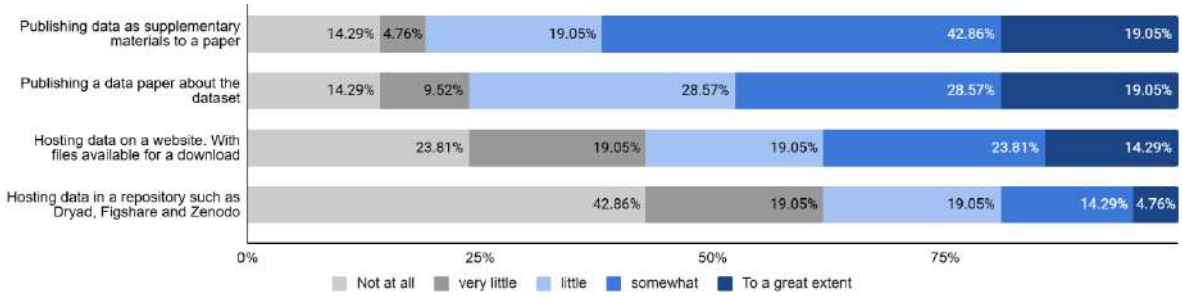


Figure 11. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as disadvantages of publishing papers as open access?*



When asked about their experience in making the data they produced openly available (**Figure 12**), majority of the surveyed respondents have at least published data as supplementary materials and publisinh a data paper about the dataset. The most uncommon activity that they have involved is hosting data in a repository.

Figure 12. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your experience, to what extent do you make the data you produced openly available?*



Additionally, the surveyed respondents believed that among the reasons for them to make the data they produced openly available are to facilitate collaboration, citation advantage and credibility (**Figure 13**). However, they also perceived that the data should not be made openly available due to many reasons such as the nature of data that can be confidential or national security related that prohibited sharing and no polices that mandate data sharing (**Figure 14**).

Figure 13. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your experience, to what extent do you make the data you produced openly available*

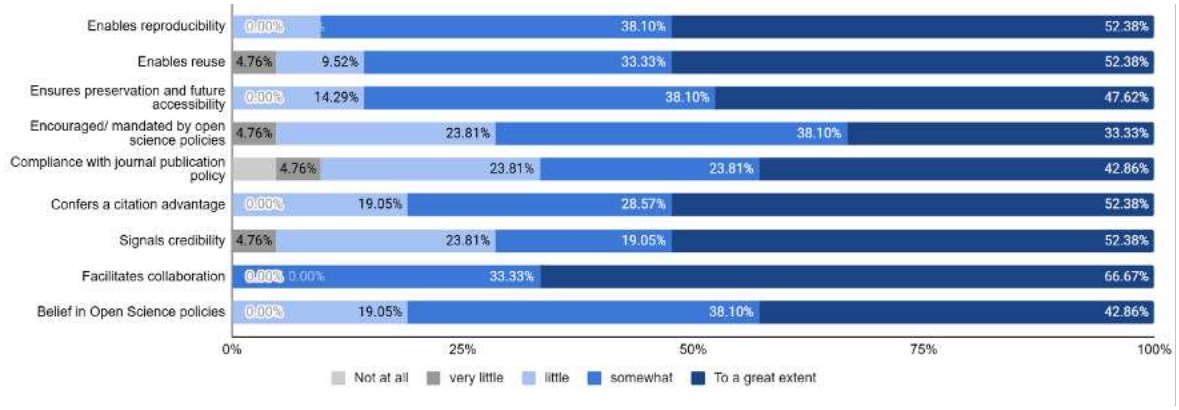
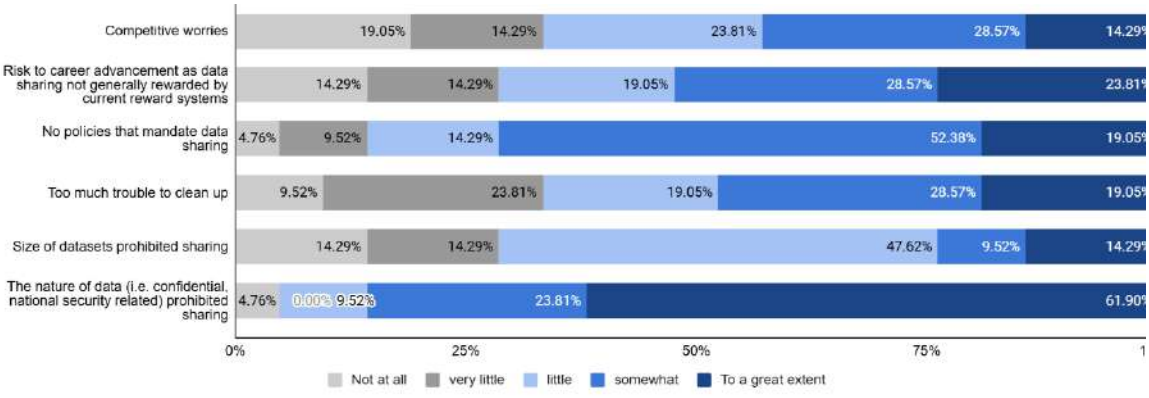


Figure 14. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as reasons of NOT making data openly available*



When asked about whether they have received any training related to Open Science at their university/organization, majority mentioned about training related to research publishing and dissemination while the least frequently mentioned is research data management (**Figure 15**). In terms of receiving support or incentives related to Open Science, the responses were fairly encouraging, with potential improvements can be made especially for technical infrastructure support (**Figure 16**).

Figure 15. Percentage (%) of TG4 respondents – Malaysia, for *Question*: *Do you receive any of the following training related to Open Science from your university/organization?*

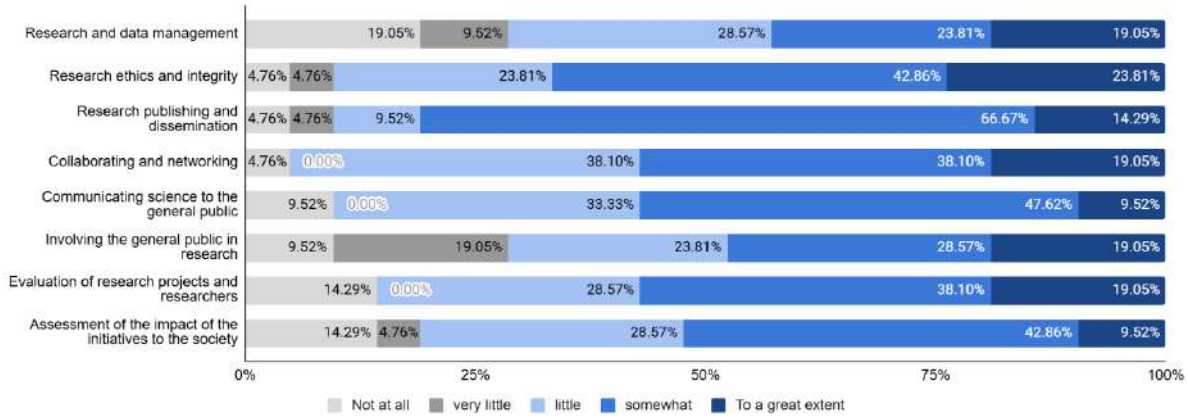
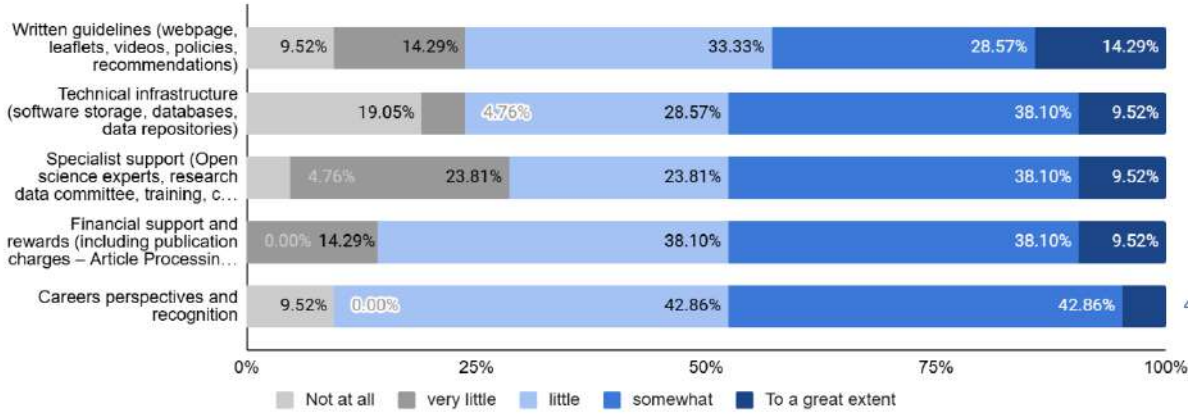


Figure 16. Percentage (%) of TG4 respondents – Malaysia, for *Question*:*Do you receive any of the following support or incentives related to Open Science from your university/organization?*



Education and skills. Several training programs related to Open Science have been organised by local universities, covering aspects such as data stewardship, research data management, using data sharing platform and publishing in Open Access journals. The training programs are not made mandatory for academics, teaching staff, researchers, scientific personnel at the

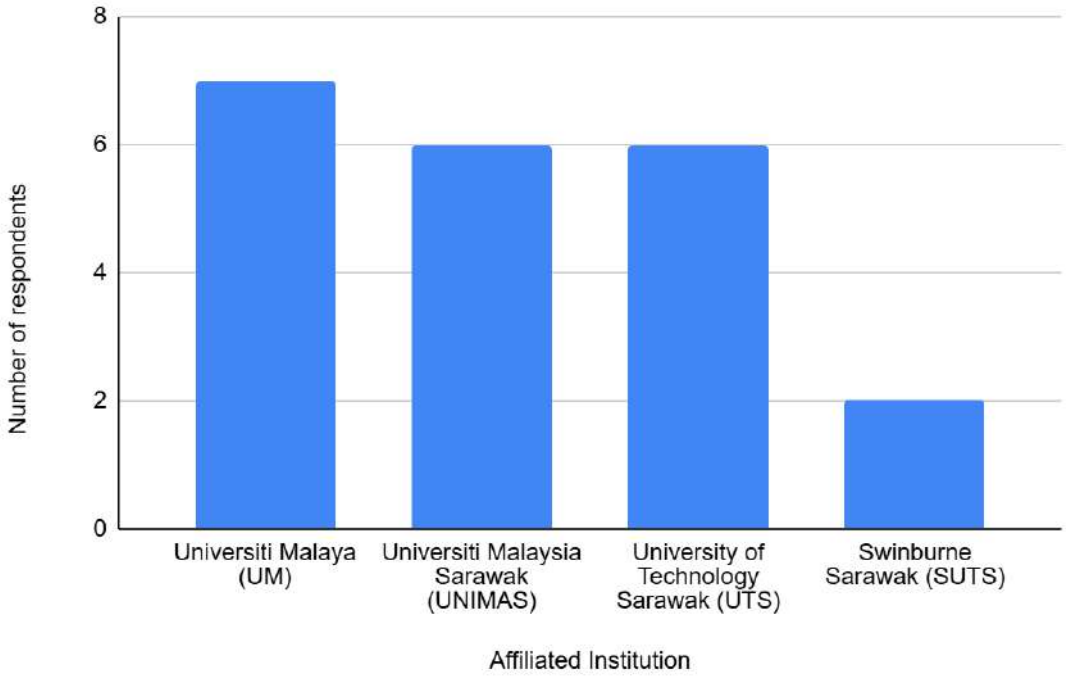
surveyed institutions. As of now, the monitoring, evaluation, or assessment of the delivery, participation, and impact of Open Science training programs were basic, with the evaluation primarily aims primarily at evaluating satisfaction of the workshop participants on the organisation of the training programs. No specific rewards or incentives were provided to academics, teaching staff, researchers, scientific personnel who engage in Open Science training programs, although in certain training programs, participants may be entitled to earn Continuing Professional Development (CPD) points. The training programs were designed targeting different groups broadly, including researchers and non-academic research staff.

In terms of specific training or support that the researchers need to adopt Open Science practices, the surveyed respondents cited several topics, such as ethical and legal considerations, integrity, research data management, Data Management Plan, publishing in Open Access journals, reproducibility as well as collaboration tools such as GitHub and OSF. Majority of surveyed respondents viewed that these topics can be integrated as part of Open Science informal curriculum, such as life-long learning modules, for academics, teaching staff, researchers and scientific personnel.

TG5: Postgraduate Students

Demographic background. A total of 21 respondents participated in this round of the survey. Respondents were postgraduate research students from various research disciplines including engineering, health sciences, computer science and information technology, social sciences. Most of them are Bachelor and Master degree holders and currently pursuing master and doctoral degrees in research. Majority of surveyed respondents are in the developing research proposal or preparing for proposal defense and data collection phases. The distribution of respondents by institutions is as followed:

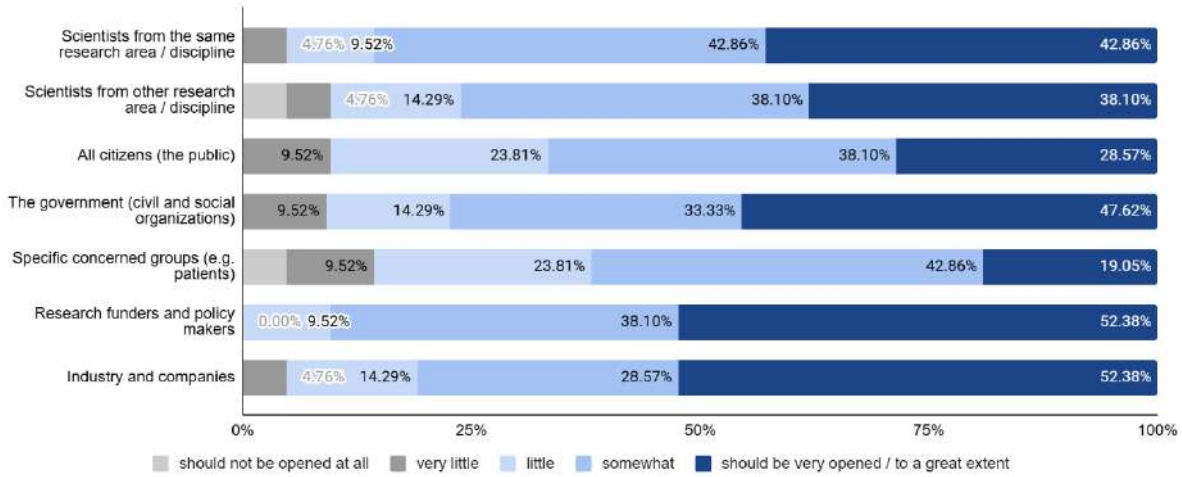
Figure 17. Distribution of respondents for TG5 by institutions - Malaysia



Awareness and perceived benefits.

When the postgraduate students were asked about their opinion about question, *to whom should science (research output) be opened?* **(Figure 18)**, the majority research students agreed that research output should be opened to scientists from the same or other research area or discipline, the government and research funders.

Figure 18. Percentage (%) of TG5 respondents – Malaysia, for *Question: In your opinion, to whom should science (research output) be opened?*



When asked about whether they think that different aspects of the scientific process should be opened to the research community (all scientists) (**Figure 19**), majority agreed that research methodologies, research results and research outcomes should be made open to the research community. Similar trends were observed when asked whether different aspects of the scientific process should be opened to the society (all citizens / general public) (**Figure 20**), and to research funders and policy makers (**Figure 21**).

