Open Science as an Opportunity for Academic Grey Literature – A Systematic Review

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Abstract

What is the future of grey literature? Is open science an opportunity for grey literature (more grey literature, more visibility and impact of grey literature), just another challenge (issues that need awareness and further action) or even a threat (less grey documents, less impact)? The following paper presents findings from a systematic review of recent studies on grey literature and open science; it includes recent reports and initiatives, and builds on our own former empirical research work.

The findings of the review are presented in four sections: the concept of bibliodiversity (production); the development of open repositories (dissemination); the transformation of research assessment (evaluation); the application of FAIR principles (processing). Some leading questions: Which is the common part of the concepts of bibliodiversity (Jussieu Call) and grey literature, and what does this mean for the future of grey literature? Which are the issues of grey literature in open repositories, and how do repositories impact the dissemination of grey literature? How do the recent initiatives for a new system of research assessment affect the grey literature (San Francisco Declaration DORA, European Commission Scoping report, OSEC Call of Paris)? Are the FAIR principles relevant for the processing of grey literature, and if so, which ones and in which way?

The paper is a scientific contribution to the analysis of the development of grey literature in the academic research environment of the 21st century. It is a rejoinder of the 2021 panel discussion on the "Next Generation Grey"; it tries to sum up what is known about grey literature and open science, and it makes some recommendations for grey literature producers, service providers and repository managers.

Keywords

Open science, open access, open repositories, grey literature

Introduction

What is the future of academic grey literature? A couple of papers have made assumptions in the past about the perspectives of grey literature, for instance, regarding the impact of new technologies or of research policies. Some predicted an unprecedented increase of the volume of grey literature, with global and unrestricted accessibility (Mackenzie Owen, 1997), while others did not observe an unusual growth of grey documents (Artus, 2005) or projected a greater diversity of grey literature and

convergence between grey and white (Schöpfel, 2006). In GreyNet's 2021 online survey on the future of grey literature, two-third of the respondents among GreyNet's own community of practice agreed that "*in academic institutions, the affirmation of open science and open access principles significantly favor the production, publication, and retrieval of grey literature*" (Schöpfel et al., 2022). It remains uncertain, however, what this exactly means, and if open science is an opportunity or a threat for grey literature, or just another challenge that needs awareness and further action, or all together (table 1).

Scenario	**Examples**
Opportunity	More grey documents More diversity Better visibility More impact
Challenge	Curation of metadata Persistent identifiers Openness
Threat	Less grey documents Less impact

Table 1. Scenarios for grey literature

As for grey literature in repositories, one respondent wondered "*(…) if it is still grey literature (because) published grey literature is no more grey*". The boundary between white and grey is still a matter of discussion, such as the distinction between data and documents. Probably it is the very concept of grey literature that is at stake, being often, especially in systematic reviews, described as "unpublished" and "non-reviewed research" (Schöpfel & Prost, 2021) which is not exactly its meaning in library and information sciences, where the focus is on dissemination and acquisition (Schöpfel & Farace, 2018).

Forecasting the future of grey literature may appear hazardous in an environment of constant and rapid change. Our paper takes a somewhat different approach, insofar we try to find out how (and if) some essential topics of the actual debate on open science have been linked to the field of grey literature. Based on a systematic review, we assessed the topics of bibliodiversity (production), of open repositories (dissemination), of research assessment (evaluation) and of FAIR principles (processing). Some results confirm what we already know; others are more surprising.

The paper is a contribution to the analysis of the development of grey literature in the academic research environment of the 21st century. It is also a rejoinder to GreyNet's panel discussion on the "Next Generation Grey" in 2021. We try to sum up what is known about grey literature and open science and to make clear what is questionable and what needs more insight.

Methodology

We conducted a systematic review on relevant studies published between 2018 and 2022 on grey literature and open science in two bibliographic databases (Web of Science, Scopus), in the Grey Guide repository and with two academic discovery tools (Dimensions, Google Scholar). The review was conducted on August 2, 2022. The retrieval strategies and filters are described in the appendix. Figure 1 shows the results of the systematic review.

