a novel, a picture & an idea

- Research, Development, and Innovation (R,D&I) agendas

Leadership and technology
CESA Infrastructure Indaba, 19-20 March 2023, CTICC.

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Techno-naivety

THE COMING CENTURY.

SCENE—*Office of a Publisher. Enter a Genius.*

Genius. I want to see the manager of the book department.

Boy. Oh, there isn't one, Sir.

Genius. Well, who looks after the pictures?

Boy. That 's done by machinery, Sir.

Genius. Isn't there a clerk who can examine patents.

Boy. Quite unnesessary, Sir. Everything that *can* be invented has been invented.

Genius. Well, I want to leave a novel, a picture, and an idea.

Boy. You must be rather old-fashioned, Sir. All sorts of work is done, nowadays, by mental photography.

[1]

[2]

Example 1 : STI 4 SHS Roadmap

Science, Technology and Innovations for Sustainable Human Settlements (STI4SHS) Roadmap

A roadmap to deploy innovations and technology to achieve green, smart and sustainable human settlements in the context of 4th Industrial Revolution

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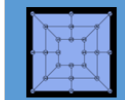
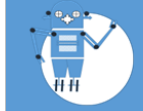
Pictorial summary of the STI 4 SHS Roadmap

*Based on **Waste RDI Roadmap pictorial***

Problem	MEANS	HOW		OPPORTUNITIES
Housing backlogs of 2.3 million units and growing. Apartheid spatial legacy, settlement quality & rising utility costs **erode quality of life.** Lack of **investment** in innovation. **Conservative** and silo approach to human settlements. Lack of a credible **evidence-base** to support decision making.	HCD		**Culture of innovation**	Empower human settlement and housing leaders, decision-makers and and practitioners to embrace innovation and to foster a culture of innovation in their institutions.	ST & I has the potential to improve speed, cost, quality and access of housing delivery. Improved planning, and management tools can transform housing and neighbourhoods to improve quality of life. Knowledge generation and sharing can support decision confidence Investment can generate job and localisation opportunities.
	RD&D		**Digitised enterprise**	Enhance human settlement planning and governance processes, enabling tools, methods & data to support collaboration across organisation boundaries and deepen evidence collection.	
	Innovation		**Strategic projects**	Think, experiment, play, innovate, create, disrupt, transform.	
			**Technology pipeline**	Strengthen relationships between government, the NSI and industry to foster innovation and technological development to address the sectors' needs and to stimulate investment, jobs & SMMEs.	
	Advocacy		**Technology diffusion**	Support technological diffusion from inception to end-of-life to reduce risk, improve operational performance and meet the user's expectations.	

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Example 1 : STI 4 SHS Roadmap

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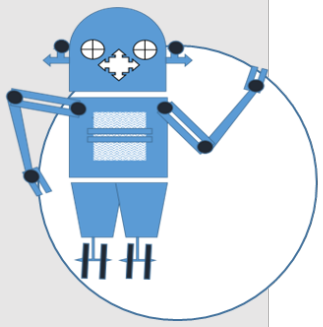
Example 1 : STI 4 SHS Roadmap

5 TECHNOLOGY DIFFUSION AND ADOPTION

Technological innovations are vetted: easily, and rapidly assessed by a competent, independent body, and this information is publicly and cheaply accessible. Vetted technological innovations are acceptable to communities, financiers and installers/contractors. Risk is understood and managed. Vetted technological innovations are applied appropriately, accepted by regulators, specified with confidence by professionals and readily maintained and operated.

Status quo

Scepticism of unfamiliar technology, lack of confidence in trying or specifying new technologies.



Drivers

Urbanisation, technological advancement, climate change, unemployment.

To consolidate and champion credible technology vetting and clearing for diffusion for appropriate STI 4 SHS

Initiatives

- TECHNOLOGY VETTING - Advocacy, augmentation and renewal of testing facilities, skills and infrastructure
- DIGITAL CATALOGUE Digital catalogue established and maintained
- INNOVATORS CONCESSION - Builder's supply consignment stock-shelf agreement.
- SOCIAL FRANCHISE - Social franchising model for affordable, sustainable uptake and maintenance of new technologies.
- M&E - Quality assurance programme, entailing
  - Client technology advisory desk (managing expectations)
  - Post-occupancy evaluation.