Figure 19. Percentage (%) of TG5 respondents – Malaysia, for *Question: In your opinion, how open do you think the different aspects of the scientific process should be to the research community (all scientists)?*

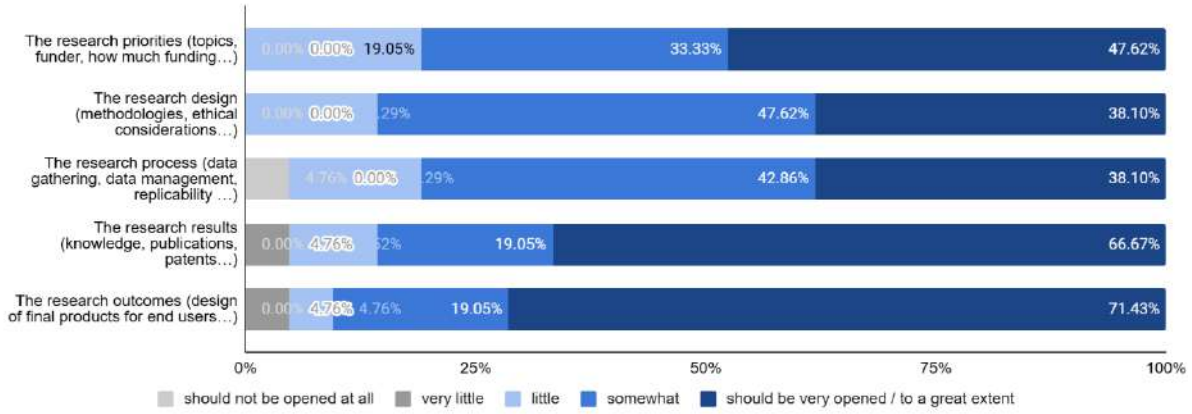


Figure 20. Percentage (%) of TG5 respondents – Malaysia, for *Question: In your opinion, how open do you think the different aspects of the scientific process should be to the society (all citizens / general public)?*

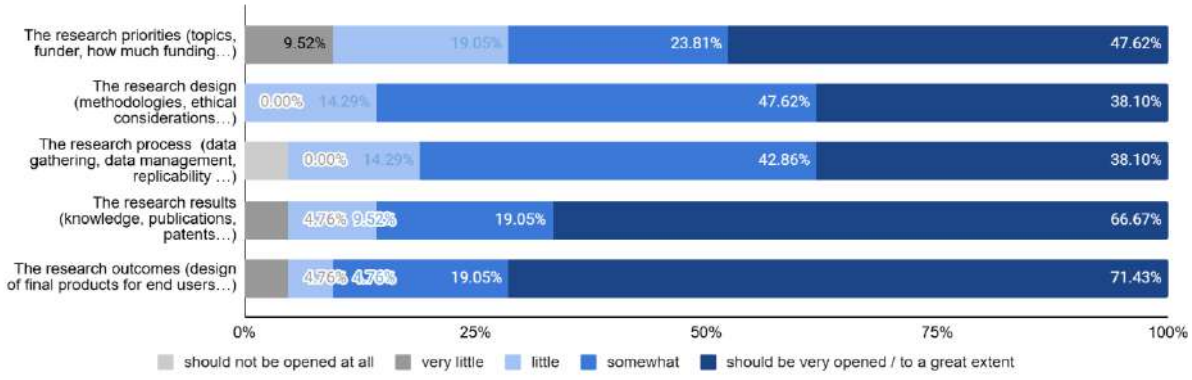
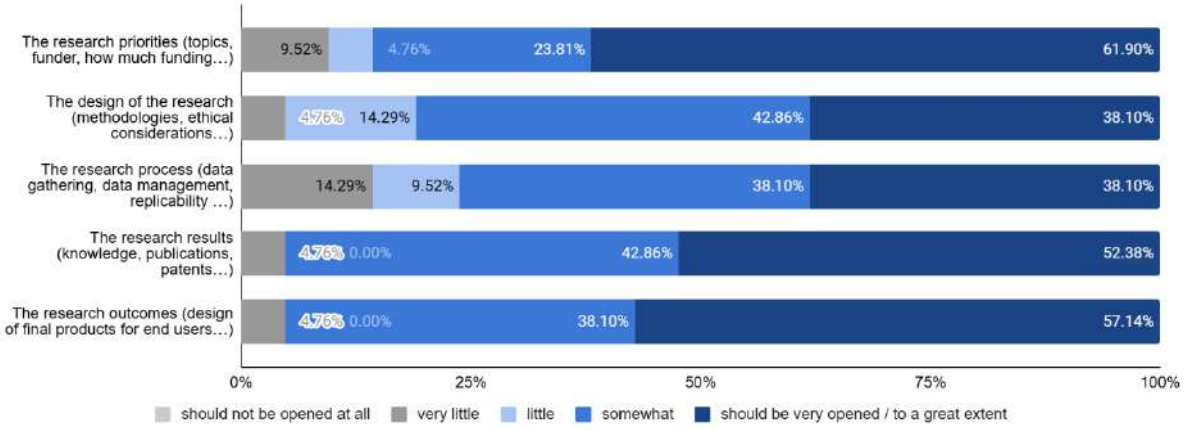
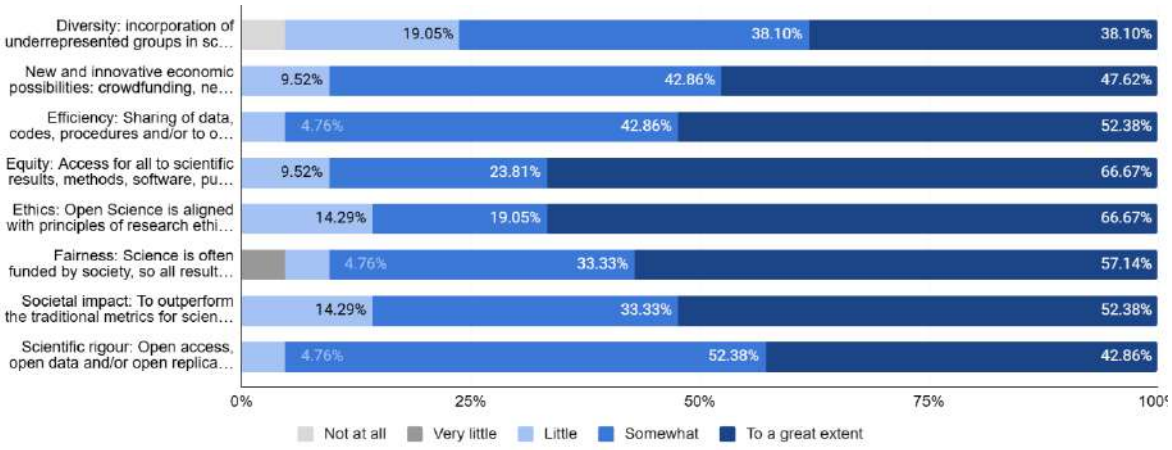


Figure 21. Percentage (%) of TG5 respondents – Malaysia, for *Question: In your opinion, how open do you think the different aspects of the scientific process to research funders and policy makers?*



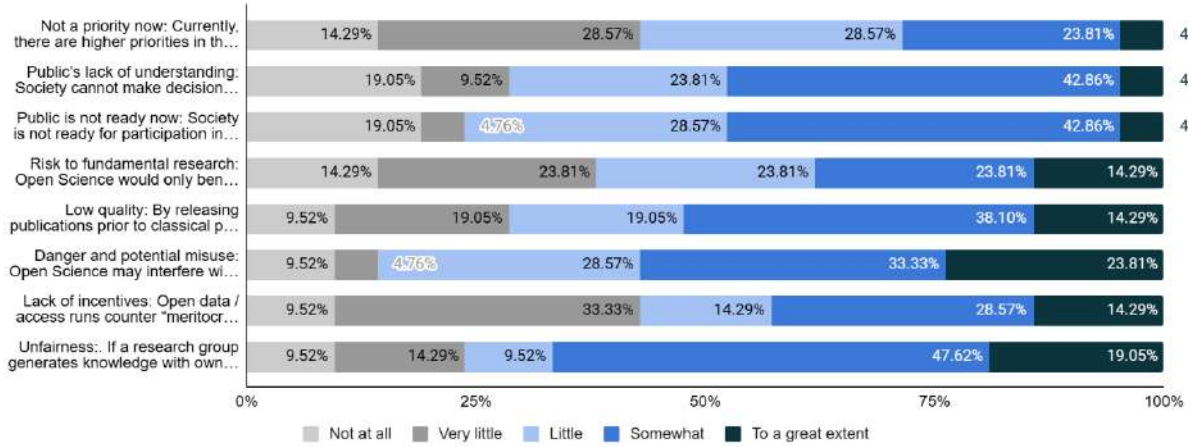
In addition, the survey findings reported diverse opinions on the reasons why science should be open (**Figure 22**). Among most cited reasons are (1) efficiency when sharing of data, codes, procedures and/or to optimize science and (2) scientific rigour such as through Open Access, open data and/or open replicability that make science easier to be reviewed.

Figure 22. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should be open?*



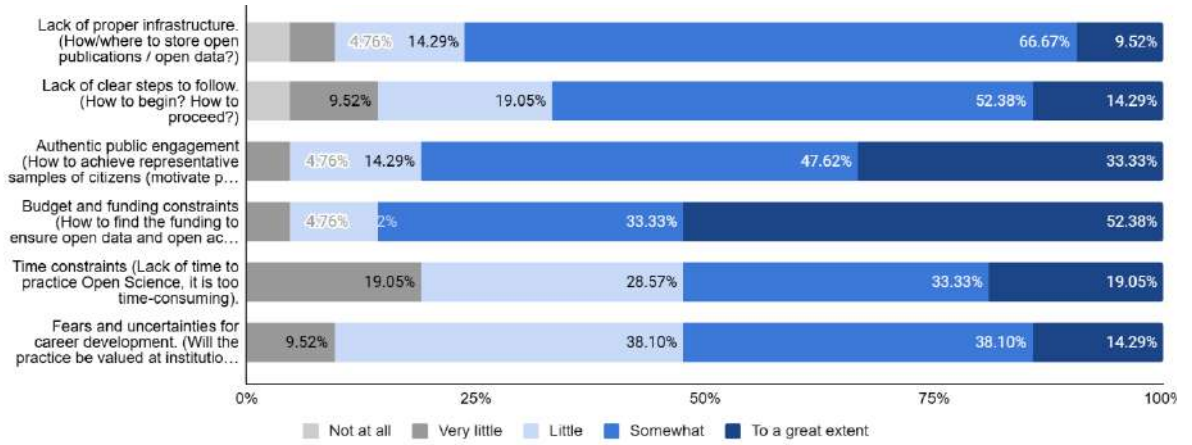
On the other hand, the surveyed respondents agreed that the primary reasons why science should not be open (**Figure 23**) is the potential danger and misuse as Open Science may interfere with research integrity (such as release of medical personal data and misuse of research results, e.g. biological weapons). Another important reason is because of unfairness, especially if a research group generates knowledge with own resources and it could be unfair if others use this knowledge to get economic benefits for themselves.

Figure 23. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should NOT be open?*



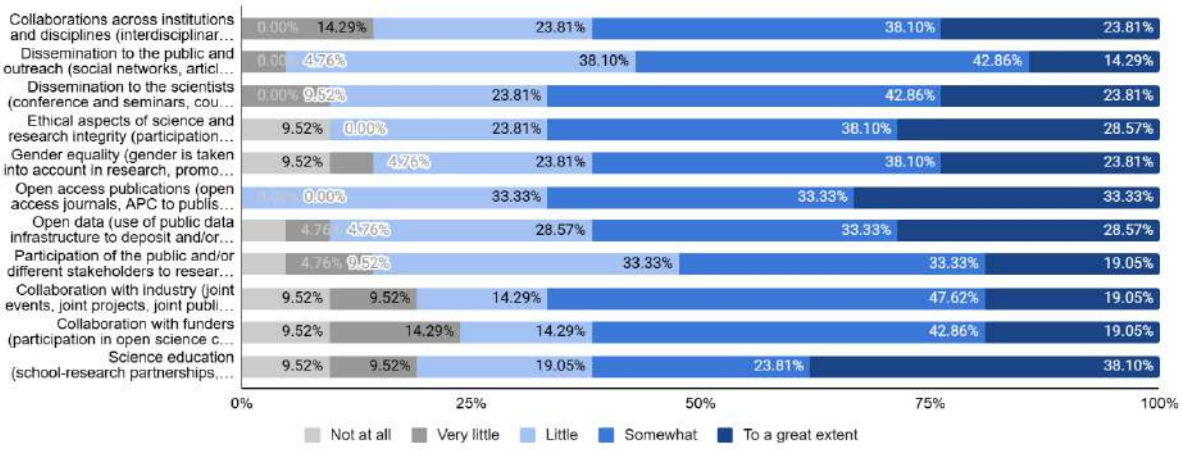
Additionally, the survey respondents described that lack of proper infrastructure (e.g. how/where to store open publications / open data), getting authentic public engagement (e.g. how to achieve representative samples of citizens to motivate people other than already concerned groups) and budget and funding constraints (e.g. how to find the funding to ensure open data and open access) as primary challenges to embrace Open Science (**Figure 24**).

Figure 24. Percentage (%) of TG5 respondents – Malaysia, for *Question: Imagine in your everyday work at your institution you decide to embrace (or you already have embraced) an Open Science perspective. In your experience, to what extent do you see each of the following as a barrier you will be facing.*



The surveyed postgraduate students have fair involvement in any types of Open Science activities **(Figure 25).** Among the mostly participated OS activities are Open Access and ethical aspects of science and research integrity.

Figure 25. Percentage (%) of TG5 respondents – Malaysia, for *Question: In your experience, to what extent do you participate in any of the following open science activities*



The postgraduate students also perceived that publishing papers as Open Access can give them benefits especially increased their visibility or discoverability (**Figure 26**). On the contrary, similar to TG4 (Academics and Researchers), the surveyed postgraduate students viewed the disadvantages of publishing papers as Open Access include the costs of OA publishing and the rise of many predatory journals (**Figure 27**).

Figure 26. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as advantage of publishing papers as open access*?

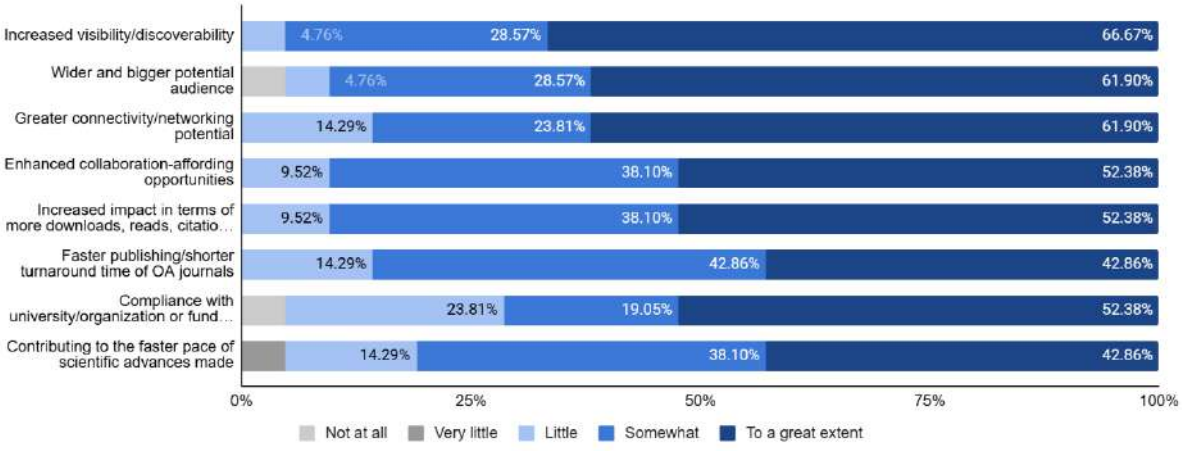
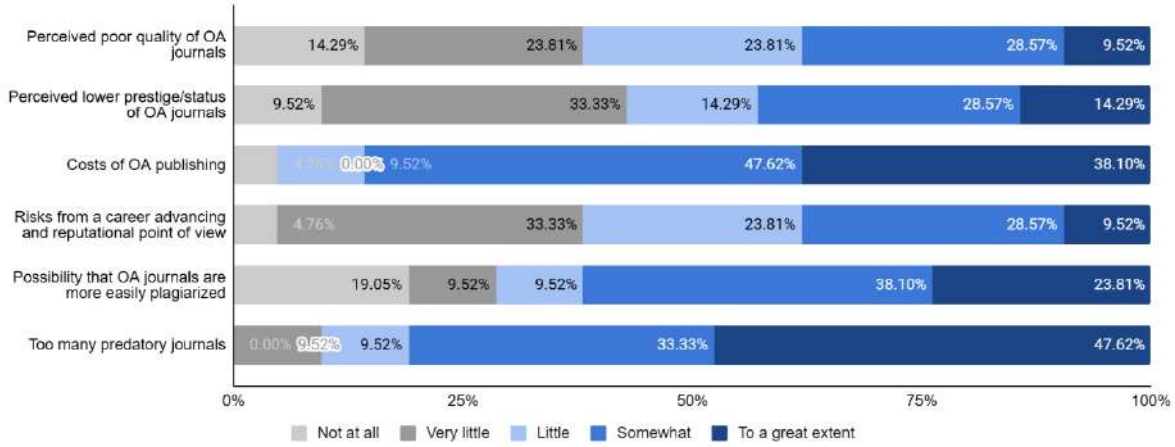


Figure 27. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as disadvantages of publishing papers as open access?*



In addition, at least 50% of the surveyed postgraduate students have experience in making the data they produced openly available, such as by publishing data as supplementary materials to a paper, publishing a data paper about the dataset and hosting data on a website with files available for a download (**Figure 28**). According to them, among the reasons of making data openly available are to enable reproducibility, ensures preservation and future accessibility, citation advantage and facilitates collaboration (**Figure 29**). However, they also perceived that the data should not be made openly available because of the nature of data that can be confidential or national security related that prohibited sharing, no polices that mandate data sharing and size of datasets that prohibited data sharing (**Figure 30**).