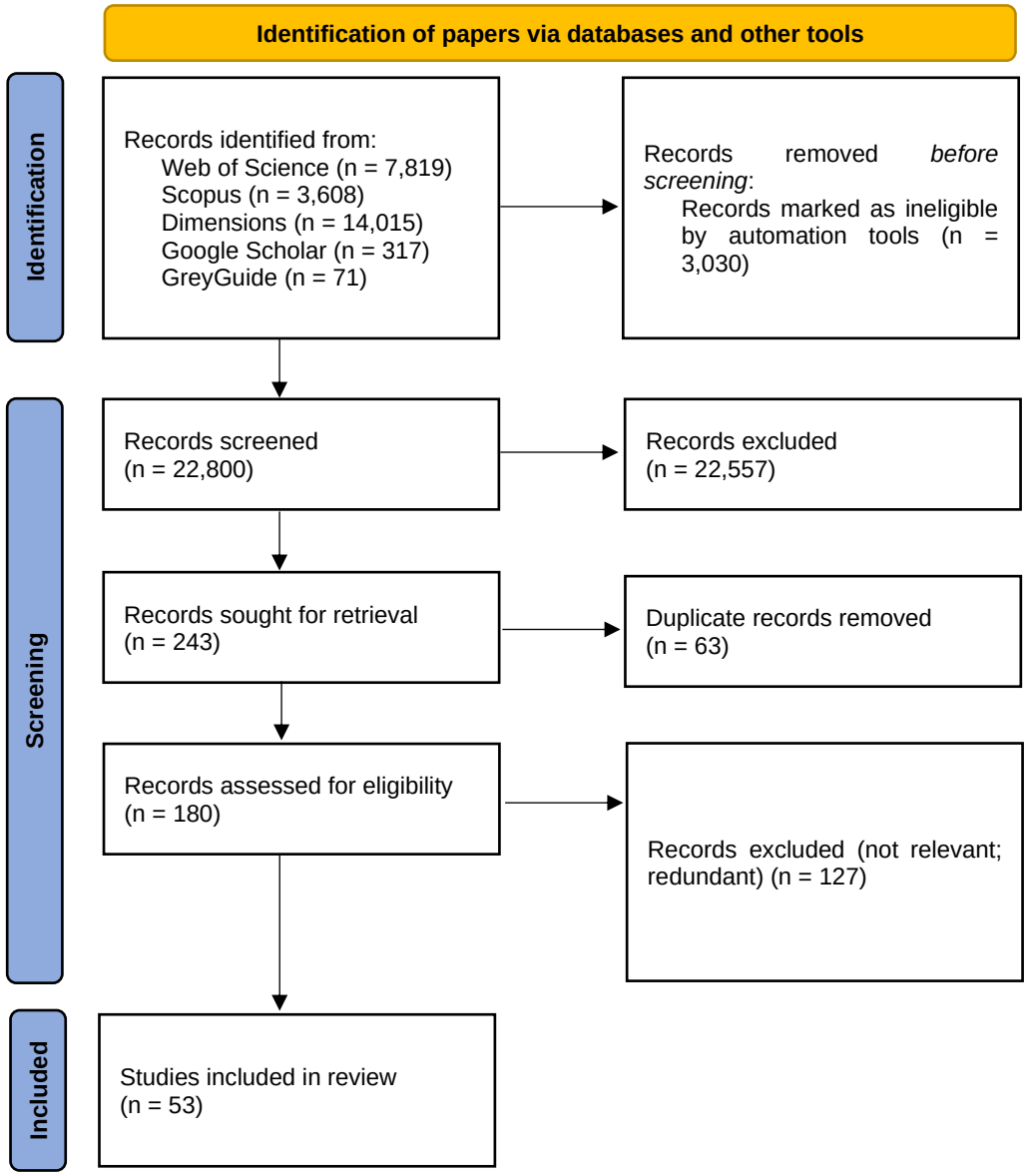

Figure 1. PRISMA 2020 flow diagram of the systematic review on grey literature

We were looking on recent, original research work on the impact of open science on grey literature, with relevant insights on the production and dissemination of grey literature, on its role for research assessment and on the application of FAIR principles. Initially, we identified 25,580 records. Most records have been discarded because they mentioned grey literature only as part of systematic reviews; others have been excluded because they were not original research or not relevant for open science. Half of the 53 included studies are papers presented at the *International Conferences on Grey Literature* and/or published by GreyNet's *The Grey Journal,* i.e., products of the GreyNet's community of practice.

Results

The call for bibliodiversity (production)

Open access to scientific information is a main pillar of open science. There is no doubt that grey literature plays a significant role in the development of open access (OA), as many repositories contain grey literature (figure 1) where it represents up to 30% of the content (Schöpfel et al., 2020).

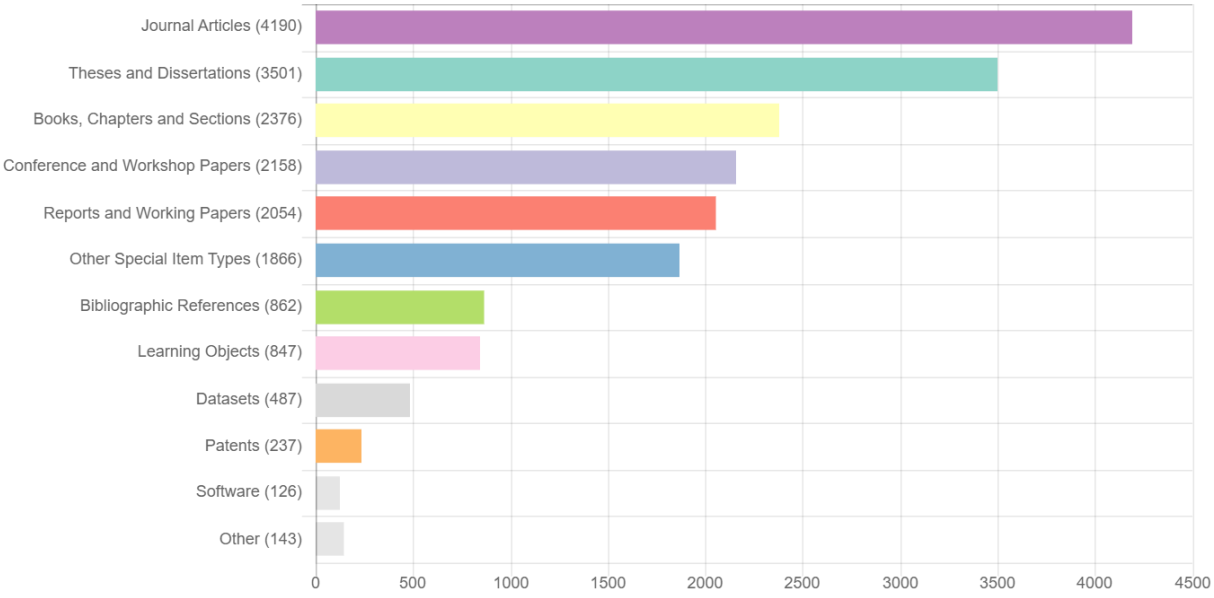

Figure 1. Content types overview in open repositories (N=5,971) (source: OpenDOAR, October 23, 2022)

However, the academic and political debate on open access mainly concerns journals and seems to ignore grey literature, as the main challenge is the business model of OA journal publishing and its economic and political impact. In the usual conceptualization of OA publishing, grey literature is more or less invisible, somewhere in the small field of non-peer reviewed items, free for readers and for authors, protected by copyright, along with preprints (figure 2).