1. *Best practice BSRIA Soft Landings*
2. *PATH Partnership for Advancing Technology in Housing - The Diffusion of Innovation in the Residential Building Industry*

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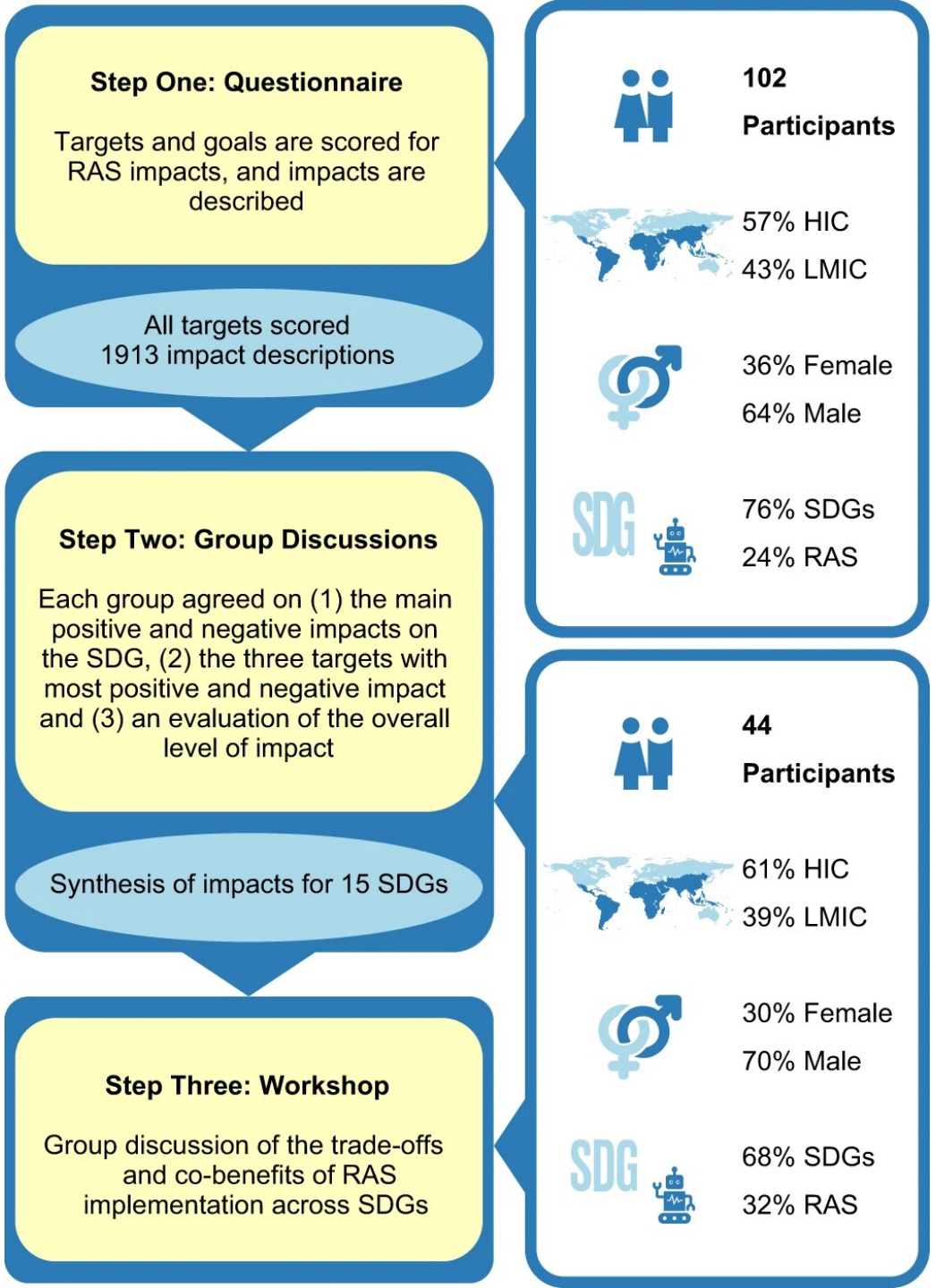
MULTI-LEVEL PERSPECTIVE

