

Preparing National Research Ecosystems for AI: Strategies and progress in 2024

Converging Science & Technology in a
Digital Era


18-19 September 2024

PREPARING NATIONAL RESEARCH ECOSYSTEMS FOR AI

-Working paper launched 28 March 2024

-Goals of the paper:

- gather the basic knowledge and information about the issues, and the current efforts to prepare science and research systems for AI;
- help countries as they develop roadmaps for the uptake of AI in their science systems;
- create regional and global networks of people involved in the reflections on adaptation and implementation of AI for science;
- raise awareness and help shape a critical discussion among the scientific and policy communities of the critical issues that AI raises for the organization of science and research



Preparing National Research Ecosystems for AI

STRATEGIES & PROGRESS IN 2024


PREPARING NATIONAL RESEARCH ECOSYSTEMS FOR AI

Working paper includes

- Literature review of 317 academic publications
- List of critical issues for the uptake of AI in science and research

Methodology

- Closed full-day workshop under Chatham House rule for invited participants (criteria for selection)
- One-on-one consultations for developing the case study
- Versioning of paper expands case studies/group of experts and allows updates on case studies



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TOOL: KEY ISSUES FOR THE UPTAKE OF AI IN SCIENCE

THEME 1: R&D agenda setting, technology assessment, foresight and science advice

THEME 2: Public engagement, science communication and public accountability

THEME 3: Regulation, standards, private sector governance and self-regulation

› **FUNDING PRACTICES**

› **CAPACITY BUILDING AND RETENTION**

› **PRIORITY SECTORS**

› **INFRASTRUCTURE**

› **SCIENTIFIC INTEGRITY IN THE CONDUCT OF RESEARCH**

› **ENVIRONMENTAL IMPACT**

› **SCIENTIFIC PUBLISHING**

› **DATA QUALITY**

› **DATA MANAGEMENT AND GOVERNANCE**

› **DATA STANDARDS**

› **LAW, REGULATION AND POLICY**

TOOL: KEY ISSUES FOR THE UPTAKE OF AI IN SCIENCE

THEME 1: R&D agenda setting, technology assessment, foresight and science advice



> PRIORITY SECTORS

a. Priority-setting

- We must find ways to identify strategic sectors for AI development and for its uptake by the scientific community. Mechanisms may include funding, infrastructure development and capacity building programmes.



> FUNDING PRACTICES

a. Will AI capacity replace scientific merit in science funding decisions?

- AI intensity may become an inappropriate deciding factor in determining the allocation of resources and hence the trajectory of scientific discovery. Its salience could close off areas of research that do not use it.
- Competition within research could become less a matter of merit and more a matter of access to AI. This risks poor decision-making and further concentration of research funding.

b. Use of AI in resource allocation

- AI relies on machine learning from existing material. It may produce reviews that are inherently conservative and which reproduce old biases.

c. Impact of AI on evaluation panels

- AI-driven science tends to be interdisciplinary because AIs do not know subject boundaries. Today's domain-led expert panels may be unable to review it adequately, despite the many recent calls for science to be more interdisciplinary.

TOOL: KEY ISSUES FOR THE UPTAKE OF AI IN SCIENCE

THEME 2: Public engagement, science communication and public accountability



› SCIENTIFIC INTEGRITY IN THE CONDUCT OF RESEARCH

a. Principles and values of current science

- AI may generate tensions between some of the core principles and values that define today's science. Such contradictions might include openness vs. rigour; privacy and confidentiality vs. open science; massive data vs. high quality data; or explainability vs. "black box" results.

b. Reliability and explainability of results

- Lack of trust in AI, within science and in other activities, may create challenges for its uptake in science. But uncritical trust will lead to a potentially dangerous overreliance on AI technology and the results it generates. AI tends to produce normative results rather than groundbreaking insights, because it is based in existing knowledge and existing opinion.

c. Reproducibility

- Today's science already has severe reproducibility issues. How will AI worsen them or perhaps solve them? For AI to improve reproducibility it will need to be more transparent, providing more information about codes, underlying data and experiment design. This applies both to AI research and to research using AI.

d. Explainability of results

- The scientific method requires scientific claims to be explainable and understandable. Some popular AI methods operate as a black box, making it impossible to say how they have reached their conclusions or to identify spurious correlations or causalities.



