

# HORIZON SCANNING

## EMERGING ISSUES FOR EU POLICYMAKING

Issue 05

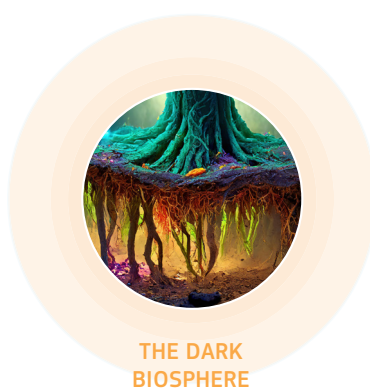
This is the fifth report resulting from an ESPAS horizon scanning process which looks at “signals of change” – emerging trends and issues – that may appear marginal today but could become important for the EU in the future. The ESPAS network (European Strategy and Policy Analysis System) launched the 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 recent developments in various domains. These developments 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, 20 signals of change were selected as most relevant for EU policymaking out of 231 items identified by the network. These are presented in the graph below and detailed in the annex.



From the list of 20 signals of change, three emerging issues were perceived as potentially most impactful by policymakers. This assessment was done through a survey followed by a prioritisation workshop, which explored the issues in more depth. The most impactful signals of change for policymaking are:



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



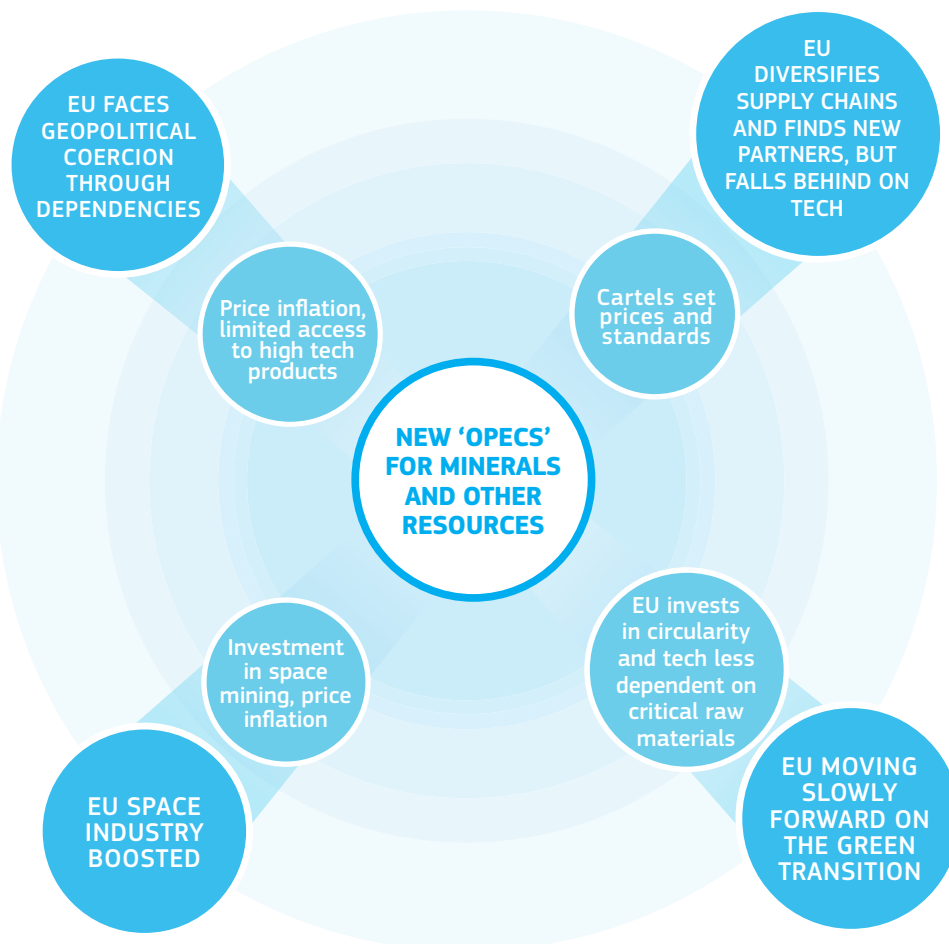
# New 'OPECs' for minerals and other resources

The race for metals and critical minerals needed for a green transition raises new geopolitical and trade issues. The number of export restrictions is growing<sup>1</sup>, and recently the exploitation of critical raw materials was brought up in the BRICS summit, as well as by African countries at the UN Environmental Assembly<sup>2</sup>. A few countries control a significant portion of these essential resources, prompting speculation about the formation of new global cartels to control the flow of raw materials vital for green technology. The idea of commodity cartels, such as OPEC, or international commodity agreements, such as those made for tin or coffee in the second half of the twentieth century<sup>3</sup>, may be gaining renewed interest from countries with high natural stocks of critical raw materials. China, in particular, is investing heavily in metals and mining overseas. With Chinese investments and contracts in the mining and metals sector surpassing USD 10 billion in the first half of 2023, the country is targeting key resources like nickel, lithium, copper, uranium, steel and iron<sup>4</sup>. Meanwhile, lithium-producing countries such as Argentina, Bolivia and Chile are engaged in discussions on managing the price of lithium<sup>5</sup>, highlighting a trend of safeguarding their resource interests and the global commons within their domain (such as rain forests<sup>6</sup>, water, etc.) in the face of increasing demand for clean technology.

