Open Access Publishing in Scientific Institutions in India: Evolving Role of Librarians

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ABSTRACT: *This paper aims to analyze the research productivity with a special focus on open-access publishing at the Indian Institute of Science Education and Research (IISERs) and how the librarians play a crucial role in supporting open-access publishing. This study analysed the number of research publications, citation count, and average citations per publication. Scopus – an abstract and citation database, was used to collect the data and analyze it to know the trend of open-access publications and their research impact. The paper quantitatively reveals the total research productivity of the group of institutions in terms of the number of publications, citations, etc. The open access publications account for 46% of the total publications, which received 62% of the total citations. Similarly, non-open access publications account for 54% of the total publications and 38% of the total citations. The average number of citations received per open-access publication for all IISERs is 30.73, whereas 16.70 for non-open-access publications. Findings also indicate the publication patterns. The data reports a rise in OA journal usage, driven by benefits, funding mandates, institutional policies, and librarians' role in promoting OA publication, leading to higher citations. This led not only to research more accessible to the public, which raised the institute's prestige, but to positioning to a good rank in the NIRF Ranking system – a ranking methodology adopted by the Ministry of Education, Government of India, to rank higher education institutions.*

Keywords: IISERs, Research Productivity, Open Access, Librarians, Open Access Publishing, Transformative Agreements, NIRF Ranking

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1. Introduction

1.1. IISERs

Indian Institutes of Science Education and Research (IISERs) are a group of seven premier institutions established by the Ministry of Education, Government of India, for delivering education and carrying out research in the field of natural sciences. They offer various academic programs such as 5-year BS-MS programs in Biological, Chemical, Mathematical, Physics, Earth & Environmental Sciences, Computer Science, Humanities and Social Sciences, MS (Research), Integrated PhD, PhD and Post-Doctoral Research Programs. The Parliament of India formally established the institutes through the Science Education and Research (Amendment) Act, 2010. IISERs were categorized as Institute of National Importance by an Act of Parliament in 2012.

Table 1. IISERs

#	Name	Year of Establishment	State	NIRF 2023 Rank (Overall)	NIRF 2023 Rank (Research)
1	IISER Kolkata	2006	West Bengal	43	40
2	IISER Pune	2006	Maharashtra	34	27
3	IISER Mohali	2007	Punjab	51	50
4	IISER Bhopal	2008	Madhya Pradesh	60	
5	IISER Thiruvananthapuram (TVM)	2008	Kerala		
6	IISER Tirupati	2015	Andhra Pradesh		
7	IISER Berhampur	2016	Odisha		

1.2. Open Access Publishing

Open access is a publishing model for scientific communication that makes research freely available to readers. Unlike the traditional subscription model, which requires readers to pay a fee for access to scholarly communication, open access promotes the visibility and reuse of academic research findings, which is one of its most significant benefits.

Publishing in open access can be done in various ways:
Gold Open Access route:

(i) Fully Open Access Journals: This publishing model may require a publication fee, known as an 'article processing charge' (APC). Authors or their institutions cover the fee.

(ii) Hybrid Journals: Hybrid journals are subscription journals that allow open-access publication of individual articles on payment of an APC.

Green Open Access route: This allows self-archiving, which means the full text of academic publications can be deposited in a repository, a publicly accessible database managed by a research institute, without paying an APC.
Diamond Open Access route does not require any APC to publish the scholarly works.

Read and Publish (Transformative agreements) Institutions and publishers are signing transformative agreements to negotiate the business model in which scholarly journal publishing moves from one based on a subscription model to one in which publishers charge a fair price for their open-access publishing services.

1.3. Role of Librarians in Open Access Publishing

The landscape of academic publishing is undergoing significant transformations globally, and India is no exception. Leading this change are the seven IISERs, which have become prominent centres of scientific research and education. Subscriptions to scientific journals are notoriously expensive, making it difficult for smaller organizations to afford them. Therefore, researchers from these organizations need access to research publications from institutions like IISERs.

As the trend towards open-access publishing becomes more popular, IISERs are also increasingly adopting OA practices to boost the visibility of their research outputs. Although OA publishing has certain complexities, librarians are crucial in navigating these challenges. The shifting to OA publishing is reshaping the academic environment, and it aims to make research freely available to the public, thereby eliminating the barriers posed by subscription-based journals. This movement is driven by transparency, accessibility, and the democratisation of research and knowledge. For IISERs, which are at the forefront of scientific research in India, accepting OA publishing aligns with their mission to advance and share scientific knowledge without restrictions. Further, the adoption of OA practices increases the visibility and impact of their research and fosters greater collaboration and innovation within the global scientific community.

Traditionally, librarians were monotonously tasked with managing collections and providing access to information; they are now instrumental in advocating for the OA movement. Librarians remain vital in ensuring that scientific research is freely available, beneficial to society, and at the forefront of scientific innovation and dissemination.

Their role in the adoption of open access within these institutions are, but not limited to:

(i) Advocacy and Awareness: In this 21st century, librarians are eagerly promoting open-access publishing within their institutions. They organize workshops, seminars, and awareness programs to educate researchers about its benefits and opportunities. Additionally, they promote it through standees, banners, websites, and social platforms. This results in greater publication in OA journals, which enhance visibility, increase citation and have an extensive societal impact on open access.

(ii) Managing Institutional Repositories: Librarians are responsible for establishing and maintaining Gold and Green Open Access in their institutional repositories. They collaborate with researchers to ensure their publications are deposited and offer guidance on copyright issues, metadata standards, and repository submission processes.

(iii) Collaboration with OA Journals: IISERs increasingly collaborate with reputable open-access journals and publishers. Many IISERs signed agreements on read and published or transformative agreements to waive the article processing charges (APC). Some of the publishers and journals with these agreements are the Royal Society of Chemistry, Company of Biologists, Rockefeller University Press, American Association for the Advancement of Science (AAAS) - Science Advance, Geological Society of America (GSA) – Geology, Institute of Physics (IOP) Publishing, etc. Even librarians often negotiate article processing charges (APCs) and other publishing fees, making it easier for researchers to publish their work openly.

1.4. NIRF Ranking

The National Institutional Ranking Framework (NIRF) uses a ranking methodology to rank institutions across India in various disciplines using broad parameters. The parameters broadly cover 'Teaching, Learning and Resources,' 'Research and Professional Practices,' 'Graduation Outcomes,' 'Outreach and Inclusivity,' and 'Perception'. The research and professional practices parameter requires the metric for the institution's quantitative and qualitative research productivity.

An institution's ranking helps measure its performance and work towards improving it. The emergence of many national and international ranking agencies with various ranking parameters influences participating organisations to take appropriate measures to improve their scoring in their different ranking parameters. The ranking system also influences students and parents, helping them to choose the right institution for admission. Government and private bodies increasingly use ranking as a reference point for selecting institutions to allocate funds for various purposes.

2. Review of Literature

The present study is focused on the research productivity of a group of institutions categorized as Institutes of National Importance by the Ministry of Education, Government of India. The paper also highlights the role of librarians in promoting OA publishing. Many authors have undertaken several studies on the role of librarians and libraries in supporting open-access publishing and OA initiatives.

Richard, Koufogiannakis, & Pam (2009) discussed the librarian's OA mandates wherein the institute's academic staff (LCR) deposit their scholarly output in the university OA repository to promote OA on campus and, where possible, publish in the OA journal. They mentioned in their paper that libraries and universities are active participants in the open-access movement, where the libraries act as publishers. On the other hand, Engeszer & Sarli (2014) explained several ways to reduce barriers faced by authors and utilise technology and licensing alternatives to promote accessibility to scholarly works.

Chen et al. (2024) reported that OA publishing may affect the visibility and impact of research published in NPP journals. They concluded that having full access to peer-reviewed scientific articles is essential in advancing knowledge and improving the transparency of scientific research. There are also many studies undertaken by various authors that explore the research productivity of institutions. Pradhan & Ramesh (2018) analyzed the research publications of six IITs published from 2006-2015. Hasan & Singh (2015) evaluated the research trend of the top five IITs from 2009-2013. Mondal & Chakrabarti (2022) studied the research performance of IISERs for the period 2006-2020. They emphasized on the chronological distribution, collaboration trend, emphasis areas, scholarly communication channels, participating institutions, collaborating countries, keywords and citations impact of the publications.

