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Building sustainability and open science in academic libraries through alliances: The case of Macao SAR

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Abstract:

The purpose of the alliance is usually to share resources and expertise, drive innovation and cultivate creativity, increase capabilities and scale, and so on. It helps libraries to improve resilience and sustainability especially in the times of public health, economic and climate crises. During the pandemic, the connection and experience sharing among libraries in responses to the Covid-19 was significant and helpful. It guided libraries with the most effective way to manage the pandemic crisis. Library alliances and associations at various levels have played an important role in it. Macao Special Administrative Region aims at building into a world-class tourism and leisure centre, as well as a commerce and trade cooperation service platform between China and Lusophone countries. A number of important library alliances had been established in Macao during the recent years. All of these alliances intend to enhance the regional and global communication and cooperation. Open science is emerging and essential in higher education and scientific research. It broadens the dissemination and engagement in science, as well as emphasizes on openness and sustainable development of scholarship. To promote open science with alliances is of critical value in libraries and for library sustainability.

Keywords: Library alliances, Sustainability, Open science, Academic libraries, Macao SAR

Introduction

The formulation of alliance occurs in various sectors, between organizations of different sizes and at different levels. The purpose of the alliance is usually to share resources and expertise, drive innovation and cultivate creativity, increase capabilities and scale, and etc. It also helps libraries to improve resilience and sustainability especially in the times of public health, economic and climate crises. For instance, during the pandemic, IFLA published a report

entitled *Covid-19 and the Global Library Field*¹ in October 2020, which facilitated the experience and knowledge sharing among libraries in response to the Covid-19. The feedbacks and results were significant and helpful. It guided libraries with the most effective way to manage the pandemic crisis. Library alliances and associations at various levels have played an important role in it.

Macao Special Administrative Region (SAR) aims at building into a world-class tourism and leisure centre, as well as a commerce and trade cooperation service platform between China and Lusophone countries, according to the *Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area*² issued by the China Government in 2019. In the meantime, a number of important library alliances had been established during these years in Macao, in order to enhance cooperation, resilience and sustainability in terms of budget issues, crisis management, social benefits and so on. Open science is emerging in higher education and scientific research. It broadens the dissemination and engagement in science, as well as emphasizes on openness and sustainable development of scholarship. To promote open science with alliances is of critical value and benefits to the global library field and for library sustainability.

Sustainability in Libraries

Sustainability has been used in various ways since 1830s. In 1980s, it started to specifically represent “the property of being environmentally sustainable” or “the degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources.”³ Sustainable development is the “development that meets the needs and aspirations of the present generation without destroying the resources needed for future generations to meet their needs.”⁴ The triple bottom line (TBL) framework shown in Figure 1, introduced by John Elkington in 1990s as an accounting framework to evaluate business performances in terms of sustainability, has received much attention in the recent years in global libraries. TBL consists of social, environmental and economic dimensions⁵, which are also commonly called the three Ps: people, planet and profits⁶.

IFLA Environment, Sustainability and Libraries Section has adopted this TBL framework as the main concept to develop its definition of a green library⁷ and updated its evaluation criteria for the IFLA Green Library Award⁸ in 2022. The American Library Association (ALA) identified sustainability as a major national trend in the *State of America's Libraries Report* for 2018. The ALA Special Task Force for Sustainability had been formed. In the final report of the Task Force, three roles were defined for ALA and its member libraries to serve: (a) inspiration and catalyst; (b) conveners and connectors; and (c) contributors to community resilience. Meanwhile, 52 recommendations in line with TBL framework were designed to “lead to transformational change in our profession, association and libraries throughout our world. This means bringing people along with us rather than acting in isolation.”⁹ In view of the Agenda 2030 for the United Nations 17 Sustainable Development Goals set in 2015, “given the interconnections among the areas and the multitude of issues involved, no one organization can tackle sustainability alone. The work requires a holistic approach in which entities with distinct capabilities collaborate to accomplish common goals.”⁵ Library associations and alliances accelerate the collaborations and the accomplishment of the sustainable goals.



Figure 1. A Venn Diagram Depicting the Definition of the Triple Bottom Line

Source: Rebekkah Smith Aldrich, “Sustainable Thinking: Ensuring Your Library’s Future in an Uncertain World.” Chicago: American Library Association, 2018.