## How can it change our optics?

Increased geopolitical competition and unstable supply chains give international production cartels a different spin. Rather than obstacles to an ever-increasing free trade, they become part of the system of new global alliances forming as more countries become major players on the global stage. This could make for more market disruption and trade disputes. It could also enable involved countries, e.g. in Latin America or Africa, to benefit more from their resources supporting sustainable socio-economic development.

## Futures Wheel: An indication of potential consequences



## What if the EU...?

... goes 'low tech' to reduce dependencies on critical raw materials and supports only R&D in technology free of critical raw materials?

1 Kowalski, P. and C. Legendre (2023), "Raw materials critical for the green transition: Production, international trade and export restrictions", OECD Trade Policy Papers, No. 269, OECD Publishing, Paris, <https://doi.org/10.1787/c6bb598b-en>.  
2 <https://www.theguardian.com/environment/2024/feb/28/african-leaders-call-for-equity-over-minerals-used-for-clean-energy>  
3 Christopher L. Gilbert, International commodity agreements: Design and performance, World Development, Volume 15, Issue 5, 1987, [https://doi.org/10.1016/0305-750X\(87\)90005-2](https://doi.org/10.1016/0305-750X(87)90005-2).  
4 <https://www.mining.com/chinas-metals-and-mining-investment-overseas-to-hit-record-in-2023-report/>  
5 Is This The Dawn Of A 'lithium OPEC'?. Forbes. (2023) <https://www.forbes.com/sites/eliasferrerbreda/2023/08/08/is-this-the-dawn-of-a-lithium-opec/>  
6 Biggest rainforest nations form triple alliance to save jungle. CNN. (2022) <https://edition.cnn.com/2022/11/14/world/rainforest-alliance-brazil-indonesia-congo-intl-hnk/index.html>

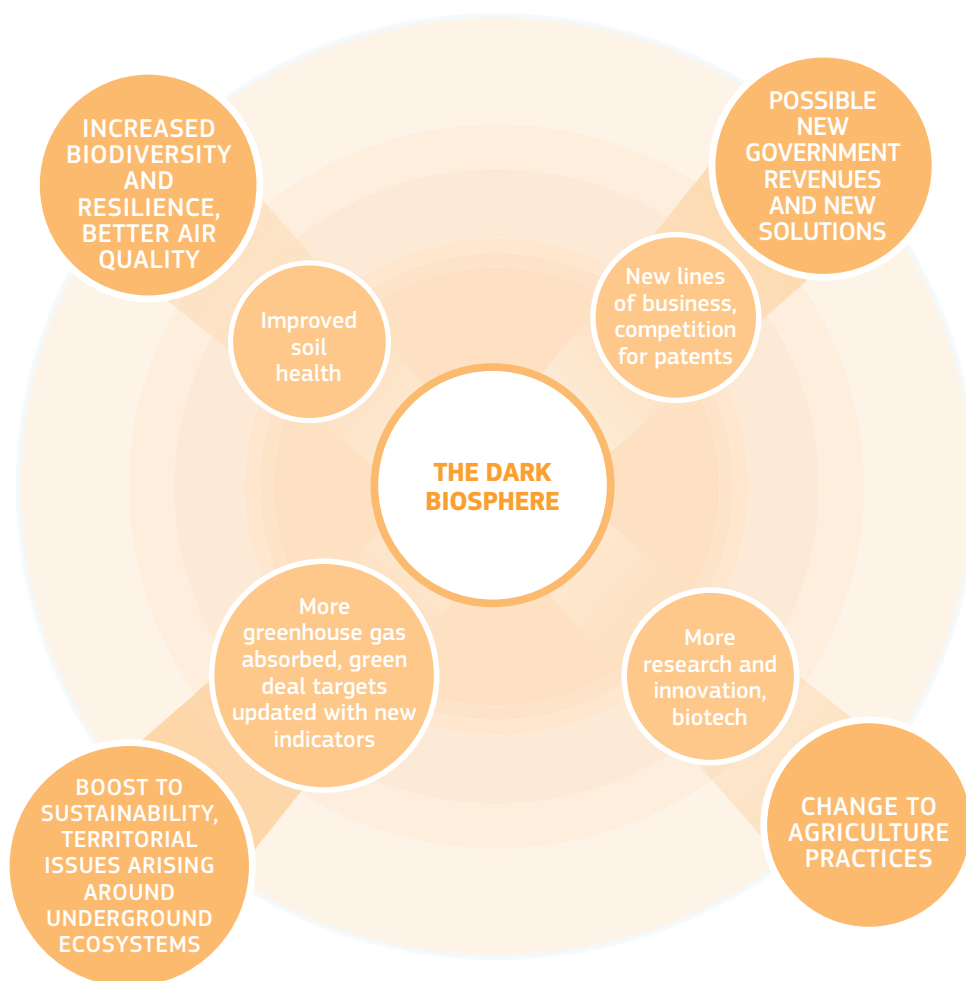
# The dark biosphere

The universe is full of unknown territories. One of them is just underneath our feet. Below the world's surface there are underground organisms, which form most of the planet's microbial mass – an underground dark biosphere, the diversity of which may exceed that on the surface<sup>7</sup>. Beyond soil, it has been assumed that many of the subterranean realms are oxygen-deficient dead zones. A recent study has now shown something opposite – microbes that produce unexpectedly large amounts of oxygen even in the absence of light. These microbes generate and release so much of what the researchers call 'dark oxygen' that it is comparable to rainforests. The finding fills a crucial gap in our understanding of how the huge subterranean biosphere has evolved and how it contributes to biogeochemical cycles. Understanding subsurface life can help us understand life in other new territories, for example, in space<sup>8</sup>.

