Monitoring Compliance with Open Access policies

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Introduction

In the last few years, academic communities have seen an increase in the number of Open Access (OA) policies being adopted at the institutional and funder levels. In parallel to policy implementation, institutions and funders have also been engaged in developing mechanisms to monitor academics and researchers compliance with the existing OA policies. This study highlights a few of the cases where compliance is being effectively monitored by institutions and funders. In the first section, Open Access is briefly overviewed and the rationale for monitoring OA policy compliance is explained. The second section looks at best practices in monitoring policy compliance with OA policies by funders and institutions. The case studies reflect on compliance with the UK Funding Councils and the USA National Institutes of Health OA policies. The third section makes recommendations on what processes and procedures universities and funders should adopt to monitor compliance with their OA policies. The final section recapitulates some of the key ideas related to monitoring policy compliance.

I. Open Access and monitoring compliance

Open Access policies: An overview

OA policies have been adopted by universities, research institutions and funders from as early as 2003. The Registry of Open Access Repository Mandates and Policies (ROARMAP) currently records the existence of 738 OA policies across the world, of which 440 have been implemented by universities (347) and funders (53) in Europe.

OA policies provide information on the set of criteria that authors are required or encouraged to comply with in order to make their research outputs available on Open Access. Research outputs can be made Open Access through self-archiving (Green OA) and/or publishing in an Open Access form (Gold OA)[1]. For the most part, OA policies will specify:

- **Who** should make scientific information openly available (e.g. researchers, academics)?
- **What** should be made available on Open Access (e.g. peer-reviewed articles, conference proceedings, research data, monographs)?
- **Why** scientific information should be made openly accessible (i.e. the benefits of OA)?
- **When** the research outputs should be made freely available online (e.g. immediately or following an embargo period)?
- **Where** the research outputs should be deposited (e.g. in an institutional, subject or multidisciplinary repository)?

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1 Hunt, M. and Swan, A., Briefing paper: Open Access, 2015, p. 4, PASTEUR4OA,
http://www.pasteur4oa.eu/sites/pasteur4oa/files/resource/Open%20Access%20-%20basic%20briefing%20.pdf

- **How** authors should comply with the policy criteria[2] (i.e. the full set of criteria that authors are required or encouraged to observe)?

Why monitor compliance with Open Access policies?

Universities and funders that have adopted mandatory OA policies[3] have also been implementing mechanisms to systematically monitor authors' compliance with their mandates. Monitoring policy compliance is important because it enables policymakers to: (i) assess which authors are adhering to the policy; (ii) decide whether additional advocacy practices and communication activities are required to raise awareness about the policy and increase compliance rates; (iii) observe whether any additional infrastructure or tools need to be used to collect evidence on compliance; (iv) determine whether any sanctions need to be implemented to enforce a systematic compliance with the policy; (v) and start the process of assessing the benefits that OA is bringing to the institution as levels of OA outputs grow. In addition, monitoring policy compliance can also contribute towards: improving policy information; advancing collaboration between stakeholders; promoting the use of evaluation techniques that provide feedback to revise policies; informing the assessment of the policy impacts (for instance, changing researchers publishing attitudes and behaviours); and helping to link policies to specific outcomes (for example, increasing the annual proportion of articles that become immediately available on Open Access or following an embargo period)[4]. More importantly, monitoring policy compliance is key for universities and funders 'to account for the outcomes of public spending and to demonstrate return on research investment'[5].

How can compliance with OA policies be monitored?

Recent studies have examined and measured the extent to which peer-reviewed articles are made available on Open Access[6]. These studies show the percentage of peer-reviewed articles that have become available on Open Access over the most recent years by academic field and/or country. The results from these studies have implications both at the policy and infrastructure level. For example, OA policies seem to exert an impact in terms of the amount of articles that are made Open Access but infrastructure such as online repositories also play a role in determining the extent to which contents can be made available and accessible. Indirectly, some of these studies demonstrate that not all the articles that are made available online have been done so in compliance with existing OA policies.

One important feature of measuring compliance with OA policies is that it is not sufficient just to measure the proportion of research outputs that are made freely available on the worldwide web. Instead, the key feature of monitoring compliance is to measure the proportion of research outputs that have been made Open Access and that effectively comply with the OA policy requirements. Often, it is observed that older peer-reviewed articles become available online because authors make them available on a website or because publishers open up older issues of their journals. However, these forms of making research outputs available online are not considered as being Open Access: the definition of Open Access implies that research outputs should become immediately available online (or as soon as possible thereafter and not for a longer embargo period than what is stipulated in the OA policy) and in compliance with the institutional or funder OA policy requirements. To measure compliance, then, one needs to look at the research outputs published at the

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2 OA policies usually include information on the types of research outputs to be deposited, the version of outputs to be deposited, where to deposit, deposit date, deposit exemptions, date to make deposited outputs available on Open Access, embargo length, licensing conditions, types of research outputs to be published in an Open Access form (e.g. peer-reviewed articles, monographs), where to publish those outputs (e.g. Open Access and/or hybrid journals), funding for publication costs, and so on.

3 Mandatory OA policies require or oblige rather than merely recommend (non-mandatory policies) authors to deposit articles in a repository (Green OA) and/or to publish articles in an Open Access form (Gold OA).

4 Waterman, R. and Wood, D. (1993) 'Policy Monitoring and Policy Analysis', *Journal of Policy Analysis and Management*, 12: 685. doi:10.2307/3325346

5 Swan, Alma (2012) Policy Guidelines for the Development and Promotion of Open Access, UNESCO, p. 50.

6 Gargouri, Y., Larivière, V. Gingras, Y. and Harnad, S. (2012). 'Green and Gold Open Access Percentages and Growth, by Field', http://eprints.soton.ac.uk/340294/1/stiGargouri.pdf

Archambault, E. et al. (2013) 'Proportion of Open Access Peer-Reviewed Papers at the European and World Levels – 2004-2011', Montreal: Science-Metrix Inc., http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf

institutional or funder level in a given year and see what is the number or percentage of those outputs that were made openly available in agreement with the institutional or funder OA policy.

