

Suggestions for a National Framework for Publication of and Access to Literature in Science and Technology in India

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The outcome of deliberation on various aspects of publication and free access to scientific literature by a panel of nominated fellows from three science academies, viz. Indian National Science Academy, Indian Academy of Sciences, The National Academy of Sciences India, and expert invitees are presented.

It is known that the wellbeing of any society is largely determined by advances in, and the application of science and technology in all dimensions. Sharing of new knowledge on a continuing basis is a key determinant of progress in science and thence of societal wellbeing. Conventionally, sharing of scientific knowledge has been done through publications in peer-reviewed journals published by academies/societies/universities and commercial publication houses. Before formal publication in such journals, the submitted articles are traditionally 'peer reviewed', in which the editor seeks advice from experts or 'referees' on various aspects that includes, e.g. identification of weaknesses in assumptions, methods, conclusions and over all scientific content of the contribution.

With the proliferation of research publications, the paradigm of free sharing of knowledge has morphed into one of knowledge being a source of revenue. Consequently, various business models for publication of scientific literature have evolved. These necessitate the availability of considerable funding not only for accessing new research but also for publishing new findings and ideas. Thus, funding is required both for subscription to journals and in many cases for payment of a variety of charges levied by the journals before they publish an article.

Given that most blue-sky research is funded by Governmental agencies in India, this new commercial dimension of scientific knowledge as a mode of revenue generation places additional demands on the funding resources required for publishing and accessing scientific literature. Obviously, it becomes imperative that the resources available to the scientific community are optimally used, without compromising on the access to scientific literature and also the funding for actual research.

Limited funding that is available to average Indian researchers has made it increasingly difficult for them to make their research output globally visible and accessible. Substantial charges levied by a few of the 'prestigious' journals in various subjects place researchers in a precarious situation. Likewise, they also find it difficult to access published articles because of high subscription and access charges.

Seized of various underlying issues arising from the present situation with regards to scientific publishing and access to scientific literature, a sub group of three National Science Academies examined various aspects of publication and access to scientific literature in detail so as to construct a framework that could help in evolving future policies in this respect. This group examined issues that may provide for optimal utilization of the available funds for (a) the widest possible sharing of research from India, and (b) the facilitation of availability of new global research output to researchers in the country, in near real time.

While discussing the issues, various international initiatives like the Budapest Open Access Initiative¹, Plan-S of the European Research Council^{2,3}, Project DEAL of the German Government⁴, the models for open access of other countries⁵⁻⁹, the Delhi Declaration¹⁰, the recent decision of the University of California and the policy document recommended by the INSA for Dissemination and Evaluation of Research output in India¹¹, were taken into consideration.

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Publication process: A survey of current practices in India

- (1) Most research in science, technology, medicine, agriculture, etc. is carried out with funding from the Government of India's Departments of Science and Technology (DST), Biotechnology (DBT), Atomic Energy (DAE), Space (DoS), Council of Scientific and Industrial Research (CSIR), Defence Research and Development Organization (DRDO), Indian Council for Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Ministries of: Environment, Forests and Climate Change (MoEF&CC), Earth Sciences (MoES), and similar other Government agencies at state and national levels. Occasionally, non-governmental agencies (including charities) and industry also provide grants for research in domains of their interest. Besides generating new basic and/or applied knowledge, large numbers of students at graduate, post-graduate, doctoral and post-doctoral levels get trained through such support for research. Most doctoral theses are thus funded by grants from one or the other funding sources mentioned above.
- (2) Historically, reputed journals were published by scholarly academies, societies and universities. In recent decades, however, many 'high profile' journals are published by leading publishing houses with commercial interests. In addition to the subscription fees paid by libraries all over the world, many of these journals also collect a variety of charges from authors to process papers for publication and/or from readers for access to the published material. Some journals have a waiver policy if the authors do not have funds to pay such charges, but many do not provide any waiver or may offer a lower priority to such papers in publication. Moreover, in the process of publication, scientists have to transfer copyright to the publisher and at times they are required to seek approval of the publisher to use a part of their results in a follow up publication such as a review article. It is indeed paradoxical that although the ideas are generated by the researchers, the work that is funded by the state and is undertaken by the researchers, is reviewed by experts without remuneration, yet the publishers insist on a copyright without investing a penny for the research.
- (3) Since the process of publication is cost-intensive, journals have traditionally depended on subscription and page charges, etc., to publish any paper/contribution. Following developments in the internet, and perceived reduction in the cost of online publication, an 'open access' model for dissemination of new research output was developed. Open