## How can it change our optics?

For the most part European Union policies relate to the world we interact with "on the ground". Yet EU policies are starting to reach out to the unseen – space, deep oceans, underground. This development requires a change of perspective. The subsurface space cannot only be seen as a treasure trove of underground resources, but as an ecosystem providing geo-system services<sup>9</sup>.

## Futures Wheel: An indication of potential consequences



## What if the EU...?

... supported subsurface planning in territorial policies?

7 Magnabosco, C., Lin, L.H., Dong, H. et al. The biomass and biodiversity of the continental subsurface. *Nature Geosci* 11, 707–717 (2018). <https://doi.org/10.1038/s41561-018-0221-6>  
8 Underground Cells Make 'Dark Oxygen' Without Light. *Quantamagazine*. (2023) <https://www.quantamagazine.org/underground-cells-make-dark-oxygen-without-light-20230717/>  
9 Frisk, E.L., Y. Volchko, O.T. Sandström, T. Söderqvist, L.O. Ericsson, F. Mossmark, A. Lindhe, et al. "The Geosystem Services Concept – What Is It and Can It Support Subsurface Planning?" *Ecosystem Services* 58 (2022). <https://doi.org/10.1016/j.ecoser.2022.101493>.

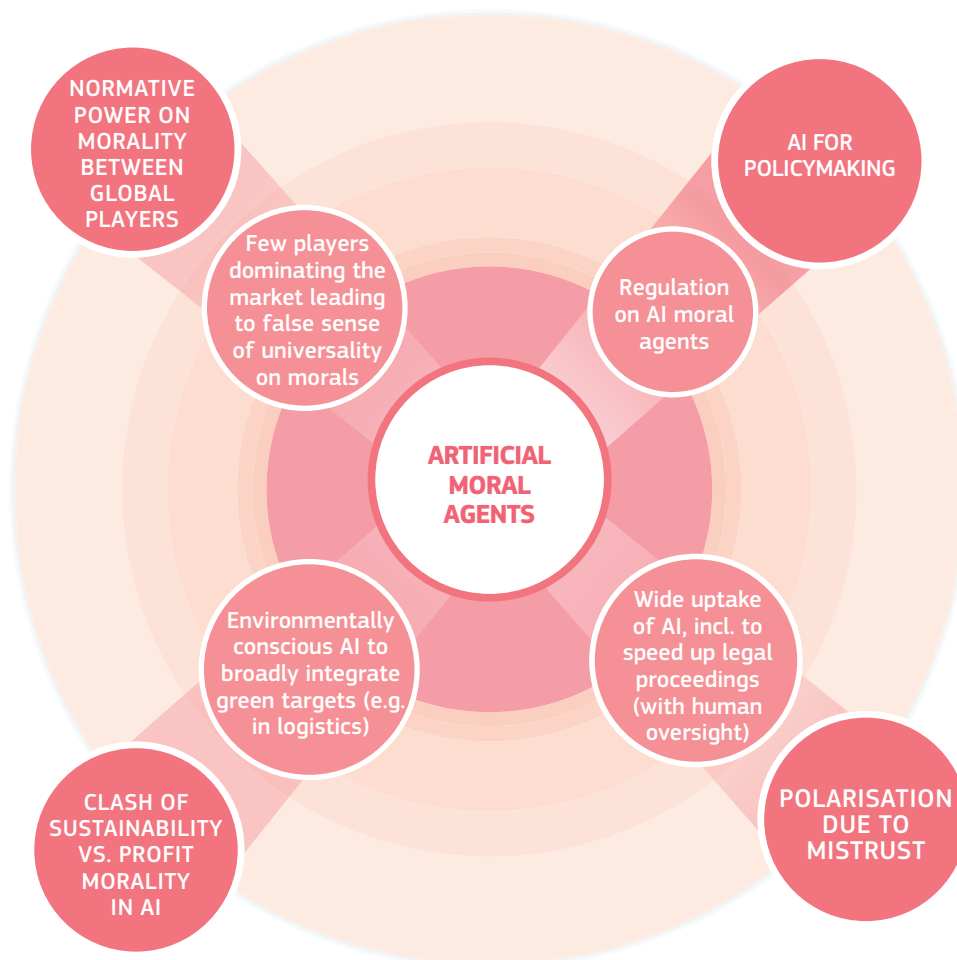
# Artificial moral agents

There has been increased interest in machine ethics with the development of AI, software bots and robotics. Beyond ethical issues linked to AI systems as objects or tools (privacy, manipulation, lack of transparency, bias), there are issues related to AI systems as subjects – artificial moral agents being able to take into account societal values, and moral and ethical considerations<sup>10</sup>. Such moral agents can be programmed top-down based on different human approaches to ethics and moral decision-making, or bottom-up, making use of learning mechanisms to develop moral judgment<sup>11</sup>. In top-down systems, this raises the issue of taking into account current moral consensus or moral progress<sup>12</sup>. Bottom-up approaches look at virtue ethics<sup>13</sup>, offering the ability to learn from experience, be context-sensitive, adapt, and conform to complex human norms<sup>14</sup>. It could lead to AI that acts as moral agents, which could ‘replace current individualist, prescriptive, inflexible, and opaque interventions with systems that transparently state their values and then openly deliberate and contest these with users, or agents that represent human and non-human stakeholders such as future generations, species, or ecosystems’<sup>15</sup>. However, another approach is to create explicit AI systems that support ethical reflection in human systems<sup>16</sup>.