By examining what policy types successfully deliver Open Access, a PASTEUR4OA study[7] concluded that mandatory OA policies and a specific set of policy conditions[8] are more likely to result in a higher number of research outputs becoming openly available. One of the study's objectives involved 'measur[ing] the amount of repository content that is Full Text (FT), Open Access (OA: Open Access, full-text items), and Restricted Access (RA: i.e. embargoed full-text items), by institution, discipline and year'[9]. By collecting this information, it is possible to observe how many deposited items indicatively comply with an institutional OA policy. Accordingly, to monitor compliance with OA policies the process must be able to identify the total number of peer-reviewed articles subject to the policy, the total number of full-text OA articles in the repository, the number of embargoed full-text items that will become OA at a later date, and whether the OA articles subject to the policy comply with its requirements (Figure 1).
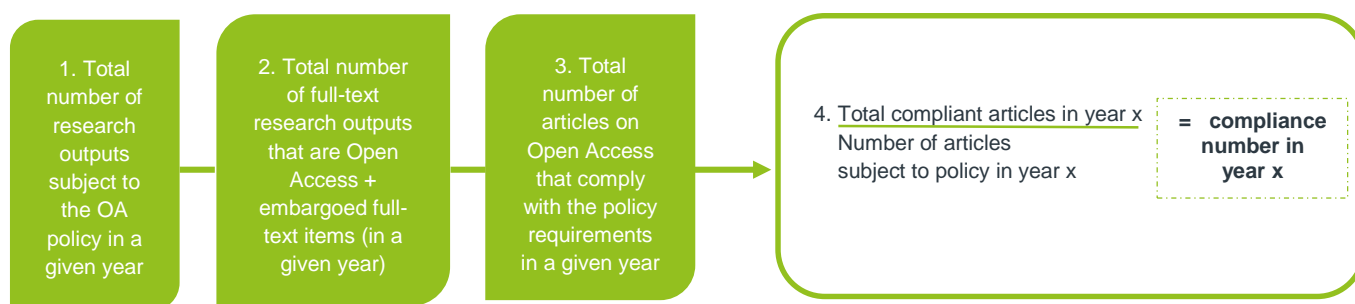

Figure 1: Monitoring compliance with OA policies.

In practical terms, monitoring policy compliance is a complex task that is often done manually but some services can assist academic support staff in undertaking this task. To monitor compliance, information about deposited research outputs as well as outputs published in an Open Access form (hybrid or Open Access journals) must be collected and subsequently cross-checked for compliance against the OA policy requirements (e.g. copyrights and licensing, embargo periods, version of deposited item, etc.). In the cases where the research outputs have not been deposited in repositories, academic support staff need to conduct additional checks to identify what other literature has been published by their academics and researchers which is not available on Open Access (e.g. by checking information recorded by literature indexing services such as Web of Science or Scopus). Some free online services can assist academic support staff, among other, in tracking articles published by their authors. These include ORCID (authors/researchers unique digital identifier), DOI (serial code used to identify single objects such as publications) and FundRef (standard taxonomy of funders' names). Other services may help with the discoverability (e.g. CORE, OpenAIRE, Google Scholar) and usage of research outputs (Google Analytics). By and large, academic support staff 'rely on multiple systems to record, verify and measure the information required to successfully track engagement with their policy'[10]. Monitoring compliance is as much of a challenging task as raising academics' and researchers' awareness about Open Access.

As more national and funders OA policies are implemented, systems that enable institutions and/or funders to automatically check compliance with OA policies and to collect data for reporting are being developed. However, such systems are still sparse. In the UK, for instance, Jisc Monitor Local will enable UK universities

7 Swan, A, Gargouri, Y, Hunt, M and Harnad, S, Work Package 3 Report: Open Access Policies, 2015, PASTEUR4OA, http://www.pasteur4oa.eu/news/109#.VSU258N0zIU
8 The list of policy conditions/criteria that ensure the effectiveness of an OA policy are: (i) articles must be deposited; (ii) deposit cannot be waived; (iii) deposit of articles is linked to research evaluation (performance assessment); (iv) articles must be made Open Access; and (v) where the policy stipulates that authors retain certain rights, this cannot be waived.
9 Ibid: 23
10 The Open Access Monitor, http://symplectic.co.uk/elements-updates/introducing-open-access-monitor/

to record and report on data related to research outputs made available through the Green and Gold OA routes. In the USA, Symplectic's new module on Open Access Monitor simplifies research institutions process to monitor policy compliance[11].

II. Best practices in monitoring compliance with Open Access policies by funders and institutions

This section looks at a few cases where OA policies have been adopted by funders and universities and where processes and procedures are being established to promote and monitor compliance with the respective policies. The first case study focuses on the measures adopted by the UK Funding Councils to promote compliance with its policy. It also illustrates what procedures the University of Glasgow, among other UK universities, is following to promote and monitor compliance with the Funding Councils policy. The second case study focuses on the USA's National Institutes of Health (NIH) Public Access Policy and highlights what mechanisms the NIH has developed to support USA universities to monitor compliance.

Case-study I: The UK Funding Councils Open Access policy

The UK higher education Funding Councils announced their OA policy in March 2014. The policy becomes effective from 1 April 2016 and applies to academics and researchers in all UK universities. The policy will become an inclusive part of the post-2014 Research Excellence Framework (REF) exercise. Accordingly, all UK universities academics and researchers are required to comply with the Funding Councils OA policy in order to be eligible to the post-2014 REF. Table 1 summarises the Funding Councils OA policy requirements.