Access (OA) is 'on-line access to scientific information that is free of charge to the end-user and that is re-usable, with the aim of promoting a widespread dissemination of research results thereby enhancing their use, application and impact'⁵. Although the idea of open access has gained increasingly widespread acceptance by researchers as well as readers, a major issue that confronts the author and/or reader is the high cost involved.

Box 1 provides operative definitions of some common practices and terms used in contemporary publication practices. With respect to access, individual journals may follow: (i) a reader-pays (subscription and/or pay-per-view) model, (ii) free open access model (reader does not pay), or (iii) a hybrid model in which some articles in a 'reader-pay' journal are made open access if the author pays an additional charge for OA. The publication in OA is covered under a Creative Commons (CC) license, (CC is a global non-profit organization dedicated to support an open and accessible internet that is enriched with free knowledge and create resources for people around the world to use, share and cultivate). Consequently the content can be used by all after due attribution.

Some of the Indian Academies follow varied models where the reader has unfettered access to the content (at the respective Academy web-site), author also does not pay, but the copyright remains with the publisher.

Commercial aspects of OA publications

The concept of OA has a flip side in that in several instances it has become brazenly commercial, with publishers using it as a business model. In this model, OA represents an upfront collection of money from a single source (author or funder of the research) for a likely future service (i.e. availability of a research paper to the public at large for eternity). In the reader-pays model, money is realized by the publisher from numerous clients through subscriptions as well as by offprint purchases by individual readers.

Lured by the monetary gains that the OA model offers, several publishers (which include societies, academies, and commercial publishers) have developed a vested interest in promoting OA journals as a source of revenue. Several publishers have set up a hierarchy of journals with varied rigor/quality so that authors of manuscripts perceived to be 'weaker' by reviewer/editor are transferred to their sister journals which require payment of OA charges. This business model ensures that the author fees are retained by the publishers and at the same time strengthens the hierarchy and prestige of the higher ranked journals. This allows for cross subsidy for publishing the 'higher-ranked' journal, through the earnings made by the 'lower-ranked' sister journals.

Box 1**Types of Journals**

- (1) *Print only journals*: These journals follow the classical model of hard-copy printed form, without providing the published content in digital form. They may or may not levy charges to authors for publication. Access to their contents in most cases is based on individual or institutional subscription, although in most cases metadata including the full abstracts are available from the journal website or through sources like PubMed and other indexing services.
- (2) *Print + electronic (online) journals*: Print + electronic (online) journals are available in hard-copy printed as well as digital online form. The hard-copy version is generally subscription-based while the online version may follow subscription based access or gold /green or pay-per-view OA model. They may or may not levy charges to authors for publication. In all these models, some meta-data, like the title, author details and abstract of the published material are generally available as free OA.
- (3) *Electronic or online only journals*: The online-only journals publish only in the digital mode with subscription based access or gold/green or pay-per-view OA. Nearly all such journals levy publication charges to authors or their sponsors for providing OA to the published content to non-subscribers.
- (4) *Pre-print Archives*: Pre-print Archives are online repositories, maintained by institutions/organizations/individuals for pre-prints, which are unpublished versions of new research papers before peer review. Pre-print Archives do not levy any charges to authors or to readers for hosting the pre-prints, which cannot be subsequently withdrawn/retracted by authors and thus remain perpetually available. The articles hosted at these archives are examined before publication only for obvious unethical practices.
- (5) *Predatory journals*: These are journals whose academic credentials are dubious and which actively solicit manuscripts and publish them on payment of fees without robust peer review and editorial services. Common and hallmark deceptive practices of predatory journals include fake peer review, fake impact factors, fake editors and even misleading journal names that are uncannily similar to well known and legitimate journals.