Figure 28. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your experience, to what extent do you make the data you produced openly available*

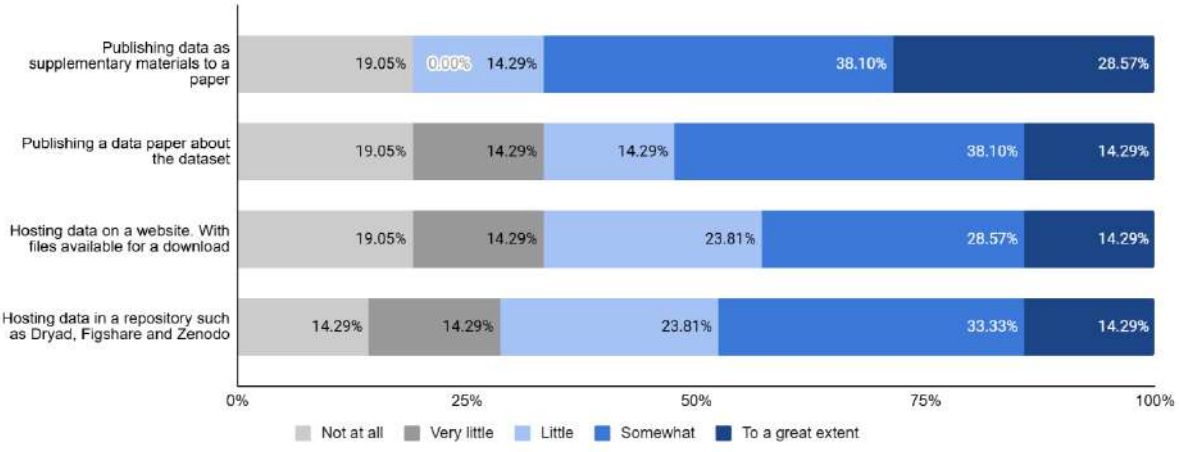


Figure 29. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as reasons of making data openly available*

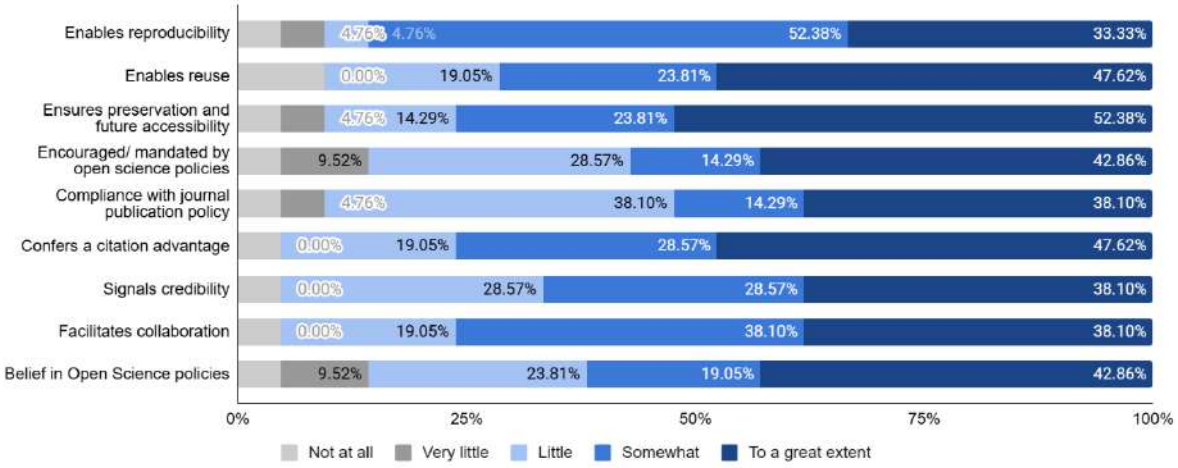
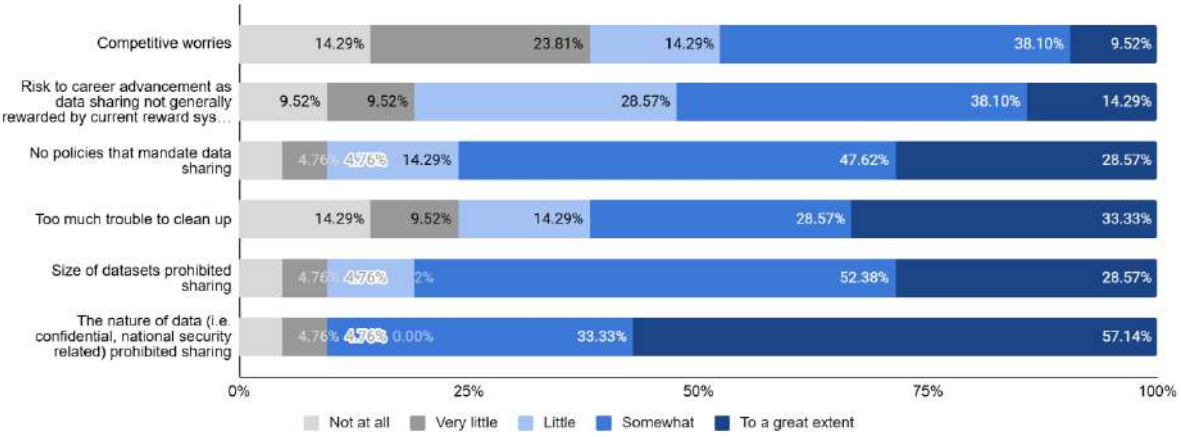


Figure 30. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *In your experience, to what extent do you see each of the following as reasons of NOT making data openly available*



When asked about whether they have received any training related to Open Science at their university/organization, majority mentioned about training related to research data management, research ethics and integrity, and research publishing and dissemination (**Figure 31**). In terms of receiving support or incentives related to Open Science, the overall responses rated it as moderate, with more specialist support such as Open science experts, research data committee, training, courses, workshops can be provided (**Figure 32**).

Figure 31. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *Do you receive any of the following training related to Open Science from your university/organization*

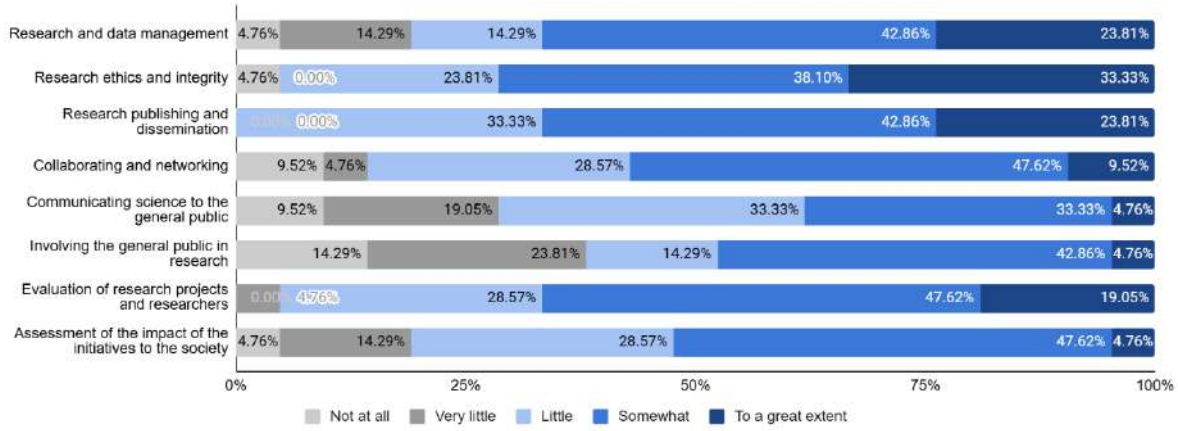
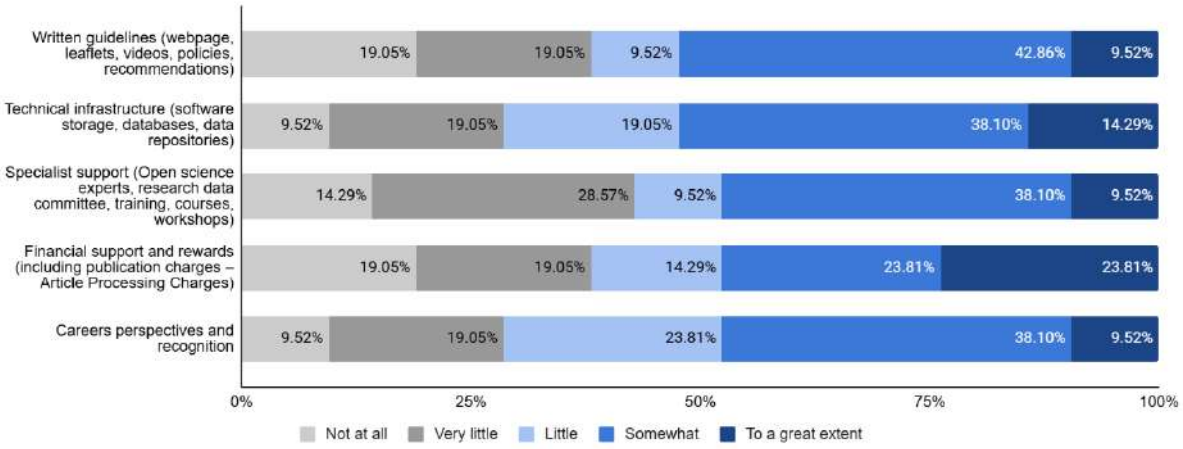


Figure 32. Percentage (%) of TG5 respondents – Malaysia, for *Question*: *Do you receive any of the following support or incentives related to Open Science from your university/organization?*



Overall, majority of the surveyed postgraduate students viewed Open Science positively, citing that Open Science as an exciting opportunity for Science, mostly with benefits and Open Science is an opportunity for science, with the benefits overcoming the drawbacks.

Education and skills. Several training programs related to Open Science have been organised by local universities, focusing on research ethics, research data management and research data archival repository. Not all training programs are made mandatory for postgraduate students at the surveyed institutions. As of now, the monitoring, evaluation, or assessment of the delivery, participation, and impact of Open Science training programs were basic, with the evaluation

primarily aims primarily at evaluating the total number of participants and satisfaction of the workshop participants on the organisation of the training programs. No specific rewards or incentives were provided to the postgraduate students, but for certain workshops, the workshop participants are entitled to receive certificate of participation.

In terms of specific training or support that the researchers need to adopt Open Science practices, the postgraduate students cited several topics, such as publishing in Open Access journals, citizen science, using data archival repositories, research data management (FAIR principles), and reproducibility tools, along with guidance on legal and ethical aspects including copyright and data privacy. In addition, providing institutional support through funding incentives, policy frameworks, and mentorship programs are also essential.

Majority of surveyed respondents agreed with the idea of integrating Open Science into formal and informal curriculum for research students, preferably as an elective course. The Open Science topics that can be integrated as part of the curriculum include Introduction to Open Science principles, Open Science tools, ethical use of research data and Data Management Plan.

5.2 INDIA

A total of 136 responses were received across the five target groups. The analysis integrates both quantitative, as illustrated in charts, and qualitative data that are summarised thematically and supported with selected illustrative statements from respondents.

Table 2. Distribution of respondents by target groups - India

Target groups (TG)	**TG1**	**TG2**	**TG3**	**TG4**	**TG5**
Number of respondents	18	3	9	66	40

TG1: Administrative Staff.

Demographic background. A total of 18 respondents participated in this survey, representing institutions from Thapar Institute of Engineering and Technology (TIET) and Narsee Monjee Institute of Management Studies (NMIMS). Respondents comprised a range of roles, such as directors, deans, deputy deans and head of departments.

Open Science progress and monitoring. This section presented respondents with forty-two questions designed to capture institutional progress in implementing Open Science (OS) principles, practices, and policies. Each item represented a specific required action, ranging from the appointment of senior personnel to lead Open Science initiatives, to long-term commitments for infrastructures and repositories to support citizen science. Respondents were asked to indicate the current status of each action using a five-point scale, where 1 = No plan at all, 2 = Starting, 3 = Partially, 4 = Largely, and 5 = Fully implemented. In addition, they were invited to provide information on the challenges associated with each action, allowing a more nuanced understanding of barriers to adoption.

Open Science Culture

Institutions reported that the appointment of senior personnel to lead OS (Q1) had begun but remained limited due to awareness gaps, systemic barriers in monitoring and evaluation of Open Science and leadership buy-in. Cultural change programmes (Q2) and advocacy efforts (Q3) were underway but hindered by low readiness and uneven institutional commitment.

Communication strategies (Q4) lacked consistency and inclusitivity, while stakeholder forums and self-regulation mechanisms (Q5) were underdeveloped due to diverse stakeholder interests and time constraints. Mandates for Open Access (Q6) had been introduced in some institutions, but respondents stressed financial support for Article Processing Charges (APC), monitoring gaps and weak enforcement as key obstacles.

Open Access

Respondents indicated that roadmaps for Open Access publishing (Q7) were still emerging but needs to be more unified and inclusive. In addition, the use of author identifiers such as ORCID (Q8) showed partial adoption especially among new researchers who are yet to have author identifiers. Support for new forms of scholarly publishing (Q9) and mechanisms for Open Access (Q10) are available but can be improved, especially in terms of financial supports and strategic partnerships with Open Access (OA) publishers.

Open Data

Institutions reported progress in drafting research data policies aligned to FAIR principles (Q11) and in establishing stewardship services (Q12), but noted shortages of trained staff. Access to infrastructures for storing and publishing research data (Q13) was limited by funding constraints, while communication of FAIR-aligned services to researchers (Q14) was hindered by low awareness. Mechanisms to gather information about archived datasets (Q15), publish metadata (Q16), and recognise data as a research output (Q17) remained weak, with respondents citing technical barriers.

Open Science Infrastructure

The establishment of institutional repositories (Q18), use of third-party repositories (Q19) and discovery services (Q20) were in progress, while commitments to engage with research clouds at institutional or national levels (Q21) were relatively strong, while the development of research data management programme (Q22) that are aligned with the principles of engagement with Open Science are progressing.

Open Science Skills

Provision of OS training (Q23) was reported progressing well while career paths for data-related professions (Q24) were still being developed. The regulations to mandate OS training

for staff, researchers, or students (Q25) varied between institutions and monitoring and assessing OS training (Q26) was not fully implemented.

Open Science Evaluation

Respondents indicated that integration of OS practices in recruitment, performance evaluation, career advancement policies (Q27) and their daily practice (Q28) was still limited. Likewise, the progress for organisations to recognise and/or reward for engaging in Open Science activities (Q29) is still limited and thus, highlighting the opportunity to develop a monitoring mechanism in place. The accessibility and availability of information about the organisation's policies on researcher evaluation received mixed views from the respondents,

Open Metrics

The development of bibliometrics policies grounded in OS principles (Q31) was reported as in early stages. Embedding new evaluation processes into promotion/reward systems (Q32) and creating guidance on bibliometrics for administrators and researchers (Q33) and training for early-career researchers on responsible use of metrics (Q34) were progressing well.

Research Integrity

Respondents reported satisfactory implementation of activities to raise awareness on OS (Q35). Embedding and abiding to OS principles within the research integrity (Q36–Q37) existed in some institutions.