· Policy scope	Journal articles and conference proceedings with an ISSN number accepted for publication after 1 April 2016.
· Self-archiving research outputs (Green OA)	Depositing and making research output Open Access is a requirement.
· Where to deposit	Institutional, multi-institutional or subject repository.
· Deposit date	As soon as possible after the point of acceptance and no later than 3 months after this date. Note: in the first year of the policy becoming effective (1 Apr 2016 to 1 Apr 2017) research outputs can be deposited up to three months after the date of publication.
· Version of item to be deposited	Author's accepted and final peer-reviewed text/accepted author manuscript/final author version/post-print version.
· Embargo period	12 months (Science, Technology, Engineering and Mathematics, STEM) / 24 months (Humanities, Arts and Social Sciences, HASS).
· Licence	Creative Commons Attribution-NonCommercial-NoDerivs (CC BY NC ND).
Publishing research outputs in an Open Access form (Gold OA)	Gold OA is accepted.
· APCs	'APCs can be funded from HEFCE institutional research funding - this is an institutional decision. No special fund has been created'.
· Embargo period	Research outputs published in Open Access form which are eligible for deposit with no embargo, 'must meet the access requirements as soon as possible and no later than one month after deposit'.

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11 Introducing our latest Elements module – the Open Access Monitor, http://symplectic.co.uk/elements-updates/introducing-open-access-monitor/

· **Exceptions**	Some exceptions are allowed: deposit (where the output does not meet the deposit requirements), access (where there are issues to do with meeting the access requirements), technical (where an output does not meet the criteria due to a technical issue), and other (must be justified and should be extremely rare).

Table 1: UK Funding Councils OA policy[12].

To monitor compliance with the policy, the Funding Councils issued guidelines explaining what information UK universities should collect 'to fulfil the submission requirements of the post-2014 REF'[13] as well as guidance on audit requirements[14]. The Councils plan to measure compliance with its policy 'by verifying the data provided in the REF submission' and if any audits are conducted, universities should provide information on 'their processes and systems for recording open-access information, as well as taking a light-touch approach to verifying supporting information'[15]. In the cases where research outputs submitted to the REF do not meet the policy requirements or exceptions, they will be considered as non-compliant, 'given an unclassified score and will not be assessed in the REF'[16]. Notwithstanding, the Councils will accept 'occasional failures where institutions have made best endeavours towards achieving full compliance' as well as 'legitimate human error or oversight'[17], and will take into consideration the cases where progress may be hindered as a result of diverse practices in distinct academic fields. In broad terms, the Funding Councils approach to compliance with the OA policy will be flexible as it acknowledges that communicating the policy and getting all the right processes and procedures in place will take time[18].

The information and auditing requirements that the Funding Councils require UK universities to collect data on for the post-2014 REF include the following sections and fields (Table 2):

Section: Definition	*Information to be provided*
Output type	List item *[Journal article, conference proceeding with an ISSN number]*
Acceptance date	Date [Definition of acceptance date available at: http://www.hefce.ac.uk/rsrch/oa/FAQ/#deposit4]
Technical exception: » Output is a conference proceeding, but not within definition » At the point of acceptance, the individual whose output is being submitted to the REF was at a different UK HEI which failed to comply with the criteria » The repository experienced a short-term or transient technical failure that prevented compliance with the criteria » An external service provider failure prevented compliance.	True/false True/false True/false True/false
Section: Deposit requirements	*Information to be provided*
Version of deposited file	List item *[Journal article, conference proceeding with an ISSN number]*

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12 Policy for open access in the post-2014 Research Excellence Framework, http://www.hefce.ac.uk/pubs/year/2014/201407/
13 Ibid: 8
14 Open access in the post-2014 Research Excellence Framework: information and audit requirements
http://www.hefce.ac.uk/media/hefce/content/What,we,do/Research/OA/Open%20access%20in%20the%20next%20REF%20information%20and%20audit%20requirements.pdf
15 Policy for open access in the post-2014 Research Excellence Framework, p. 8, http://www.hefce.ac.uk/pubs/year/2014/201407/
16 Ibid: 8
17 Ibid: 8
18 Johnson, B (2015) 'REF OA Policy Overview', Workshop How compliant is your institution? Meeting RCUK and REF metadata and policy requirements, 24 November 2015, Jisc: London, http://savilleav.mediasite.com/mediasite/Play/7a40d751343c4625832210e6e77f785f1d

Deposit date	Date *[Note: must be as soon as possible after the point of acceptance and no later than 3 months after this date.]*
Deposit exception: » The individual whose output is being submitted to the REF was unable to secure the use of a repository at the point of acceptance.	True/false
» The individual whose output is being submitted to the REF experienced a delay in securing the final peer-reviewed text.	True/false
» The individual whose output is being submitted to the REF was not employed by a UK HEI at the time of submission for publication. » It would be unlawful to deposit, or request the deposit of, the output.	True/false
» Depositing the output would present a security risk.	True/false
Section: Access requirements	***Information to be provided***
Publication date	Date
Embargo end date	Date *[Note: 12 months STEM / 24 months HASS]*
Free to read	Date
Free to download	Date
In-text search	Date
Access exception: » The output depends on the reproduction of third party content for which open access rights could not be granted.	True/false
» The publication concerned requires an embargo period that exceeds the stated maxima, and was the most appropriate publication for the output.	True/false
» The publication concerned actively disallows open-access deposit in a repository, and was the most appropriate publication for the output.	True/false
Section: Other exception	***Information to be provided***
Other exception	Free text

Table 2: Funding Councils information and audit requirements for REF open-access policy[19].

The Funding Councils' guidelines on information and audit requirements provide detailed guidance on the contents and metadata that should be provided for each field (summarised in Table 2) as well as on what evidence auditors will seek to collect from universities[20]. To monitor compliance with the Funding Councils' OA policy and audit requirements, universities can collect information manually or automatically (e.g. with the RIOXX plugin[21] but this service does not collect information on all the fields).