Types of access to readers

- (1) *Open access*: Open-access (OA) literature in the broadest sense is online digital content, which is available free of charge on the public internet, and which permits a user to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl for indexing, pass them as data to software, or use them for any other lawful purpose, without financial and legal barriers. The only constraint is on reproduction and distribution, and the only role for copyright in this domain is to give authors control over the integrity of their work and the right to be properly acknowledged and cited.
- (2) *Gold open access*: Gold OA makes the final version of an article freely and permanently accessible, immediately after publication, for everyone. Copyright for the article is retained by the authors and most of the permission barriers are removed. Gold OA articles can be published either in fully OA journals (where all the published content is OA) or hybrid journals (a subscription-based journal that offers an OA option which authors can choose on payment of a fee).
- (3) *Green open access*: Green OA, also referred to as self-archiving, is the practice of placing a version of an author's manuscript in a repository, which is freely accessible for everyone. The version that can be deposited into a repository is dependent on the policies of funder and/or publisher. Individual self-archiving policies of different journals and publishers determine the terms and conditions about article's version and the time when the article can be made openly accessible (also called an embargo period) in the repository vary.
- (4) *Pay-per-view access*: In this model, a non-subscriber (individual or institutional) reader may access the desired non-OA content on payment of a defined fee for each access.

(Contd)

- (5) *Embargo period*: Within the reader-pays model of access, several publishers permit journal content to be released for unfettered access (green OA) after an embargo period, generally varying between six to twelve months. The publisher may also permit the authors to host their published content on an institutional or other repository after the embargo period.

Publication charges: Many journals levy different kinds of charges to authors for publication of the submitted content. These include, page charges and/or colour printing (for graphics, images, etc.) and/or the charges (open access charges or OAC) paid for making the article green OA. In addition, some journals also charge, upfront, non-refundable article processing charges (APC) at the time of manuscript submission, without guaranteeing publication.

Type of access provided by journals

- (1) *OA archives or repositories (green OA)*: These make their online contents freely available to readers across the world. They may contain un-refereed preprints (pre-print archives), refereed post-prints, or both. Archives that comply with the metadata harvesting protocol of the open archives initiative are interoperable and users can find and access their contents freely.
- (2) *OA journals (gold OA)*: These publish peer reviewed contents available online at no cost to readers. Expenses for such journals may be met by the hosting university or professional society or they charge a fee (OAC) paid by the author or the author's sponsor (employer, funding agency).
- (3) *Hybrid open-access journal*: This is a subscription journal in which some of the articles are OA. This OA typically requires payment of a publication fee (OAC) to the publisher by the author or author's sponsor in order to make the article OA to those who do not subscribe (institutionally or individually) to the journal.

Open researcher and contributor ID (ORCID identifier): ORCID is an international, interdisciplinary, open, and not-for-profit organization created in 2010 for the benefit of a range of stakeholders, including researchers, research organizations, research funders and publishers. The ORCID provides a persistent digital identifier to distinguish one researcher from other researcher and, through integration in key research workflows such as manuscript and grant submission, supports automated linkages between the author and his/her professional activities ensuring that the work is duly attributed to the specific researcher.

Current Indian expenditure on publishing OA articles and subscriptions to indexing databases

India has approximately 7000 R&D institutions in various disciplines. In 2018, Indian scientists published 0.17 million research articles in journals indexed by SCOPUS. The total number of publications would be higher as the SCOPUS database does not cover all journals. Since a large number of research personnel are engaged in serious research activity in the country, this set of professionals require appropriate infrastructure for easy access to published scientific literature and for the dissemination of their research. Both activities are cost intensive and, therefore, require due consideration for evolving a formal framework that augments and optimizes publication, research and funding scenarios. In the larger national interest, it is also important to ensure that the country is not double charged, i.e. for subscription (for readers) as well as open access (for authors)^{12,13}.

During 2010–2014, Indian researchers used 488 OA journals that charged a fee ranging from \$7.5 to \$5000

per article. In this period, a total of 15,400 papers were published involving a payment of about \$2.4 M (i.e. about Rs 20 crores). During 2018, India spent over Rs 1200 crores for subscription for e-journals and an estimated Rs 1500 crores for subscriptions to these-and/or print journals. Between 2016–19, an estimated sum of Rs 38 crores were spent by Indian researchers for publication in just two OA journals, viz. *PLOS One* and *Scientific Reports*. An estimated Rs 30 to 50 crores were spent on access to SCOPUS and Web of Science databases for a limited number of researchers in well-funded national institutions and some universities. Thus, one is looking at very large numbers in terms of financial outlays.