Sustainability and Library Alliances of Macao SAR

Macao SAR, located on the south coast of China, is bordered by Guangdong Province to the north and across the Pearl River Delta from Hong Kong SAR. It is of high population density in a 33-square-kilometre territory with about 680,000 residents. Its economy is mainly dependent on tourism and gaming industry. It aims at building into a world-class tourism and leisure centre, as well as a commerce and trade cooperation service platform between China and Lusophone countries, according to the *Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area* issued by the China Government on 18 February 2019. During the recent 10 years, a number of library alliances have been established in or with Macao to cope with Macao’s rapid development. Library alliances facilitate resource sharing, drive innovation, and improve efficiency and resilience.

- **Macau Academic Library Alliance (MALA)**¹⁰, established in 2014, consists of nine major academic libraries in Macao. With the support of the Education and Youth Development Bureau of the Macao SAR Government, members work together in cooperative acquisitions of e-resources, building a union catalogue platform with interlibrary loan and document delivery services (entitled “MALA Hub”), creating open specialized resources portals (such as Macao Studies Portal, MALA Theses and Dissertations Portal and etc.) to share with local community, as well as conducting research support services and literacy workshops.
- **Guangdong-Hong Kong-Macao University Library Alliance (GHKMULA)**¹¹, with 36 member libraries at present, was formed in 2016 following the establishment of the

Guangdong-Hong Kong-Macao University Alliance in 2014. There are 7 higher education libraries in Macao joining this Alliance. Member libraries collaborate for interlibrary resource sharing projects, cooperative cataloguing, annual seminars for idea and experience sharing, publication exchange, and so forth.

- Two alliances focusing on Portuguese and Chinese languages teaching and learning resources¹² had been formed in 2021, so as to support and align with the Macao local government policy to serve as a commerce and trade cooperation service platform between China and Lusophone countries.

--Academic Library Alliance between the Macao Special Administrative Region (China) and the Portuguese-speaking Countries (ABAMAPLP), with 20 library members from Portugal, Brazil, Angola, Mozambique, Cape Verde, East Timor and Macao. There are 2 libraries from Macao.

--Academic Library Alliance for Portuguese Language Resources Between Macao Special Administrative Region and Mainland China (ABAMACHINA), with 21 member libraries from China, including 4 libraries from Macao.

These two alliances aim at promoting interlibrary resources sharing, as well as collecting open educational resources for teaching and learning of Portuguese and Chinese languages, which are catalogued and shared on the alliance's discovery platform permanently for public access free of charge. Exhibitions, seminars, staff communication and interaction are expected to be conducted more frequently in the coming future.

These alliances intend to enhance the regional and global communication and professional development of the member libraries. In the meantime, sustainability has been strengthened for the libraries in Macao through the collaboration and implementation of the common goals of these alliances, e.g. to enhance innovative thinking and maximize effectiveness. The projects in these alliances have contributed to the UN SDG 4 Quality Education, SDG 9 Industry, Innovation and Infrastructure, SDG 11 Sustainable Cities and Communities, and SDG 12 Responsible Consumption and Production in Macao. The UN SDG 17 Partnerships for the Goals are related as well. Partnerships, associations and alliances could build communities to promote and achieve common goals. In many cases, the TBL framework for sustainability might not equally emphasize on its three dimensions, i.e. environmentally sound, socially equitable, and economically feasible. This happens commonly worldwide in various sectors or industries. Environmental dimension is usually given least attention due to no immediate negative impacts, or profit-driven mind-sets. This dimension usually associates with the concept and implementation of green buildings and relevant green best practices. Office general green routines and principles are usually required to be adopted and implemented by libraries in Macao. More literacy and educational work could be conducted on the environmental dimension by libraries in Macao.

Climate change, ecosystem threats and energy crisis are the critical environmental issues nowadays. Libraries are memory and educational institutions for human beings. They follow and promote the sustainable development, which has to meet the needs of the present generation without destroying the resources needed for future generations. Environmentally sound dimension for sustainability has to be considered more attentively and implemented widely by the library stakeholders (management, staff, users and social communities). To partner with relevant professional associations locally or worldwide like IFLA ENSULIB Section¹³ could help to enhance and develop the libraries/projects towards green and

sustainable ones in various effective ways. ENSULIB allies with the global library field to prepare and advocate the definition, criteria, best practices and stories of green and sustainable libraries and projects worldwide.

