

HORIZON SCANNING

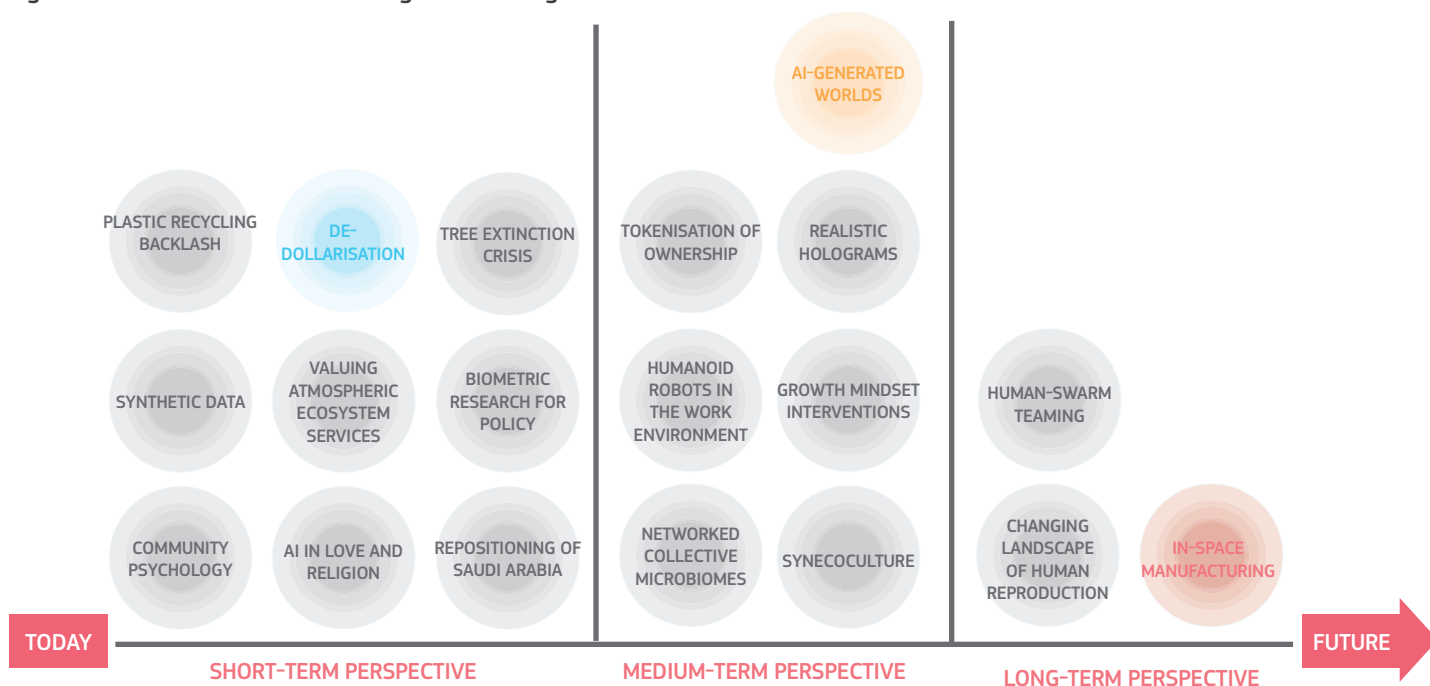
EMERGING ISSUES FOR EU POLICYMAKING

Issue 04

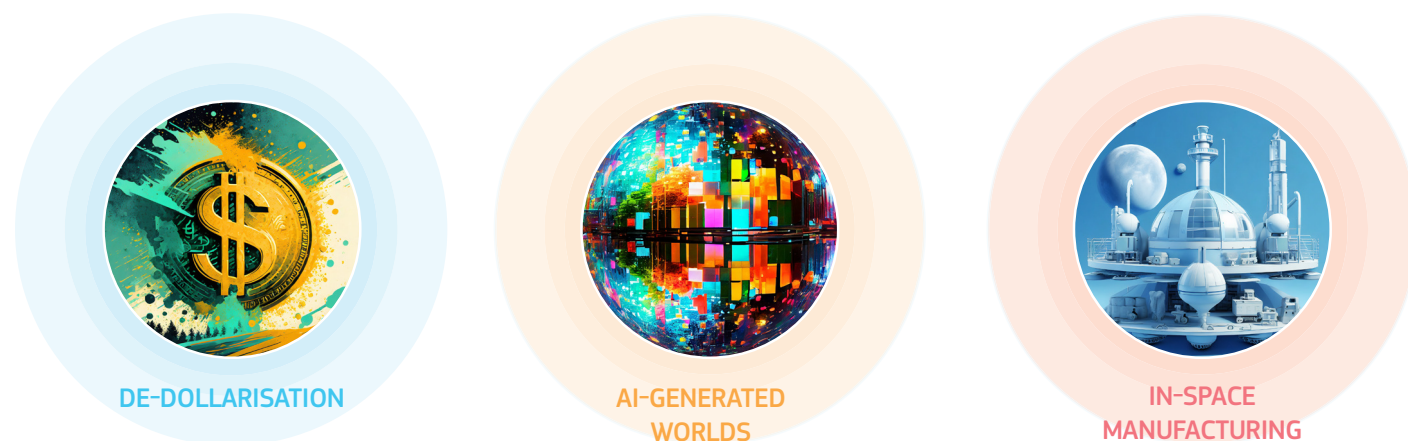
This is the fourth report resulting from an ESPAS horizon scanning process which looks at “signals of change” – emerging trends and issues – that may appear marginal today but could become important for the EU in the future. The ESPAS network (European Strategy and Policy Analysis System) launched the process, led by the Joint Research Centre and the European Parliamentary Research Service, in 2022. These signals of change were identified and developed via a series of workshops with participants from across the EU institutions and bodies looking at the recent developments in various domains. These may be considered as new lenses through which we can get a different perspective on the challenges and opportunities the EU is facing now and in the coming years.

Over three months of scanning and sense-making workshops, 19 signals of change were selected as most relevant for EU policymaking out of 230 items identified by the network. These are presented in the graph below and detailed in the Annex.

Figure 1: Overview of the selected signals of change



From the list of 19 signals of change, 3 emerging issues perceived as most impactful were selected by policymakers through a survey followed by a prioritisation workshop and have been explored in more depth. The most impactful signals of change for policymaking are:



The following pages offer a first exploration of questions, problems or new solutions that can emerge from these three selected emerging trends. They are not meant to be exhaustive, but merely an indication of issues that may merit further examination, always based on existing sources and references.



De-dollarisation

In the late 1970s, 85% of world foreign exchange reserves were denominated in dollars. The latest IMF data show that the share of the dollar in allocated reserves fell to around 59% in 2022¹. The preference for using the dollar globally is linked to the infrastructure and legal certainty that facilitates payments. This quality of the dollar is challenged by current structural changes². Currently, countries that wish to maintain their economic ties with Russia are no longer able to use the dollar (or the euro) because of sanctions. China issues yuan-denominated loans in Belt and Road Initiative³. The BRICS members consider creating a new currency and Brazil and Argentina also proposed a common currency⁴. Central bank digital currencies, currently in some phase of development in 114 countries, can facilitate this transition away from the dollar. The financial, economic and geopolitical implications impacts of de-dollarization will be felt most strongly once alternative payment infrastructures are consolidated⁵.

How can it change our optics?

The traditional view on global reserve currencies were those of dominance, seigniorage, geopolitical power and control. While these factors are still at play, the arrival of new forms of money together with a multipolar world can lead to a more diverse, volatile landscape of monetary plurality.

Futures Wheel: An indication of potential consequences



What if the EU...?

... would engage in creating a new type of global currency, underpinned by a supranational financial institution and linked to financing the UN's Sustainable Development Goals?