After reviewing the literature on this area, the authors found that no specific research has been conducted on this topic.

3. Objectives

The study was undertaken with the following objectives.

- To analyze the trend and growth rates for OA publications at IISERs.
- To understand the adoption rate of OA publishing across different IISERs.
- To compare citation rates between OA and non-OA publications.
- To compare average citations per publication (quality of research) for OA vs. non-OA publications.
- To understand the broader impact of OA on the visibility and dissemination of research findings.
- To assess the role of librarians in promoting open-access publishing.

4. Scope and Limitations of the study

The study is confined to analysing the research productivity of only IISERs with a special focus on open-access publications. The research has been conducted by analyzing the data extracted from the Scopus bibliographic database.

5. Methodology

In this study, the primary data were retrieved from two sources; the first one was the National Institutional Ranking Framework (NIRF) report 2023, and the second one was the Scopus database. The publications data of all seven IISERs were downloaded from the Scopus database from 2006-2024 on 4th June 2024 using the "Organization Search" tab.

Bibliographic details exported from the database include the following data, 'Author(s)', 'Document title', 'Year', 'Source title', 'Citation count', 'Source & document type', 'DOI', 'Open Access', 'Publisher'.

MS Excel and Word software were used for data analysis and drawing charts and tables. The publication data was retrieved from the Scopus database to compare the institutions based on the OA and non-OA publications.

6. Data Analysis and Discussions

The total number of publications from all IISERs per the exported data is 22,439, of which 10,428 are published as OA and 12,011 are non-OA. The OA publications account for 46% of the total publications, which received 3,20,485 citations, which constitutes 62% of the total citations received by all the publications. Similarly, the non-OA publications are 54% of the total publications, which received 2,00,603 citations, which accounts for 38% of the total citations.

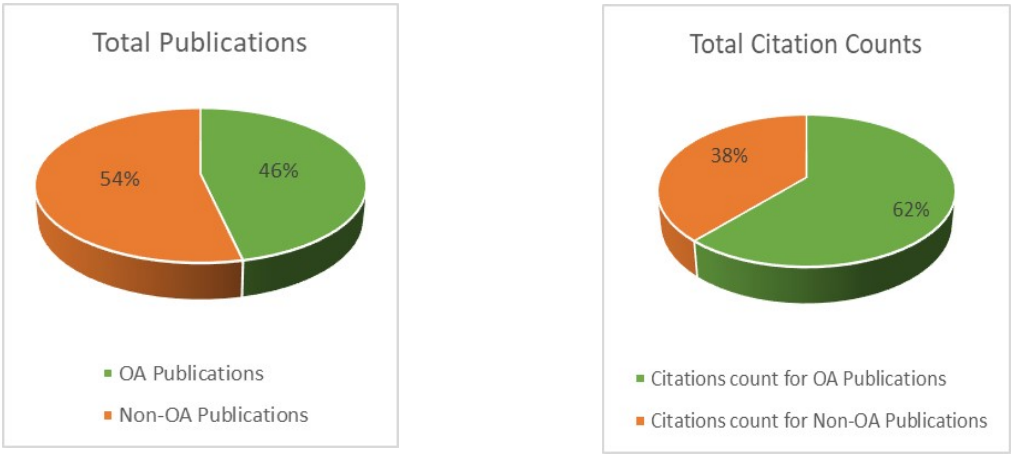


Figure 1. Share of total publications and their citations count at all IISERs

Further delving into the institute-wise publications data shows that the overall rate of OA publications is lower than that of non-OA publications at most IISERs except IISER Berhampur and Pune. IISER Berhampur has a marginally higher rate of OA publications, whereas IISER Pune has a significantly higher rate. However, the rate of non-OA publications at IISER Kolkata is significantly higher than that of other IISERs.

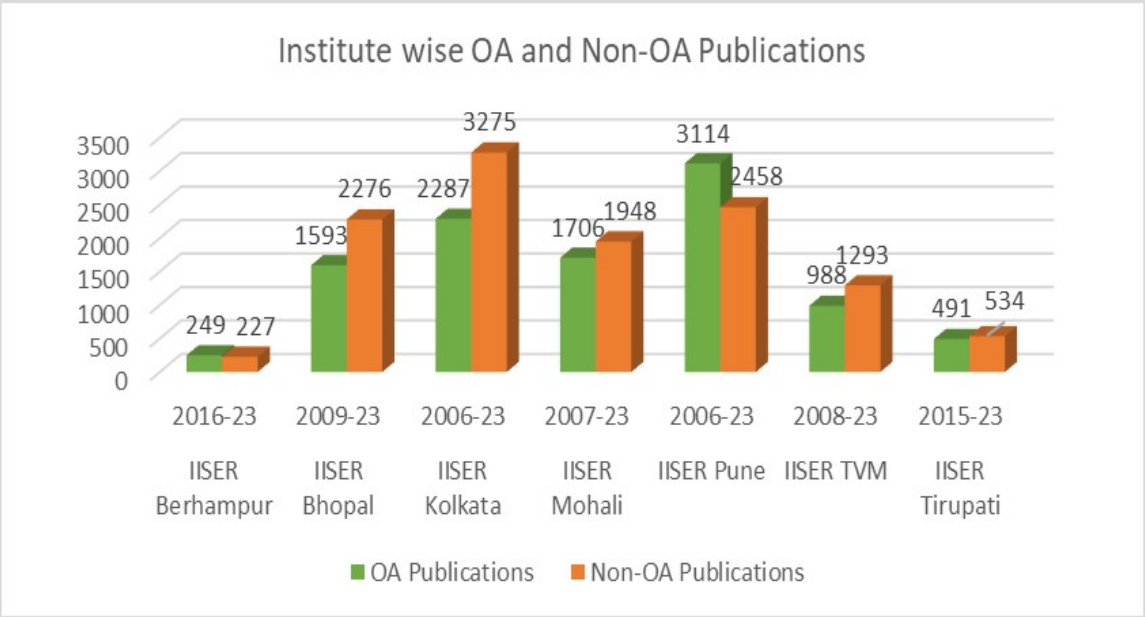


Figure 2. Institute-wise open-access and non-open-access publications

The citation count of all IISERs shows that except IISER Bhopal, all other IISERs have a higher number of citations for OA publications than non-OA publications, whereas IISER Kolkata has reported the highest number of citation counts for OA publications than for non-OA publications.