Citizen Science

Citizen Science was the weakest cluster overall. Recognition of citizen science as a legitimate research method (Q38) and support for researcher–citizen dialogues (Q39) were limited to the research disciplines. Raising awareness of good practices (Q40) and assessing citizen science contributions (Q41) were underdeveloped while long-term commitments to infrastructure in citizen science proposals (Q42) are still evolving.

Open Science training and policy development. This section examined institutional policies and practices around OS training. Respondents were asked whether training programmes exist, whether participation is mandatory for certain groups, whether delivery and participation are monitored, and whether there are incentives or rewards for engaging.

Most respondents supported a leadership-focused training program on Open Science for senior university management and areas of leadership training in Open Science that would be most beneficial to senior university management include (1) Ethics and compliance: Ensuring FAIR and responsible Open Science practices, (2) Funding and sustainability: Securing financial support for Open Science, (3) Technology and infrastructure: Understanding Open Science platforms and digital repositories, (4) Change management: Leading Open Science cultural change and (5) Policy and governance: Developing institutional Open Science policies.

There were mixed responses about whether formal training programmes are made mandatory or voluntary to the campus community. The target groups include postgraduate research students and researchers. When asked about whether monitoring, evaluation and assessment of the delivery, participation, and impact of Open Science training programs were done at the University, the responses were mixed. In terms of rewards and incentives, some respondents indicated that there were no such policies or benefits, while others affirmed that rewards and incentives are provided to individuals who engage in Open Science training programs.

To conclude, perspectives from the Target Group 1 (TG1) highlighted the need for capacity building, financial support, mainstreaming policy across universities, integration of OS training into university curriculum and partnering with global Open Science platforms and consortia to encourage cultural change towards Open Science practices.

TG2: Public Administrators and Private Sector Representatives.

Demographic background. 3 respondents have participated in the survey and all respondents have a minimum bachelor's degree.

Open Science Awareness and Engagement. The respondents indicated a low level of familiarity with Open Science principles and practices and no implementation of formal Open Science policies at their institutions. When asked about which Open Science aspects that are most relevant to their role as administrators in their organisation, the responses cited Open Access to research publications, Open Data and Research Data Management, Citizen Science and public pngagement, research integrity and ethics as important topics to them. Partnerships with universities to access research outputs, data, or expertise do exist, but the challenge remains in terms of limited awareness of available Open Science resources, legal or policy

restrictions, lack of technical capacity to access/use research data and concerns about data quality and reliability.

Expectations and Needs. The responses mentioned that organising Open Science training will benefit their role in policymaking, research administration, or private sector innovation. Examples of training focus areas include understanding Open Science policies and strategies, using Open Data for policy and decision-making, navigating legal and ethical considerations in Open Science, developing public-private collaborations using Open Science and implementing Open Science principles in governmental or corporate settings. Besides training, additional support or resources such as access to Open Science tools and platforms, having clearer policies and legal frameworks for Open Science, garnering institutional support for Open Science adoption and access to training on Open Science best practices are valuable for them to incorporate Open Science into their work.

TG3: Technical and Support Staff.

Demographic background. The respondents identified their roles as Laboratory Assistants and Technical Staffs. All respondents have a minimum Diploma or Bachelor'degree in fields such as Computer Sciences and Library Sciences. Their years of experience varies, ranging from 2 to over 20 years of experience in their roles. All respondents are working at either Narsee Monjee Institute of Management Studies (NMIMS) or Thapar Institute of Engineering and Technology (TIET).

Open Science Infrastructure and Stewardship. Thapar Institute of Engineering and Technology (TIET) provided Open Science services through their institutional repository that is built using the Dspace system, embedded with the Handle System and supports Creative Commons licences. TIET also manages and supports a publishing platform, which is Thapar Scientific Letters (OJS) and uses Moodle as their institutional Learning Management System (LMS) or Virtual Learning Environment (VLE) to support Open Education practices. The technical staffs provide supports in terms of research data management, e-infrastructure and Open Educational Resources. The Full-Time-Equivalent (FTE) to support the activities is typically 1 to 2 days per week.

At Narsee Monjee Institute of Management Studies (NMIMS), researchers have access to an information system that regularly captures information about research on a monthly basis. The

researchers also have access to and use open software such as Cloudera, Codeblocks, Vscode, Python, Jupyter Nootbook and Codeblocks. NMIMS also provided resources and tools to support Research Data Management (RDM) for its students and researchers. This includes access to various databases, online resources, dedicated support services, as well as training programs and workshops to enhance data analysis and research skills. In addition, NMIMS ensures all research outputs are assigned with DOIs through its library or research support services. Advocacy for Open Educational Resources is carried out by The NMIMS Library through the Knowledge Trendsetters newsletter. The Library published the latest issue themed "Open Access Educational Resources that introduces the concept of OERs, explains their types and selection, and provides practical resources such as FAQs, database tutorials, and library updates. For Open Access, NMIMS produces its own in-house publications, including the NMIMS Journal of Economics and Public Policy and the Engineering and Technology Review, as well as the Knowledge Trendsetters newsletter, which often highlights themes such as Open Access publishing. The institution actively promotes Open Access by providing access to resources like the Directory of Open Access Journals (DOAJ), while the NMIMS Library supports learning and research through a wide collection of e-books, e-journals, and online databases. In terms of tools or a platform to support Citizen Science or Public Engagement, the promoted social activities through Enactus and Community Service with the help of students and faculty. The technical staffs provide supports in terms of research data management, e-infrastructure, Citizen Science and Public Engagement and Open Educational Resources. The Full-Time-Equivalent (FTE) to support the activities is typically 1 day per week.

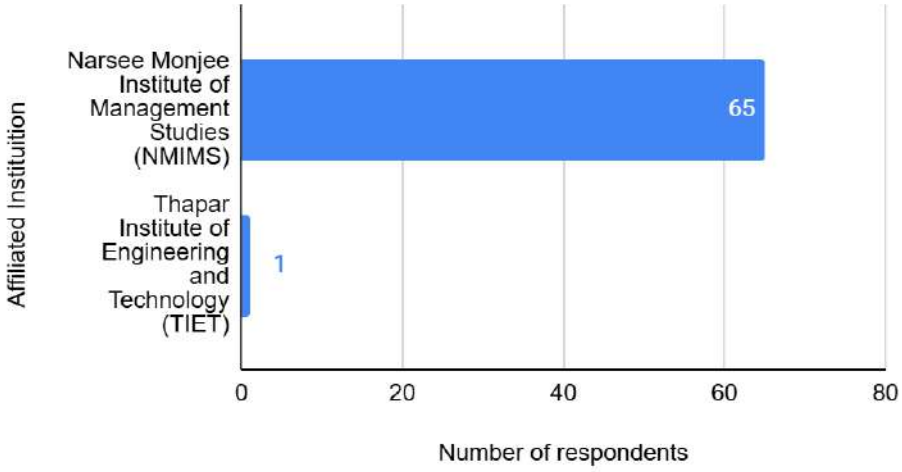
Training and Education. The surveyed respondents mentioned that challenges in terms of lack of training or certification and lack of access to tools or platforms for data management are key challenges that they face in their role to support OS practitioners. Some of them have not received any formal training such as in forms of workshops, certification programs, or on-the-job training in any areas of Open Science while for those who have received training, the topics that they have learnt include Advanced Excel and Communication. The respondents also mentioned that several Open Science knowledge, resources, tools and skills that were perceived necessary to help them improve their role in supporting Open Science initiatives include Open Science concepts, tools, and technology and policies and processes while learning about the tools for ensuring data interoperability and reuse, strategies for data preservation and archiving and legal and ethical considerations in Open Science (e.g., licensing, GDPR compliance) are

beneficial for them. Currently, Open Science is promoted through various means, such as through physical workshops and online events. In terms of support needed for the technical staffs to effectively advocate for Open Science in their institution, the respondents mentioned about the importance of Open Science Policy and guidelines, creating collaboration opportunities with researchers and providing enhanced IT infrastructure for data management.

TG4: Academics and Researchers

Demographic background. A total of 66 respondents participated in this round of the survey. Respondents were academics and researchers from various research disciplines including Computer Science and Information Technology, Physical Sciences and Social Sciences. Most of them are either Master's degree and PhD holders and have served at respective universities at least two years. The distribution of respondents by institutions is as followed:

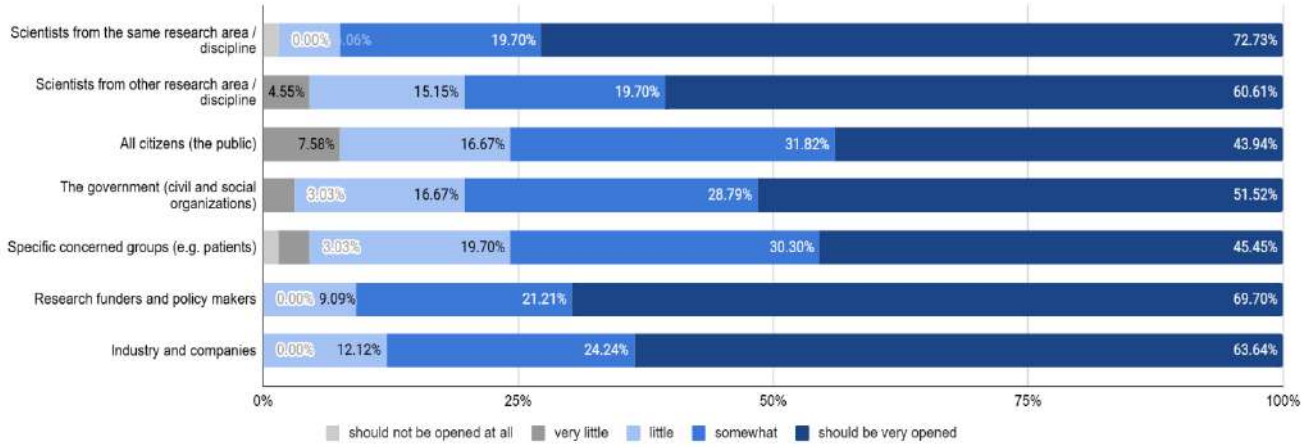
Figure 33. Distribution of respondents for TG4 by institutions - India



Awareness and perceived benefits.

When the researchers asked about their opinion about question, *to whom should science (research output) be opened?* **(Figure 34)**, the majority researchers agreed that research output should be opened to scientists from the same or other research area or discipline, research funders, and industry or companies.

Figure 34. Percentage (%) of TG4 respondents – India, for *Question: In your opinion, to whom should science (research output) be opened?*



Majority of the surveyed researchers perceived that different aspects of the scientific process should be opened to the research community (all scientists) (**Figure 35**), as well as to the society (all citizens / general public) (**Figure 36**), or to research funders and policy makers (**Figure 37**).

Figure 35. Percentage (%) of TG4 respondents – India, for *Question*: *In your opinion, how open do you think the different aspects of the scientific process should be to the research community (all scientists)?*

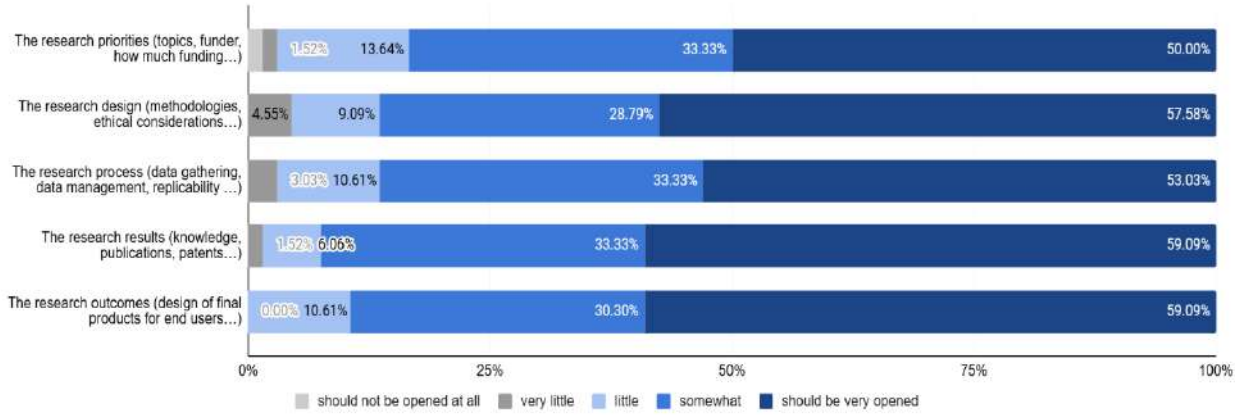


Figure 36. Percentage (%) of TG4 respondents – India, for *Question: In your opinion, how open do you think the different aspects of the scientific process should be to the society (all citizens / general public)?*

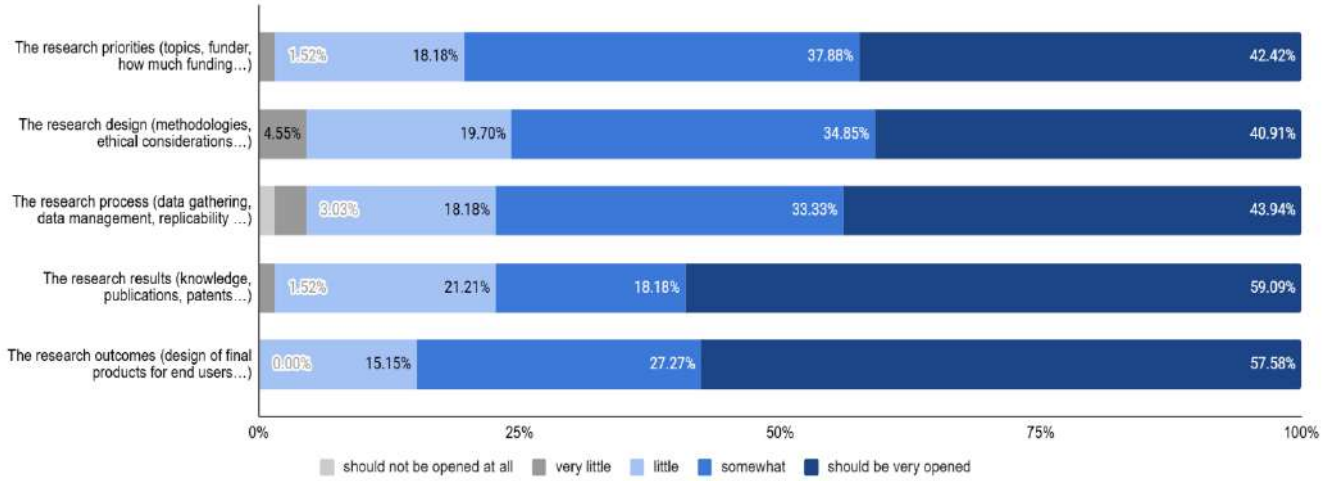
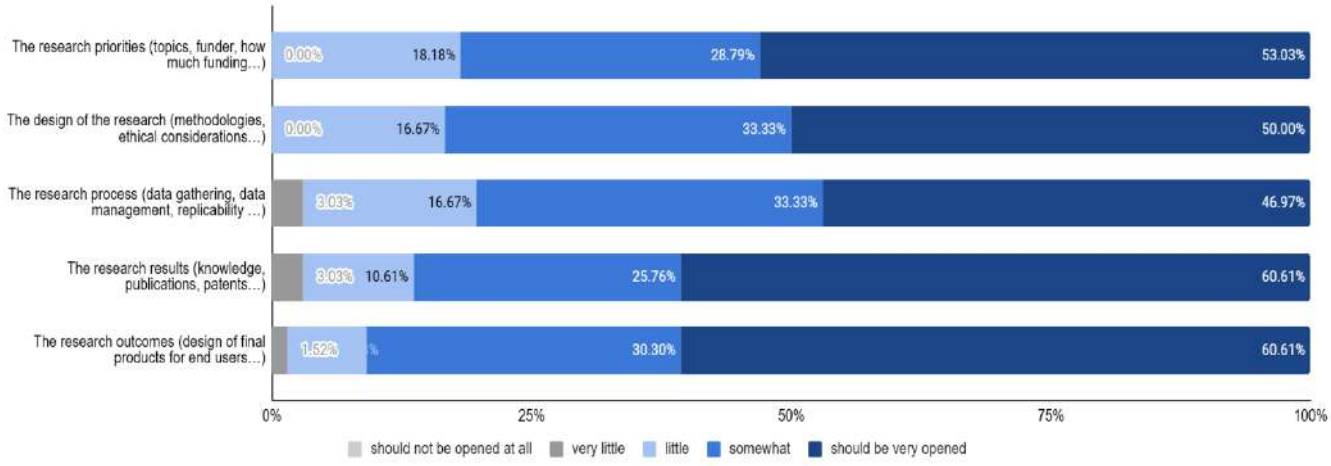
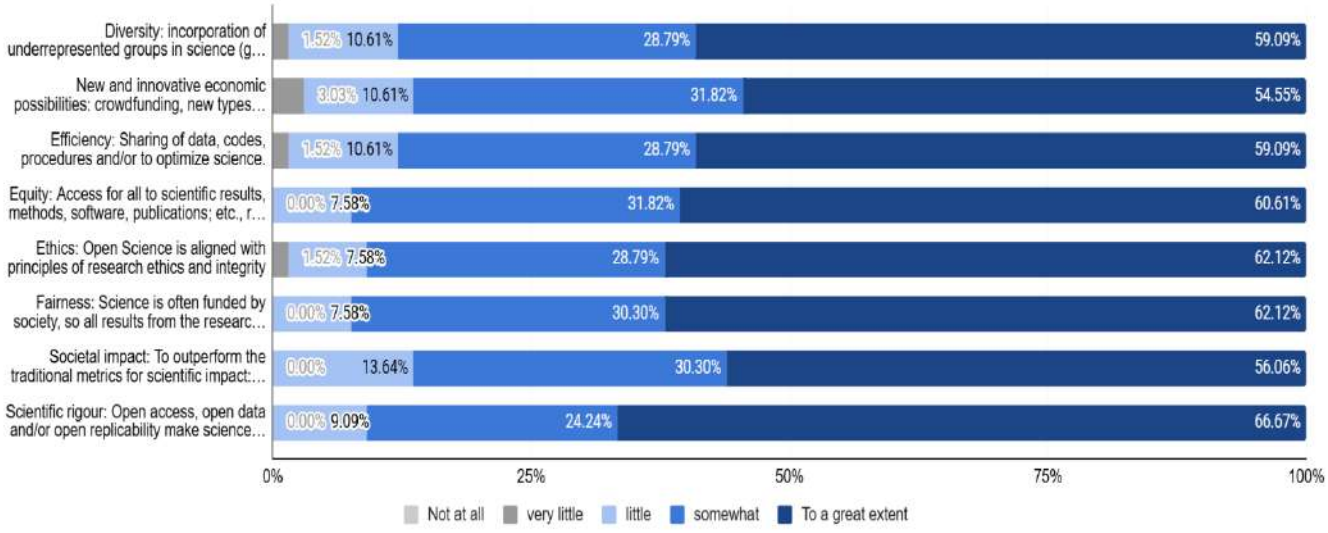