Under the umbrella of OA, a large number of spurious (predatory) journals have also mushroomed in the country. For a cost, these predatory journals publish any paper submitted to them with spurious or without any peer review. The amount spent on such publications would also be substantial but cannot be estimated as these are not indexed in any of the standard databases, and therefore, not

directly searchable. Incidentally, India has been a fertile ground for such predatory journals and this needs to be remedied.

Thus, although large amounts of public money are spent on publication of country's research output and for accessing research publications, a significant proportion of researchers in the country face insurmountable pay-walls to publish their research and to provide global OA for their research output, and to access those of others.

The basic issue, therefore, is how to ensure that the work done with financial support from the Government of India becomes available freely to all interested readers in India and abroad. Three basic questions related to this issue are: *what is the cost, who pays, and how much?* The moot concern is as to how this investment can be leveraged to buttress research, training and education, in the country.

Dissemination of and access to research output: existing practices in India

Indian researchers publish in diverse journals that either do not have publication charges or levy varying publication and/or OA charges (OAC). Most institutions and research grants do not have formally earmarked provision for the use of research/project funds for payment of processing/publication fee/page/OAC and these are handled in an ad-hoc, case by case manner. Often the money meant for contingency expenditure is used for such payments.

Researchers in the universities and colleges often find it difficult to publish their research because the diverse charges levied by the journals are generally too high for their modest funding. In the current models of inter-institutional rankings that lean heavily on the publication profiles, this is a contributory factor for the universities and colleges, remaining at a perpetual disadvantage due to their limited resources.

A substantial number (21,895 in 2017) of serial titles published in India are registered with the ISSN International Centre (<https://www.issn.org/wp-content/uploads/2018/03/Records-for-countries-with-NC.pdf>). Rather than being a healthy and encouraging sign, such a mushrooming of journals has been a matter of serious concern since it is likely that a major proportion of these fall in the class of 'predatory' journals, a class of journals which publish 'anything' for a fee. To some extent, this has been catalysed and buttressed by faulty policies and practices during academic and research evaluations and assessment¹³⁻¹⁵.

It is a matter of concern that the established Indian research journals with a long publication record also do not generally attract high-quality research output even from within the country and, therefore these are not interna-

tionally competitive^{12,13}. Besides improving the publication infrastructure of these journals, there is a need for change of mindsets and to move away from the practice of *where published* for assessment to *what is published*. This was recommended earlier by the Indian National Science Academy in its policy guidelines for assessment of individuals and institutions¹¹.

Since most of the Indian journals and several international journals published by established scholarly academies/societies or universities do not levy any charge for publication, improving their competitiveness these would greatly facilitate Indian researchers in providing Green OA to their research output¹³. A recent news feature in *Science* suggests that several publishers are also planning to adopt the Green OA option².

Publishing and accessing new research: Institutional framework in Indian and international contexts

Increasing publication costs and subscription/OA charges of established journals have attracted global attention. With limited research funds, researchers in India have remained at a disadvantage with respect to visibility of their research output as also in having easy access to latest global research. These limitations do dent the country's ranking.

With continuously expanding utilization of the internet for information dissemination and sharing, the OA model for research dissemination is becoming increasingly popular. However, the issues of *who pays, and how much* remain.

With a view to facilitate OA to publicly funded research output, the Department of Science and Technology/Department of Biotechnology issued directives for OA, including suggestions for placing the research papers on institutional repositories for OA¹⁶. However, these efforts have not gained much traction and are yet to become a reliable and dependable practice. Furthermore, these directives did not specify funding mechanisms for payment to the publishers for publishing and/or OA. DBT also provides access to its DeLCON site (<http://dbtindia.gov.in/slider/sharing-delcon-resources-pis-co-pis-scientists-dbt-funded-ongoing-projects>) for various journals subscribed by it to the PI/Co-PIs of DBT-funded projects¹⁶.