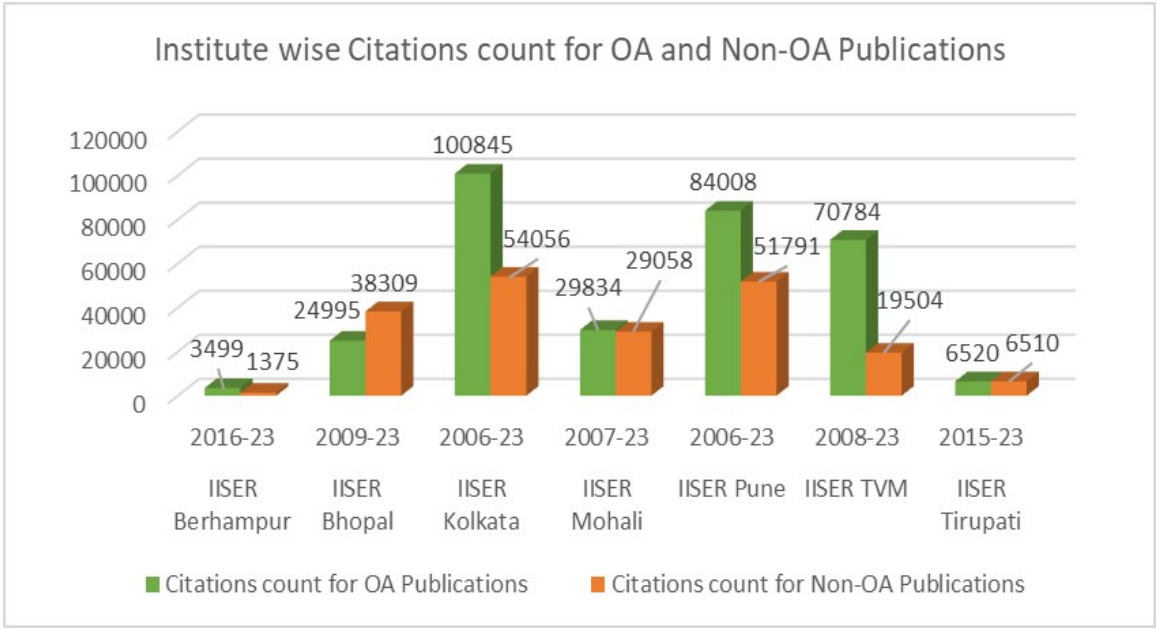


Figure 3. Institute-wise citations count for OA and non-OA publications

The comparative data of average citations received per publication indicates that IISER Thiruvananthapuram and IISER Kolkata have received the significantly higher average citations per open access publication, whereas IISER Thiruvananthapuram received the highest average citations, 71.64 per open access publication, followed by IISER Kolkata received average citations 44.09 per open access publication. However, among all IISERs, only IISER Bhopal has reported fewer average citations per open-access publication than per non-open-access publication. Other IISERs have reported better average citations per OA and non-OA publication. The average number of citations received per OA publication for all IISERs is 30.73, whereas 16.70 for non-OA publications.

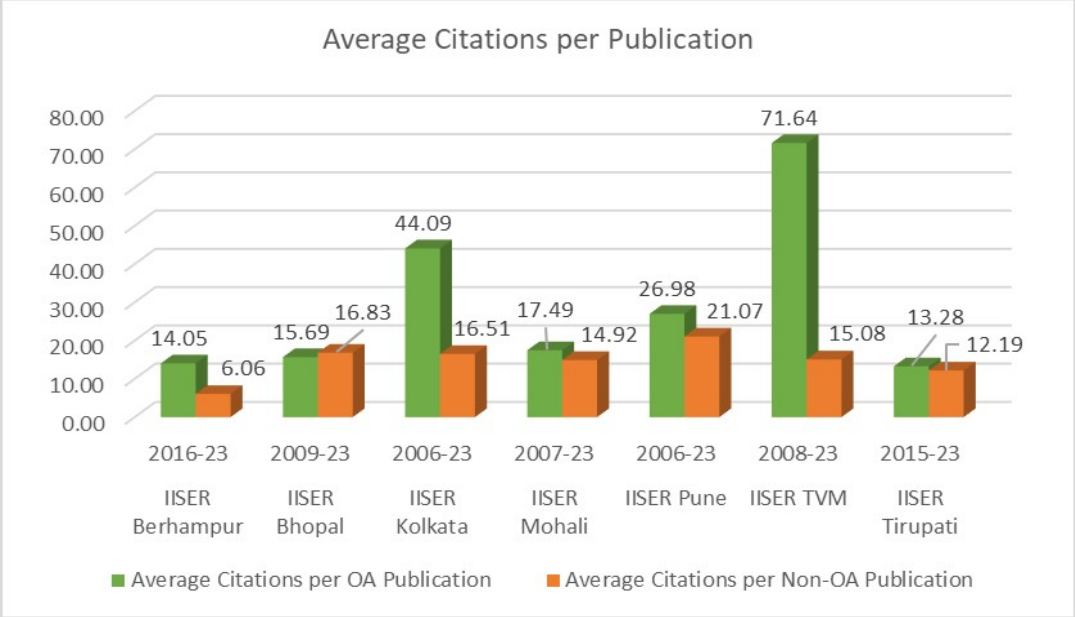
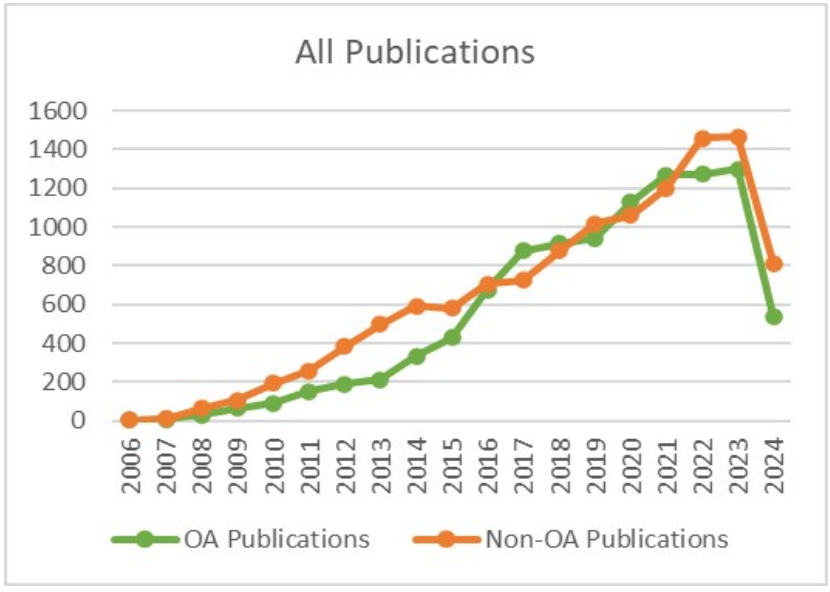


Figure 4. Institute wise average citations per publication for OA and non-OA publications

Publication trends and growth rates for OA articles

he year-wise distribution of all publications and their respective citation counts are shown graphically. The data shows that the number of both OA and non-OA publications increased steadily. In contrast, the data also indicates a significant increase in the citation count for OA publications compared to the non-OA publications during 2015-2017. In contrast, there was a



sharp drop in citation count in the year 2018. However, the citation count for OA publications is significantly higher than non-OA publications. The highest citation count for OA publications reached 67,816 in 2017, whereas the highest for non-OA publications reached 19,835 in the same year. The year-wise trend of average citations per publication shows that the average citations per non-OA publications increased steadily during 2008-2012, then decreased steadily. In the case of OA publications, the average citations per publication was much higher in 2015-2017 than in non-OA publications and continued following the years.