In a nutshell, compliance with the Funding Councils OA policy implies that universities will need to follow the subsequent steps and be aware of the verification and audit process (Figure 2):

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19 Open access in the post-2014 Research Excellence Framework: information and audit requirements, p. 3-6, http://www.hefce.ac.uk/media/hefce/content/What,we,do/Research/OA/Open%20access%20in%20the%20next%20REF%20information%20and%20audit%20requirements.pdf
20 Ibid: 3-6
21 RIOXX is a metadata application profile which provides a mechanism for institutional repositories to meet RCUK and most of the Funding Councils OA policies requirements. For more information go to: http://rioxx.net/
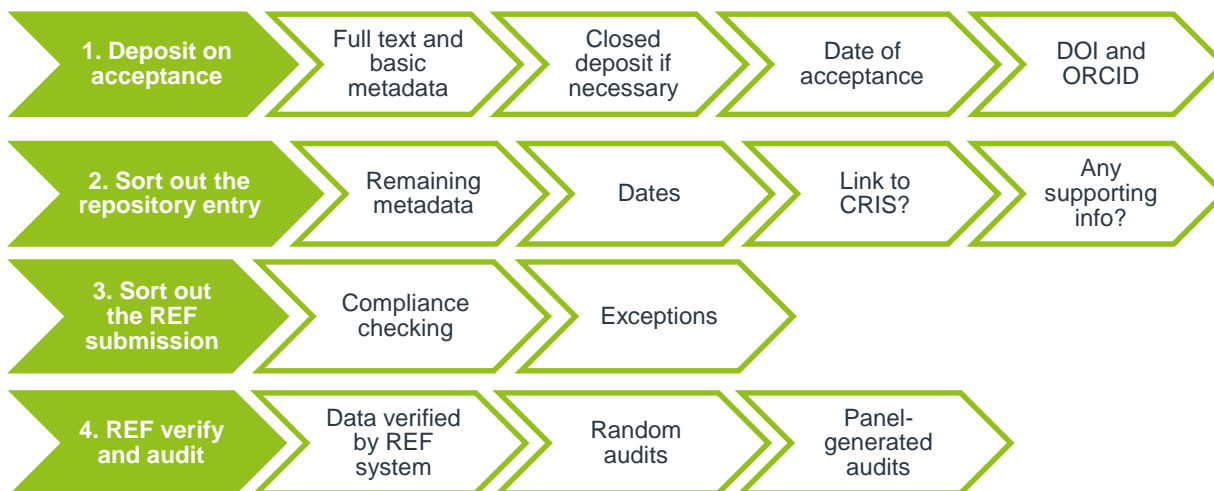
Figure 2: Overview of the process for UK universities to comply with the Funding Councils OA policy[22].

To assist universities in collecting information as well as monitoring and reporting on compliance, the Funding Councils have been working with repository software vendors, Jisc and other stakeholders to develop systems and tools that enable a simple and effective information recording mechanism. It must be observed that in the case of the UK the development and future use of automatic mechanisms to collect, monitor and report information on policy compliance is largely facilitated by the fact that all universities have online repositories, the majority of which use either an EPrints or DSpace software. For instance, EPrints developed the REF Compliance Checker plugin[23] which will enable the collection of data that will indicate if a research output is eligible for the next REF. The RIOXX metadata application profile has been developed and can be implemented in an EPrints or a DSpace repository to ensure that the right metadata is recorded by institutional repositories, that consistent tracking of OA publications is maintained and, ultimately, that systematic information can be collected to report on policy compliance. This application supports the implementation of both the RCUK and the Funding Councils OA policies. SHERPA is developing a new service, Sherpa/REF, to support authors and institutions to determine if the journal where the publication is intended to be submitted allows them to comply with the Funding Councils OA policy.

By and large, the Funding Councils have been actively working with multiple stakeholders to ensure that the right support mechanisms are in place to facilitate compliance with its OA policy from April 2016 onwards. The case studies below illustrate how two UK universities are working towards implementing processes and procedures at the institutional level that will ensure compliance with the Funding Councils OA policy[24].

Monitoring compliance with the UK Funding Councils' REF OA policy: The University of Glasgow

The UK Funding Councils announcement of the post-2014 Research Evaluation Framework (REF) OA policy has meant that all Universities in the UK have been taking steps to ensure that they raise awareness and provide support to their academics about the policy and implement the most suitable tools to monitor compliance. Because the emphasis is placed on academics being required to make their research outputs available on Open Access

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22 Johnson, B. (2015) 'REF OA Policy Overview', Workshop How compliant is your institution? Meeting RCUK and REF metadata and policy requirements, 24 November 2015, Jisc: London, http://savilleav.mediasite.com/mediasite/Play/7a40d751343c4625832210e6e77f785f1d
23 The REF Compliance Checker plugin for EPrints, http://scholarlycommunications.jiscinvolve.org/wp/2015/10/08/the-ref-compliance-checker-plugin-for-eprints-timelines-for-implementation/
24 The vast majority of UK universities have web pages dedicated to provide information on the Funding Councils OA policy (**example**). Universities are also engaged in numerous outreach activities (e.g. delivering presentations, workshops and trainings to academic and non-academic staff; providing helpdesk support) to raise awareness and promote compliance with the Funding Councils OA policy (**example**). UK associations and organisations such as Jisc have also been engaged in activities to raise awareness about the Funding Councils OA policy. For instance, in November 2015 Jisc hosted a workshop on 'How compliant is your institution? Meeting RCUK and REF metadata and policy requirements' (**link**) and ARMA organised a webinar on 'Advocacy in Open Access' (**link**).

and on having to ensure that this requirement is met for their outputs to be eligible for the REF, the University of Glasgow's library staff have been engaged in ensuring that the transition to sharing research outputs in Open Access takes place in an efficient way.

The University of Glasgow has had a **Publications Policy** in place since 2008 and an OA **repository** in operation since 2004 which means that the University has already been active in promoting Open Access for a few years. The Funding Councils OA policy has, consequently, meant that the University's library has been investing more resources in advocacy activities, in providing support to academics and in enhancing the use of existing infrastructure that can assist in monitoring compliance.

Some of the advocacy activities that the University's library have been involved in include delivering multiple workshops, training sessions and presentations across the University to raise their academics, researchers and non-academic staff awareness about OA and **how to comply** with the Funding Councils policy. Simultaneously, support systems are in place to inform and assist academics in **depositing** their publications in Enlighten Publications. Information and support is also provided to academics through the **institutional website** and through dedicated **support service**. The University of Glasgow has been taking a pro-active role in working with its academics by providing a low barrier service where it provides support and does all the administration on behalf of the author wherever possible – from depositing research outputs in Enlighten to checking if research outputs are made Open Access in compliance with the Funding Councils but also with other OA policies.