Open Science for Sustainability and Roles of Libraries

Open science is an emerging phenomenon and global movement. It has been mentioned in various contexts for different purposes. Vicente-Saez & Martinez-Fuente had done a systematic literature review for the definition of it. They concluded that “open science is transparent and accessible knowledge that is shared and developed through collaborative networks”¹⁴. Open science is knowledge, which includes code, data, scientific outputs, results and publications, information and ideas.

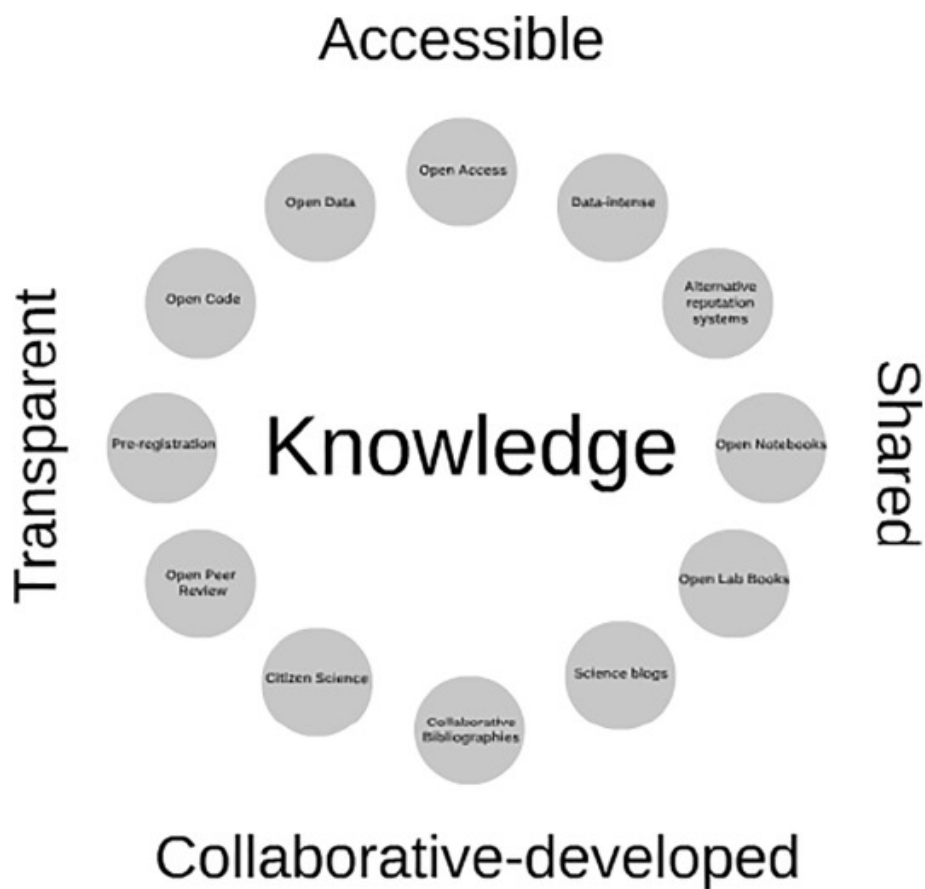


Figure 2 Open Science Definition - Emerging Trends on Open Science

Source: Vicente-Saez, R., & Martinez-Fuentes, C. "Open Science now: A systematic literature review for an integrated definition." *Journal of Business Research*, 88, 428-436 (2018).
doi:<https://doi.org/10.1016/j.jbusres.2017.12.043>

In order to have a global understanding and standards of open science for its fair and equitable operationalization at the individual, institutional, national, regional and international levels, the UNESCO Recommendation on Open Science was adopted in November 2021¹⁵. It “takes into account academic freedom, gender-transformative approaches and the specific challenges

of scientists and other open science actors in different countries and in particular in developing countries, and contributes to reducing the digital, technological and knowledge divides existing between and within countries.”¹⁶ It also recommends that people gain free access to scientific publications, open research data, open educational resources, open source software and source code and open hardware. Open science “is increasingly recognized as a critical accelerator for the achievement of the United Nations Sustainable Development Goals and a true game changer in bridging the science, technology and innovation gaps and fulfilling the human right to science.”¹⁵ It helps in improving the quality of education and research, the affordability of research data and hardware, collaboration on biodiversity loss and climate change, as well as benefits for all human beings. To achieve the objectives of the Recommendation, UNESCO’s member states are encouraged in the Recommendation to take concurrent action in the seven areas below:

- Promoting a common understanding of open science, associated benefits and challenges, as well as diverse paths to open science;
- Developing an enabling policy environment for open science;
- Investing in open science infrastructure and services;
- Investing in human resources, training, education, digital literacy and capacity building for open science;
- Fostering a culture of open science and aligning incentives for open science;
- Promoting innovative approaches for open science at different stages of the scientific process;
- Promoting international and multi-stakeholder cooperation in the context of open science and with a view to reducing digital, technological and knowledge gaps.