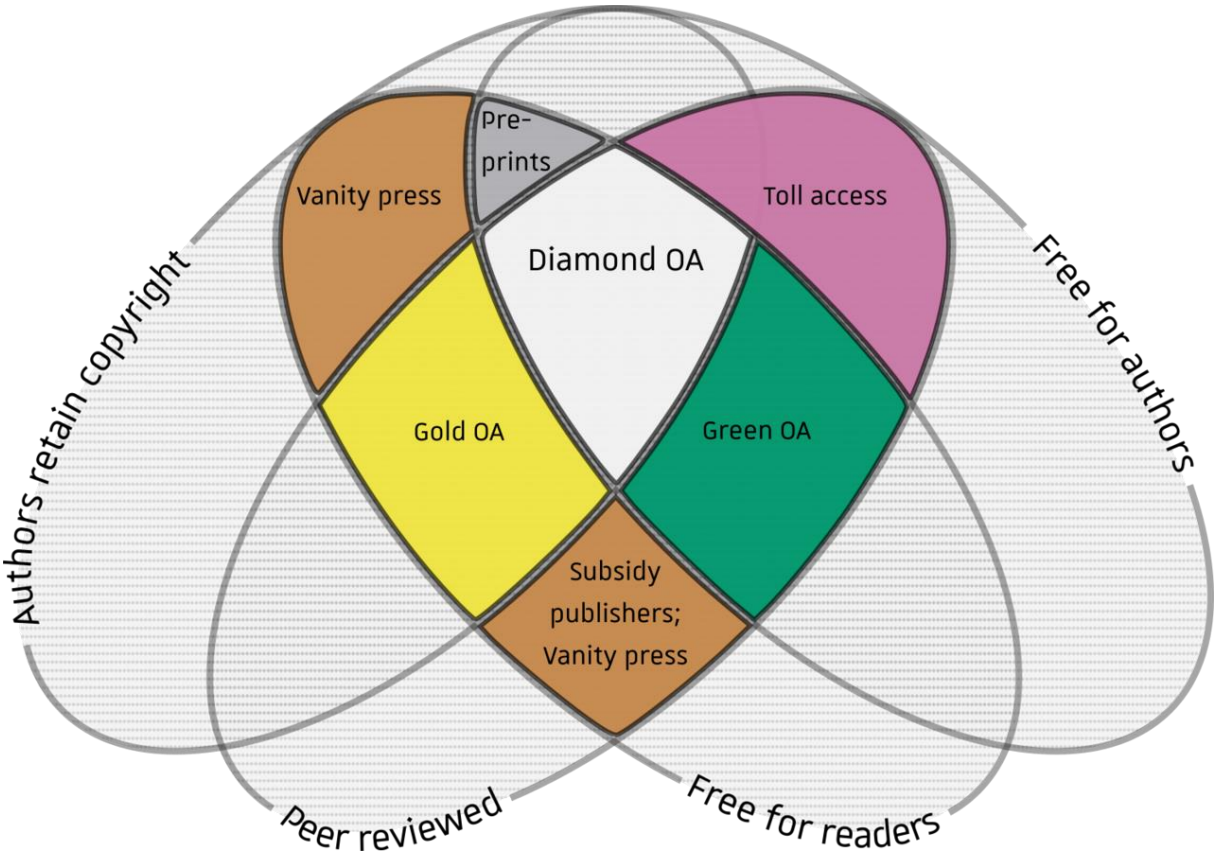

Figure 2. Different types of open access in scholarly publishing (source: Wikipedia Open Access[1])

Recently, a couple of initiatives have been taken against the development of a dominant OA publishing model based on article processing charges (APC). While some focus on journals, such as the *Action Plan for Diamond Open Access*[2] promoted by Science Europe and the cOAlitionS, others are more open and inclusive, like the *Jussieu Call for Open Science and Bibliodiversity*[3] launched in 2017 by French scientists and professionals and promoting open access to scientific publications that encourages bibliodiversity and innovation and does not imply the exclusive transfer of subscriptions to APCs.

Even if the main concern of the *Jussieu Call* is journal and book publishing, its scope is larger as it explicitly invites for innovation and experimentation in the field of dissemination of research results and academic publishing. Our systematic review retrieved recent papers that highlight the richness and the diversity of unconventional academic literature, (partly) non reviewed and (partly) published outside of the usual commercial channels:

Preprints (non-reviewed, unpublished literature): Drawing on examples from the U.S. National Library of Medicine, Sheehan (2021) recommend the usage of elements of grey literature (preprints, study protocols, clinical trials…) to support open science as part of the response to the COVID-19 pandemic (figure 3). Even if some preprints will never become a published article, their dissemination via preprint

[1] By Jamie Farquharson - https://doi.org/10.6084/m9.figshare.6900566.v1, CC BY 4.0, https://commons.wikimedia.org/w/index.php?curid=111532339)

[2] Action Plan for Diamond Open Access https://www.scienceeurope.org/our-resources/action-plan-for-diamond-open-access/

[3] Jussieu call for Open Science and Bibliodiversity https://jussieucall.org/

servers and repositories contributes to the knowledge of the field, including deadlocks (Lombardi, 2021).