The University of Glasgow's repository is an EPrints software. By using the recently developed REF Compliance Checker plugin for EPrints, the University's library staff will be able to determine which research outputs are eligible for the REF and to monitor compliance with the policy.

To monitor how academics at the University of Glasgow are currently doing in terms of making their research outputs available on Open Access, the University library has been developing general reports with detailed information on authors and their publications. These reports are being shared with management so that they are aware of how they are performing and how many outputs they have or have not made available on Open Access.

These reports are also an information tool to ensure all academics can be supported and made aware of the need to make all their research outputs available on Open Access once the Funding Councils policy becomes effective. The library will monitor compliance by sending reminders where acceptance date is > 2 months ago and a suitable version of the manuscript is not available in the repository.

In a nutshell, the University of Glasgow is currently dedicated to:
- making their academic and non-academic staff as widely informed about the Funding Councils OA policy as possible before the policy becomes effective on 1 April 2016;
- ensuring that full support is provided to academics to comply with the policy;
- ensuring that compliance with the OA policy is effectively monitored and that all the outputs published by the University's academics are eligible for REF – including the cases where exceptions apply and there are reasons for specific outputs not to be made OA.

Monitoring compliance with the UK Funding Councils' REF OA policy: The University of Oxford

In 2013, the University of Oxford issued a **Statement on Open Access** where it recommended its academics and researchers 'provide Open Access to published research outputs' by depositing a copy of the peer-reviewed articles in the Oxford Research Archive (**ORA**). At the institutional level, work has been done to raise awareness about Open Access and to promote both the deposit and the making of research outputs available on OA in the last few years. However, the announcement of the RCUK and the Funding Councils REF OA policies has resulted in the scale and scope of the work done so far having to increase significantly.

Since the RCUK and the Funding Councils REF OA policies were announced, the University of Oxford has been devoted to improving OA support including implementing a major OA project – The Open Access Service Design project – which involves providing an efficient service to its academics and researchers on issues involving the deposit and making research outputs openly available, as well as promoting compliance with the post-2014 REF requirements for Open Access. The project has been based on collaborative work developed, among other, by the University's Bodleian Libraries, Research Services, IT Services, Academic Divisions, and the Oxford University Press. The Open Access Service Design **project** has involved enhancing work processes in areas that include 'Communications; Service design and workflows; Technical design and development (ORA, Symplectic Elements, subject repositories; APC management); REF compliance assurance & data collation; and Management information & benchmarking'.

The project has resulted in various processes and plans being implemented or tailored in order to ensure that information is communicated widely, that the appropriate infrastructure is fully functioning, and that the right information is collected and used for reporting. Since October 2015, a communications and action plan has been put into practice to advocate/encourage for Oxford academics and researchers to 'Act on Acceptance'. The **Act on Acceptance** strategy follows the Funding Councils OA policy requirement to deposit the research output in a repository (in this case in ORA) as soon as possible after the point of acceptance for publication, or within a maximum of 3 months. This strategy has been publicised in a number of different ways. For instance, through events organised at the university, department and faculty level; through communications sent by departments and representatives of academic divisions; through training delivered to academic staff, subject librarians, and other staff; through online support delivered via the Open Access Live Help **tool** and via **email**. The University is, therefore, sending a clear, simple and coordinated message by simply asking researchers and academics to **deposit** their research outputs in order to be eligible for the post-2014 REF. The Bodleian Libraries add significantly to the support by checking permissions and enhancing metadata for items deposited in the repository. The University relies on researchers to deposit their research outputs but it also relies on appointed OA contact points in academic departments to communicate with their academics and researchers in order to ensure that outputs are deposited, and on the Bodleian Library staff to ensure that the deposited articles are compliant with the Funding Councils OA policy. Since the start of the Act on Acceptance campaign more than 1,000 peer-reviewed articles and other research outputs have already been deposited in ORA.

At the infrastructure level, the University of Oxford has adopted **Symplectic** as an application that will assist in policy compliance monitoring. The University is also promoting the use of persistent identifiers that will, in time, make it easier to track academics and researchers publications, in particular **ORCIDs**.

Overall, the University of Oxford's top priorities until the post-2014 REF OA policy becomes effective in April 2016 are: to enhance work on technologies, to make systems more automated, to carry on outreach activities with researchers, academics and non-academic staff, and to continue to advance the library's work to support academics and researchers.

Case-study II: The USA National Institutes of Health Public Access Policy

The National Institutes of Health (NIH) announced the Public Access Policy in April 2008 which requires investigators and awardees directly funded by NIH as well as NIH staff to submit 'an electronic version of the final peer-reviewed manuscript upon acceptance for publication'[25] in PubMed Central (PMC). The manuscript must either become immediately available in PMC or following a maximum of 12 months embargo period. Table 3 summarises the NIH Public Access Policy requirements.

· Policy scope	Peer-reviewed journal manuscripts
· **Self-archiving research outputs (Green OA)**	Depositing and making final peer-reviewed manuscripts Open Access is a requirement. There are four methods through which manuscripts can be deposited: journals submit all their articles to PMC (Method A); articles are deposited by the publisher in PMC usually following the 'payment of an immediate open access publication charge' (Method B); authors deposit the manuscript in the NIH Manuscript

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25 NIH Public Access Policy Details, https://publicaccess.nih.gov/policy.htm

	Submission System (NIHMS) (Method C); publishers deposit the manuscript in NIHMS (Method D).
· Where to deposit	PMC.
· Deposit date	Upon the manuscript's acceptance for publication (i.e. official date of publication).
· Version of item to be deposited	Final peer-reviewed manuscript.
· Embargo period	No later than 12 months after the official date of publication.
· Licence	Institutions and authors must address copyrights. Copyright transfer agreements must allow manuscripts to be submitted to NIH. Final peer-reviewed manuscripts are freely accessible in PMC under the principles of Fair Use[26].
Publishing research outputs in an Open Access form (Gold OA)	Gold OA is accepted.
· APCs	Publication costs, including author fees, may be charged to NIH grants and contracts on three conditions: (1) such costs incurred are actual, allowable, and reasonable to advance the objectives of the award; (2) costs are charged consistently regardless of the source of support; (3) all other applicable rules on allowability of costs are met.'
· Exceptions	NIH will 'grant exceptions only under the most extreme circumstances, such as death of the sole author. NIH will consider such exceptions on a case-by-case basis'.
· Sanctions	From 1 July 2013, 'NIH will delay processing of an award if publications arising from it are not in compliance with the NIH public access policy'.
· Other	Grant number must be include in the manuscript. Authors must include PMC or NIH Manuscript Submission reference number when citing articles arising from NIH funded research.