What’s the role of libraries in open science? It is ambiguous yet innovative. Ayris and Ignat defines the role of libraries in the open science landscape by using the European practice. Four roles for libraries are identified, namely, open access and open access publishing, research data management, E-infrastructures, and citizen science¹⁷. Open science facilitates social engagement with science. By combining the three roles defined by ALA’s Special Task Force on Sustainability (i.e. inspiration and catalyst; conveners and connectors; and contributors to community resilience), the relationship of open science, sustainability, and libraries (including individual libraries, as well as associations, societies and alliances, which facilitate effective and deepen collaborations) are conceptualized in Figure 3. Open science accelerate the achievement of SDGs. Libraries support and enhance open science for sustainability in the aspects of open access and open access publishing, research data management, E-infrastructures, and citizen science. Library associations/alliances and their members develop the three roles identified by ALA for achieving the 17 SDGs at different levels.



Figure 3 The Relationship of Open Science, Sustainability, and Roles of Libraries

Open Science in Libraries of Macao SAR

In view of the four aspects of libraries for promoting open science for sustainability, the library alliances of Macao SAR and its member libraries have projects for some aspects, for instance, open access and open educational resources on shared platforms as part of E-infrastructures of the alliances. The efforts on research output and data management, as well as citizen sciences are expected at a later stage when relevant funding is obtained. They could be connected and promoted as an alliance project or a citywide event.

The MALA Hub project (https://mala.hosted.exlibrisgroup.com/primo-explore/search?vid=MALA&lang=en_US) integrates the open access resources of Macao into the Hub, which includes the contents from the Internet, the local digitization projects of the member libraries, as well as the publications from the local associations and societies, Macao governmental departments and Macao Foundation. The Macao Foundation, supported and funded by the Macao Government, has been committed to promoting academic research and publishing for decades. It has published or sponsored the local individuals, associations and societies in Macao to publish over 1,000 titles of books and periodicals, most of which have been provided freely online on macaodata.com (formerly Macau Virtual Library) with the hope to share the academic and cultural resources of Macao with the general public worldwide. University of Macau (UM) Library has created and shared on the MALA Hub platform about 20,000 metadata records for these mentioned open access book titles and

articles from 56 major academic journals published in Macao dating back to 1980s, most of which are with links directly to the open access contents. UM Library has also collected from the free texts projects, like Project Gutenberg and Internet Archive, over 2,000 open access books published between the 16th to early 20th centuries in English, Portuguese, French, and etc. and integrated the metadata and the documents onto the Hub. Macau University of Science and Technology (MUST) Library collected over 2,000 ancient maps in digital format related to Macao studies from all over the world, which have been shared freely on the Hub with interested scholars and Macao citizens. Macao was designated as a UNESCO Creative City of Gastronomy in 2017. The Macao Institute for Tourism Studies Library curated a valuable collection¹⁸ of recipes, manuscripts, books and publications about Macanese cuisine for preservation of the culinary heritage over the past five centuries. Meanwhile, ABMAPLP and ABAMACHINA, the two alliances focusing on Portuguese and Chinese languages teaching and learning resources, aim at promoting, collecting and creating collaboratively open educational resources for teaching and learning of Portuguese and Chinese languages and shared on the alliance’s discovery platform (https://porpmo-primo.hosted.exlibrisgroup.com/primo-explore/search?vid=PORPMO&lang=en_US) permanently for public access free of charge. A good number of open education resources (ebooks, ppts, videos, course syllabus and more) have been included onto this platform. The above-mentioned several alliances have their own shared discovery platforms invested by the Macao Government for resources sharing and services. To develop and deepen the collaboration on open access (publishing) and relevant shared E-infrastructure could enhance the sustainability of Macao through open science.