1 <https://www.bnnbloomberg.ca/de-dollarization-is-happening-at-a-stunning-pace-jen-says-1.1909109>

2 <https://www.aier.org/article/de-dollarization-has-begun/>

3 <https://markets.businessinsider.com/news/currencies/dedollarization-china-yuan-loans-belt-and-road-initiative-usd-renminbi-2023-10>

4 <https://www.reuters.com/markets/currencies/what-is-brics-currency-could-one-be-adopted-2023-08-23/>

5 <https://www.bruegel.org/comment/de-dollarisation>

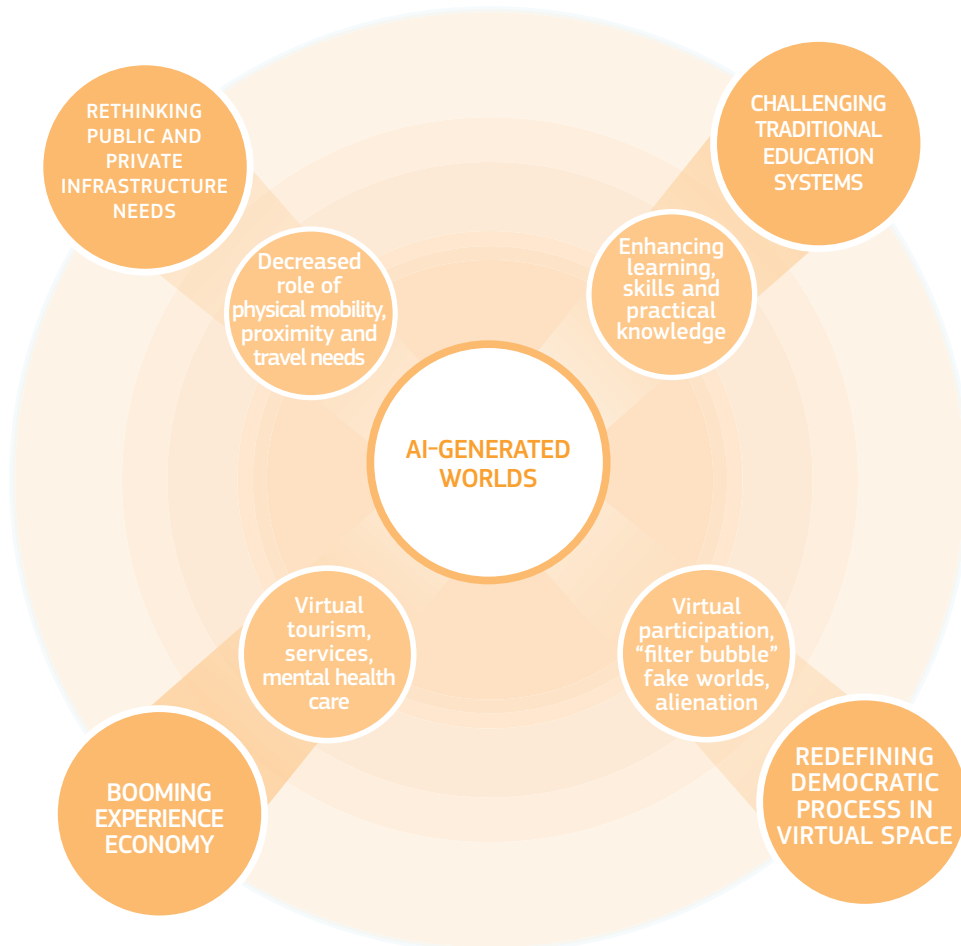
AI-generated worlds

Extended (augmented/virtual) reality is seen as key element of blending the digital and physical world, but the cost and skill barriers in generating virtual worlds limited their use⁶⁷. Recently, the use of generative AI for image generation and 3D graphics enables the creation of virtual worlds in real-time⁸. Current first experiments still require large computing power, but they are likely to be more cost-efficient in a few years, prompting ideas about dreaming up virtual worlds in real time or creating 3D worlds based on any given video⁹. Such virtual worlds can be used for training, simulation, education, learning or healthcare¹⁰.