Table 3: The NIH Public Access Policy[27].

To promote compliance with the Public Access Policy, the NIH has given guidance on how investigators, awardees and NIH staff can comply with the policy's deposit requirements. They include the following steps[28]:

- Authors must determine if the research output is covered by the NIH policy, i.e. a peer-reviewed article;
- Authors must notify the publisher that the article to be published is funded by the NIH and is subject to its Public Access Policy;
- Authors must include all the applicable grant numbers in the article;
- Authors and institutions must ensure that the publisher's copyright agreement allows the article to be submitted to NIH;
- Journals, publishers or authors must submit the articles to PMC (directly or via NIHMS) via Method A, B, C or D (see Table 3, self-archiving);
- Authors must include the article's PMC unique identification number, known as PMCID, in any applications, proposals or progress reports submitted to NIH.

Articles will be considered as being compliant with the NIH policy if they meet the policy's requirements and in particular: a) if authors address copyrights when preparing the manuscripts, b) if articles are submitted to PMC and tracked via the My NCBI bibliographic management system[29], and c) if when reporting to NIH (or when submitting an application or proposal) the authors include the PMC unique identification number, PMCID[30]. To promote compliance with its policy, the NIH monitors the articles published by its grantees through the information provided in their annual progress reports. Failure to comply with the policy will result in grant funds being withheld until compliance the Public Access Policy has been demonstrated[31].

26 More Information on Fair Use, http://copyright.gov/fair-use/more-info.html
27 NIH Public Access Policy Details, https://publicaccess.nih.gov/policy.htm
Frequently Asked Questions about the NIH Public Access Policy, http://publicaccess.nih.gov/FAQ.htm#I
28 How to Comply with the NIH's Deposit Requirements, https://www.library.ucsf.edu/services/scholpub/nih
29 My NCBI and My Bibliography: Definitions, http://publicaccess.nih.gov/communications.htm
30 When and How to Comply, http://publicaccess.nih.gov/
31 Changes to Public Access Policy Compliance Efforts, http://grants.nih.gov/grants/guide/notice-files/NOT-OD-13-042.html
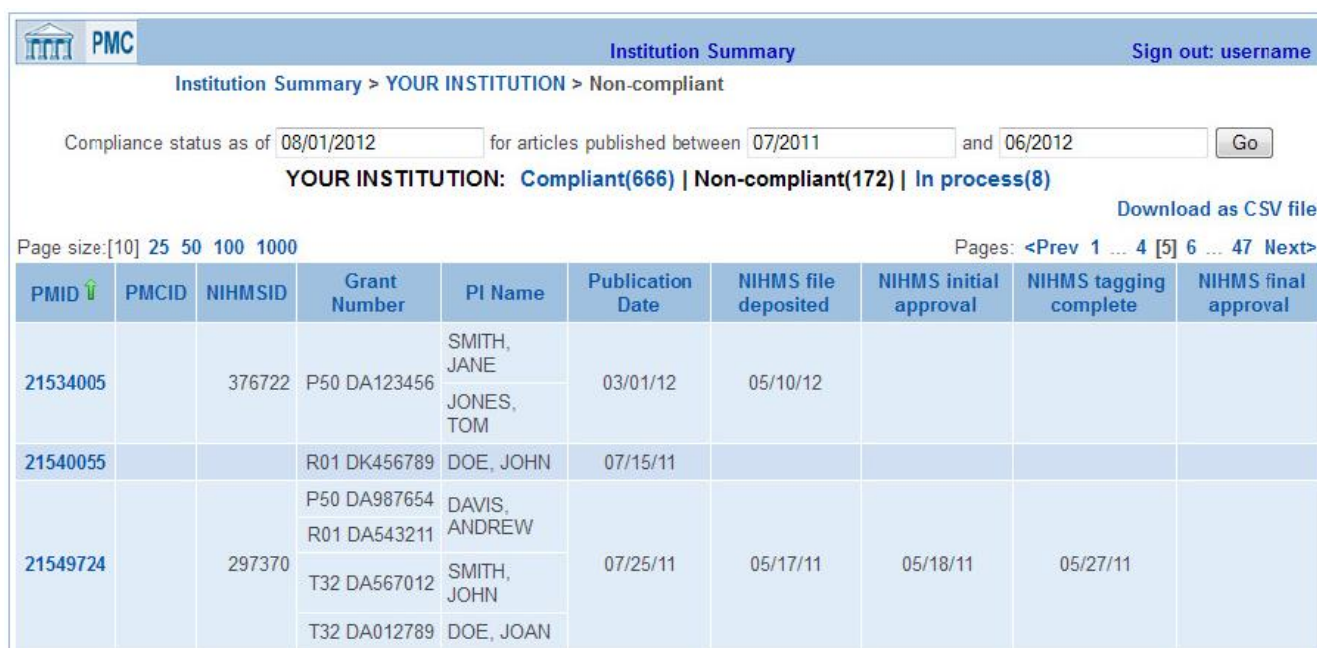
To support institutions in monitoring compliance with the Public Access Policy, the NIH has developed an online tool – the NIH Public Access Compliance Monitor (PACM) – that 'provides an institution with the current compliance status of all journal articles that are associated with the institution and fall under the NIH Public Access Policy'[32]. In order to track compliance, PACM identifies which articles are linked to which awards by collecting and sorting information on grants, awardees and their publications via PubMed (citation and abstract database), My NCBI ('tool that retains user information and database preferences'[33]), PMC (repository of biomedical and life sciences peer-reviewed literature), and the NIHMS (manuscript submission system). Institutional staff that are assigned permission to access PACM (i.e. staff with a Public Access Compliance Report role) can view the institutional summary information which includes the total compliant[34], non-compliant[35] and in-process[36] manuscripts as well as the institutional overall compliance rate. Institutions can also download reports on non-compliant articles and track the progress of articles submitted to NIHMS. Moreover, institutions can view information by category (compliant, non-compliant, in-process) and identify it by its PMID (PubMed Identifier), PMCID (PubMed Central reference number), NIHMSID (NIH Manuscript Submission Identifier), grant number, Principal Investigator (PI) name, publication date, and by date the file is deposited in NIHMS as well as by NIHMS initial and final approval dates (Figure 3).