The MUST Library has started to build a repository project for the research outputs of the academic members of MUST entitled *MUST Scholar Hub* (<https://scholar.must.edu.mo/>) and the UM Library has been developing the *UM Scholars Page* (<https://repository.um.edu.mo/>) in the recent years. Scholarly works of gold open access, preprints or green open access (self-archiving) associated with the relevant institutions are put alongside the scholarly works behind the paywall. Figure 4 demonstrates the total research outputs with the ratio of open access produced by the institutions/organizations in Macao SAR in the recent ten years 2012-2021. The percentage of open access output to the annual total research output has increased from 19.7% to 38.1% during the period. The percentage of open access output of Macao is 34.7% in the recent 5 years (2017-2021), which is not high comparing with the world 40.9% and other regions shown in Figure 5. Thus, it is recommended to publish or make more open access research output/data from Macao in various subject areas. On the other hand, a shared platform called *Macao Scholar Hub* was considered and discussed by MALA members a year ago. *Macao Scholar Hub* is a shared repository of scholarly works (and research data if possible) from all the scholars in the higher educational institutions in Macao. Due to the budget constraints of individual members and no other funding obtained, the project is pending for future consideration.

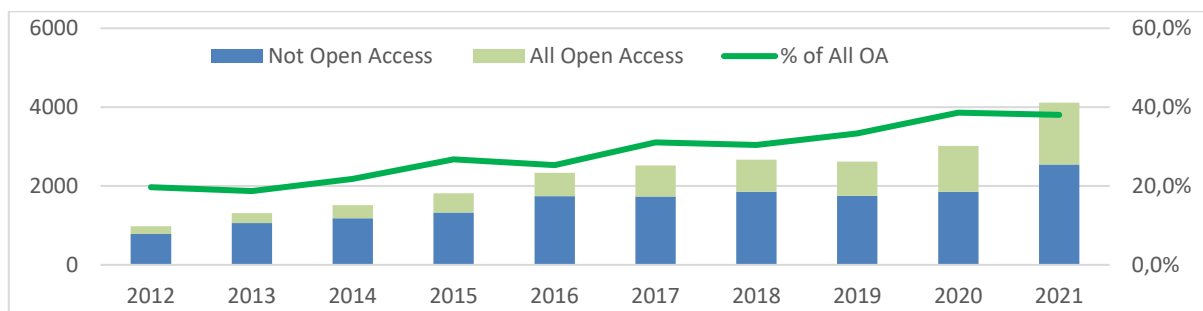


Figure 4 Research Output of Macao SAR 2012-2021

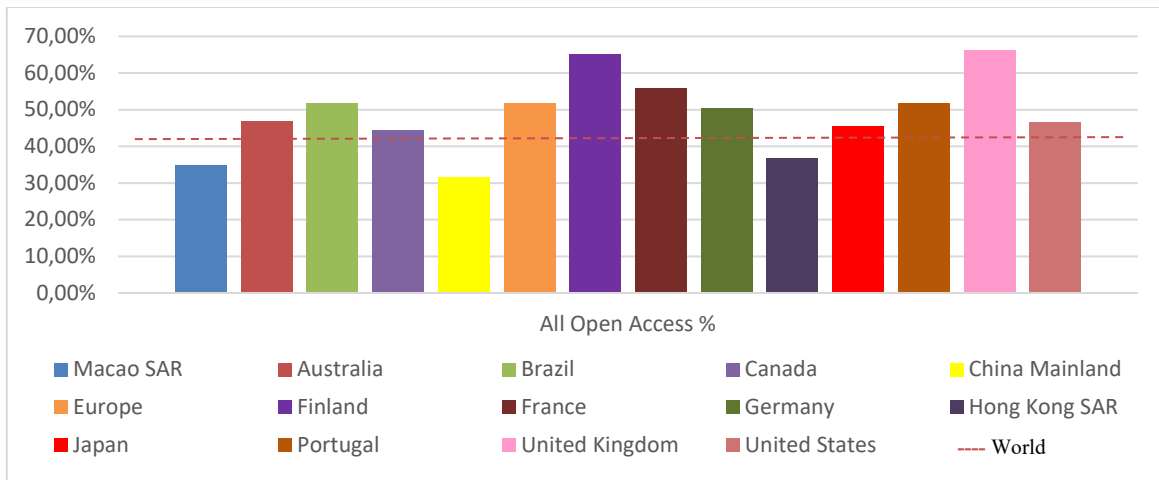


Figure 5 Percentage of Open Access Output 2017-2021

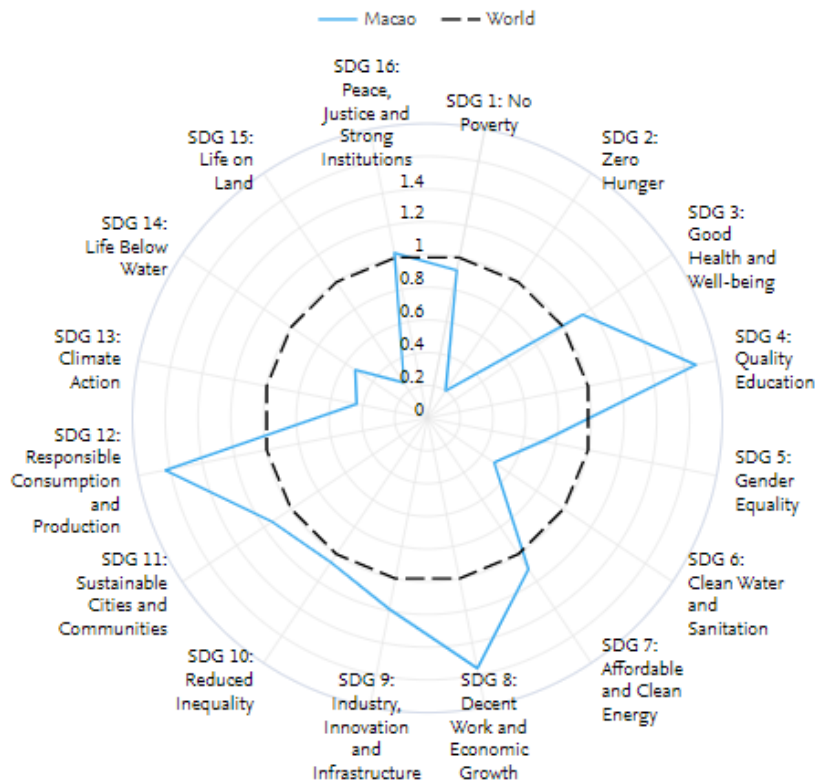


Figure 6 Macao's Scholarly Output in SDGs Relative to the Worldwide Share, 2012-2021

Source of Figure 4, 5 & 6: Scopus and SciVal extracted on 18 June 2022.

Note: All Open Access includes gold, hybrid gold, bronze and green open access defined in Scopus.

With the support of the Education and Youth Development Bureau of the Macao SAR Government, MALA members have been subscribing to 11 databases of e-journals and dissertations and theses since 2015, as well as several research and patents databases with analytical features since 2020. To make the best of those research analytical databases, MALA librarians learned and prepared relevant analysis reports collaboratively. Figure 6 shows Macao's scholarly output in SDGs relative to the worldwide share in the past ten years. A number of SDGs received more attention in the research activities in Macao during the period,