## How can it change our optics?

Making complex moral decisions is a defining capacity for human beings, but with the growth of AI that capacity may not be exclusive to humans anymore and will have to be learned. The decisions going into guiding the morality of AI will require serious reflection and oversight. Making the moral principles behind decisions explicit demands more transparency from humans as well.

## Futures Wheel: An indication of potential consequences



## What if the EU...

... regulates AI morality to be planet-centric rather than human-centric?

10 Müller, Vincent C., "Ethics of Artificial Intelligence and Robotics", The Stanford Encyclopedia of Philosophy (Fall 2023 Edition), Edward N. Zalta & Uri Nodelman (eds.), <https://plato.stanford.edu/archives/fall2023/entries/ethics-ai>.

11 Cervantes, JA., López, S., Rodríguez, LF. et al., Artificial Moral Agents: A Survey of the Current Status. *Sci Eng Ethics* 26, 501–532 (2020). <https://doi.org/10.1007/s11948-019-00151-x>.

12 Kenward, B. and Sinclair, T. (2021), Machine morality, moral progress, and the looming environmental disaster, *Cogn. Comput. Syst.* 3: 83–90. <https://doi.org/10.1049/ccs2.12027>.

13 A general term for theories emphasising the role of virtue and character in moral philosophy, as distinct from, for example, deontology or consequentialism.

14 Stenseke, J. Artificial virtuous agents: from theory to machine implementation. *AI & Soc* 38, 1301–1320 (2023). <https://doi.org/10.1007/s00146-021-01325-7>.

15 Laschke, M., A. Bucher, P. Coulton, M. Hassenzahl, L. Kuijjer, C. Lallemand, D. Lockton, G. Ludden, and S. Deterding. *Moral Agents for Sustainable Transitions: Ethics, Politics, Design*, 2023. <https://doi.org/10.1145/3544549.3573814>.

16 Volkman, R., Gabriels, K., AI Moral Enhancement: Upgrading the Socio-Technical System of Moral Engagement, *Sci Eng Ethics* 29, 11 (2023). <https://doi.org/10.1007/s11948-023-00428-2>.

## ANNEX : OTHER PRIORITISED SIGNALS

### CLIMATE-BASED WORK PATTERNS

2023 has been the hottest year on record and extreme weather events are becoming more common<sup>17</sup>. The need to adapt working life to climate change means that the regular 9-5 work pattern is no longer tenable in the office or at home. In the hottest months, even in a temperate climate, workers, particularly those in manual labour, may be required to work from 4 or 6 am until no later than 2 pm. Increased demand for cooling in air-conditioned office spaces will also force us to adapt office hours, taking into account patterns in Mediterranean countries or countries with extreme heat in central Africa<sup>18,19</sup>. For many places, this means adapting new cultural norms regarding breaks, siestas and workload management. It will also require more asynchronous work communication, more flexible logistics systems or aligning the working patterns of educational and social services with new work patterns.

### MULTILATERAL PATCHWORK

It is well recognised that there are ongoing shifts in the global geopolitical landscape. One result may be the emergence of a multilateral patchwork. For instance, China is the world's biggest bilateral lender in terms of debt stock, and its influence and role in providing financing to emerging countries has been growing. Still, multilateral organisations, such as the IMF and the World Bank, should not be discounted. In 2020-2021, financial flows to developing countries by multilateral institutions were far greater than those from China<sup>20</sup>. In 2023, the G20 granted permanent membership to the African Union<sup>21</sup>, making the forum more inclusive and open to more influence from African countries. Another trend is minilateralism, meaning international cooperation on specific issues or smaller groups of countries pursuing common goals more informally, i.e. outside of multilateral structures or without universal treaties. There are some topics of global relevance, such as ongoing work for a renewed international agreement on pandemic preparedness, particularly in the WHO but also elsewhere<sup>22</sup>, which can be seen as a recent example of pursuing focused, limited cooperation in the emerging multilateral patchwork.

### MEDICALLY PRESCRIBED DIETS

Therapeutic diets offer solutions to certain health problems like cardio-vascular diseases or diabetes. These diets are becoming increasingly effective combined with personalised lifestyle coaching that includes nutritional counselling tailored to a patient. Understanding the complex interplay between consumption of specific foods and health and disease outcomes has enormous potential to inform certain actions, for example, preventing metabolic diseases<sup>23</sup>. Dietary interventions are not new, but there is still a long way to go in developing the diets that will noticeably impact public health and integrating them to healthcare systems. Prescription of diets instead of pharmaceuticals requires significant change in thinking and behaviour. The Rockefeller Foundation and the American Heart Association, have mobilised USD 250 million to roll out the nationwide 'Food is Medicine Research' initiative. This aims to generate evidence and tools to help the health sector design and scale programmes that increase access to nutritious food, improve both health and health equity, and reduce overall healthcare costs<sup>24</sup>. Fast developing detection methods and increasing self-monitoring allows for even more fine-tuned and personalised medical diets. Start-ups offering solutions to medically tailored meals, personalised nutrition supplements and apps supporting healthy eating are attracting venture capital<sup>25</sup>.