PMID ⇧	PMCID	NIHMSID	Grant Number	PI Name	Publication Date	NIHMS file deposited	NIHMS initial approval	NIHMS tagging complete	NIHMS final approval
21534005		376722	P50 DA123456	SMITH, JANE	03/01/12	05/10/12			
				JONES, TOM					
21540055			R01 DK456789	DOE, JOHN	07/15/11				
21549724		297370	P50 DA987654	DAVIS, ANDREW	07/25/11	05/17/11	05/18/11	05/27/11	
			R01 DA543211						
			T32 DA567012	SMITH, JOHN					
			T32 DA012789	DOE, JOAN					

Figure 3: Example of NIH Public Access Compliance Monitor details of non-compliant manuscripts[37].

The NIH has also been involved in encouraging institutions to engage with their investigators and awardees on ways that can ensure compliance with the Public Access Policy. Some of the recommendations made by the NIH make reference to institutions role in implementing communication and dissemination plans as well as in delivering training to their investigators so that they become aware of the NIH policy and know where to find more information and support. Other recommendations involve institutions encouraging their investigators to

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32 NIH Public Access Compliance Monitor User Guide, http://www.ncbi.nlm.nih.gov/pmc/utils/pacm/static/PACM-USER-Guide-Dec_2012.pdf
33 My NCBI Help, http://www.ncbi.nlm.nih.gov/books/NBK3842/#MyNCBI.What_Is_My_NCBI
34 PACM considers an article as being compliant if it has a PMCID identifier (which indicates that the article is available in PMC) or if an article has been deposited by the journal in PMC (Method A).
35 PACM considers an article as not being compliant if the article was not deposited via Method A and it does not have a PMCID and is not in-process (see below).
36 PACM considers an article as being in-process if the article has been deposited via Methods B, C or D and 'is less than 3 months past its final publication date' and is 'somewhere in the NIHMS processing cycle', http://www.ncbi.nlm.nih.gov/pmc/utils/pacm/static/PACM-USER-Guide-Dec_2012.pdf
37 NIH Public Access Compliance Monitor User Guide, http://www.ncbi.nlm.nih.gov/pmc/utils/pacm/static/PACM-USER-Guide-Dec_2012.pdf

use My NCBI, to associate their articles with awards numbers (e.g. NIHMSIDs and grant numbers), to define policy compliance plans during the article writing stage, and to ensure compliance at the stage that articles are submitted for publication in a journal rather than only at the stage that NIH annual reports are due for submission[38].

To conclude, recent research on the impact of the NIH policy on citation rates of journal articles[39] shows that when comparing peer-reviewed articles published in 2009 with NIH funding and made available in PMC with similar articles published in the same journals but that have not been deposited nor made openly available in PMC there is a considerably higher level of citations in the first case (26%). The article considers that the NIH Public Access mandate has had a significant impact in making scientific information more visible and easily accessible and recommends other USA federal agencies to follow the NIH's example. Furthermore, the article shows that in 2013 the overall compliance had reached 75%. Essentially, the NIH determines its overall compliance rate by calculating the number of articles that it considers to be subject to its policy in a given year. The number of articles subject to the policy is calculated on the basis of the articles linked to NIH awards. This information is collected from the following data sources: a) authors registered in NIHMS, b) authors and PIs registered in the MY NCBI system, c) PIs and institutions connected to electronic progress reports, and d) 'authors and publishers in the acknowledgement section of' articles[40]. Since May 2005, a total of 555,397 manuscripts have been submitted to NIHMS, of which 96% have been submitted since the Public Access Policy was implemented in April 2008 (Figure 4).
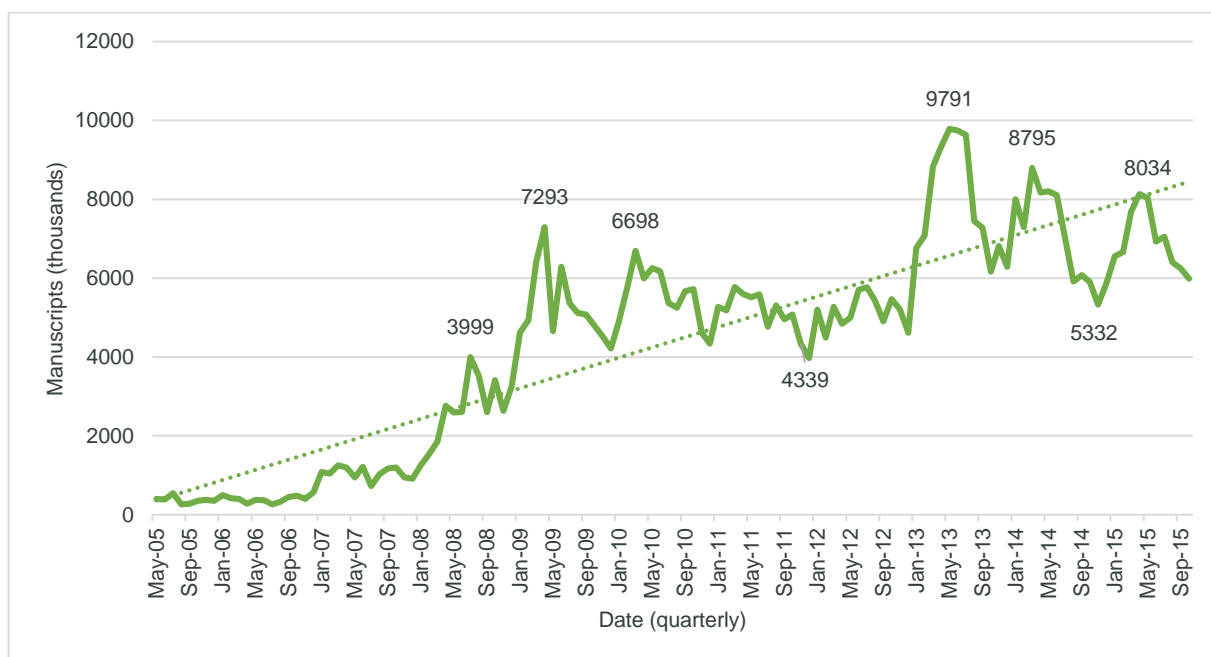