Figure 37. Percentage (%) of TG4 respondents – India, for *Question: In your opinion, how open do you think the different aspects of the scientific process to research funders and policy makers?*



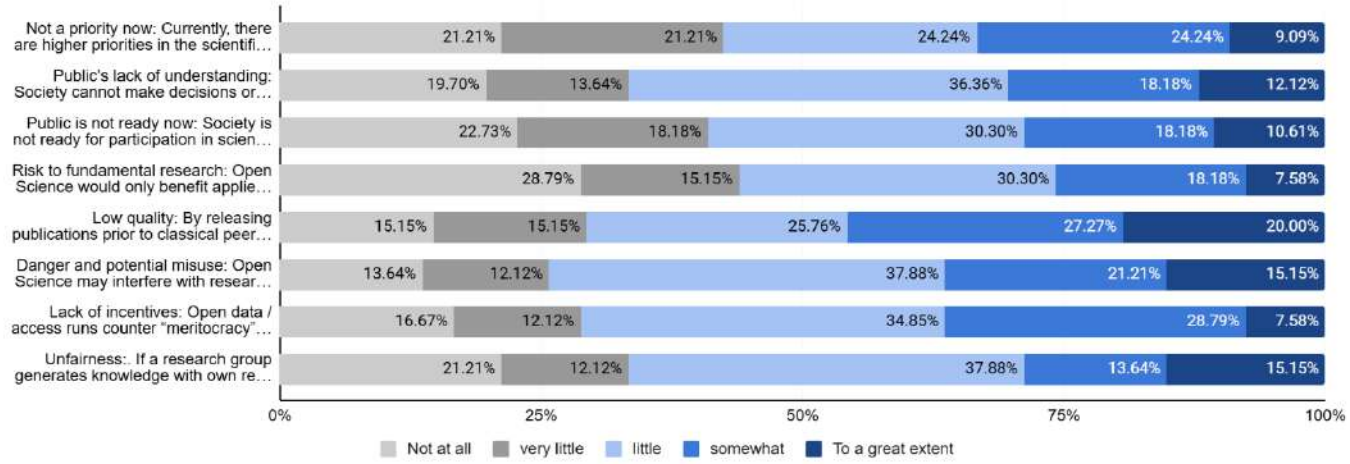
When asked about their views on the reasons why science should be open (**Figure 38**), the surveyed researchers cited several key reasons such as equity by providing access for all to scientific results, methods, software and publication, as well as achieving fairness, social impact and scientific rigour.

Figure 38. Percentage (%) of TG4 respondents – India, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should be open?*



On the contrary, majority of the surveyed respondents described the primary reasons why science should not be open (**Figure 39**) are potentially due to low quality of work (by releasing publications prior to classical peer review, the veracity of papers will be difficult to assess by individual researchers; quality is not guaranteed by preprint servers/digital repositories) and the potential danger and misuse (examples are release of medical personal data and facilitate misuse of research results such as biological weapons).

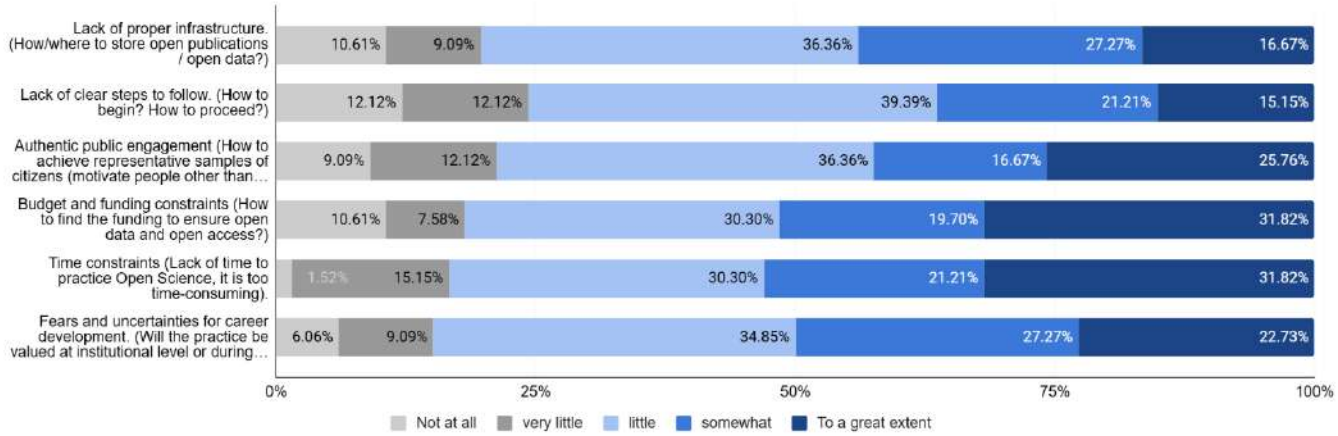
Figure 39. Percentage (%) of TG4 respondents – India, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should NOT be open?*



In addition, the respondents perceived time constraint (e.g. Lack of time to practice Open Science, it is too time-consuming) as well as fears and uncertainties over career development

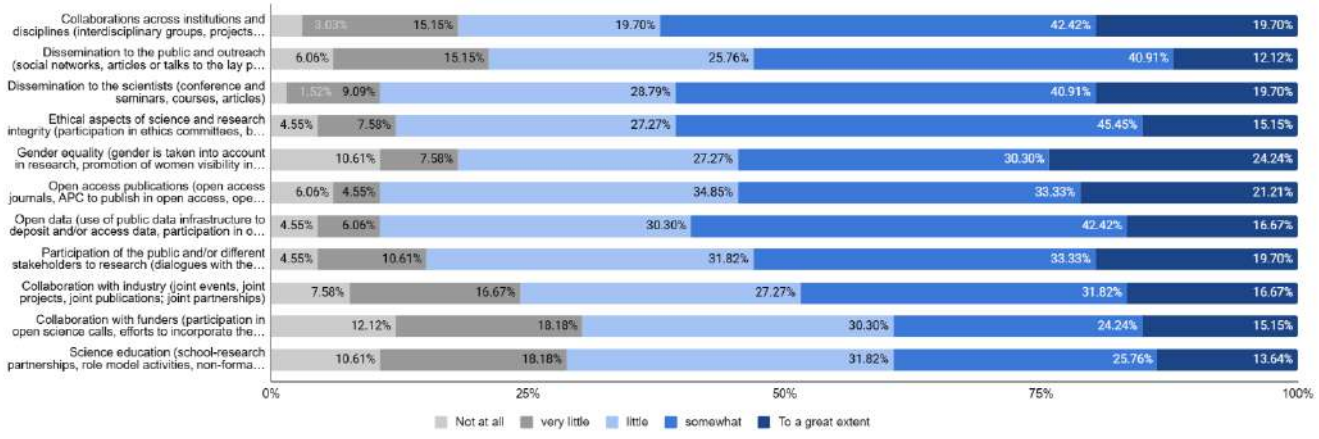
(e.g. researchers concern if the practice will be valued at institutional level or during career) as primary challenges to embrace Open Science (**Figure 40**).

Figure 40. Percentage (%) of TG4 respondents – India, for *Question: Imagine in your everyday work at your institution you decide to embrace (or you already have embraced) an Open Science perspective. In your experience, to what extent do you see each of the following as a barrier you will be facing.*



Majority of the surveyed researchers have involved in any types of Open Science activities **(Figure 41).** Examples of participated OS activities include dissemination to the scientists (e.g. conference and seminars, courses, articles), open data and collaborations across institutions and disciplines (e.g. interdisciplinary groups, projects or meetings, collaborative initiatives etc).

Figure 41. Percentage (%) of TG4 respondents – India, for *Question: In your experience, to what extent do you participate in any of the following open science activities?*



The survey respondents also confirmed that publishing papers as Open Access gave them many advantages such as increased visibility or discoverability, reached wider and bigger potential audience, and contributing to to the faster pace of scientific advances (**Figure 42**). Nonetheless, they perceived the disadvantages of publishing papers as Open Access include the costs of OA publishing and the existence of many predatory journals (**Figure 43**).

Figure 42. Percentage (%) of TG4 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as advantage of publishing papers as open access*?

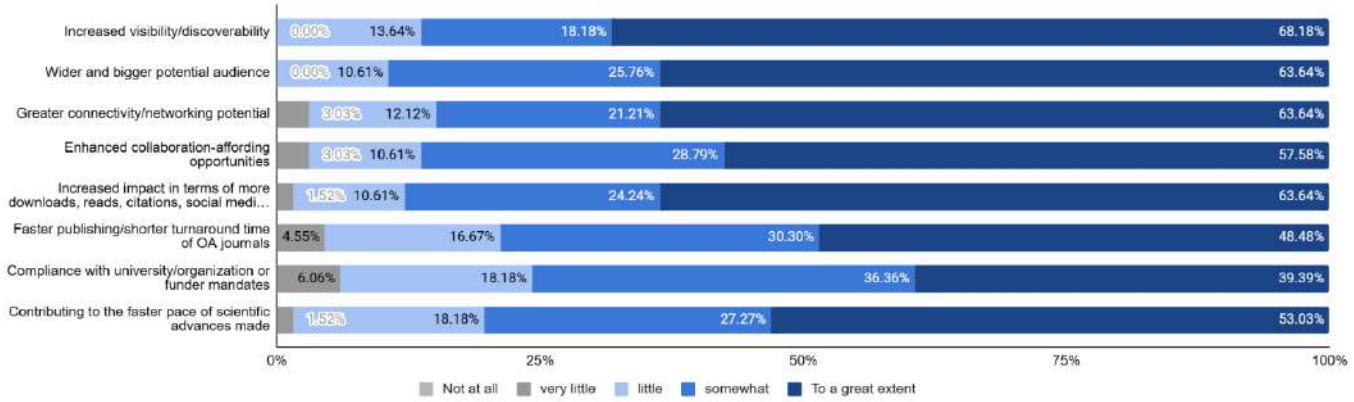
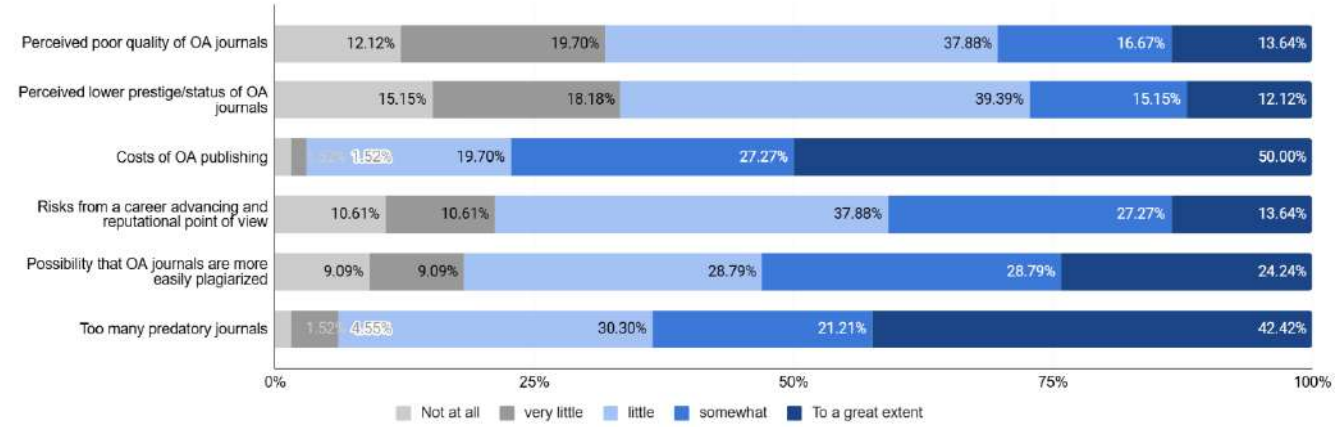


Figure 43. Percentage (%) of TG4 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as disadvantages of publishing papers as open access?*



Additionally, the surveyed researchers have made the data that they produced openly available by various means (**Figure 44**), especially publishing data as a supplementary materials to a paper. When asked about the reasons for them to make the data they produced openly available, majority agreed that the reasons are to achieve a citation advantage and signals credibility (**Figure 45**). However, they also believed that the data should not be made openly available

primarily due to the nature of data that can be confidential or national security related that prohibited sharing and too much hassles to be done for data cleaning up (**Figure 46**).