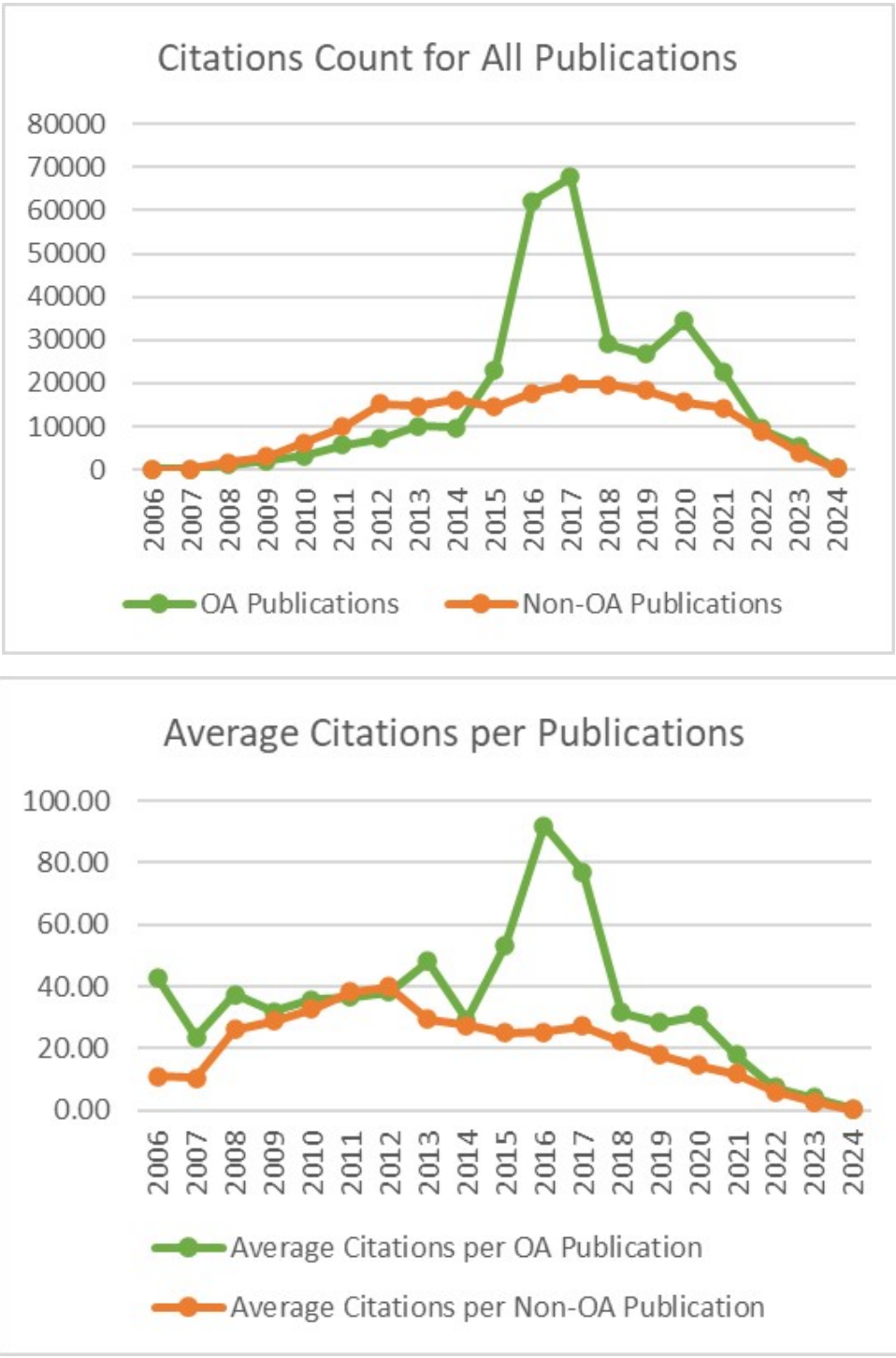
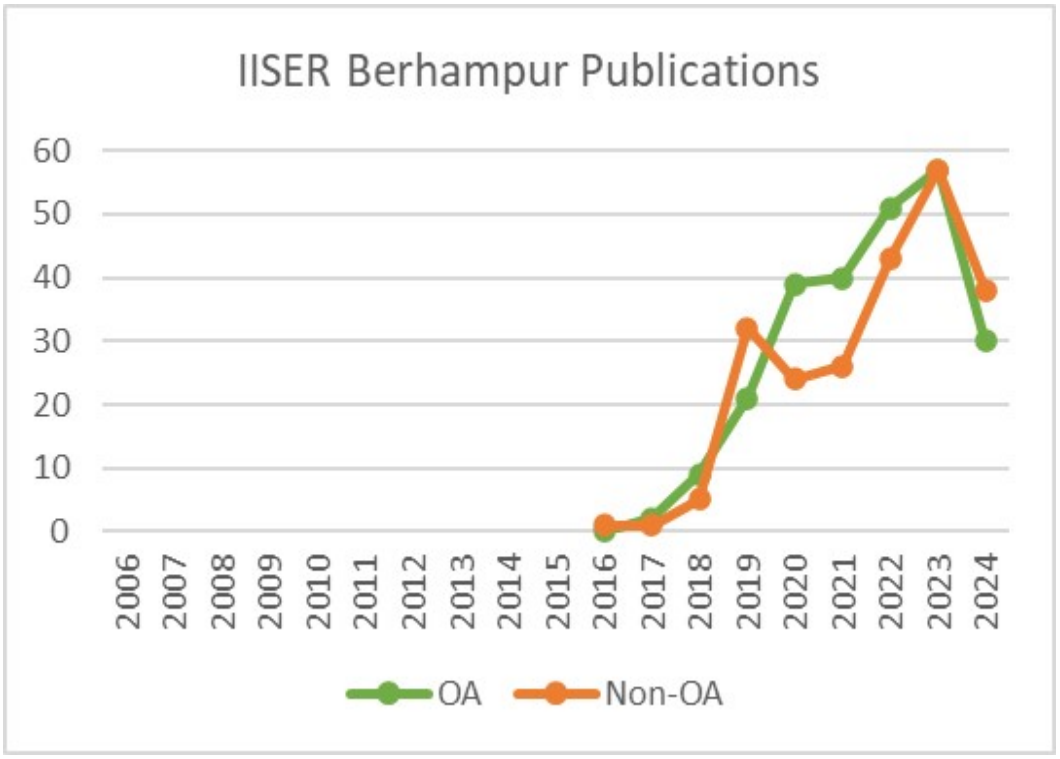
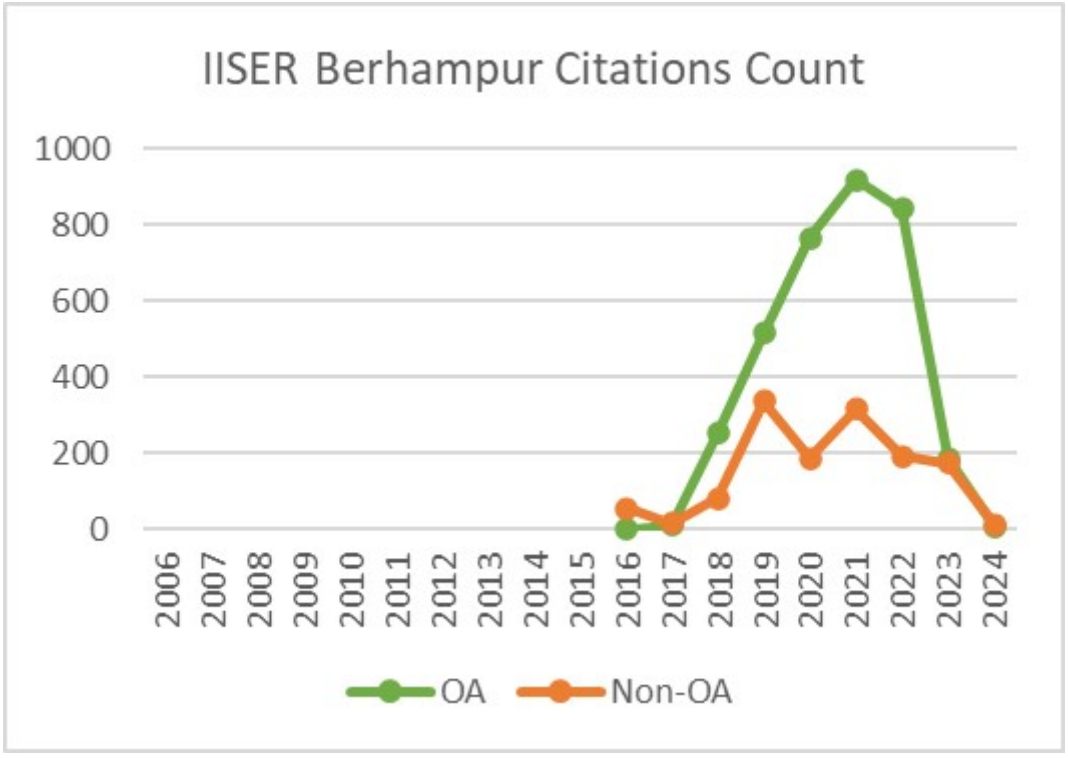


Figure 5. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication

Year-wise distribution of institution-level OA and non-OA publications

The year-wise distribution of institution-level OA and non-OA publications trend has been illustrated separately from figures 6 to 12 for each institution.