The CSIR also issued an Open Access Mandate, which states, 'All research papers published from all CSIR laboratories and supported by a grant from CSIR will be made open access by depositing the full-text and the metadata of each paper in an institutional repository' (<http://www.csircentral.net/mandate.pdf>). It further states, 'If the publishers do not follow transparent models of subscription/licensing the content, CSIR scientists will not publish in the journals, will not review the papers and will not join the editorial boards of the journals of those

publishers'. However, it is not clear as to how much of this has been implemented.

Recent efforts like the 'Plan-S' of the Science Europe³ seek to provide for national level licensing and payment to scientific journals to meet publication costs and OA charges. Similar initiatives are also being considered in other countries like Brazil, Singapore and others⁵⁻⁹.

Possible paths for OA to global scientific literature in India

Keeping in view the issues discussed above, the following possible steps were considered to facilitate OA to globally published research and global OA to that published by researchers in India. The discussion below also considers global trends and efforts like arXiv.org, bioRxiv.org and the like.

(1) *Archive of preprints and accepted version and free access*: In order to avoid the inherent delays in publication of research output in the conventional peer-reviewed journals, results of new research may be made available through *pre-print archives*, a process that also eliminates possibilities of idea plagiarism. Several international pre-print archives in different domains of S&T are already available. In addition, those maintained by individuals/institutions/funding bodies may also be used. Research output available on preprint archives provides Green OA, without any charge to authors or readers and, is thus available easily for assessment as well.

It is necessary to strengthen the idea of archiving pre-prints of research output in India. The DST and DBT together have set up www.sciencecentral.in as an institute repository, encouraging laboratories whose research is supported by these agencies to post their research findings¹⁶. However, as noted above, these are, for a variety of reasons, not widely used. A recent report in *Nature* (<https://www.nature.com/articles/d41586-019-01082-0?fbclid=IwAR31502qO-8ZubnQmbT0zJij2LzGvWfVzFJUKfd0kNdPmh29xIH-tYsLXB8Fo>) suggests that a new initiative *IndiaRxiv* is also being planned. There is a need to synergize these efforts in India for a robust, all-inclusive Indian repository, i.e. an Indian arXiv or a similar system.

Indian researchers should not only have the freedom to publish their research output in standard (not 'predatory' journals) online and/or print journals, but also be mandated to make their research papers available in freely accessible online pre-print archives of their choice and link the same with the published version when available. This will ensure quality publications and free access to papers coming from Indian laboratories, which would facilitate establishing their leadership.

(2) *Recommended list of journals for payment of publication and/or OA charges*: Since many of the 'high profile' journals levy substantive charges towards publication and/or OA charges, many Indian researchers are not able to publish their findings in these journals. Therefore, one of the suggestions has been that public funds be allowed to be used for such publication and/or OA access charges through an appropriate budget element in the grants.

In order to ensure that the public money is judiciously utilized for this purpose, it would be essential that the funds are utilized only for publication in 'high profile' journals. It has been suggested that this can be achieved by creation of a recommended list of journals that are approved for use of public funds to pay the publication and/or OA charges. The Delhi Declaration on Open Access has recommended adoption of the policy of such a select list.

This suggestion, however, has been contested in view of the following considerations: (i) perception of 'high profile' journals varies in the diverse fields of S&T research and given the very diverse areas of active research in the country, a list of such approved journals would always be contentious, become unmanageable, and may even lead to undesirable practices. This has happened with several such lists of 'approved journals' prepared by other agencies in the country; (ii) The idea of greater 'credit/prestige' for publication in 'high profile' journals is contradictory to the policy guidelines that lay emphasis on *what is published* rather than on *where published*.

Given the finances involved, such an exercise will surely need abundant probity, total transparency and a good measure of scientific prudence and an honest vision for national good. A *via media* for these orthogonal views presented above could be that a certain fraction of a research grant is allotted for expenses related to publication. It will be up to the wisdom of the researcher to partition funds for research and for its publications being conscious that good work published any where will gain attention.