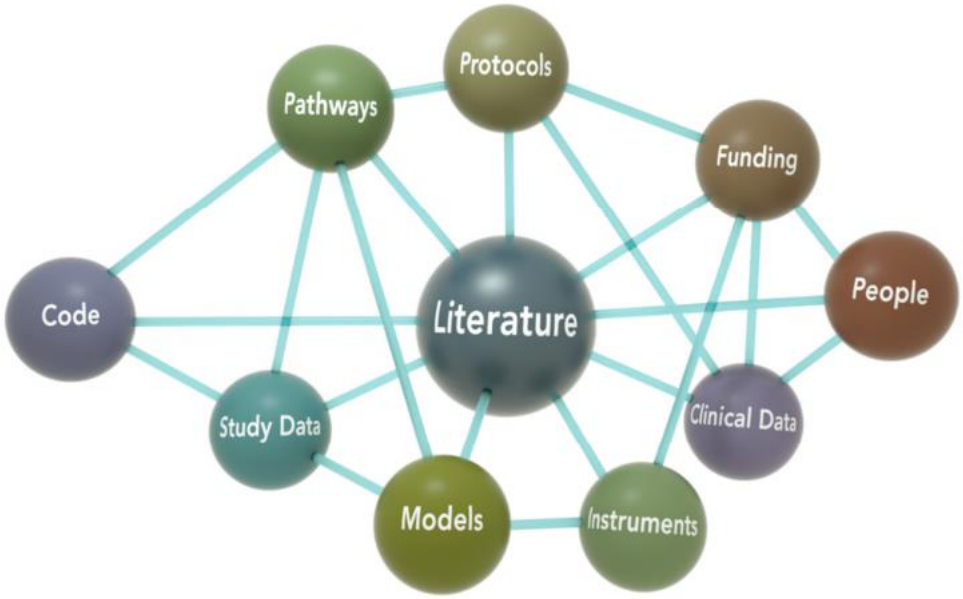

Figure 3. Network of interlinked research objects (source: Sheehan, 2021)

The Japan Atomic Energy Agency (JAEA) brings up the issues of long-term preservation and permanent access of conference proceedings and technical reports published in electronic media such as CD/DVD-ROM and flash memory (Kumazaki et al., 2019). Providing long-term preservation and improving discoverability of reports is also the purpose at Columbia University Libraries (Bielskas et al., 2022); in a similar approach, Cirkovic et al. (2019) argue for digitization, curation, preservation, and dissemination via open repositories of scientific heritage material, like older theses and dissertations.

Other categories and elements of grey literature have been put forward, in different domains:

- Law: Williams (2020) discusses the place of grey literature in the realm of legal materials (primary and secondary sources) and the challenges of discoverability of various types of grey legal materials.
- Linguistics: A study from the Italian CNR assesses the presence of a large variety of grey literature in the CLARIN Virtual Language Observatory, including translations, agreements, press releases, notebooks, and bulletins (Goggi et al., 2017)[4].
- Open educational resources (OER): Puccinelli et al. (2020) provide a framework for the management of OER characterized by "*openness, flexibility, innovative approaches, digital dimension, liquidity and high granularity*" and insist on the development of "*validated and certified platforms, for providing quality levels in shared contexts, and persistent identification systems, for guaranteeing resources integrity* (and) *traceability*".
- Another paper describes grey literature outside of academy, as extra-academic and/or professional documents, such as expert, CRM, R&D or corporate annual reports, market studies, executive directives, memoranda, white papers, and hearings, with examples in the fields of nuclear energy, aeronautics, archaeology and library and information sciences and

[4] This paper was retrieved because the communication was published in the conference proceedings in 2018.

four major challenges, i.e., monitoring, standardization, data, and preservation (Schöpfel, 2019).

Assuming that "*traditional publishing streams of books and journals capture just a fraction of the content (…) contextualized in open science*", Gelfand & Lin (2020) provide a taxonomy of new forms of scholarship including theses, preprints, lab manuals, interviews, and other multimedia materials, and demonstrate how, in the context of open science, the research process contribute to "*outputs, innovation and new forms of grey literature*". A similar, large range of resources has been identified by a scientometric study on systematic reviews and other articles making use of grey literature (Schöpfel & Prost, 2021).

Obviously, there is a common ground where both concepts, bibliodiversity and grey literature, overlap. As the *Jussieu Call* admits, the "*means to achieve the goal of Open Access are yet to be discussed*". Our suggestion is that the signing institutions - research organizations and scientific communities, scientific and technical information professional associations and organizations, learned societies, scientific journals and editors – explicitly consider grey literature when they refocus "*the issue of business models (...) in the broader perspective of the editorial processes and methods upon which research and innovation will rely in the future*", for the benefit of a "*very broad bibliodiversity*".

The GreyNet community of practice, on the other side, should seize the opportunity of the Open Science initiatives for bibliodiversity, such as the *Jussieu Call*, for advocacy and promotion of the richness and diversity of grey literature which are in constant need for attention, curation, funding, and innovation, in order to increase its findability and accessibility.

The development of open repositories (dissemination)

More than ten years ago, Daniela Luzi reviewed the development of institutional repositories and stated that "*grey literature is at home in open archives*" (Luzi, 2010). Which are the issues of grey literature in open repositories today, and how do repositories impact the dissemination of grey literature?