How can it change our optics?

Sharing a common world was taken for granted in creating the global community, addressing global challenges and articulating humanity as a whole. The future multitude of disposable and tailor-made virtual worlds requires the rethinking of what holds communities together.

Futures Wheel: An indication of potential consequences



What if the EU...?

... enlarged to a network of virtual worlds that could claim to be part of the EU after fulfilling certain membership criteria and undergoing a federation process?

6 Hupont Torres, I., Charisi, V., De Prato, G., Pogorzelska, K., Schade, S., Kotsev, A., Sobolewski, M., Duch Brown, N., Calza, E., Dunker, C., Di Girolamo, F., Bellia, M., Hledik, J., Nai Fovino, I. and Vespe, M., Next Generation Virtual Worlds: Societal, Technological, Economic and Policy Challenges for the EU, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/51579, JRC133757

7 <https://www.information-age.com/obstacles-vr-will-overcome-go-mainstream-for-business-users-18560/>

8 <https://www.pcgamer.com/stable-diffusion-vr-is-a-startling-vision-of-the-future-of-gaming/>

9 <https://mixed-news.com/en/stable-diffusion-image-ai-creates-vr-dream-worlds/>

10 <https://aicontentfy.com/en/blog/ai-generated-content-for-virtual-reality-and-augmented-reality>