### ACOUSTIC RESTORATION OF NATURE

Acoustic restoration focuses on using soundscapes to help restore ecosystems after natural or anthropogenic catastrophes or ecological degradation. Sounds of healthy ecosystems can be used to lure single species or groups of species for recolonisation to speed up recovery. They can also help increase the number of animals visiting specific ecosystems, which in turn increase the availability of seeds, spores, bacteria and fungi re-inoculating aquatic and terrestrial communities<sup>26</sup>. Recordings of ecosystem soundscapes can also serve as a benchmark for restoration (using sounds produced by the ecosystem before its degradation), and to measure biodiversity<sup>27,28</sup>. Furthermore, natural soundscapes are being increasingly viewed as important for creating 'restorative environments' for people – facilitating recovery from everyday cognitive fatigue, negative mood and stress<sup>29</sup>.

17 <https://climate.copernicus.eu/copernicus-2023-hottest-year-record>

18 Miranda, N.D., Lizana, J., Sparrow, S.N. et al., Change in cooling degree days with global mean temperature rise increasing from 1.5°C to 2.0°C. *Nat Sustain* 6, 1326–1330 (2023). <https://doi.org/10.1038/s41893-023-01155-z>.

19 Y.J. Masuda, B. Castro, I. Aggraeni, N.H. Wolff, K. Ebi, T. Garg, E.T. Game, J. Krenz, J. Spector, How are healthy, working populations affected by increasing temperatures in the tropics? Implications for climate change adaptation policies *Global Environ. Change*, 56 (2019), pp. 29–40.

20 <https://viewpoint.eiu.com/analysis/article/1803489963>

21 <https://viewpoint.eiu.com/analysis/article/1353516518>

22 <https://journals.plos.org/globalpublichealth/article?id=10.1371/journal.pgph.0001921>

23 <https://www.nature.com/articles/s41591-023-02330-7>

24 <https://www.rockefellerfoundation.org/news/statement-by-dr-rajiv-j-shah-president-of-the-rockefeller-foundation-and-nancy-brown-ceo-of-the-american-heart-association-on-new-food-is-medicine-research-initiative/>

25 <https://www.wsj.com/articles/food-as-medicine-startups-draw-venture-capital-11665050402>

26 Znidarsic, E. & Watson, D.M. (2022) Acoustic restoration: Using soundscapes to benchmark and fast-track recovery of ecological communities, *Ecology Letters*, 25, 1597–1603. Available from: <https://doi.org/10.1111/ele.14015>.

27 Müller, J., Mitesser, O., Schaefer, H.M. et al. Soundscapes and deep learning enable tracking biodiversity recovery in tropical forests, *Nat Commun* 14, 6191 (2023). <https://doi.org/10.1038/s41467-023-41693-w>.

28 Robinson, J.M., Breed, M.F. and Abrahams, C. (2023), The sound of restored soil: using ecoacoustics to measure soil biodiversity in a temperate forest restoration context, *Restor Ecol*, 31: e

29 Ratcliffe E (2021), Sound and Soundscape in Restorative Natural Environments: A Narrative Literature Review, *Front. Psychol.* 12:570563. doi: 10.3389/fpsyg.2021.570563.



## SHIFTING DEMOCRATIC MAJORITIES

In August 2020, an analysis of census data<sup>30</sup> led to reports that Generation Z would be the last generation to have a white majority<sup>31</sup>. A couple of months earlier, the City Council of Hamtramck, Michigan, the first in the US to have a Muslim majority, voted to ban the flying of the Pride flag on city property<sup>32</sup>. These developments are a reminder that a demographic transition is underway in several countries and cities, and that it can be accompanied by polarisation between different groups. There is some irony in the City Council's decision in that a group that has historically been a minority and the target of several forms of discrimination embraced a measure that discriminated against another minority. However, demographic trends do not point to the simple replacement of one cohesive majority by another. Rather, city populations will comprise groups of several different identities. Achieving political power at city level may increasingly depend on attracting support across ethnic and religious divides. This can also involve attempts to stigmatise and exclude particular groups. A general trend towards polarisation of this kind would be a huge challenge both to democracy and social solidarity.

## SLEEP HYGIENE

Addressing sleep quality may be an easier way to start for people who are interested in getting mental healthcare but still reluctant to take the first step<sup>33</sup>. Stress and financial pressures are the top two factors affecting workers' sleep quality. Businesses providing a place to rest will reduce the costs incurred from lost time and the fatigue-related errors<sup>34</sup>. It also allows senior management the chance to acknowledge the challenges of the 24/7 culture and come up with top-down solutions that encourage workers to take care of themselves both in and out of work, which could go a long way in terms of retention. Some businesses, including Thrive and HuffPost, have already provided facilities for employees to take naps, with Google providing sleep pods as far back as 2014 and companies including Nike and Ben & Jerry's providing nap rooms. The practice has even been adopted by the NHS, with a growing number of hospitals introducing sleep pods for staff to help them get more rest. Taking a short nap during the day may help to protect the brain's health as it ages. Researchers have suggested this after finding that the practice appears to be associated with larger brain volume. While previous research has suggested long naps could be an early symptom of Alzheimer's disease<sup>35</sup>, other work has revealed that a brief doze can improve people's ability to learn<sup>36</sup>.