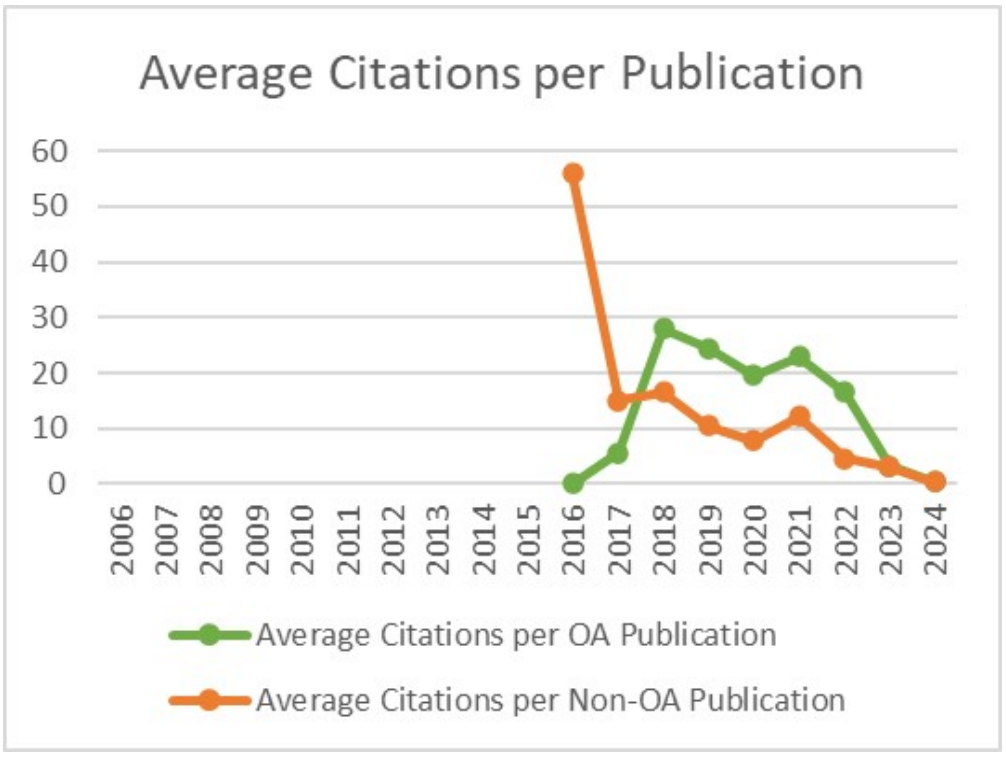
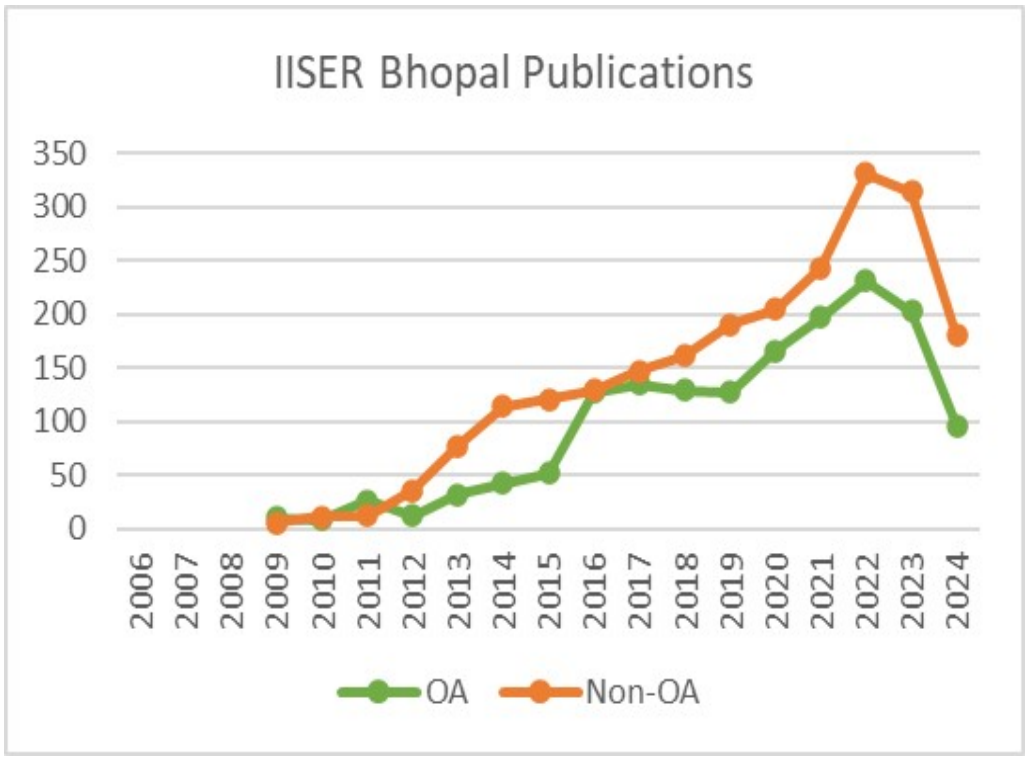
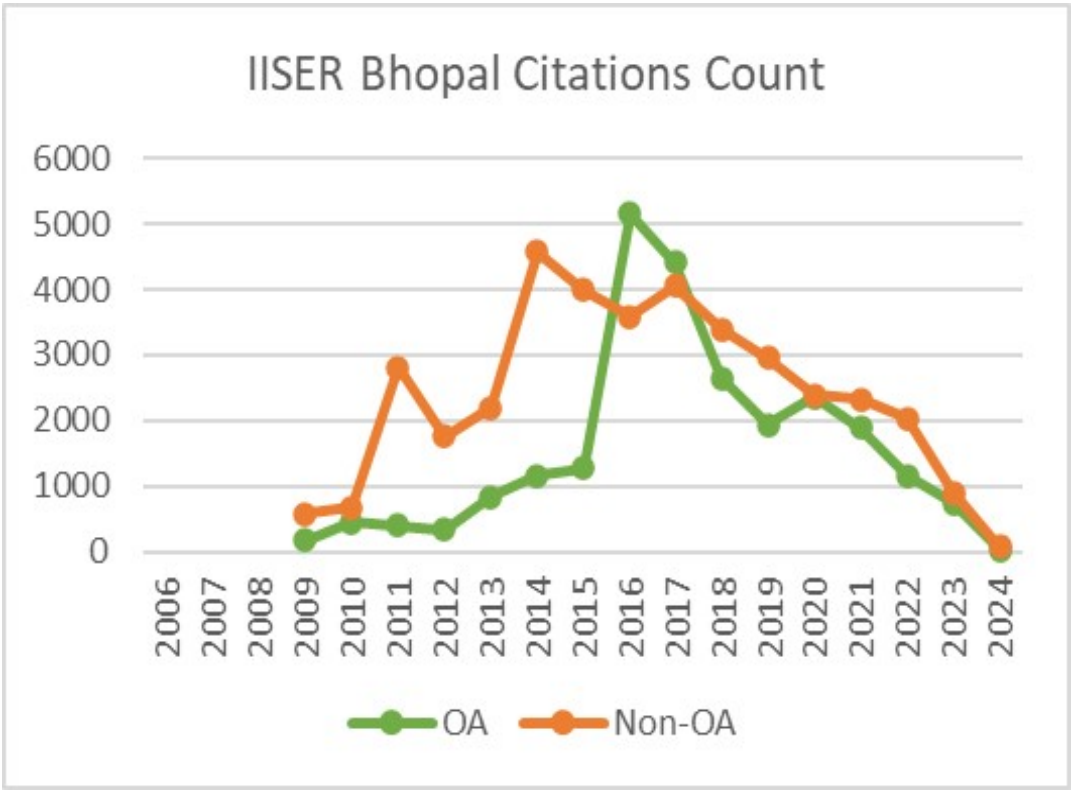