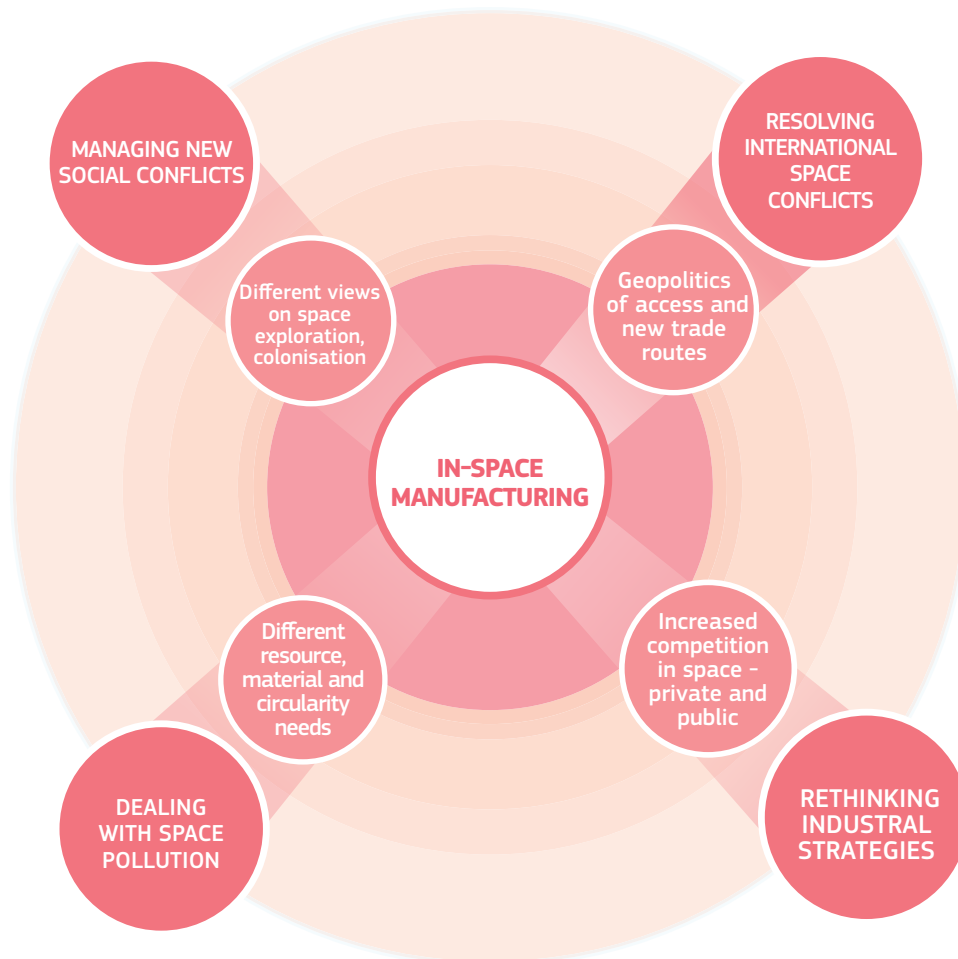
In-space manufacturing

In June, the Varda Space start-up has put in the orbit a compact space factory - a commercial satellite platform attached to two modules - one containing equipment autonomously manufacturing a product and a re-entry capsule to bring the goods back to Earth¹¹. In-space manufacturing is currently developed mostly for pharma, semiconductor, beauty and health industries benefitting from microgravity, ultra-vacuum and containerless processing in high temperatures to produce high quality products which are much more difficult to produce on Earth¹². Other attempts to move activities beyond the Earth atmosphere includes data centres¹³ and Space-Based Solar Power¹⁴.

How can it change our optics?

Manufacturing and industrial strategy is still strongly linked to land, territory and trade routes shaped by standards in processes and products and the available infrastructure on Earth. Extending the industrial ecosystems to space questions many of the assumptions on which they were built.

Futures Wheel: An indication of potential consequences



What if the EU...?

... extended the four freedoms of the Single Market (free movement of people, goods, capital, services) to space?

11 <https://www.freethink.com/space/first-space-factory>

12 https://www.factoriesinspace.com/graphs/In-Space-Manufacturing_2022_Erik-Kulu_IAC2022.pdf

13 <https://techmonitor.ai/technology/emerging-technology/data-centres-eu-big-tech-microsoft>

14 https://esamultimedia.esa.int/docs/technology/The_Case_for_an_ESA_preparatory_programme_for_Space-Based_Solar_Power_for_terrestrial_energy_needs.pdf

ANNEX: OTHER PRIORITISED SIGNALS

AI IN LOVE AND RELIGION

As artificial intelligence becomes a pervasive element of consumer products and services, it also increasingly influences the spiritual and sensual aspects of life. AI-based tools are developed to help find closer relationships from better match-making algorithms to creating AI-trained avatars, which could interact with avatars of potential partners¹⁵. At the same time, AI-powered chatbots become popular intimate companions, that people can create themselves in an app¹⁶, with many confessing being in love with them¹⁷. The expanding concept of love is also linked to corporate chatbots, eliciting “brand love”¹⁸. AI-powered chatbots and robots are also involved in religious practices, like a Christian mess¹⁹ or ritual automation in Hinduism and Buddhism²⁰, but potentially AI could also be a subject of religious following as well. Both trends will have an effect on interpersonal relations and society^{21,22}.

COMMUNITY PSYCHOLOGY

With the growing attention to mental health, alongside responses in helping individuals, the community psychology perspective is increasingly used to understand collective emotions, feelings, and thoughts²³. It is part of a wider consideration of community wellbeing as more than the wellbeing of individuals in a community, instead arising from the common life, the shared enterprise of living with others, including spatial and social inequalities; multiple settings and scales; temporal choices and legacies including sustainability and inter-generationality²⁴.

CHANGING LANDSCAPE OF HUMAN REPRODUCTION

Decreasing fertility rates across the world have mainly been associated with economic development and women’s empowerment in fertility decisions²⁵. Currently, new considerations are coming to the fore. Declining reproductive health is one, related to exposure to toxins and pollution (chemicals found in plastics, household medications, in the food chain and in the air) but also lifestyle factors.^{26,27} Psychosocial stress and mental health issues - anxiety, depression, mood disorders also play a role²⁸. Finally reproductive decisions are increasingly influenced by eco-anxiety and general climate change concerns²⁹ but also putting off pregnancies due to economic and public health uncertainties, confirmed by the sharp rise in egg-freezing³⁰. On the other hand, there is a growing number of people convinced about not having children with a growing no-kids online movement supporting such choice³¹.