## WIRELESS BODY AREA NETWORKS

The number of wearable connected devices has been increasing steadily, reaching 1.1 billion in 2022<sup>37</sup>. They are primarily used for monitoring personal health and well-being. However, when many users are connected to a common wireless system, it can also act as a monitoring and warning system as regards the environment, for example, monitoring safety in mines (CO<sub>2</sub>, temperature, humidity)<sup>38</sup>. These developments lead to creating wireless body area networks, which connect many wearable and implanted biomedical sensors on someone's body to provide a more complete picture and enable the person to act on it<sup>39</sup>. The applications of such networks include healthcare, emergency services, military, education, professional sport and fitness, consumer electronics, and games<sup>40,41</sup>.

## ADAPTATION STRATEGIES TO BIODIVERSITY LOSS

Despite biodiversity loss being recognised as a major crisis or a 'sixth extinction', with various pledges being made to stop and reverse the trend, there is a continued decline of biodiversity and degradation of ecosystems<sup>42</sup>. This could mark a shift from the current focus on mitigation strategies to adaptation. While adapting to climate change may be a part of it, there are other important drivers to consider: land use change and habitat fragmentation, pollution, invasive species, and over-exploitation<sup>43</sup>. Human systems have been implicitly adapting to these changes, but more explicit strategies may need to be considered to deal with such consequences as: i) reductions in the immediate availability of food (and less diverse diets), medicine, fuel and fibre; ii) lower primary productivity; and

30 <https://www.brookings.edu/articles/new-2020-census-data-shows-an-aging-america-and-wide-racial-gaps-between-generations/>

31 <https://www.theguardian.com/us-news/2023/aug/08/gen-z-americans-white-majority-study>

32 <https://www.theguardian.com/us-news/2023/jun/17/hamtramck-michigan-muslim-council-lgbtq-pride-flags-banned>

33 <https://www.aol.com/sleep-hygiene-may-hr-next-132228305.html>

34 <https://www.theguardian.com/science/2023/jun/20/short-daytime-naps-may-keep-brain-healthy-as-it-ages-study-says>

35 <https://www.theguardian.com/society/2022/mar/17/naps-early-sign-alzheimers-disease-study>

36 <https://www.theguardian.com/science/2010/feb/21/naps-improve-learning-ability>

37 <https://www.statista.com/statistics/487291/global-connected-wearable-devices/>

38 H. C. Nguyen, T. H. Dam, M. T. Le, Q. C. Nguyen and D. D. Nguyen, 'Internet of Things-Based Telehealth Monitoring System in Mines: Architectural Concept and Wearable Device Prototype,' 2023 IEEE 9th International Conference on Smart Instrumentation, Measurement and Applications (ICSIMA), Kuala Lumpur, Malaysia, 2023, pp. 121-126, doi: 10.1109/ICSIMA59853.2023.10373536.

39 Salehi Shahraki, A.; Lauer, H.; Grobler, M.; Sakzad, A.; Rudolph, C., Access Control, Key Management, and Trust for Emerging Wireless Body Area Networks, *Sensors* 2023, 23, 9856. <https://doi.org/10.3390/s23249856>.

40 Bhatti, D.S.; Saleem, S.; Imran, A.; Iqbal, Z.; Alzahrani, A.; Kim, H.; Kim, K.-I., A Survey on Wireless Wearable Body Area Networks: A Perspective of Technology and Economy, *Sensors* 2022, 22, 7722. <https://doi.org/10.3390/s22207722>.

41 Al-Sofi, Soleen Jaladet, Salih Mustafa S. Atroshey, and Ismail Amin Ali. 'Review of Wireless Body Area Networks: Protocols, Technologies, and Applications', *Bulletin of Electrical Engineering and Informatics* 12, no. 6 (December 1, 2023): 3677–89. <https://doi.org/10.11591/eei.v12i6.5543>.

42 WWF (2022) *Living Planet Report 2022 – Building a nature-positive society* (eds. Almond REA, Grooten M, Juffe Bignoli D, Petersen T). WWF, Gland, Switzerland.

43 <https://www.ipbes.net/topic/how-when-does-autochthonous-human-adaptation-biodiversity-change-lead-transformation>

iii) reduced availability of keystone species (pollinators, seed dispersers)<sup>44</sup>. Where local communities that depend on biodiversity-rich ecosystems already need to adapt to sustain themselves in a changing environment (often through ecological diversification, resource tracking, disintensification and shifts in species), issues like multilevel governance, building on indigenous knowledge and creating adaptation pathways are crucial for success<sup>45</sup>.