Figure 44. Percentage (%) of TG4 respondents – India, for *Question*: *In your experience, to what extent do you make the data you produced openly available*

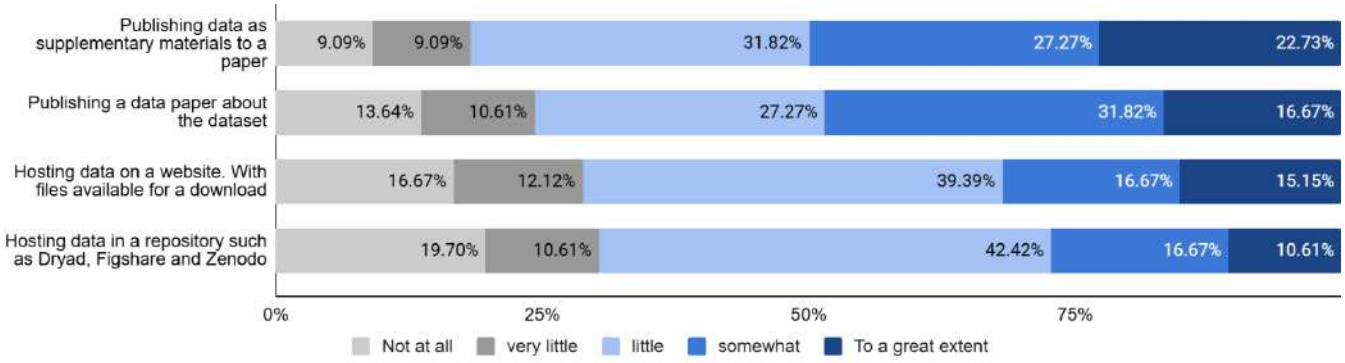


Figure 45. Percentage (%) of TG4 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as reasons of making data openly available*

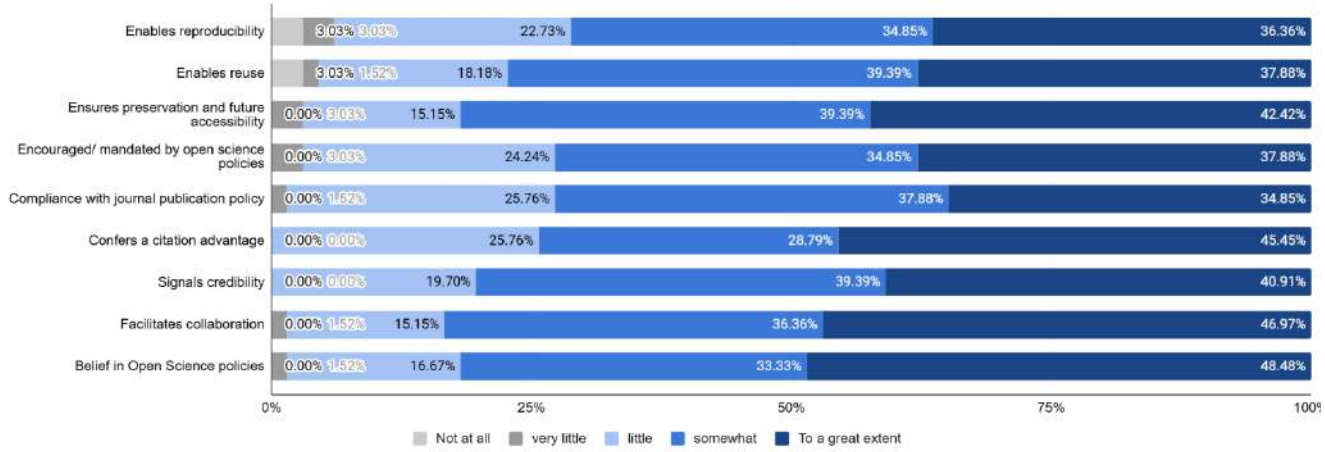
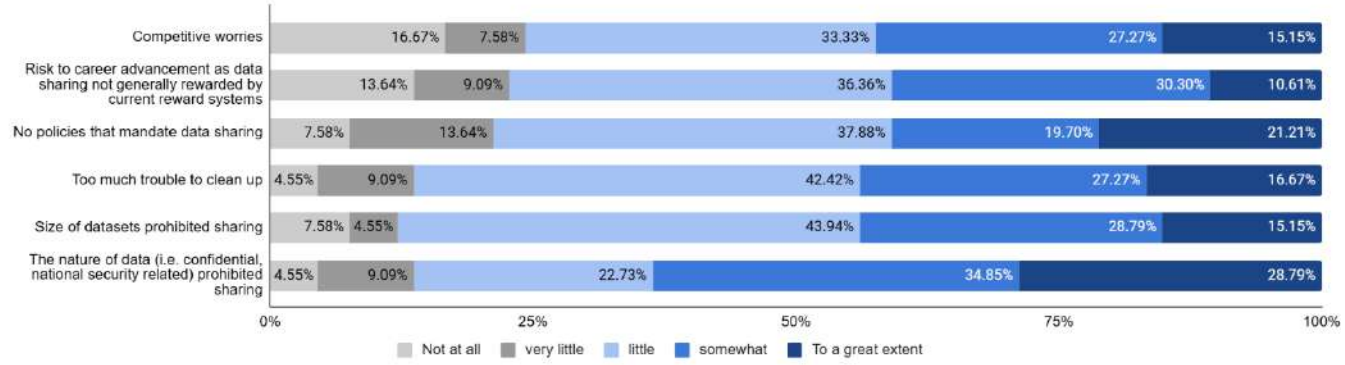


Figure 46. Percentage (%) of TG4 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as reasons of NOT making data openly available*



When asked about whether they have received any training related to Open Science at their university/organization, the respondents mentioned that the most participated activity is evaluation of research projects and researchers, while the least participated activity is research data management (**Figure 47**). In the aspect of receiving support or incentives related to Open Science, the overall responses received mixed views, with careers perspectives and recognition and technical infrastructure such as software storage, databases and data repositories received the highest vote (**Figure 48**).

Figure 47. Percentage (%) of TG4 respondents – India, for *Question*: *Do you receive any of the following training related to Open Science from your university/organization*

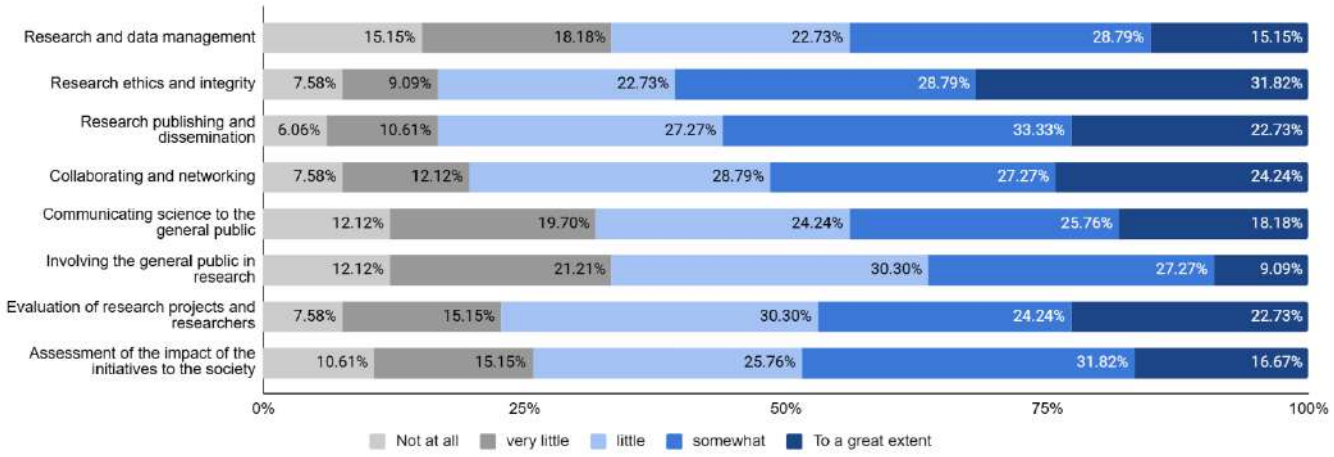
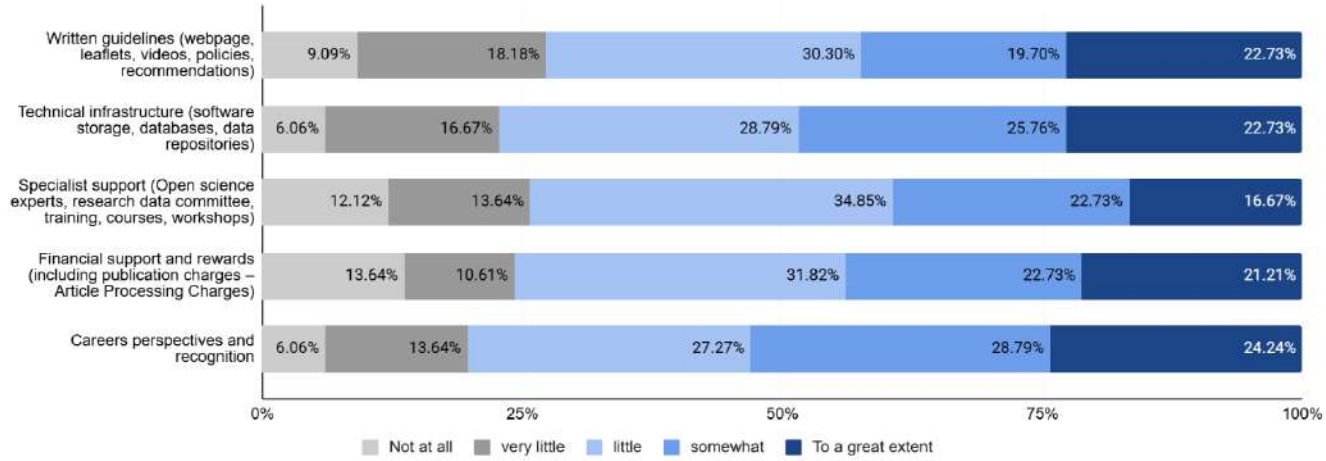


Figure 48. Percentage (%) of TG4 respondents – India, for *Question*: *Do you receive any of the following support or incentives related to Open Science from your university/organization*



Lastly, the overall view of Open Science was mixed, citing that Open Science as an exciting opportunity for Science, mostly with benefits and also important drawbacks.

Education and skills. Overall responses suggested that the offering of training programs related to Open Science have been limited, with participation are not made mandatory to the researchers. Generally, there is no formal mechanism implemented for monitoring, evaluation, or assessment of the delivery, participation, and impact of Open Science training programs, except for general research capacity-building workshops that collected workshop attendance and feedback survey for workshop improvement. The responses also suggested that specific rewards or incentives were provided but no specific examples were mentioned.

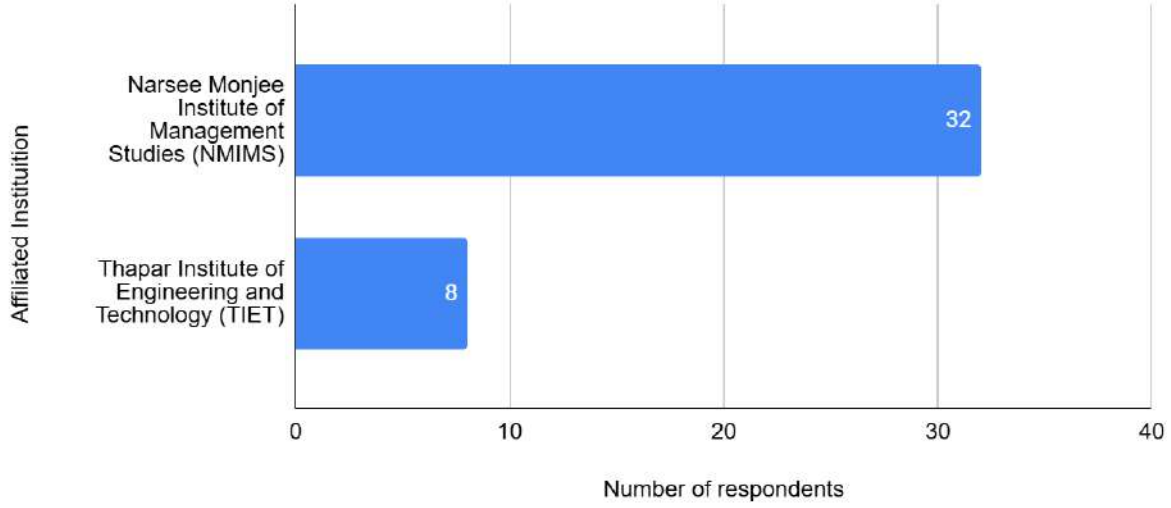
In terms of specific training or support that the researchers need to adopt Open Science practices, the respondents proposed several topics, such as FAIR principle for domain-specific research, data management, open data repositories and tools (e.g. GitHub, Jupyter, Open Science Dramework), ethics and Open Science policy and publishing in Open Access journals. In addition, providing institutional support through providing incentives for publication in Open Access journals and research infrastructure such as fully equipped research laboratories are also essential.

Majority responses believed that integrating Open Science into formal and informal curriculum for academics, teaching staff, researchers, scientific personnel is useful. Examples of topics that can be included as part of the curriculum are publishing in Open Access journals, Open Data, Reproducibility, data ethics and legal considerations and open source software.

TG5: Postgraduate Students

Demographic background. A total of 40 respondents participated in this round of the survey. Respondents were postgraduate research students from various research disciplines including life sciences, engineering and computer science and information technology. Most of them are Bachelor and Master degree holders and currently pursuing master and doctoral degrees in research. Majority of surveyed respondents are in the developing research proposal or preparing for proposal defense and data collection phases. The distribution of respondents by institutions is as followed:

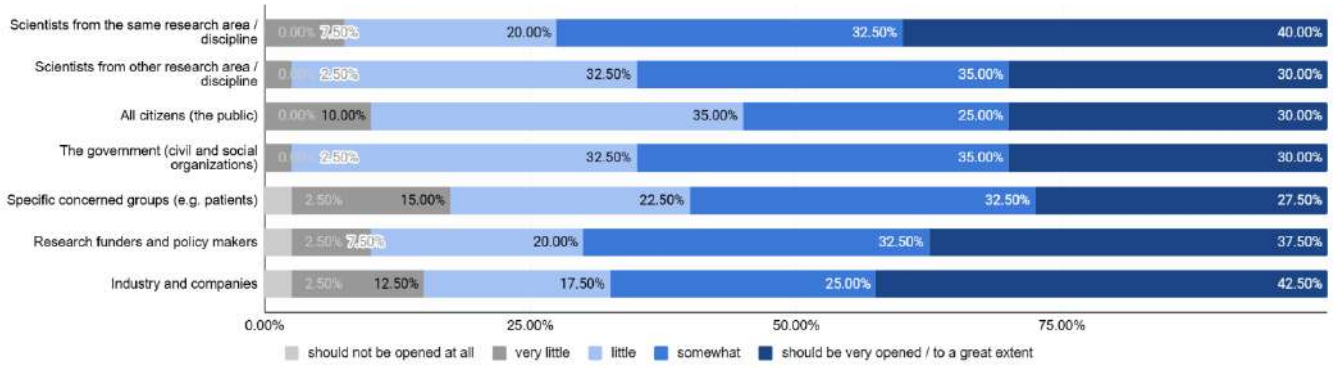
Figure 49. Distribution of respondents for TG5 by institutions - India



Awareness and perceived benefits.

When the postgraduate students were asked about their opinion about question, *to whom should science (research output) be opened?* **(Figure 50)**, majority responses agreed that research output should be opened to scientists from the same or other research area or discipline and the government, as well as civil and social organisations.

Figure 50. Percentage (%) of TG5 respondents – India, for *Question: In your opinion, to whom should science (research output) be opened?*



When asked about whether they think that different aspects of the scientific process should be opened to the research community (all scientists) (**Figure 51**), all agreed that research results and research outcomes should be made open to the research community. In addition, majority responses described that research process and research outcomes should be opened to the society (all citizens / general public) (**Figure 52**), and to research funders and policy makers (**Figure 53**).