GROWTH MINDSET INTERVENTIONS

A growth mindset is the belief that personal characteristics, such as intellectual abilities, can be developed and improved through effort, in contrast to a fixed mindset, which is the belief that such characteristics are fixed and unchangeable. In the face of difficulty, a growth mindset helps people to continue to improve, where those with a more fixed mindset would give up.³² Research has demonstrated that supporting the development of such growth mindset is feasible, and a number of experiments in education show a strong achievement for students facing greater adversity and impacted by stereotype threats.³³ The growth mindset is increasingly explored not only in the context of education, but also innovation³⁴, leadership³⁵, overcoming poverty³⁶ or aging³⁷.

15 <https://thesnackapp.com/>

16 <https://replika.com/>

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19 <https://arstechnica.com/information-technology/2023/06/chatgpt-takes-the-pulpit-ai-leads-experimental-church-service-in-germany/>

20 <https://www.religionwatch.com/with-rise-of-ai-concerns-about-ritual-automation-grow-in-hinduism-buddhism/>

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25 <https://www.economist.com/leaders/2023/06/01/global-fertility-has-collapsed-with-profound-economic-consequences>

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HUMANOID ROBOTS IN THE WORK ENVIRONMENT

Industry and services have been successfully incorporating robotic automation for manufacturing and other manual tasks such as logistics, inspection, maintenance and surface cleaning. However, advances in humanoid robots have the potential to disrupt activities and jobs that are focused on human interaction and not solely on manual repetitive tasks³⁸. Walking and talking machines will soon act as guides, companions and deliverers³⁹. Different companies are coming from different directions in their approaches to making and using humanoid robots⁴⁰. This trend could have great impact on the job market in terms of availability of jobs and emerging skills needs (e.g., supervising service robots in customer care).

TOKENISATION OF OWNERSHIP

With the help of distributed ledger technologies, there is an increase in attempts to create virtual fragmentations of real-world assets into tradeable shares or digital tokens. The smaller, more affordable units can provide more liquidity and access to investment opportunities with blockchain platforms providing a secure and transparent platform for storing and transferring tokens⁴¹. Most of the interest focuses on the real estate markets, however experiments are also conducted in art markets, agricultural production (tokenizing a cattle ranch), insurance, automotive and other areas⁴² in an industry that the Boston Consulting Group estimates could be worth 16 trillion USD in the future⁴³. Fractional ownership can also change the nature of the sharing economy, moving beyond shared consumption to more shared ownership⁴⁴.

REALISTIC HOLOGRAMS

A series of breakthroughs in holographic projections, virtual representation of 3D images in the real world, brings this technology closer to everyday applications in telepresencing. More realistic holograms are being created using a new approach, three-dimensional scattering-assisted dynamic holography (3D-SDH), with more than three orders of magnitude greater depth resolution⁴⁵. Tensor holography allows the creation of real-time holograms in an efficient way⁴⁶, while new AI algorithms bring down the cost and complexity of creating 3D representations of humans or physical objects⁴⁷. This technology can help in the areas of volumetric 3D printing, microscopy, medical imaging, visualisation and in the longer run, development of remote services and dematerialisation of consumption⁴⁸.

HUMAN-SWARM TEAMING

Development of robotic swarms, or multiple coordinated robots that can perform a collective task, has been very rapid in recent years. Such swarms have multiple applications, including area exploration, target search and rescue, security and surveillance, agriculture, air defence, area coverage and real-time monitoring, providing wireless services, and delivery of goods⁴⁹. It takes advantage of swarm intelligence – intelligent behaviour emerging from interactions of elements⁵⁰. Semi-autonomous swarms with human control are the most reliable, effective and ethically responsible, but require functioning human-swarm interactions⁵¹. Such systems borrow from the shepherding systems with sheepdogs, where humans provide high level mission planning and an AI agent provides task-level planning and execution^{52,53}.