	Strategic objective	Activities performed	Outputs, outcomes impacts
1.	Learning: Platforms for circulation of ideas, advocacy and marketing	3 x Green buildings conventions. 2 x Institute of Human Settlements Practitioners events. 2 x Human settlements I'ndaba. 2 x Human settlements conferences. 1 x SALGA Human settlements summit. 1 x Ministerial IBT Summit with NHBRC. 1 x International Conference in Ghana.	Appr 2100 stakeholders formally reached for circulating ideas on use STI in achieving sustainability objectives of the human settlements sector. Additional +/- 900 stakeholders informally reached for advocacy on use STI in achieving sustainability objectives of the human settlements sector.
2.	Knowledge: Masters and doctoral support. Capacity building.	Supervision of 2 x Masters students. 1 x IBT Workshop with Pretoria Institute of Architects and the NHBRC 1 x meeting to a review PhD proposal by a student from University of Leicester linked to the SA MRC	Contribute graduates with critical scares skills in the sector. Increased membership of PIA and other professional associations with knowledge of the application of IBTs in the sector.
3.	Tech Pipeline: New tech and niches introduced.	Smart villages (e.g., TAFFDs Smart City concept) and indigenous knowledge systems for human settlements discussed with key stakeholders for mainstreaming (nascent stages). Rural housing application MobileApp. Backyard dwelling application MobileApp. Mass Timber, Recycled Plastic, Hemp based building materials. Net-zero house information dissemination.	Acquired institutional knowledge and database on innovation and entrepreneur pipeline in human settlement. Acquired institutional capability to link early-stage innovations with resources to assist with further development. Acquired institutional capability to link late-stage innovations with pilot and demonstration projects

Number	Icon	Name
1		No poverty
2		Zero hunger
3		Good health and well-being
4		Quality education
5		Gender equality
6		Clean water and sanitation
7		Affordable and clean energy
8		Decent work and economic growth
9		Industry, innovation and infrastructure
10		Reduced inequalities
11		Sustainable cities and communities
12		Responsible consumption and production
13		Climate action
14		Life below water
15		Life on land
16		Peace, justice and strong institutions
17		Partnerships for the goals



Example 2: Meeting sustainable development goals via robotics and autonomous systems