Like Daniela Luzi, most retrieved papers express the conviction, based on evidence, that repositories are good for grey literature and that grey literature, as an essential part of scientific output, should be part of repositories. "*Archiving in a repository is the way to let grey literature to become open*" (Lombardi, 2021). Based on a study on grey literature in repositories of Balkan countries, an invited paper of the 2018 UNESCO International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage recommends that universities and academic libraries "*should direct their efforts towards the creation of institutional repositories, allowing the preservation of and free access to the results of scientific studies performed at the institution, to its theses and dissertations, as well as to other kinds of grey literature*" (Pavlovska, 2018).

A survey at the University of Minnesota concludes that "*endorsing the depositing of materials into (institutional repositories) is a step in the direction of efficiency*". Because many researchers are using Google and Google Scholar to locate grey literature, librarians should encourage the deposit grey literature into repositories in order to "*mitigate the web instability factor to which grey literature falls prey*" and to increase accessibility "*when Google crawls (institutional repositories)*" (Cooper et al., 2019). Based on many years of interdisciplinary research on grey marine literature, MacDonald et al. (2020) demonstrate how open practices can increase the impact of grey literature on political decision-making processes; yet, MacDonald and his colleagues also alert that this impact can be affected by (too) massive quantity, multiplicity of formats and content, and by (perceived) uncertain quality.

Similar results on the dissemination of grey literature via open repositories can be found in studies from Algeria (Babori & Aknouche, 2020), France (Schöpfel et al., 2019, 2020 and 2021), the United States (Lipinski & Kritikos, 2018; Mack, 2020), and from the BRICS countries (Bansal, 2020). Our own research in France shows that grey literature represents about 30% of the national repository's content. While Mack (2020) provides a model for the development of a campus-based open access program with a special focus on grey literature, Babori & Aknouche (2020) make recommendations how to improve the deposit, visibility, and usage of grey literature in institutional repositories. Lipinski & Kritikos (2018) assess the open access policies of 22 US iSchools, show how these policies can affect access to grey literature, and recommend best practices for grey literature in institutional repositories.

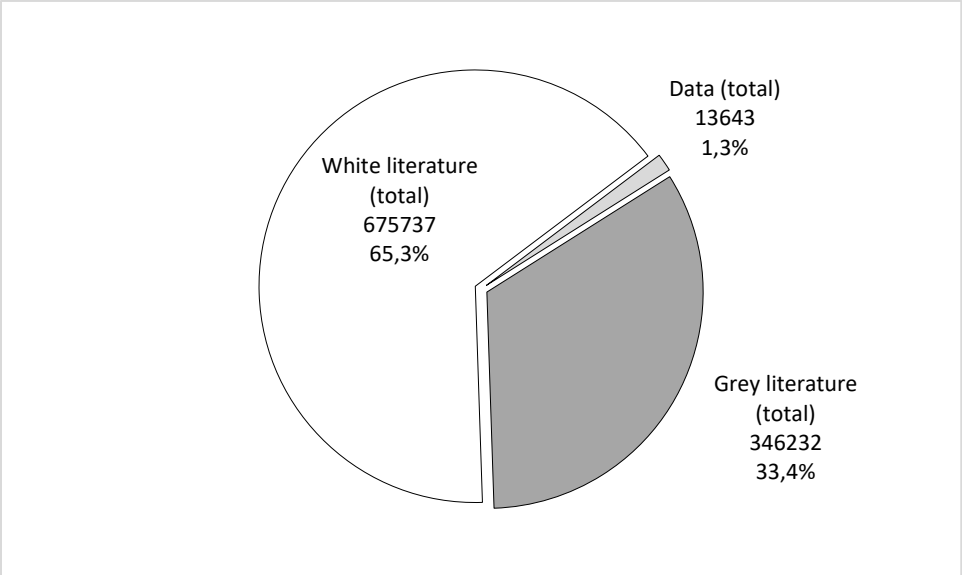

Figure 4. Part of grey literature in the HAL repository (source: Schöpfel et al., 2021)

Other papers describe the role of academic and national libraries (Richardson & Renner, 2018; Kingsley, 2020; Vandepontseele & Isbergue, 2020; Marsolek et al., 2021), with special attention on the need for identification, capture and deposit of grey literature into institutional repositories, for metadata curation, and for advocacy and awareness raising among the scientific communities. A comparison between institutional repositories and national aggregator systems insists on the need for advocacy and promotion on the institutional level: without the researchers' practice of self-archiving, the repositories will remain empty (Cernohlavkova & Vycitalova, 2018).

The main argument of Marsolek and her colleagues from the University of Minnesota is that grey literature increases the richness and the diversity of the libraries digital collections which is crucial for the quality of systematic reviews. Also, they conclude with a kind of pro-grey pleading: "*Librarians have done and continue to do the important work of collecting GL, preserving it, and providing access to it. For those who are collecting GL, in solidarity we thank you and ask you to please continue the work (…) We encourage those who are not collecting GL to begin talking with your colleagues about how collecting it could be an opportunity for your organizations (…)*" (Marsolek et al., 2021).

A final, general comment, based on two very different papers. The first paper, an introduction into the field and concept of grey literature, emphasizes its importance and dynamic nature and concludes that "*technology has played a catalytic role in eradicating the issues and problems (of) grey literature*" (Gul et al., 2020), where technology means above all repositories (platforms) and search engines. A second paper presents results of a needs assessment for improving library support for dentistry researchers: 80% of participants use grey literature for their research (primarily, conference and seminar proceedings, and theses and dissertations), none of them consider it as "very important", and only

20% indicate that they found it somewhat easy to search for and access it. Also, the authors of the study conclude that more and better library support is needed (He et al., 2018).