## NATURE MARKETS

Market mechanisms are used for environmental protection and climate mitigation in various ways, most notably through carbon markets. Their focus is mostly on concrete ecosystem service or particular issues, e.g. carbon, water, wetland restoration with their particular market design challenges<sup>46</sup>. The term ‘nature markets’ try to adopt a broader perspective, looking at the whole subset of the economy where nature is specifically traded and valued, from large agricultural commodity markets to other ecosystem or natural capital markets<sup>47</sup>. Within the nature markets there are four segments: i) intrinsic markets (trade of resources), ii) asset markets (trading rights to ecosystem assets), iii) credit markets (trading allocated units), and iv) derivative markets. This broader conceptualisation can offer more coherent approaches to tackling the interconnected environmental challenges and help companies and countries build better strategies and ways of working with those markets to improve environmental outcomes.

## INTERGENERATIONAL CLASH – YOUNG PEOPLE’S PRIORITIES CHANGING

Young people across Europe are quitting their jobs, which is becoming one of the biggest barriers to addressing the skills shortage for companies, according to a new report<sup>48</sup>. New figures reveal how 60% of talent managers say the trend of younger workers quitting, and their struggles to attract new hires with the right skills, means they cannot fill their skills gaps. Furthermore, younger people are not aspiring to become managers. There was a time when the title ‘manager’ meant prestige, respect, maybe even admiration – a chance to lead, a pathway to the top. But that dynamic has been shifting for decades and can now feel out of touch and out of date. In China, hundreds of posts about resignation parties have been spreading on Chinese social media since 2023. Most of the people participating in the trend are in their 20s, citing various reasons for quitting ranging from low wages to burnout according to China’s LinkedIn equivalent Maimai<sup>49</sup>. Furthermore, young people are spending more now and worrying less about retirement. A ‘soft saving’ trend, i.e. putting less money into the future and using more of it for the present<sup>50</sup>, is emerging among younger workers, challenging the traditional way of thinking.

## COMMUNICATING SCIENCE THROUGH FAIRY TALES

Recent academic articles describe how fairy tales are useful for communicating scientific concepts<sup>51</sup>. The idea is that a more playful approach to communication can better reach non-expert audiences. This builds on an existing trend of using storytelling in the social sciences. It is also related to the ‘STEAM’ concept – the idea that adding Arts to STEM education can improve retention of ideas<sup>52</sup>. Attaching a fairy tale image to an idea can make it more memorable; it can also cater for a degree of complexity. The article cited gives the example of characterising renewable energy as a mermaid. While the image is positive, it also has an element of unreality. By implication, promoting renewable energy is attractive, but should not overshadow the need for other measures, such as demand reduction. This approach allows for more creativity, and seems more likely to engage readers. One possible consequence would be to counteract the tendency to exclude conclusions of hard science from public debates. Communication that incorporates imagination and indeed emotion can boost the impact of empirical results. Every civilisation has its folklore; this shows how deeply metaphor and fantasy are ingrained in human consciousness. Efforts to improve digital skills are undoubtedly important but so are the cultivation of human and interpersonal skills linked to the humanities. Both skills can be combined in a concerted effort to preserve and pass on the global treasure of folklore and fairy tales.

## SIMULATING SOCIAL INTERACTIONS

Virtual and mixed reality technologies have been successfully used to create training environments in medical fields, safety and security, education and other fields<sup>53</sup>. Virtual reality provides a means for creating unique, tailored exposure scenarios that can simulate real-life experiences, e.g. for treating anxiety disorders<sup>54</sup>, increasing

44 <https://www.iied.org/adaptation-missing-ingredient-new-un-biodiversity-action-plan>

45 Howard, P.L., Pecl, G.T., Introduction: Autochthonous human adaptation to biodiversity change in the Anthropocene, *Ambio* 48, 1389–1400 (2019). <https://doi.org/10.1007/s13280-019-01283-x>.

46 Alexander Teytelboym, Natural capital market design, *Oxford Review of Economic Policy*, Volume 35, Issue 1, Spring 2019, Pages 138–161, <https://doi.org/10.1093/oxrep/gry030>.

47 Taskforce on Nature Markets, *Making Nature Markets Work*, October 2023, <https://www.naturemarkets.net/publications/making-nature-markets-work-extended-report>.

48 <https://www.euronews.com/next/2023/10/23/young-people-across-europe-are-quitting-their-jobs-and-companies-are-struggling-to-fill-th>

49 <https://us.cnn.com/2023/10/05/economy/china-youth-resignation-parties-intl-hnk/index.html>

50 <https://www.cnbc.com/2023/10/23/soft-saving-trends-reshape-gen-z-millennials-personal-finance-goals.html>

51 <https://www.sciencedirect.com/science/article/pii/S2214629623001603>

52 <https://www.jstem.org/jstem/index.php/JSTEM/article/view/1744/1520>

53 A. Peña-Rios and J. G. Wu, ‘Guest Editorial The Metaverse and the Future of Education’, in *IEEE Transactions on Learning Technologies*, vol. 16, no. 6, pp. 887–891, Dec. 2023, doi: 10.1109/TLT.2023.3324843.

54 Andersen, Nicole J., Deborah Schwartzman, Carolina Martinez, Gina Cormier, and Martin Drapeau, ‘Virtual Reality Interventions for the Treatment of Anxiety Disorders: A Scoping Review’, *Journal of Behavior Therapy and Experimental Psychiatry* 81 (December 2023): 101851. <https://doi.org/10.1016/j.jbtep.2023.101851>.

empathy<sup>55</sup> or improving social cognitive skills<sup>56</sup>. Simulations can also support self-observation, i.e. observing virtual body-double in social interactions can help in the technique known as mental rehearsal that helps reduce anxiety in such interactions<sup>57</sup>. Continued technological advancement and cost reduction will soon make this technology much more accessible to a wide range of audiences<sup>58</sup>. This will allow them to rehearse and pre-experience expected everyday social interactions, receiving both detailed feedback and recommendations on potential improvements. This can have a significant impact on the quality and nature of social interactions at the workplace and in everyday life.