(3) *One nation-one subscription*: Only about 20% of journals provide OA to published content and therefore, most research becomes accessible to the public only if subscribed to or paid for by institutions or individuals. Various research and academic institutions spend substantial funds on subscriptions, either through common subscription (e.g., through INFLIBNET) or individually. The e-ShodhSindhu is the Consortium for Higher Education Electronic Resources executed by the INFLIBNET centre. The e-ShodhSindhu consortium has been providing access to electronic resources to the Higher Education Institutions in India including 97 centrally funded institutes, 217 universities, 97 technical institutes and 3200+ colleges.

Box 2. Augmenting the competitiveness and credibility of Indian journals

- (1) No distinction be made between 'national' and 'international' journals for assessment. What is published, rather than where it is published, should be the *basic principle* of assessment of research output.
- (2) Researchers, receiving public funding for their research activities, should be encouraged to publish at least 20–30% of the output in research journals published from India having good publication policies and peer-review system.
- (3) As part of assessment for awards, election to fellowships of Academies/Societies, etc., contributions by the candidate/nominee to research journals published in India may be one of the considerations for selection. This will be a contribution to nation building, akin to human resource development.
- (4) Research publication in Indian journals should not be discounted but should be judged solely based on their quality and impact.
- (5) Senior and established researchers should consciously decide to contribute to these journals so that the younger faculty members also feel encouraged. Only when good content is published from within the country, journals published from India would become internationally credible and attract good manuscripts from across the world.
- (6) *Earmarked funds for supporting Indian research journals:* One of the factors that keeps Indian research journals less attractive to researchers is the less than optimal efficiency of editorial processing of the submitted manuscripts. In most cases, the efficiency remains sub-optimal because of the very limited funds and infrastructure which in turn limits their attractiveness and visibility. In order to break this vicious circle and effectively improve these journals, the Govt of India should earmark separate funds for upgrading and supporting Indian journals on a long-term basis. Indian research journals in different disciplines that have a relatively established publication record and which follow good publication policies should be identified and financially supported through grants directed to improve their ability to process the submitted manuscripts efficiently and promptly. Such support should be to augment the editorial office staff to an optimal level, to improve the editorial office infrastructure and to provide for good software for online processing of the submitted manuscripts. Good quality manuscript processing software may be designed *de novo* or the existing publicly available template may be customized and made available to all the identified journals. In view of the public grants being made available, these journals should provide free access to all readers in India and abroad without any OA or other charges to authors or institutions. Such investment on facilitating Indian journals to becoming internationally competitive would be compensated in due course of time by reduction in the outflow on subscription and other charges being paid to journals published outside India.

To minimize the cost for global OA to all researchers in the country, a centralized system for information access and dissemination needs to be created. Several possible models for this were considered and the choice will need due diligence, once the concept is accepted. It was suggested that one nation-one subscription model like that of Brazil and Singapore may be considered^{5–9}.

An attempt like the one made by the University of California, Berkeley can be undertaken by the Government of India involving all publishers of scientific books and journals, and a consortium of all the institutions and universities of higher learning for a unified national subscription. Although the efforts of the Uni-

versity of California at Berkeley failed, it is anticipated that in view of the substantially large pool that India offers, a good bargain would be possible. The Science Academies may be enlisted to help with this process since such an activity could be best handled by them, being institutions of practicing professionals.

Another subscription model can be similar to that followed by the American Mathematical Society, which offers a subscription for the *Mathematical Reviews* to a consortium of universities and Institutions from India. The National Board for Higher Mathematics pays the subscription fee to make this journal available to a large number of readers across the country.

Box 3. Guidelines for assessment and evaluation of research output
(<http://insajournal.in/insaojs/index.php/proceedings/article/view/544>):

- (1) Assessment of an individual's research contributions should *primarily be based on the impact of what is published rather than on where it is published*. The 'impact factor' of a journal should neither be used as the primary indicator nor be used in isolation.
- (2) Requirement of a minimal number of research publications for any assessment should be considered only as a subordinate parameter.
- (3) Instead of assessing on numbers of papers published by an individual, assessors should find out if the research output was only confirmatory in nature or led to incremental or path-breaking advances.
- (4) Each of the 'best 5' papers identified by candidate/nominator may be categorized as 'confirmatory', 'incremental advance' or 'path-breaking advance'. Identification of a work as 'path-breaking advance' should be justified by (a) explicit citations from non-overlapping authors or (b) brief statement as to why the applicant/nominator considers the given work as 'path-breaking'.
- (5) In cases of multi-authored papers, specific contribution by the applicant/nominee in the given paper may be clearly identified for assessment.
- (6) All the regulatory bodies, Academies and other agencies involved in assessment of research output for one or the other reason should widely publicize these policies so that the applicants/nominees/nominators/selection committee members are aware of the assessment policies. The regulatory bodies should also issue clear directives to the institutions under their charge to follow the above guidelines in letter and spirit.