Taken together, these recent papers on grey literature in open repositories seem to confirm what has already been observed more than ten years ago (Schöpfel et al., 2012): repositories are essential for the dissemination, visibility, and use of grey literature, and their technology has contributed to expand its impact; but repositories have not (with the words of Gul et al., 2020) "*eradicated the issues and problems of grey literature*", and they have not "white-washed" it. Open access or even accessibility is still not enough. More efforts and investment are required, to improve the curation of grey literature (metadata, including persistent identifiers) and to increase the assurance regarding quality and long-term archiving. The situation has not fundamentally changed since then; even if today, these questions are addressed (and reformulated) in terms of the FAIR principles (see below). One interesting example how the situation can be improved on the top of open repositories is presented by Vicary & Pettman (2020), capitalizing "*on the opportunities presented by Open Science and new technologies*".

The transformation of research assessment (evaluation)

How do the recent initiatives for a new system of research assessment affect the grey literature? Do they? Neither the San Francisco Declaration on Research Assessment (DORA)[5], nor the recent European Commission Scoping report *Towards a reform of the research assessment system*[6], nor the UNESCO *Recommendation for Open Science*[7], nor the *Paris Call on Research Assessment* presented at the *Open Science European Conference* (OSEC)[8], organized in the context of the French Presidency of the Council of the European Union, specifically mention grey literature. Does this mean that grey literature plays no (or only a marginal) role when it comes to transform the actual system dominated by journal-based metrics like the impact factor?

The reverse is true. All these declarations and reports have in common that they recommend diversity and inclusivity as fundamental criteria for research assessment. DORA (which has been signed by more than 22,000 institutions and individuals in 159 countries and is supported by the European Commission) recommends that funders and institutions consider, for the purposes of research assessment, "*the value and impact of all research outputs (including datasets and software) in addition to research publications*". The EC Scoping report asks that research assessment should acknowledge the "*diversity of research activities and practices, with a diversity of outputs*", while the Paris Call promotes the concept of bibliodiversity (see above), which means to consider "*all scientific productions*", including for instance, preprints.

The UNESCO paper is more precise; starting from the assumption that "*evaluation systems should take into account the wide breadth of missions within the knowledge creation environment* (and that) *these missions come with different forms of knowledge creation and communication, not limited to publishing in peer reviewed international journals*", the UNESCO recommends that research assessment should include all kind of scientific publications such as, among others, peer-reviewed journal articles and books, research reports and conference papers, disseminated by publishers and/or deposited in open repositories.

[5] DORA (2012) https://sfdora.org/

[6] EC Scoping report (2021) https://op.europa.eu/en/publication-detail/-/publication/36ebb96c-50c5-11ec-91ac-01aa75ed71a1/language-en

[7] UNESCO Recommendation (2021) https://en.unesco.org/science-sustainable-future/open-science/recommendation

[8] OSEC (2022) https://osec2022.eu/paris-call/

Our review retrieved only few papers that explicitly deal with this topic. The most relevant one is perhaps the case study by Giannini et al. (2017)[9] who analyzed the Italian research assessment exercises 2004-2010 and 2011-2014 and concluded that

- Both exercises did not explicitly include or mention grey literature;
- Yet, a detailed and time-consuming assessment allows the identification of some types of grey literature among the cited references of research products (output);
- This identified grey literature represents less than 1% of all cited output;
- This percentage is slightly increasing, from 0.61% (2004-2010) to 0.74% (2010-2014);
- The relative importance of grey literature varies between disciplines.

These findings are not optimistic but appear realistic, and they are compliant with the general observation that grey literature is "*usually ignored in research evaluations*" (Bickley et al., 2020). However, without any other empirical evidence (we could not retrieve any other paper like this one), it is impossible to say if these findings are representative for the research assessment in large research organizations, and if there have been changes since then.

A recent paper by Reed et al. (2021) proposes a conceptual framework of research assessment exercises. Based on a systematic review, the authors identify five different approaches of research impact evaluation; but only one design explicitly includes grey literature, i.e., "*evidence synthesis approaches*" which provide summative evidence of research as a sufficient cause of impact (figure 5).