## INSTITUTIONAL REMEMBERING FOR PREPAREDNESS

Over the last few years, the world has experienced a large number of crises and disasters. The world is currently on course to pass 2°C of warming in the 2040s or 2050s and we are facing more and more extreme weather events every year<sup>59</sup>. A comprehensive study of epidemiological data shows a worrying trend in zoonotic infections in humans, with prevalence and morbidity increasing at an exponential rate. Up to 12 times more people could die from zoonotic viruses by 2050<sup>60</sup>. According to the 2023 State of the World's Preparedness report, we have the knowledge to stop the next pandemic, but in practice the gaps in preparedness leave us dangerously exposed and preparedness remains fragile<sup>61</sup>. Post-disaster recovery requires learning from past experience, but collective memory results from a balance between remembering and forgetting elements of the disaster<sup>62</sup>. Institutional forgetting happens through positing individual and collective memories outside the public sphere, discouraging commemorative practices, therefore removing blame for past failures as well as responsibilities for future preparedness<sup>63</sup>. Another attempt to explain the surprised reaction of governments to extreme weather, pandemics and migration crises despite their considerable knowledge of these global threats is through a concept of 'known-corporally but unknown intellectually' threats, which means opposing abstract knowledge to personal, bodily experience<sup>64</sup>.

## GREEN CRIME AND CORRUPTION

With increased public investment in green projects and more restrictive environmental regulation, the scope for environmental crime is widening. Traditionally concentrated around the issues of waste management, illicit trafficking (wildlife, timber, fish), illegal mining and ozone-depleting substances, criminal activities have expanded to include water management, illicit trade in chemicals, and pollution crime<sup>65</sup>. These activities involve in many cases organised crime, fraud, document forgery and money laundering<sup>66</sup>. Green criminology offers a broader look at the range of victims (human and non-human) and approaches to achieving environmental restorative justice<sup>67,68</sup>. Green corruption has gained particular attention recently, as playing a crucial role in facilitating crime<sup>69</sup>. In the presence of corruption, implementing technologically advanced environmental policies may have an opposite effect.<sup>70</sup> At the same time people's perception of environmental problems correlates with perception of corruption undermining trust in government<sup>71,72</sup>.

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## **UNBOXING MANUFACTURING**

At a presentation to investors in March 2023, Tesla presented a new manufacturing technique that replaces assembly line production with modular sub-assemblies that are only connected at the end<sup>73</sup>. Together with its Giga Press die-casting programme<sup>74</sup>, creating single-piece complex components<sup>75</sup>, this technique could considerably increase the efficiency of developing and manufacturing complex objects, such as cars, robots, etc. Tesla claims that it could help shorten the time needed to develop new vehicles to 1.5-2 years (from 3-4), reduce costs by 30% and manufacturing space by 50%<sup>76</sup>.

## **MAINTENANCE OF HUMAN-ENHANCING TECHNOLOGY**

There is an emerging issue around the long-term maintenance and support of human-enhancing technology and devices. The companies developing and manufacturing these devices are initially accountable for ensuring their proper functioning and updates, and for addressing any issues that may arise. However, if the responsible company goes out of business or moves on to other products, several challenges can emerge. Users may face difficulties getting technical support, updates, or necessary repairs, due to lack of availability or affordability. This could jeopardise the effectiveness and safety of implanted technology, such as brain implants. The lack of ongoing maintenance may lead to functional issues, potential health risks, or even render the enhancements obsolete<sup>77</sup>. There is a growing need for regulatory frameworks that ensure the ongoing support and maintenance of human-enhancing technologies.

## **REVISITING 'GLOBAL SOUTH'**

The traditional divisions between what has been termed the 'Global North and South' are evolving or becoming less relevant due to shifts in economic power, development, and geopolitical dynamics. It is projected that by 2030 three of the four largest economies will be in Asia, with the order being China, India, the United States and Indonesia. Already the GDP in terms of purchasing power of the BRICS nations – Brazil, Russia, India, China and South Africa – surpasses that of the G7. The withdrawal of France from Niger and the US from Afghanistan also symbolises a retreat of West and the redundancy of the corresponding 'South'. As the political and economic influence of various countries across the globe grows and as there is an increased hostility towards post-World War II multilateral organisations, the future is unlikely to reflect the logic behind the idea of a global south and north. Although both China and India are competing to assert their role as the leader of the 'Global South', their success has been limited and it may be time to move on from this thinking.

73 <https://www.core77.com/posts/120223/Teslas-Radical-Unboxed-Manufacturing-Technique-Could-Reduce-Costs-by-50>

74 Die-casting is manufacturing process in which molten metal is forced into fixed molds. The Giga Press uses huge die-casting machines to create single-piece components for its vehicles.

75 <https://www.reuters.com/technology/gigacasting-20-tesla-reinvents-carmaking-with-quiet-breakthrough-2023-09-14/>

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