TOOL: KEY ISSUES FOR THE UPTAKE OF AI IN SCIENCE

THEME 3: Regulation, standards, private sector governance and self-regulation



› DATA QUALITY

a. Accuracy

- Larger datasets are better for training AIs, yet they are also more likely to produce responses based too closely on the data available to them (overfitting) or to contain inaccuracies and biases that could result in wrong or misleading results. Incorrectly sourced data, Frankenstein datasets and biased datasets already have dangerous implications for science. This problem needs to be addressed at every level, from considerations of governance and management to operational use.

b. Bias and exclusion

- While AI, and large language models in particular, use ‘biases’ (statistical similarity) in data to produce results, it is important to curate training data to avoid further marginalization of particular groups and regions. Digital exclusion leads to gaps in data. Furthermore, how do we represent those who are offline?

c. Subject orientation of data vs. the interdisciplinary nature of AI research

- Most scientific knowledge comes from a specific subject. We need to encode and use it, while enabling communication between domains and allowing for the growing generation of interdisciplinary knowledge.

d. Data coding and annotation

- AIs, and large language models in particular, require humans to code and annotate the data they use. These individuals must be aware of the risk of embedding cultural differences in the data during the annotation process.


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Countries included in first version of the working paper:

-Australia, Benin, Brazil, Cambodia, Chile, China, India, Malaysia, Mexico, Oman, Uruguay, Uzbekistan

Countries to be included in the second version of the paper:

-Argentina, Colombia, Dominican Republic, Canada, Kenya, Pakistan, Palestine, Panama, South Africa.



**Preparing
National Research
Ecosystems for AI**

STRATEGIES & PROGRESS IN 2024

PROJECT TIMELINE

October 2023: Workshop in Kuala Lumpur

→ **February 2024:** Consultations with local experts from around the world + Co-writing of the case study for 12 different countries

March 2024: Publication of first version of the paper

April 2024: Workshop in Santiago de Chile + continuation of consultations for additional case studies and expansion of group of experts

May 2024: Official launch of IDRC Science Systems Futures project

→ **November 2024:** Publication of second version of the paper

January 2025: Workshop in Oman

March 2025: Publication of clarification (more technical) papers

June 2025: Release of third version of the paper

KEY MESSAGES FROM CASE STUDIES AND REGIONAL DISCUSSIONS

- Countries are at different levels of implementation (from observation to being to being at the forefront of developments)
- Some countries identifying a leader role in AI development
- Awareness and recognition of the importance to work to integrate AI in national research ecosystems especially in LAC region
- Very compatible assessments of the opportunities, as well as of the efforts and resources required for AI to work for science, particularly in LAC region

GAPS IDENTIFIED

- Roadmaps for the uptake of AI in science are driven by the national strategies
- Limited knowledge on transnational and regional initiatives and approaches that could be benefited from
- Sustainability issues are barely mentioned at all

ACTIONS FROM THIS WORK

- Creating linkages between countries/regions and or institutions that did not previously exist
- Versioning of the paper to keep an updated case study and an active network
- Identifying issues to be further clarified through technical papers with the network

REACH OUT TO US IF YOU THINK YOUR COUNTRY SHOULD BE THERE

Reach out to me directly via email:

dureen.eweis@council.science

USEFUL LINKS FOR ISC MEMBERS

You can find the critical issues tool on our website:

<https://council.science/publications/ai-science-systems/>

Download the report

Read online

Accompanying resources:

- A list of critical issues for the uptake of AI in science
- Bibliometric results (317 documents on national AI in science resulting from the bibliometric study)
- Bibliography per country (a compilation of resources and documents provided by each country)

And a compilation list of all the referenced documents

FEEDBACK ON THE PAPER

<https://council.science/publications/ai-science-systems/>

Name *

First

Last

Title and affiliation

Email *





THANK YOU


We look forward to the next steps.

For any questions, email me at

csf@council.science

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