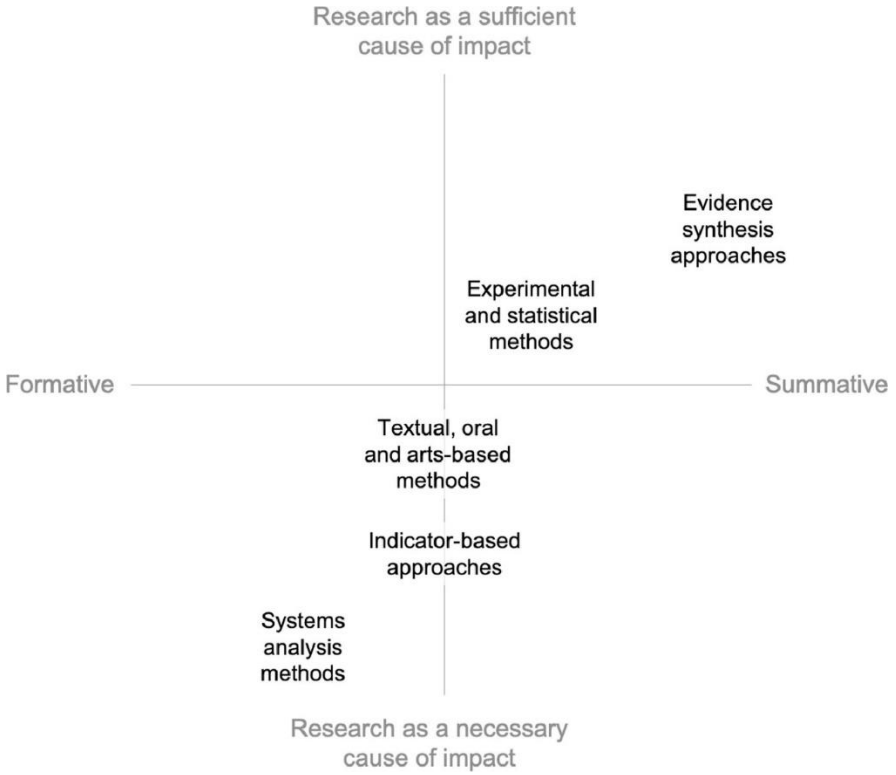

Figure 5. Five types of impact evaluation designs (Source: Reed et al., 2021)

Following Reed et al. (2021), such evidence synthesis "*typically takes place at the programme level and draws on bodies of work emerging from multiple projects*"; it is "*a process of carrying out a review of existing data, literature and other forms of evidence with pre-defined methodological approaches, to provide a transparent, rigorous and objective assessment of whether something arising from research is a sufficient cause of impactful outcomes* (…)". As systematic reviews generally include grey literature,

[9] This paper was retrieved because the communication was published in the conference proceedings in 2018.

they are (or should be) part of this kind of research assessment. However, the authors are aware of the potential issues of including grey literature into evidence synthesis: "*it is time and labour intensive as it requires considerable consultation with likely end-users and searching of unpublished and grey literature, often by hand and often at geographically disparate locations*".

If the interest of grey literature for systematic reviews is largely accepted (Bonato, 2018; Hoffecker, 2020; Schöpfel & Prost, 2021), the related problems have been identified, like the lack of persistent identifiers and of rich metadata, reduced findability and accessibility, issues that limit the grey literature's usefulness for monitoring and altmetrics and make it still more difficult to conduct scientometric assessment with grey literature than with journal articles or books (Bickley et al., 2020; Roos Lindgreen et al., 2021; Schöpfel & Prost, 2020; Valles et al., 2020). Also, when Kenfield et al. (2019) tried to develop a framework for the reuse assessment of grey literature in institutional repositories, they observed different barriers, such as "*lack of best practices, documented workflows, assessment training, and staffing*". "*Improper indexing and bibliographic control*" are other barriers to the reuse (citation) and assessment of grey literature (Shrivastava & Mahajan, 2020).

Obviously, we can observe a kind of paradox: while the international initiatives to transform quantitative and journal-based research assessment explicitly call for more diversity of research outputs, the role and importance of grey literature for research assessment remain marginal, so far. Is this definitive and inherent to the characteristics of grey literature? Not sure. But without any doubt, advocacy and promotion of diversity will not be enough to raise awareness for the interest of grey literature for research assessment, if it is not (more) compliant with the fundamental values and principles of open science, including FAIR. The UNESCO recommendation is very clear: research assessment should make use of repositories and other platforms "*that are supported and maintained by an academic institution, scholarly society, government agency or other well-established not-for-profit organization devoted to common good that enables open access, unrestricted distribution, interoperability and long-term digital preservation and archiving*"; and it should ensure diversity in "*scholarly communications with adherence to the principles of open, transparent and equitable access and supporting non-commercial publishing models and collaborative publishing models with no article processing charges or book processing charges"*. To increase its role for research assessment, grey literature must be open, accessible, and findable, and it must be disseminated on trustworthy platforms and with FAIR data and metadata.

The application of FAIR principles (processing)

Are the FAIR principles relevant for the processing of grey literature, and if so, which ones and in which way? Initially developed for research data repositories (Wilkinson et al., 2016), they have been progressively applied to all kind of infrastructures, procedures, and resources, including items belonging to grey literature[10]. Our systematic review reveals that above all, two FAIR principles are an issue for grey literature, i.e., findability and accessibility.

Findability: Grey literature is relevant if not a must-have for systematic reviews (see for instance Whaley et al., 2020; also, Schöpfel & Prost, 2021); yet, the inclusion of grey literature in reviews is generally considered as more time-consuming and costly as for journal articles (Enticott et al., 2018), mainly because grey resources have less standardized publication formats (Landerdahl Stridsberg et al., 2022). A couple of papers make recommendations how to improve findability of grey literature, especially through the enrichment of metadata and indexing (Jamoulle et al., 2017; Marsolek et al.,

[10] See for instance the recent NDLTD conference on the FAIRness of electronic theses and dissertations at Novi Sad, Serbia https://etd2022.uns.ac.rs/

2018) and the minting and usage of persistent identifiers, namely DOI but also ISSN, ORCID and ROR (Farace et al., 2019 and 2021; Price & Murtagh, 2020; Reynolds & Ross, 2020). Careful curation is required to improve the visibility and searchability of grey literature; or with the words of Marsolek et al. (2018), an "*increased level of collection development of grey literature in institutional repositories would facilitate preservation and increase the findability and reach of grey literature*".