Figure 6. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Berhampur





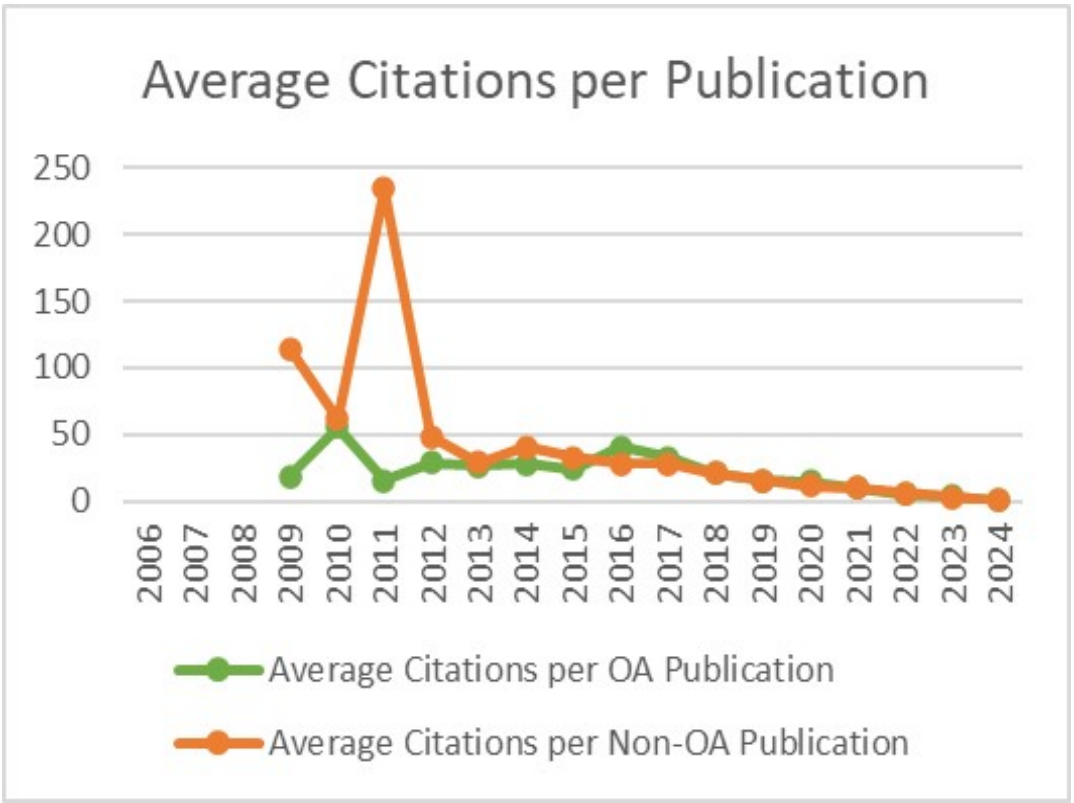
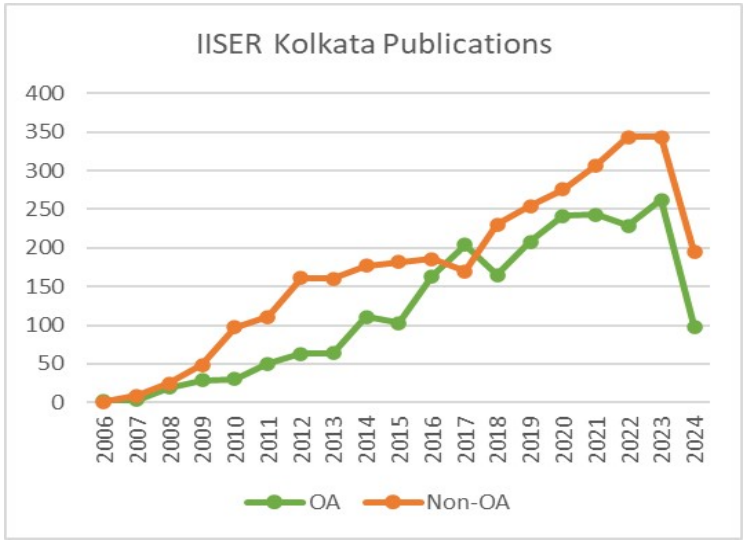
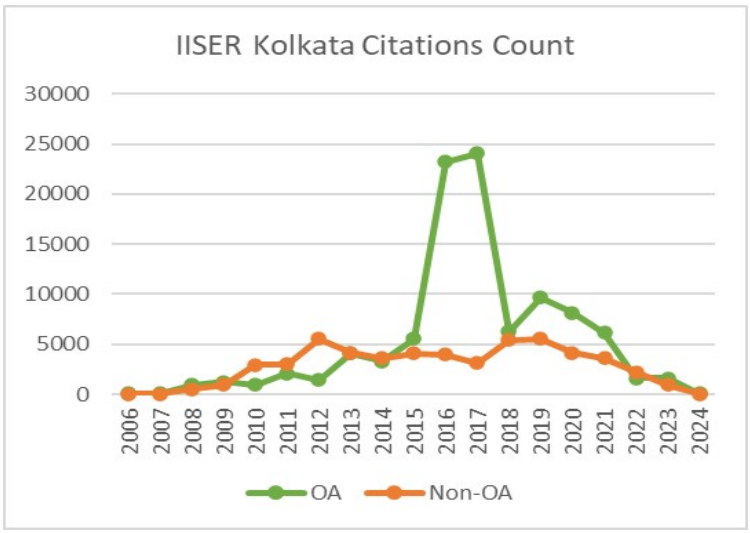


Figure 7. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Bhopal





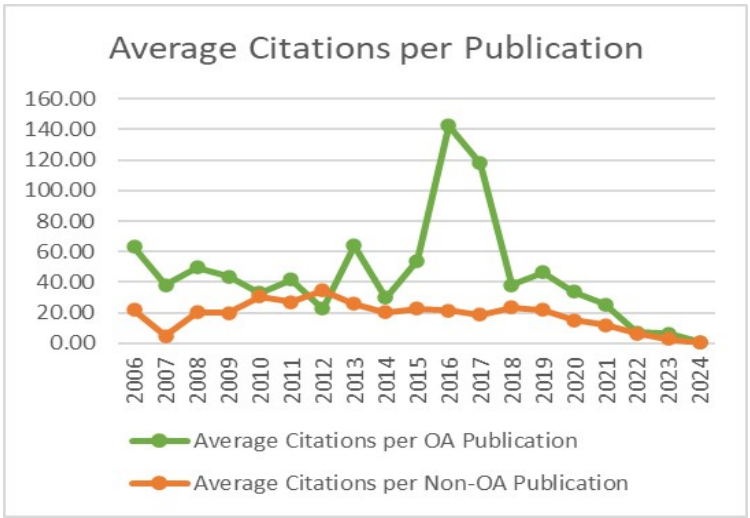
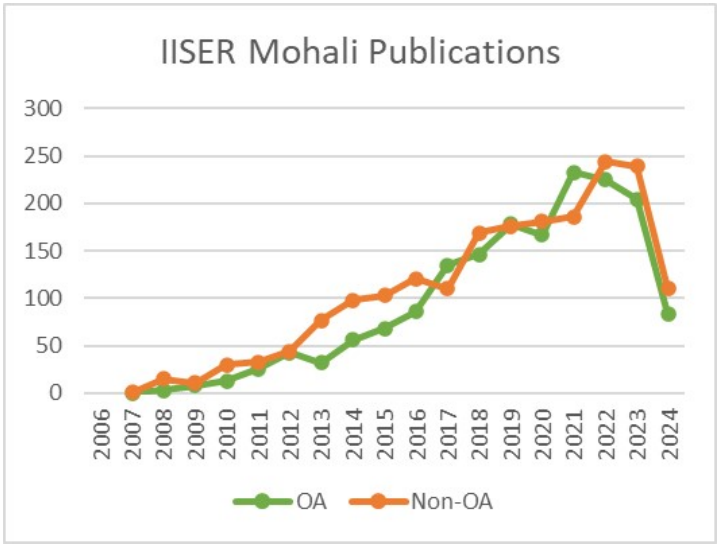
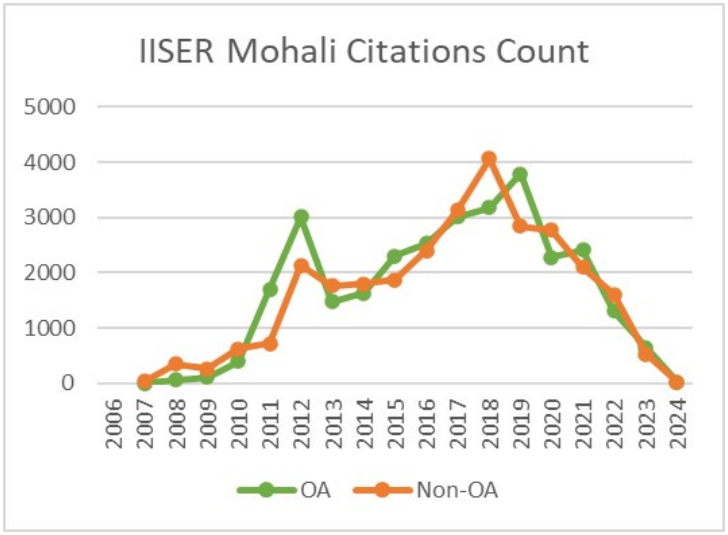