Recommendations for information access in S&T in India

A country of the size of India with a large pool of scientific workforce needs mechanisms to ensure that they have access to scientific literature in near real time. India also needs to create systems to further ensure that its science is published in appropriate journals from India or overseas so that there is a serious and sustained effort towards capacity building and towards enhancing the credibility and visibility of Indian Journals¹³.

To achieve these, the following recommendations are made.

- (a) As a country, India needs to accept Green OA as a National Policy, both for making scientific literature available to its people and for facilitating Indian work to be published in appropriate journals in India and overseas.
- (b) The Green OA will imply considerable resource allocation (~500 M or thereabouts on an annual basis) but this investment (reasonable in the National context) is essential and inescapable, if we as a country are to remain contemporary in the knowledge space. The current annual expenditure of over Rs 1500 crores (\$200 M+) towards multiple subscriptions to databases and journals could be optimized through a 'One nation-one subscription policy'. The above estimate of \$200 M includes only the expenditure on subscription incurred by 10 consortia, 1450 institutions that participated in NIRF and by other R&D organisations. The estimate may actually be twice this amount if the entire set of higher education institutions are included.
- (c) A wider use of the diverse Green OA preprint archives should be made mandatory and the research output available on preprint archives should be eligible for assessment of individuals and institutions. An Indian preprint archive with proper infrastructure may also be considered.
- (d) An institutional mechanism for National Science Repository Preprint archive/Published data archive and searchable metadata for India be created. Recent initiative of MHRD like the *Indian Research Information Systems* needs to be taken up in a mission mode with a formal institutional framework and status through assured long term funding for its sustenance. The Science Academies could develop robust guidelines and framework for such a system, with due consultation with all the stake holders. All publications from publicly funded research, except which is classified, must be deposited in this archive. Any new funding for a PI must be released after the prior published results are deposited in the archive.
- (e) Publication in journals that allow OA immediately or after an embargo period, without charges to author or reader, be encouraged. Instead of paying Gold OA charges, authors should be advised to share

- preprints or pdf files of the published papers with peers.
- (f) In order to facilitate publication in journals that have high standing in a given field but require publication charges to be paid by authors, the funding agencies may allocate a certain amount as ‘Publication Charges’ as part of the extra-mural funding to the interested PIs. A separate budget head for such expenditures in the grant budget may be created and the choice of the journal be left to the researcher.
- (g) Initiatives towards publication of state funded research in reputed journals that do not levy publication/processing/open access charge and their appropriate cognizance in evaluation/assessment procedures will be needed. In particular, Indian journals published by established academies and societies should be developed further, so that they are internationally competitive. Appropriate resource augmentation and its availability in a sustained manner, and appropriate incentives for publication in these journals are needed (see Box 2). There is a need for a paradigm shift in the evaluation process for individuals and institutions that encourages researchers to choose such journals as a destination for their publications.
- (h) Following the guidelines from the Indian National Science Academy (<http://insajournal.in/insaojs/index.php/proceedings/article/view/544>), assessment of scientific research output should be based on the quality of research output and NOT merely on bibliometric measures (see Box 3). Thus, no distinction between ‘National’ and ‘International’ journals be made for the assessment of scientists and what is published and not where published should be the *leitsatze*. These mental constructs will need to be formalized.
- (i) Multiple subscriptions to databases/resources are to be avoided and the suggestion for ‘one nation-one subscription’ be taken up to provide inclusivity in respect of information access to all without any barriers.
- (j) Publications in predatory journals or those with dubious credentials are to be discouraged and avoided. Given that these are a national shame, appropriate regulatory mechanisms are called for to enable accreditation of journals published from India.
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1. Budapest Open Access Initiative; <https://www.budapestopen-accessinitiative.org/read>