Accessibility: Open access with no or less restrictions remains an issue for grey literature, even if the deposit of theses and dissertations, conference proceedings, working papers and reports on open repositories improved their dissemination and impact. As said above, many repositories contain grey literature (figure 1) where it represents up to 30% of the content. However, other platforms are useful for different types of grey literature, such as PubMed Central and Clinicaltrials.gov from the US National Library of Medicine (Sheehan, 2021) or ConfIDent, the conference platform from the German National Library for Scientific and Technical Information (Hagemann-Wilholt et al., 2019). On the other hand, embargo periods can reduce the accessibility of grey resources on institutional repositories (Rasuli et al., 2022).

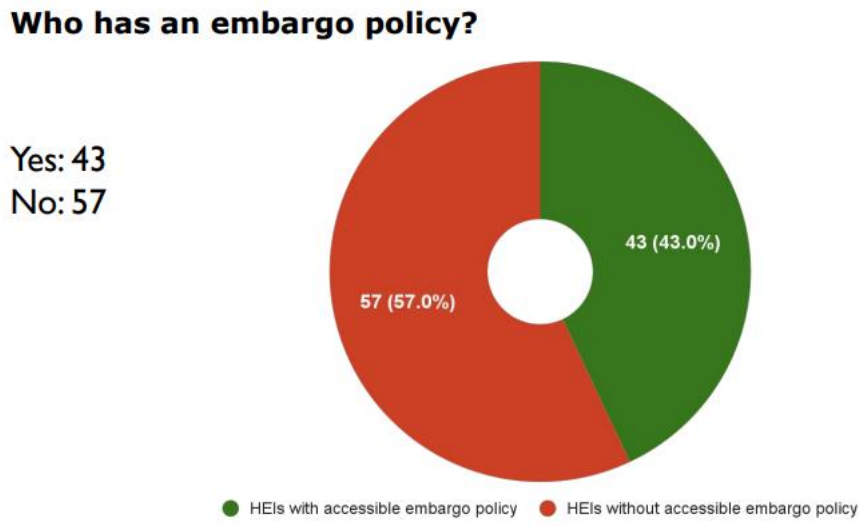

Figure 6. Embargo policies in universities (source: Rasuli et al., 2022)

We can make two recommendations, and they are not really new: The producers of academic grey literature (research organizations, universities…) and repository managers should systematically attribute persistent identifiers to grey literature (dissertations, reports, working papers, conference papers…), especially when these documents are deposited in institutional repositories. On the other hand, institutions and repositories should create a framework (= technical, political, social, and legal environment) that fosters openness and accessibility of grey literature

Perspectives

The findings of our review reflect a continuing scientific and professional interest in grey literature, in- and outside of the GreyNet community of practice, as reflected by special issues in academic journals (Dyas-Correia & Mering, 2021; Garousi et al., 2022), by handbooks (Bonato, 2018) and by a steadily growing number of systematic reviews (Schöpfel & Prost, 2021). The main issue of grey literature today is not typology but FAIRness.

Open science improves the openness of grey literature, its visibility, and its accessibility especially in open repositories. However, as our findings show, open science also emphasizes and exacerbates the usual shortfalls of grey literature, the lack of persistent identifiers, problems with the quality and the

richness of metadata, and with the long-term conservation. According to some recent research, these issues are not specific to grey literature; inconsistent implementation of unique identifiers are key challenges for open access books (Laakso, 2022), and open access journals can simply vanish from the web (Laakso et al., 2021). But the lack of long-term conservation, of findability (i.e., non-efficient search and retrieval) and of standards are serious threats to the sustainability of grey literature (Savic, 2022).

Thus, open science is an opportunity as well as a challenge for grey literature. One way to face the challenge is the continuous work on the concept of grey literature: "*Taking into consideration the volume and speed of* (grey literature*) creation, there seems to be a need to revisit the old definition of GL by refocusing on quality, intellectual property, curation, sustainability and usability (*so that*) proper attention can be focused on relevant (…) issues and solutions*" (Savic, 2018). This conceptual work is not simple, as there are contradictory arguments and perspectives; but as open science is here to stay, grey literature should be "*completely integrated in the emerging open science infrastructures, as open as possible (and just as closed as necessary), easily retrievable and accessible and largely reusable by (*machines*)*" (Schöpfel & Rasuli, 2018).

In the previous sections we made some recommendations for grey literature producers and services. Our final suggestion for the GreyNet community of practice would be a kind of grey literature observatory, a virtual place for information professionals, researchers and service provides, to analyze and discuss the impact of open science on grey literature and to contribute to its integration into this new landscape, with advocacy, information, and training.

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Appendix

We searched for publications in English, published between 2018 and 2022.

Web of Science: We searched in the WoS Core Collection for "grey literature" or "gray literature" in title, abstract and keywords. Review articles were excluded. We then filtered with the following terms

in the full text: “open science”, “repositories”, “bibliodiversity”, “assessment”, “evaluation”, “FAIR principles” or “DORA”.

Scopus: We searched for “grey literature” or “gray literature” in title, abstract and keywords. Review articles were excluded. We then filtered with the following terms in the full text: “open science”, “repositories”, “bibliodiversity”, “assessment”, “evaluation”, “FAIR principles” or “DORA”.

GreyGuide: Manually selection of relevant conference papers.

Dimensions: We searched for “grey literature” or “gray literature” in title and abstract. We then filtered with the following terms in the full text: “open science”, “repositories”, “bibliodiversity”, “assessment”, “evaluation”, “FAIR principles” or “DORA”. We selected all documents in Library and Information Science.

Google Scholar: We searched for “grey literature” or “gray literature” in title. We excluded all citations. We then filtered with the following terms in the full text: “open science”, “repositories”, “bibliodiversity”, “assessment”, “evaluation”, “FAIR principles” or “DORA”.