Figure 8. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Kolkata





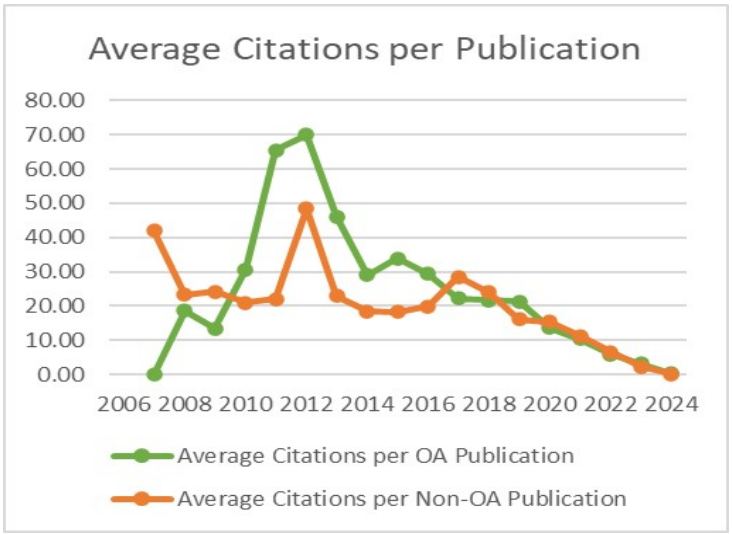
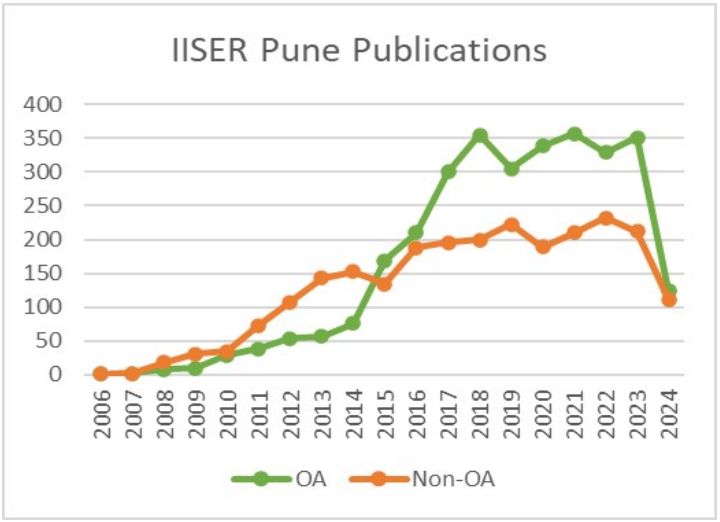
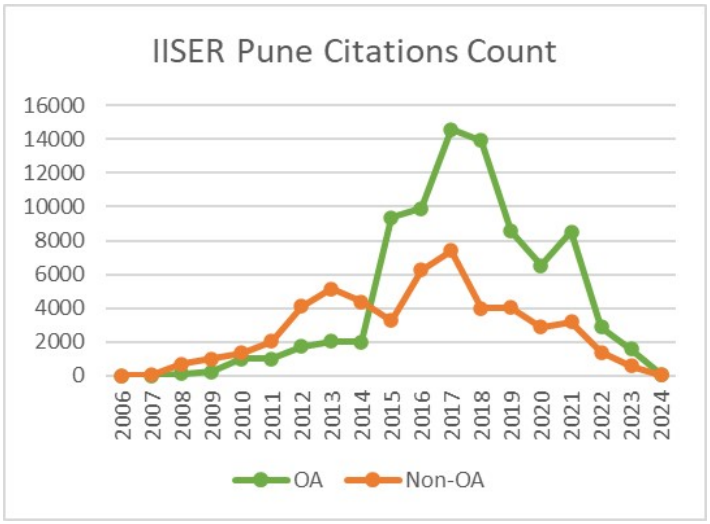