Figure 51. Percentage (%) of TG5 respondents – India, for *Question: In your opinion, how open do you think the different aspects of the scientific process should be to the research community (all scientists)?*

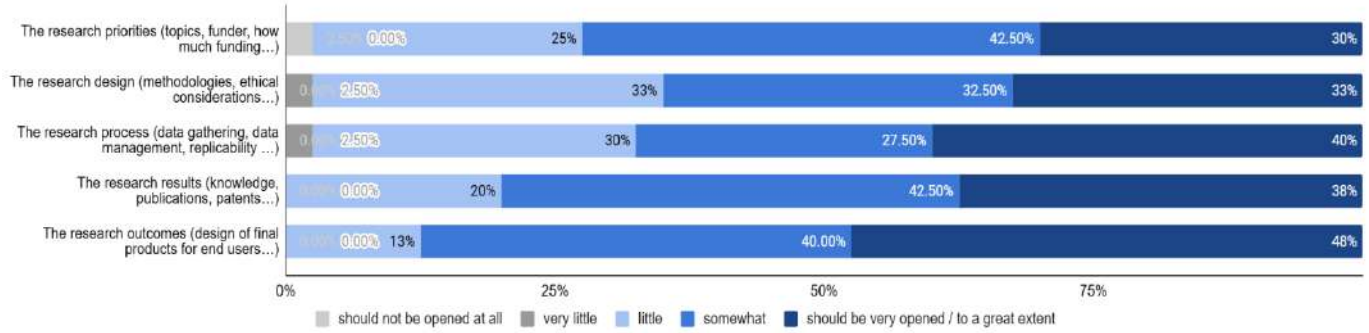


Figure 52. Percentage (%) of TG5 respondents – India, for *Question: In your opinion, how open do you think the different aspects of the scientific process should be to the society (all citizens / general public)?*

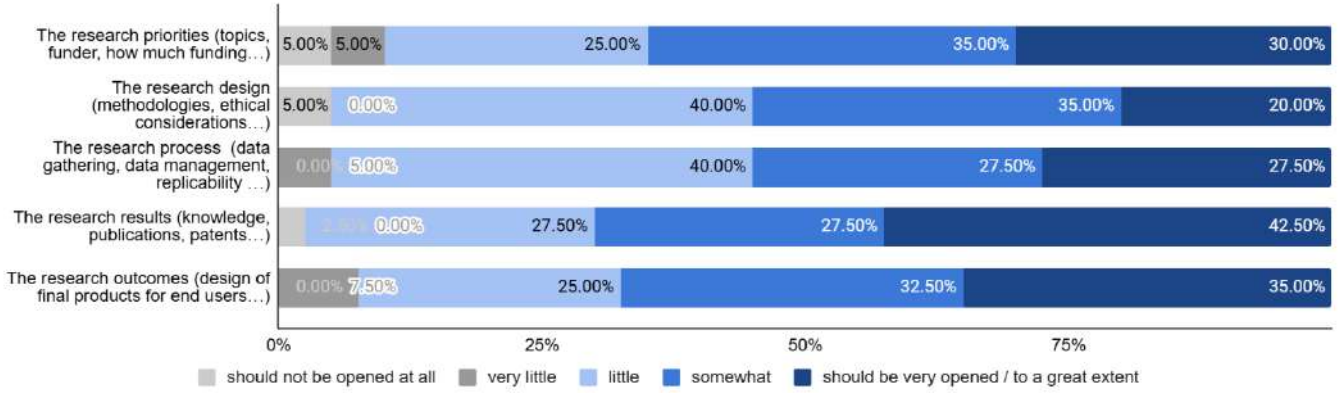
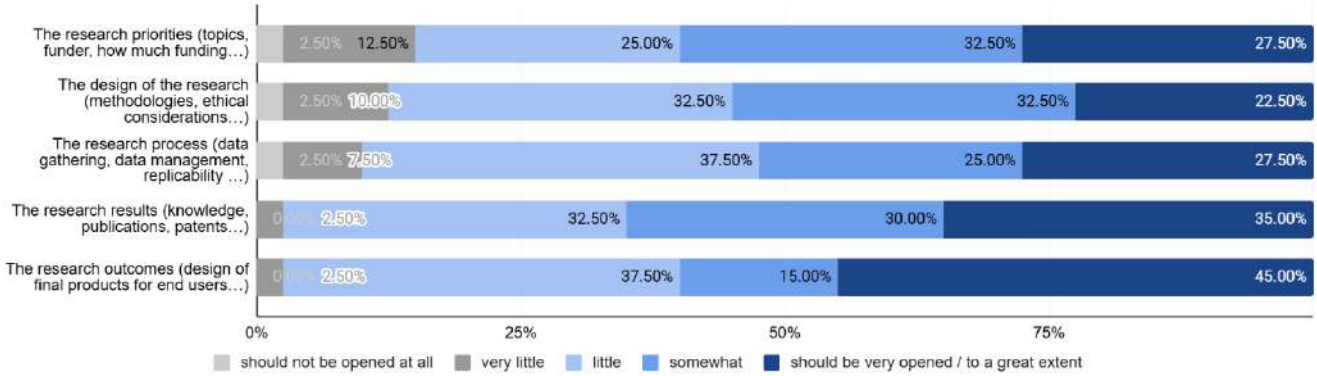
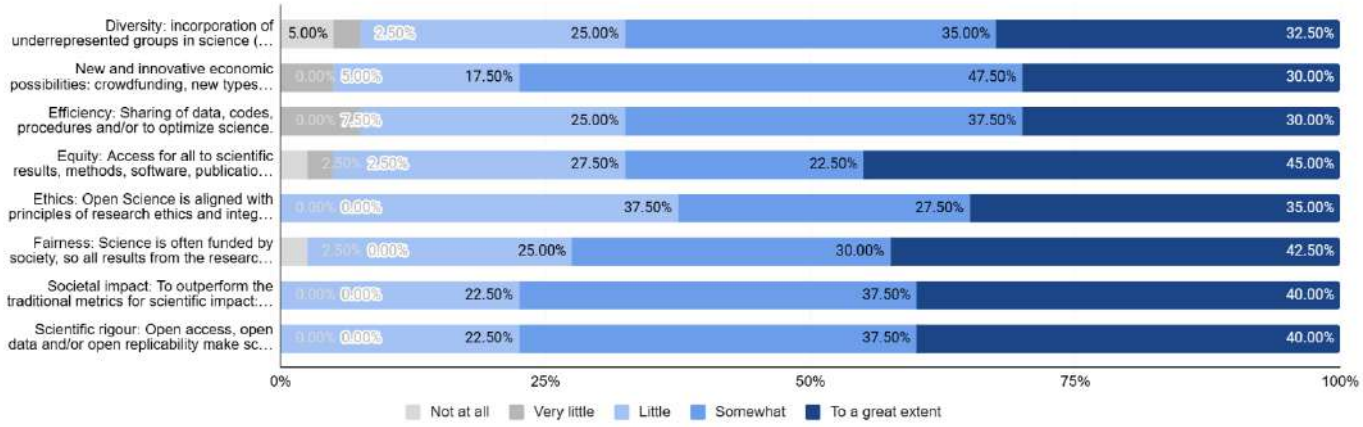


Figure 53. Percentage (%) of TG5 respondents – India, for *Question: In your opinion, how open do you think the different aspects of the scientific process to research funders and policy makers*



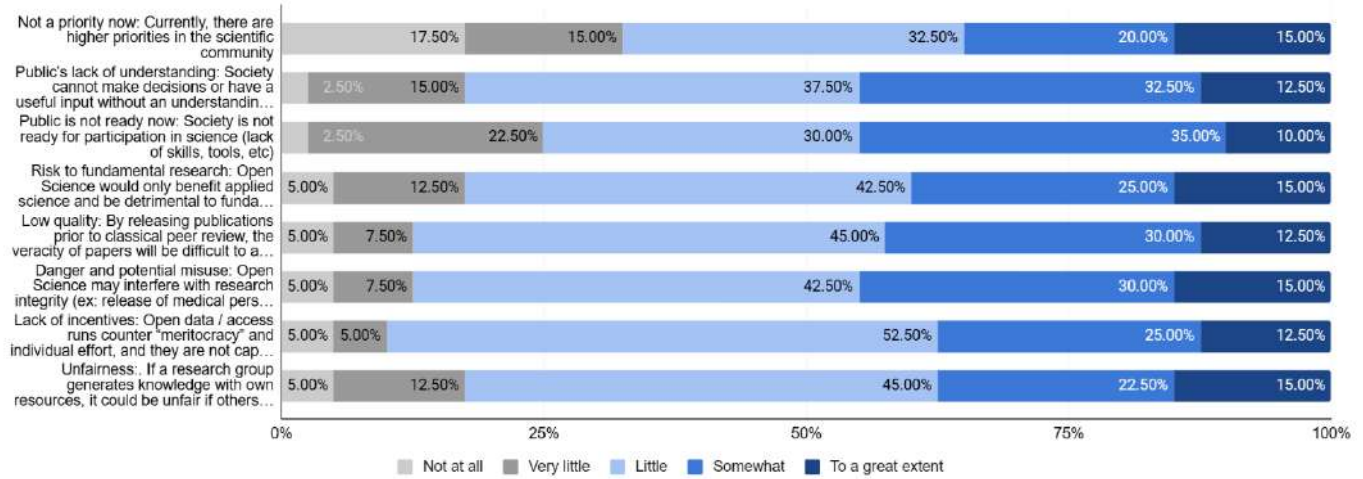
Additionally, the survey findings reported various opinions on the reasons why science should be open (**Figure 54**). Among most cited reasons are (1) scientific rigour such as through Open Access, open data and/or open replicability that make science easier to be reviewed and (2) to achieve societal impact (such as by outperforming the traditional metrics for scientific impact).

Figure 54. Percentage (%) of TG5 respondents – India, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should be open?*



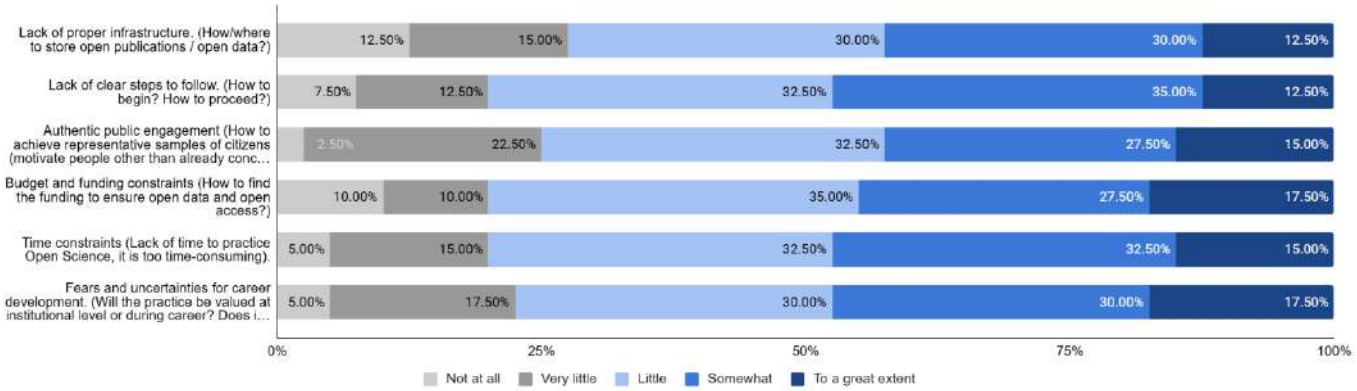
On the contrary, the surveyed respondents agreed that the primary reasons why science should not be open (**Figure 55**) is due to public's lack of understanding as society cannot make decisions or have a useful input without an understanding of science or the scientific process. Another important reason is because of the public is not ready for participation in science, either due to lack of skills, tools, etc.

Figure 55. Percentage (%) of TG5 respondents – India, for *Question*: *In your opinion, to what extent do you see each of the following as a reason why science should NOT be open?*



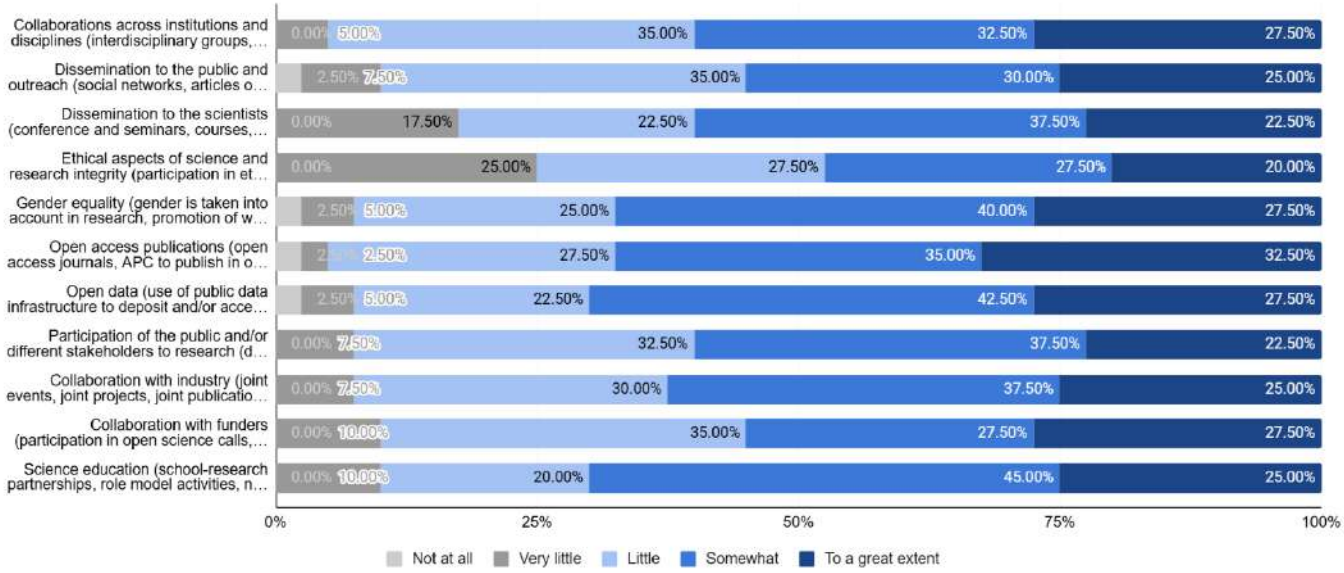
In addition, the survey respondents agreed that attaining authentic public engagement (e.g. how to achieve representative samples of citizens to motivate people other than already concerned groups) time constraint and fears and uncertainties over career development as key challenges to embrace Open Science (**Figure 56**).

Figure 56. Percentage (%) of TG5 respondents – India, for *Question: Imagine in your everyday work at your institution you decide to embrace (or you already have embraced) an Open Science perspective. In your experience, to what extent do you see each of the following as a barrier you will be facing.*



Majority of the surveyed postgraduate students have participated in any types of Open Science activities **(Figure 57).** Among the mostly participated OS activities are science education (e.g. school-research partnerships, role model activities, non-formal education activities, etc.), activities related to ethical aspects of science and research integrity (e.g. participation in ethics committees, bioethical research, training, awareness activities, etc.) and dissemination activities to the scientists (e.g. conference and seminars, courses, articles).

Figure 57. Percentage (%) of TG5 respondents – India, for *Question: In your experience, to what extent do you participate in any of the following open science activities*



The postgraduate students also described that publishing papers as Open Access is advantages especially to enhance collaboration hence affording opportunities, increased their visibility or discoverability and provide faster publishing or shorter turnaround time of OA journals (**Figure 58**). On contrary, the surveyed postgraduate students perceived the disadvantages of publishing papers as Open Access include the costs of OA publishing and perceived lower prestige or status of OA journals (**Figure 59**).

Figure 58. Percentage (%) of TG5 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as advantage of publishing papers as open access*?