38 <https://www.economist.com/science-and-technology/2022/11/07/humanoid-robots-are-getting-close-to-reality>

39 <https://hbr.org/2023/03/robots-are-changing-the-face-of-customer-service>

40 <https://newatlas.com/robotics/openai-figure-ai-robotics/>

41 <https://www.forbes.com/sites/forbestechcouncil/2023/05/22/the-future-of-real-estate-tokenization-and-its-impact-on-the-industry/>

42 <https://cointelegraph.com/news/insurance-agriculture-real-estate-asset-tokenization-reshaping-status-quo>

43 <https://web-assets.bcq.com/1e/a2/5b5f2b7e42dfad2cb3113a291222/on-chain-asset-tokenization.pdf>

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47 [Revolutionary AI algorithm brings holograms within everyone's reach - IO \(innovationorigins.com\)](https://www.innovationorigins.com/news/2023/05/23/revolutionary-ai-algorithm-brings-holograms-within-everyones-reach-10/)

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52 Debie, E. et al. (2021). Transparent Shepherding: A Rule-Based Learning Shepherd for Human Swarm Teaming. In: Abbass, H.A., Hunjet, R.A. (eds) *Shepherding UxVs for Human-Swarm Teaming*. Unmanned System Technologies. https://doi.org/10.1007/978-3-030-60898-9_12

53 Baxter, D. P., Hepworth, A. J., Joiner, K. F., & Abbass, H. (2022). On the Premise of a Swarm Guidance Ontology for Human-Swarm Teaming. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 66(1), 2249–2253. <https://doi.org/10.1177/1071181322661541>

SYNTHETIC DATA

Synthetic data sets are generated to emulate certain key information found in the actual data to provide the ability to draw valid statistical inferences. A statistical process is used to extract information from an actual data set collected from a set of respondents and is re-expressed as a collection of artificial or synthetic data sets for public consumption⁵⁴. This approach helps to avoid privacy, confidentiality and security issues associated with using real life data in many domains. It can help control unevenness and bias in algorithmic governance and enable better targeted policies.⁵⁵ Fake data is used in finance, training AI systems, but also by statistical institutions and in medicine (with experimentation in medical trials)^{56,57,58}. A wider adoption will depend on trust in synthetic data, quality data sources for the synthesis and proper mapping of outliers.⁵⁹

TREE EXTINCTION CRISIS

Reforestation programmes are seen as an important part of climate change mitigation, carbon capture and renewable energy targets. However, increasing numbers of signals point to negative consequences of many poorly managed and ill-conceived projects. One relates to “phantom forests” – failed high profile initiatives to plant millions of trees⁶⁰. Another is linked to proliferation of alien invasive tree species, which can have a negative effect on the ecosystems and incur considerable costs^{61, 62}. At the same time climate-induced tree mortality is increasing, caused by pathogens, droughts/heat waves, fire/bark beetles, and air pollution⁶³. The evidence produced by the Global Tree Assessment suggests that a third of the world’s tree species are currently threatened with extinction. They call it a tree extinction crisis⁶⁴.

VALUING ATMOSPHERIC ECOSYSTEM SERVICES

Of the various ecosystem services provided in the Earth’s critical zone (atmosphere, vegetation, soil, surface water, groundwater) – atmospheric services attracted least attention⁶⁵. Long believed to be less relevant because of abundance and renewable character, there is an increasing appreciation of its value for breathing, radiation protection, cleansing capacity, warming, direct use, redistribution of water services, combustion, sound, communication, energy, extraction of atmospheric gases, tourism and visual aesthetics.⁶⁶ Increasing interest in air for CO2 extraction and utilisation (production of proteins, bio-based chemicals), as well as water extraction or hygroelectricity (electricity from humid air) change the perceptions of air as a resource^{67,68}.