Figure 4: Total peer-reviewed manuscripts submitted via NIHMS[41]

The total number of manuscripts funded by NIH and available in PMC is, however, higher than the total number of manuscripts submitted via NIHMS as in some cases journals have made agreements with NIH to submit

38 How can institutions ensure compliance, https://www.youtube.com/watch?v=wqkn_UeDDZk&index=7&list=PLOEUwSnjvqBJS9LZs1vMoG6vcAbTAxq0H
39 De Groote S L, Shultz M, Smalheiser N R (2015) 'Examining the Impact of the National Institutes of Health Public Access Policy on the Citation Rates of Journal Articles', PLoS ONE 10(10): e0139951. doi:10.1371/journal.pone.0139951
40 National Institutes of Health Plan for Increasing Access to Scientific Publications and Digital Scientific Data from NIH Funded Scientific Research, February 2015, p. 20, http://grants.nih.gov/grants/NIH-Public-Access-Plan.pdf
41 NIHMS Statistics, https://www.nihms.nih.gov/stats/

manuscripts automatically to PMC (Method A)[42] and in other cases authors have made arrangements with publishers to submit manuscripts directly to PMC (Method B)[43].

III. Recommendations on monitoring OA policy compliance

This section highlights the processes and procedures that universities, research institutions and funders can follow to monitor compliance with their OA policies. These recommendations are considered as the initial steps that stakeholders can follow to start monitoring policy compliance. In addition, the procedures implemented by different stakeholders that were highlighted in the previous section can also be used as examples of mechanisms to monitor compliance.

Step 1: Collecting data on research outputs published by authors

- Collect information on research outputs published by academics and researchers in an institution (to monitor compliance with the institutional OA policy) or funded by a grant (to monitor compliance with the funder OA policy) by year:

    » Collect information on all published research outputs by an author per year (e.g. via Web of Science, Scopus, Google Scholar);
    » Collect information on how many of the published research outputs have been made available on Open Access (e.g. via institutional, subject or multidisciplinary repository).

Step 2: Monitoring research outputs compliance with OA policies

- Examine the OA policies requirements and define indicators to monitor compliance:

    » Indicators to monitor compliance with Green OA requirements;
    » Indicators to monitor compliance with Gold OA requirements.

- Assess what infrastructure is being used and whether its functionalities can be enhanced in order to collect information on compliance:

    » Can the tools of Current Research Information Systems (CRIS) be enhanced?
    » Can the tools of the institutional repository software (e.g. EPrints, DSpace) be enhanced?
    » Can additional services be incorporated into the repository software (e.g. plugins)?

- Determine what tools will be used to monitor compliance:

    » Will the information collected on articles made available on Open Access and checked for compliance with OA policy be recorded manually (e.g. on an excel spreadsheet) or automatically (e.g. by acquiring a specific software)?

- From the total research outputs subject to the OA policy:

    » Identify how many research outputs are subject to the OA policy, how many outputs have been made Open Access (immediate or embargoed), and how many have not. For research outputs that have not been made available on Open Access, alert authors on how to comply with the OA policy;
    » Assess if the research outputs made Open Access are compliant with the OA policy. If the research outputs are not compliant with the policy, alert the author on how the article can be made compliant.

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42 List of journals that submit manuscripts directly to PMC, http://publicaccess.nih.gov/submit_process_journals.htm
43 List of publishers with whom authors can make arrangements to submit manuscripts directly to PMC, https://publicaccess.nih.gov/select_deposit_publishers.htm

> **Step 3: Progress and Reporting**
>
> ▪ Review work progress on a regular basis and make adjustments to the process of monitor policy compliance whenever required;
> ▪ Report findings to internal stakeholders and determine whether changes in the process to monitor policy compliance are needed or whether further advocacy plans are required to promote compliance.

IV. Conclusion

Open Access to scientific information has numerous advantages to the academic community and to the society in general. It increases the accessibility, visibility, use and impact of research. It improves the speed and efficiency of research. It fosters the transfer of knowledge from the academic to the public, not-for-profit and private sectors. And, it delivers increased returns on investments in publicly funded research. Many institutions and funders in Europe and North America are leading the way in changing the practices in the scholarly communications system by implementing OA policies. Monitoring compliance with OA policies is pertinent because it enables institutions and funders to assess the extent to which their academics, researchers and grantees are complying with policies. OA policy monitoring has led to the development of quantifiable definitions that assist in tracking compliance with requirements such as who should make scientific information OA, what should be made OA, when should scientific information be made OA, where and how. This study has also illustrated how institutions and funders are monitoring compliance (manually or automatically), what tools can assist in monitoring compliance (Web of Science, Scopus, Google Scholar), and what international standards can be included in publications which will also facilitate the process of monitoring compliance (ORCIDs, DOIs, FundRef). The case studies described in the paper illustrate how OA policies can be monitored effectively by funders and institutions. The recommendations made on how to monitor OA policies provide information on the steps that stakeholders planning to adopt monitoring mechanisms should follow. Ultimately, as more institutions and funders develop processes and procedures to monitor policy compliance, it would be relevant to consider the scope for OA policies to become increasingly aligned as this would impact on how compliance is monitored. In particular, if OA policies are aligned institutions will only need to follow a single workflow to assess their academics and researchers compliance with one or multiple policies (for example: institutional and funders policies).