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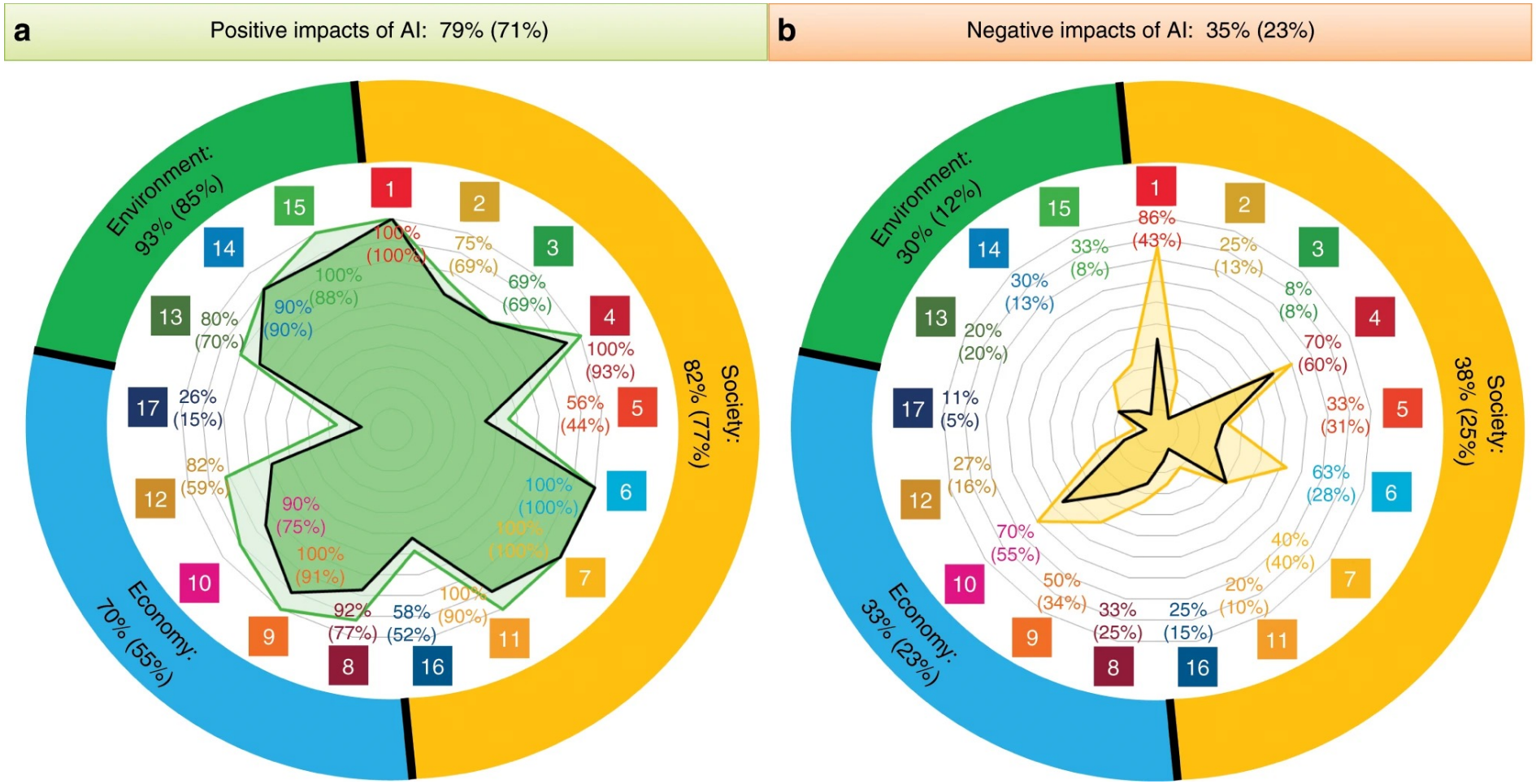
Example 3 : The role of artificial intelligence in achieving the Sustainable Development Goals