SYNECOCULTURE

Synecoculture is a novel method of market gardening, based on a high-density mixed association of edible plants without the application of tillage, fertilizer, and chemicals. Developed by Sony Computer Science Laboratories, the approach focuses on the artificial creation of ecosystems for cultivating a rich diversity of crops (200 species, 700 varieties on 1000m²) for year-round sustainable harvests while also enriching local biodiversity.^{69,70} It leverages big data and machine learning for better understanding of ecosystems, allowing human augmentation of ecosystems, and the use of robots for sowing, pruning and harvesting in such a complex environment.^{71,72}

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- 60 <https://e360.yale.edu/features/phantom-forests-tree-planting-climate-change>
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NETWORKED COLLECTIVE MICROBIOMES

A great variety of bacteria, fungi, and archaea as well as viruses, trillions of microorganisms exist on and in human bodies, and constitute the human microbiome which significantly affects the physical and psychological well-being of humans or their ill-being. All other life forms—e.g. animals or plants—together with all habitats of these life forms—such as soils, air, or waters—contain microbiomes⁷³. Originally perceived as a bilateral relation between microbiome and its habitat, recent analysis concentrates on network interactions between multiple microbiomes⁷⁴. In a wider perspective, this allows to understand ‘individuals’ as symbiotic consortia of hundreds of species and multiple ecosystems: as composite organisms, as ‘holobionts’ – giving calls for microbial ethics that might facilitate engaging considerably with the realm of microbes that constitute human life-worlds⁷⁵.

REPOSITIONING OF SAUDI ARABIA

There are several notable developments occurring in Saudi Arabia. First, the kingdom aims to be at the forefront of a civilizational revolution by redefining urban development with carbon-neutral smart cities such as The Line or Oxagon⁷⁶. Second, Saudi Arabia is seeking to diversify its economy away from oil, with massive investments in more R&D intensive sectors such as electric vehicles and video gaming⁷⁷. These investments are coupled with social reforms meant to increase the workforce by encouraging work. Third, the country is reconfiguring its foreign policy by restoring its relations with Iran and through a closer involvement with the BRICS countries and especially China. Saudi Arabia’s repositioning could have regional implications, most notably from the future of the Israeli-Arab relations. Furthermore, Saudi Arabia could act as a global linchpin in view of its positioning on the geopolitical arena, as well as an urban development trendsetter⁷⁸.

BIOMETRIC RESEARCH FOR POLICY

Biometric research is a method of investigating the subconscious signals from the body, to reveal otherwise hidden features related to emotion, attention, cognition, and physiological arousal⁷⁹. This allows to study both explicit and implicit behaviour in response to stimuli – usually used in psychology, consumer research and neuromarketing to understand better human behaviour⁸⁰. The developing wearables market simplifies the use of biometric tools (such as eye-tracking or portable EEG devices) and expands the scope of their use to areas of interest to policies. Eye-tracking is used in analysing perception of urban and landscape environments⁸¹ (e.g. one study is looking at the emotions related to car-free streets⁸²) or information literacy⁸³.

PLASTIC RECYCLING BACKLASH

Although recycling is still the most visible aspect of a more circular economy, the plastic recycling ecoindustry has been facing a strong backlash. A Greenpeace report published in May 2023, “Forever Toxic: The science on health threats from plastic recycling” warns that toxic chemicals can make their way into recycled plastics either through direct contamination, leaching of toxic substances or their generation in the process itself.⁸⁴ Other research point to the potential of plastic recycling facilities to release microplastic pollution⁸⁵. Finally, low rates of recycling and poor recycling habits (such as “aspirational recycling” – throwing non-recyclable items like plastic bags, Styrofoam into recycling bins rather than garbage cans) work against the 45 billion USD industry experiencing 7% annual growth^{86,87}. Other eco-industries could experience similar increased scrutiny.

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