Figure 9. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Mohali





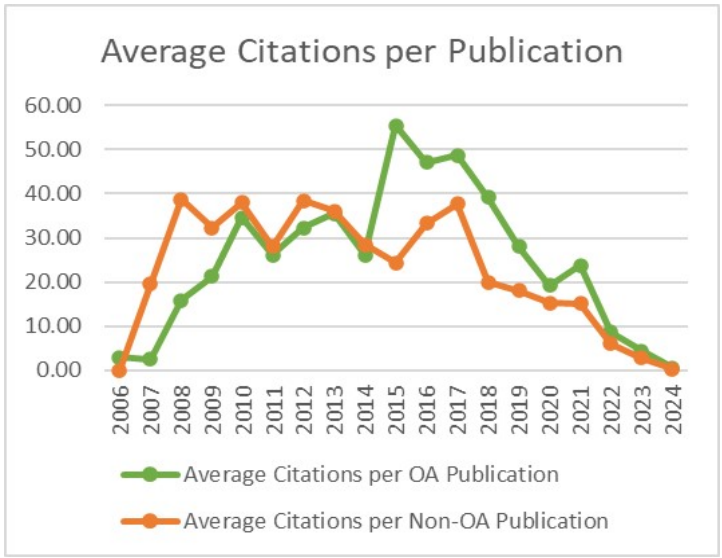


Figure 10. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Pune

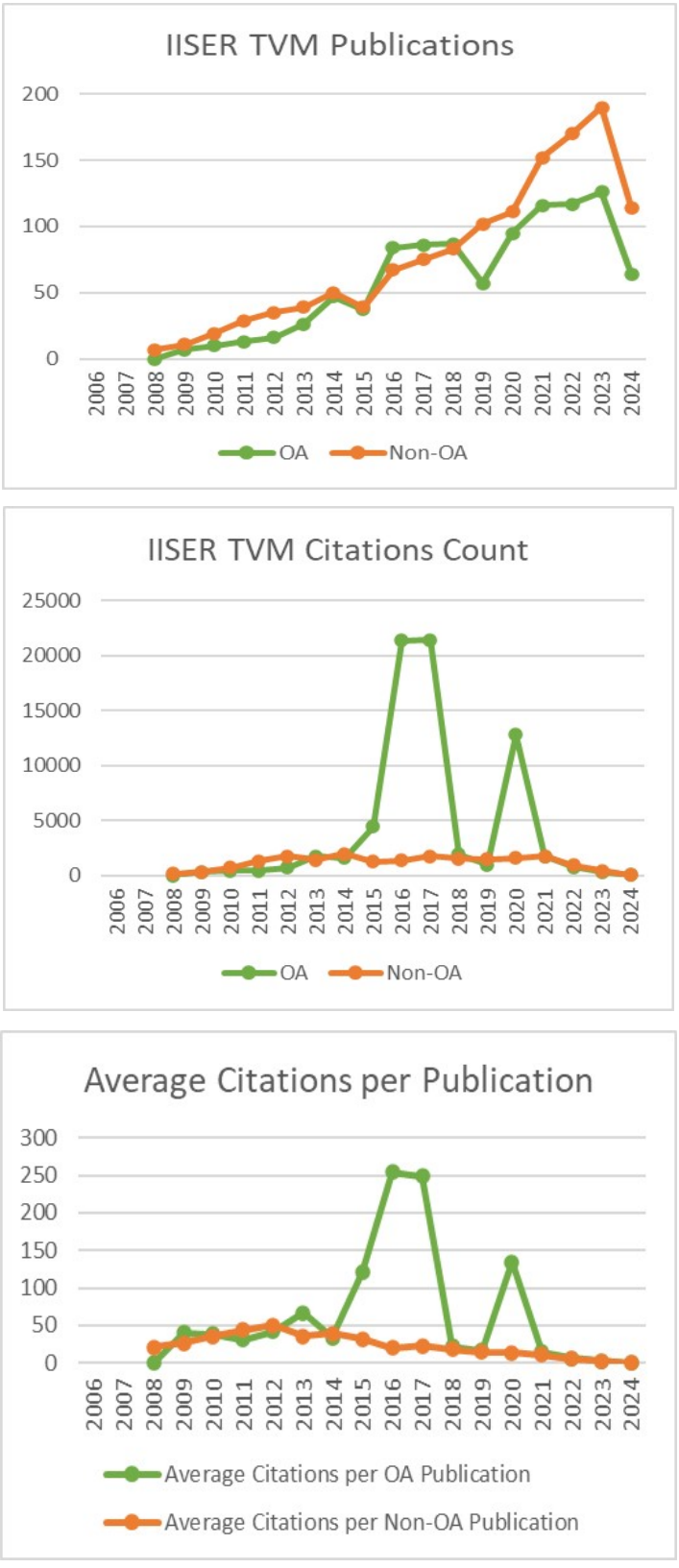


Figure 11. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Thiruvananthapuram (TVM)

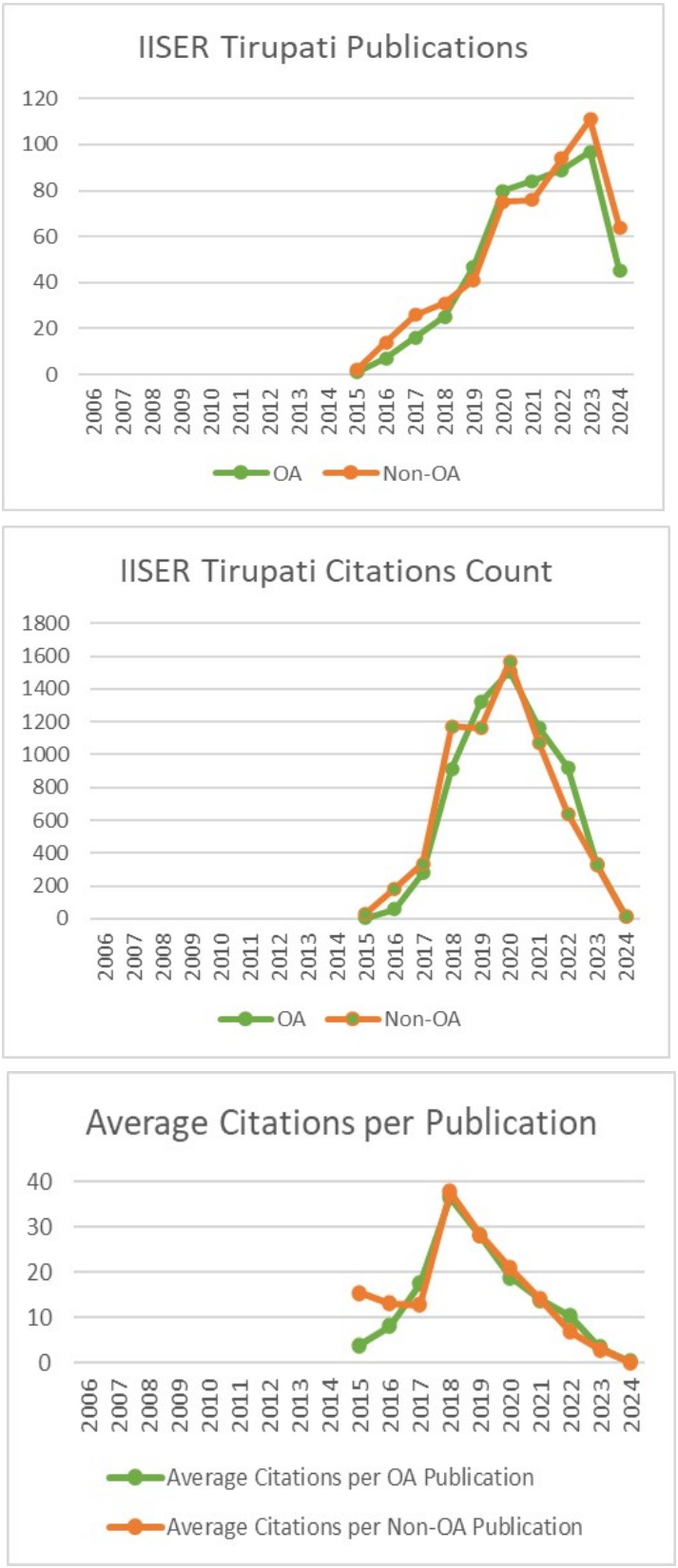


Figure 12. Year-wise distribution of OA and Non-OA publications, their citations count and average citations per publication of IISER Tirupati

Among the IISERs, IISER Berhampur, being the youngest IISER, has shown consistent growth in terms of OA publications and their citation count as well as the average citations per publication compared to the non-OA publications. The publication trend of IISER Bhopal shows a steady growth rate for non-OA publications as compared to the OA publications, and in terms of citation count, both OA and non-OA publications have shown inconsistent growth. However, the average citations per publication in both cases (OA and non-OA publications) follow a similar trend. In the case of IISER Kolkata, the growth rate of non-OA publications has been consistent; however, in the case of OA publications, their citation count and the average citations per publication have outperformed the non-OA counterparts. After a certain period, IISER Pune has shown an outstanding growth rate of OA publications and citations count, as well as their average citations per publication compared to non-OA publications. IISER Thiruvananthapuram has an inconsistent growth rate for OA publications. IISER Mohali and Tirupati have shown a similar growth rate for both OA and non-OA publications in terms of publication, citation count, and average citations per publication.

7. Findings and Conclusions

The study found that although all IISERs except IISER Pune and IISER Berhampur have a higher growth rate of publications in non-OA, their OA publications account for a higher number of citations count and the average citations per publication. IISER Bhopal has a higher number of citations count and average citations per publication for non-OA publications. The OA publications of all IISERs are marginally lower than the non-OA publications. However, their citation count is significantly higher than that of non-OA publications. The average citations per OA publication is around two times the average citations per non-OA publication.

In recent years, IISERs have witnessed a substantial increase in researchers opting for OA journals compared to subscription-based journals. As a result, there are many more citations overall in open-access publications. There are several factors, including the growing recognition of the benefits of OA, mandates from funding agencies, institutional policies and the role of librarians in supporting OA publishing. A substantial benefit of open-access research is that it can advance society. Promoting open-access publishing within the institute, using institutional repositories, and collaborating with publishers in adopting various subscription models can be the initial efforts that librarians can start to make to lead the OA movement in making research more prominently reach the scientific community. This will ultimately increase the prestige of the institution and help it achieve a good position in any ranking system.

Per the author's understanding, the ranking agencies don't provide any special weightage to open-access publications and their citations count. The publications input required by ranking agencies covers all research publications, whether OA or non-OA. Giving weightage to OA publications and including them in ranking parameters in the ranking system by the decision makers may greatly benefit the researchers and society.

Disclaimer

The authors have exported and analysed the data from the Scopus bibliographic database. Any minor errors in interpretation may be excused. Further, statements mentioned in this publication have the authors' opinions and are not intended to represent any organizations/bodies.

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