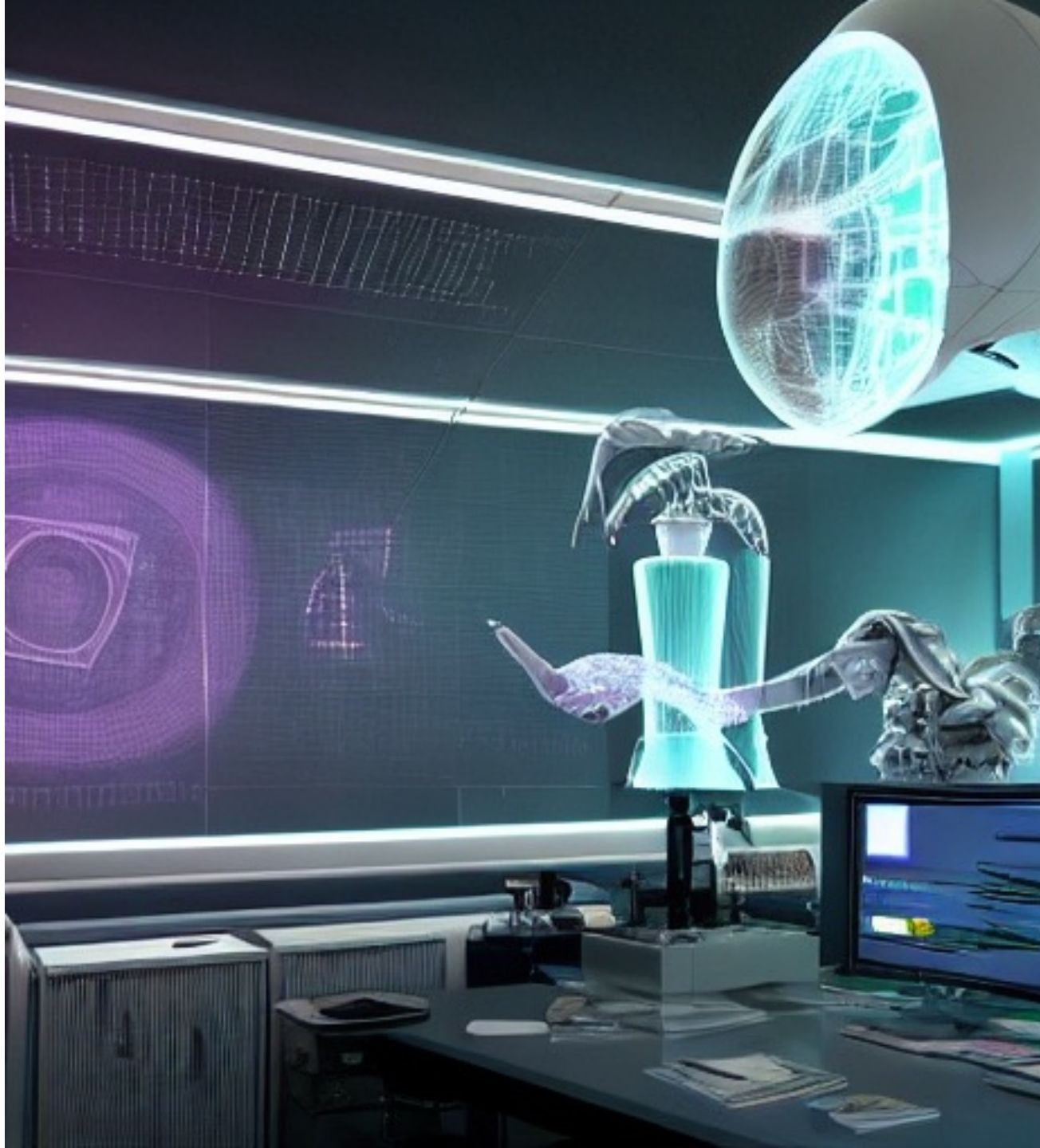
[5]

Techno-optimism

Iliana Ivanova, EU Commissioner for Innovation, Research, Culture, Education and Youth, said:

> “Augmented by the transformative power of artificial intelligence, Europe’s robust scientific base and exceptional talent creates a unique asset. Leadership in AI-powered science will translate into leadership in discovery and innovation, which is essential for Europe’s competitive edge, prosperity, and technological sovereignty. Together with our partners, we need to take a responsible, trustworthy approach, so we build and maintain public trust for enduring success.”

[6], [7]



EU Coordinated Plan on Artificial Intelligence 2021

Example 4 : Laboratory of the future?