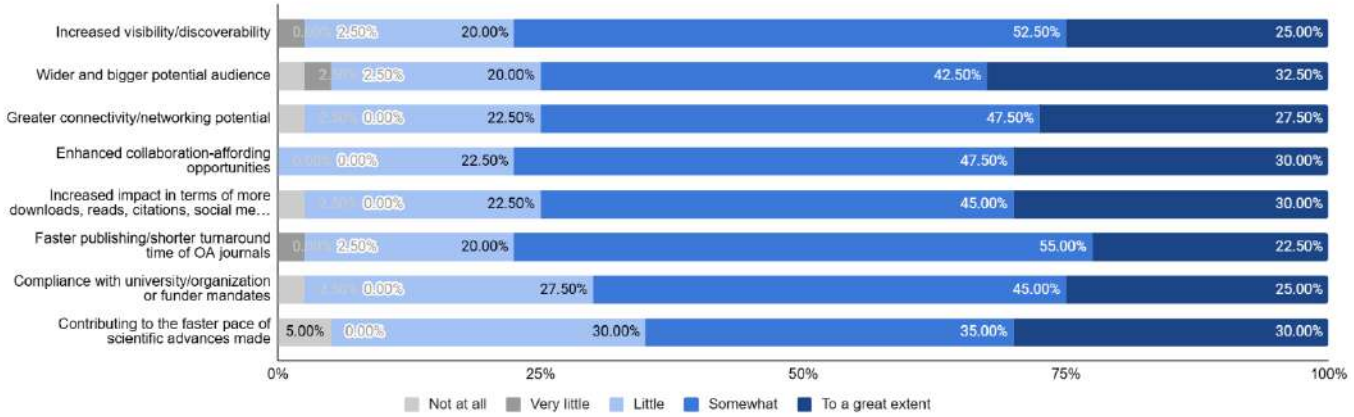
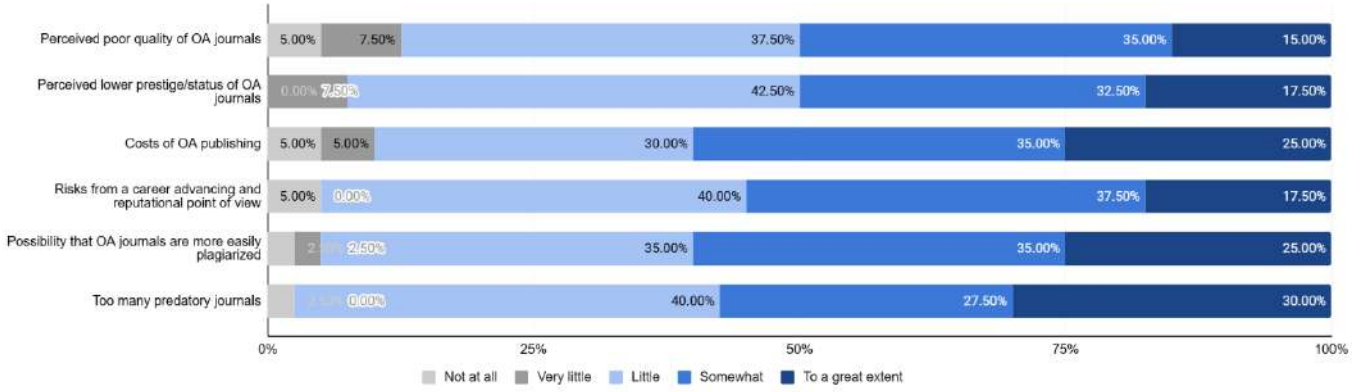


Figure 59. Percentage (%) of TG5 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as disadvantages of publishing papers as open access?*



In addition, majority of the surveyed postgraduate students have previously made the data they produced openly available, such as by publishing data as supplementary materials to a paper, publishing a data paper about the dataset, hosting data on a website with files available for a download and hosting data in a repository such as Dryad, Figshare and Zenodo (**Figure 60**). Based on the survey findings, the respondents described that key reasons of making data openly available are to enhance credibility, enable reproducibility, reuse, ensures preservation and future accessibility, and because they are encouraged or mandated by Open Science (**Figure 61**). However, they also perceived that the data should not be made openly available because of competition, risk to career advancement, no polices that mandate data sharing and size of datasets that prohibited data sharing (**Figure 62**).

Figure 60. Percentage (%) of TG5 respondents – India, for *Question*: *In your experience, to what extent do you make the data you produced openly available*

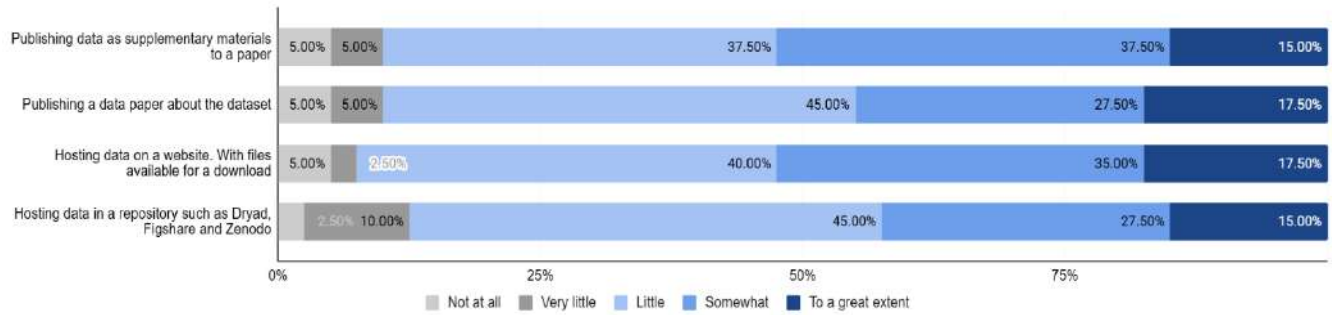


Figure 61. Percentage (%) of TG5 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as reasons of making data openly available*

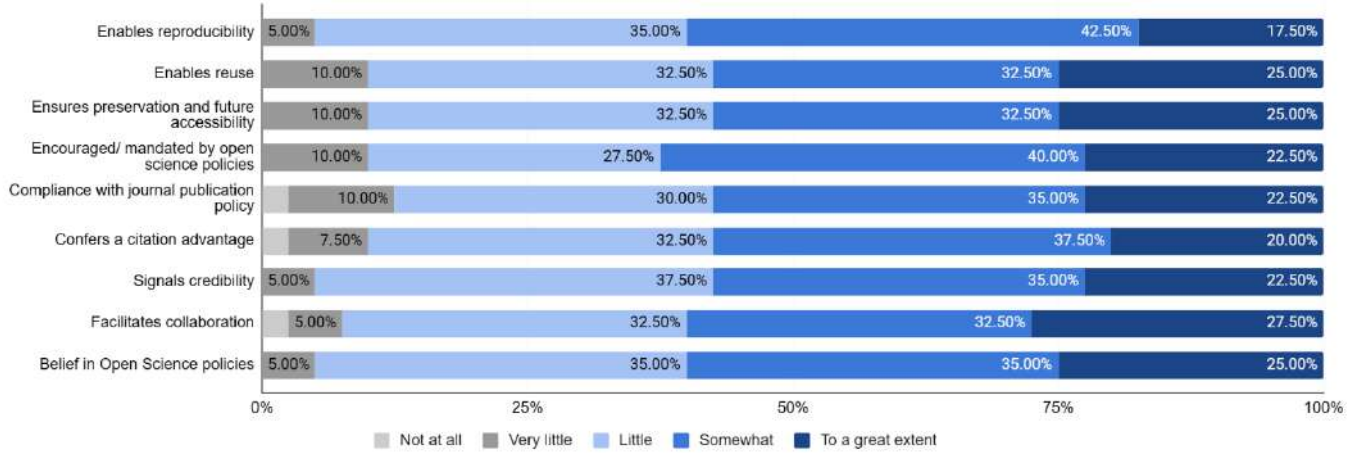
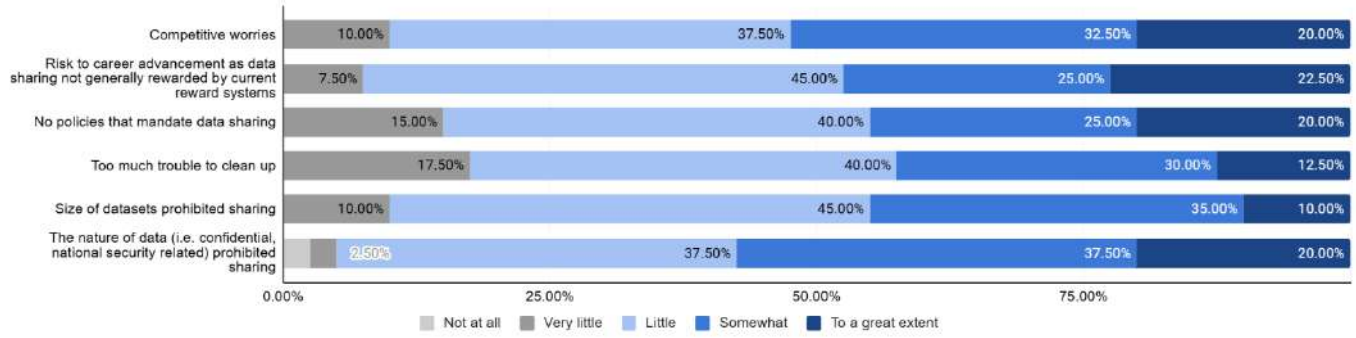


Figure 62. Percentage (%) of TG5 respondents – India, for *Question*: *In your experience, to what extent do you see each of the following as reasons of NOT making data openly available*



When asked about whether they have received any training related to Open Science at their university/organization, majority confirmed that they have participated in training related to various Open Science topics such as research ethics and integrity, and collaborating and networking (**Figure 63**). They also affirmed the various support or incentives related to Open Science that have been received, including written guidelines, technical infratsructure and careers perspectives and recognition (**Figure 64**).

Figure 63. Percentage (%) of TG5 respondents – India, for *Question*: *Do you receive any of the following training related to Open Science from your university/organization*

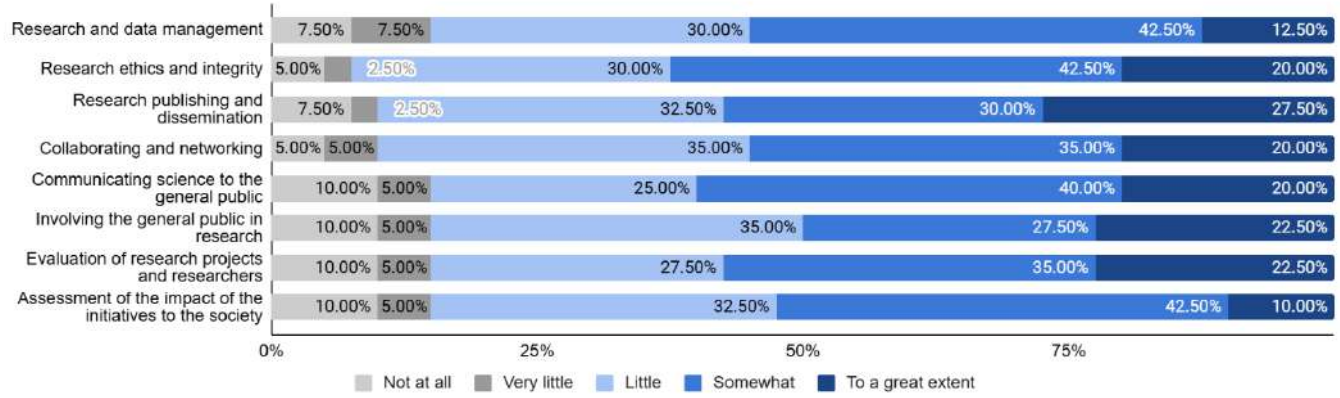
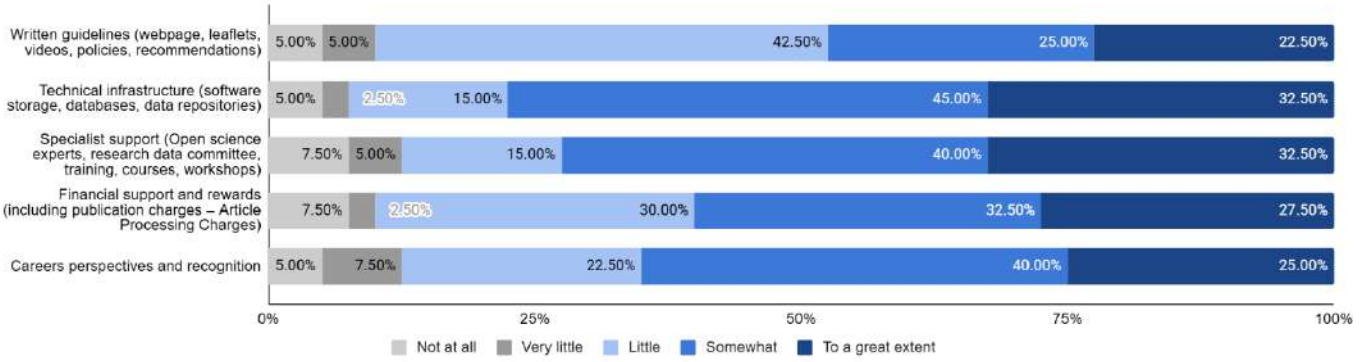


Figure 64. Percentage (%) of TG5 respondents – India, for *Question*: *Do you receive any of the following support or incentives related to Open Science from your university/organization?*



To sum up, the overall view of Open Science received mixed responses, and regarded Open Science is an opportunity for Science, and has both the benefits as well as the drawbacks.

Education and skills. Several training programs related to Open Science have been organised by local universities, primarily on topics such as research data management, open access publishing, open-source tools, and research ethics. Not all training programs are made mandatory for postgraduate students at the surveyed institutions. As of now, the monitoring, evaluation, or assessment of the delivery, participation, and impact of Open Science training programs were minimal, with selected training programs have implemented monitoring mechanism through attendance records, feedback forms, and periodic evaluations. Additionally, impact evaluation was assessesed by reviewing research practices such as data sharing, open access publications, and compliance with institutional and funding guidelines. No specific rewards or incentives were provided to the postgraduate students.

In terms of specific training or support that the respondents need to adopt Open Science practices, the postgraduate students cited several topics, such as research data management (FAIR principles), open access publishing, and reproducibility. In addition, providing institutional support through funding incentives is also important for them to adopt Open Science practices.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

The findings from this trial dataset demonstrate that technical and support staff at Universiti Malaya are academically qualified, professionally trained, and actively engaged in supporting institutional Open Science activities. Nonetheless, significant challenges remain in aligning technical infrastructure with researcher practices. To strengthen Open Science implementation, institutions should prioritise improvements in IT systems, institutional policy frameworks, and strategies for researcher engagement.

The survey findings from Malaysia and India demonstrate that Open Science (OS) is widely recognized as an essential shift in research and education, yet its adoption across institutions remains fragmented. While awareness of OS principles is rising, practical integration into institutional systems, policies, and curricula is still at an early stage.

Key challenges include:

- Limited and uneven provision of OS training across target groups.
- Weak institutional monitoring, evaluation, and incentive mechanisms.
- Gaps in technical infrastructure and data stewardship capacity.
- Cultural resistance, financial constraints, and uncertainty about career implications.
- Insufficient policy alignment and lack of sustainable frameworks for Open Access, Open Data, and Citizen Science.

At the same time, the survey highlights positive developments: Institutions have begun establishing repositories, implementing Open Access policies, and engaging in interdisciplinary collaborations. Researchers and students showed strong interest in OS, particularly for enhancing visibility, credibility, and collaboration. Technical and support staff are playing active roles in data management and digital infrastructure, though they remain under-resourced.

Taken together, these findings suggest that while progress has been made, systemic reforms are needed to transform OS from isolated initiatives into embedded institutional practice in Malaysia and India.

Based on the survey findings, several recommendations are proposed:

a. Institutional Policy and Governance

- Develop clear, institution-wide OS policies aligned with FAIR principles and national strategies.
- Establish leadership roles and committees dedicated to OS adoption and monitoring.
- Embed OS into research integrity frameworks to ensure consistency and trust.

b. Capacity Building and Training

- Introduce structured OS training programmes tailored to each target group (administrators, policymakers, support staff, researchers, and students).
- Make OS training mandatory for key groups, supported by Continuing Professional Development (CPD) credits or equivalent recognition.
- Integrate OS topics into formal curricula for postgraduate students and informal lifelong learning opportunities for staff.

c. Incentives and Recognition

- Establish reward systems such as grants, career advancement points, and institutional recognition for OS engagement.
- Incorporate OS practices into performance evaluations and promotion criteria.
- Encourage early-career researchers and students through targeted mentorship and funding opportunities.

d. Infrastructure and Technical Support

- Strengthen institutional repositories, data management systems, and Open Access platforms.
- Provide tools and services that support FAIR-aligned research data management, metadata standards, and interoperability.
- Expand collaboration with national and international OS platforms to reduce duplication and share best practices.

e. Awareness, Engagement, and Culture

- Conduct advocacy and awareness campaigns to build a positive OS culture across institutions.

- Promote Citizen Science and public engagement activities to highlight the societal relevance of OS.
- Foster cross-sector partnerships with government, private sector, and civil society to mainstream OS practices beyond academia.

f. Sustainability and Monitoring

- Secure sustainable funding models for OS infrastructure, training, and policy implementation.
- Establish systematic monitoring and evaluation mechanisms to track OS adoption and impact.
- Use survey data as a baseline to measure long-term progress within the OPEN-ASIA project framework.

By addressing these skill gaps and structural barriers, higher education institutions in Malaysia and India can accelerate the transition toward a robust Open Science ecosystem. The recommendations outlined here provide a roadmap for embedding OS into governance, training, infrastructure, and culture, ensuring that openness, transparency, and collaboration become defining features of the region's research and innovation landscape.