such as SDG 4 Quality Education, SDG 8 Decent Work and Economic Growth, SDG 12 Responsible Consumption and Production, SDG 3 Good Health and Well-Being, SDG 7 Affordable and Clean Energy, SDG 9 Industry, Innovation and Infrastructure, and SDG 11 Sustainable Cities and Communities. By understanding and promoting the scientific research activities in Macao, libraries could engage the students and community, and advocate the citizen science to contribute to science and SDGs.

Conclusion and Recommendation

It is increasingly crucial to develop and enhance sustainability and open science in libraries (especially academic libraries) and the communities. Library alliances accelerate the process and benefit the member libraries through the effective collaboration and communication. There are challenges for libraries in implementing this, for instance, common understanding of open science and its value and benefits in libraries and communities, stable investments in open science infrastructure and services, new skills and knowledge needed for the library staff, support from the library leadership and the authorities, legal issues and policies and so forth.

This paper examines the case of Macao SAR and found that the common goals and activities in the academic libraries of Macao through alliances were basically efficiency-driven and aimed at benefitting the economic and social dimensions. More attention is expected to pay to the climate change and green literacy education, particularly via alliances or associations to share the green literacy knowledge and importance with the relevant communities. Open access publishing has been developing for some years in Macao for the research and publications related to Macao studies with the support of the Macao Government. It is recommended to publish or make more open access research output/data from Macao in various subject areas. Initial investment and continued support on the relevant E-infrastructures from the local government and the academic institutions is essential. Citizen science engaging the general public could educate citizens for scientific research and innovation, as well as contribute to the sustainability and advancement of communities and societies in long run.

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