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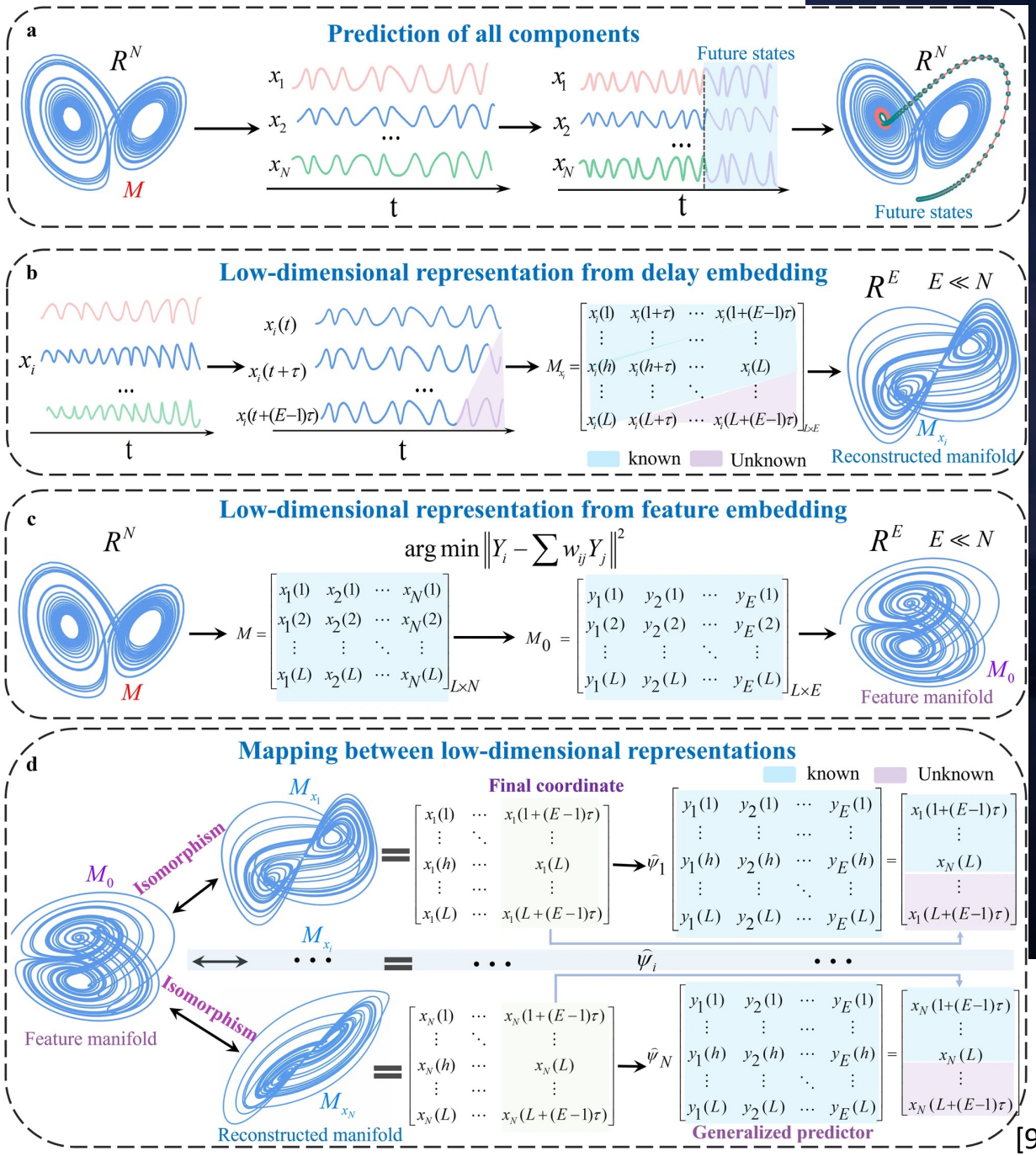
Example 4 : Laboratory of the future?



[9]

Techno-pessimism

Researchers evaluating the risks of AI in science and society have recognized a variety of ethical concerns. Among others:

- including algorithmic bias, [7,8,9]
- environmental costs,[10,11]
- public misunderstanding of the capabilities of AI,[12]
- exploitative labour practices,[11,13]
- lack of accuracy (e.g. due to ‘hallucinations’),[10,14,15,16]
- failures of reproducibility,[17,18] and
- lack of interpretability.[16,19,20]

[10], [7]

“All models are wrong, but some are useful”

[11]

References and acknowledgements

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[6] https://digital-strategy.ec.europa.eu/en/library/coordinated-plan-artificial-intelligence-2021-review

[7] https://deepai.org/machine-learning-model/cyberpunk-generator

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[10]

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Thanks to all my colleagues at the Functional Building Infrastructure Impact Area and Smart Places cluster at the CSIR, collaborators, and partners.

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