



ESPAS HORIZON SCANNING

SIGNAL●CARDS



THE SIGNAL ● CARDS FOR HORIZON SCANNING

What is horizon scanning?

Horizon scanning is a foresight exercise to systematically identify and examine early signs of future developments which are at the margins of the current thinking but may have an important impact in the future.

What are the Signal Cards?

The Signal Cards present emerging issues identified during the ESPAS Horizon Scanning activity. The cards are ideal for workshops to expand thinking, foster imagination and explore different potential futures.

How to use the Signal Cards?

The Signal Cards can be used in various settings. Here we propose four different short exercises to be used at the beginning of a workshop to spark imagination and encourage looking forward. A fifth exploratory exercise to imagine future developments of the signals and their potential impacts can be used for example at the beginning of a project.

The set of Signal Cards will be updated annually with the new signals. This set is 2026 edition. Please provide feedback, ask for support or present your unique way of using the Signal Cards for future editions by dropping us an email at: JRC-HORIZONSCAN@ec.europa.eu

Illustrations by Alice Conquand.

Signal Cards are available to any interested party under a Creative Commons license.

THE SIGNAL CARDS' CATEGORIES

The Signal Cards are categorised by the novelty aspects below, describing the nature of the change.



CONTRADICTION - demonstrates opposing or incongruous forces at play simultaneously



INFLECTION - occurrences that mark a major turning point or establish a new paradigm



EMERGING - emerging behaviours that are becoming more pronounced or gaining in popularity



HACK - inventive, unintended uses of tools, technologies and systems



EXTREME - instances of technologies, functions or concepts being pushed to new limits that might change the nature of their use



NOVELTY - vague developments, which are difficult to interpret



DISRUPTION - ripples through industries, questions best practices and lifelong experiences



TRANSFORMATIVE - game changer, reframes our understanding

ICE BREAKERS / INTRODUCTORY EXERCISES

 15-30 min

Short exercises at the beginning of any workshop/meeting to broaden the thinking, spark imagination and encourage looking forward.

Choose the one best fitting your workshop goal.

Exercise A: **The most relevant signals**

1. Each participant selects one Signal Card they think is most relevant to the workshop topic.
2. Form groups of 3-4 participants.
3. Each participant presents their chosen signal and explains why they selected it.
4. After hearing from everyone, the group agrees on the most relevant signal.
5. Subgroups present the selected signal to all participants.

Exercise C: **Changing the perspective**

1. Each participant selects one Signal Card based on curiosity.
2. Form groups of 2-4 participants.
3. Each group discusses how their selected signals could change the perspective on the topic of the workshop.

Exercise B: **Different aspects of novelty**

1. Form groups of 3-5 participants.
2. Each group selects 4-6 cards from different novelty categories.
3. The group answers the question on each Signal Card.
4. Next, they describe a future where all the signals become reality.

Exercise D: **Culminating impacts**

1. Each participant selects one Signal Card based on curiosity.
2. Participants read their signal and reflect on its potential impact on the workshop topic.
3. Form groups of 2-3 participants.
4. Each group discusses how their signals together could impact the workshop topic.

FUTURE DEVELOPMENTS IMPACTS

 2-3 h

Exploratory exercise to imagine future developments and their potential impacts for example at the beginning of a project.

1. FORM GROUPS: Divide participants into groups of 4-7 people.
2. SELECT SIGNALS: Each group selects 3 signals based on curiosity.
3. IMAGINE THE FUTURE: Groups envision a world where all selected signals have become mainstream and create a headline for a news article that describes this future.
4. POTENTIAL IMPACTS: Identify potential direct impacts of this future using the STEEP (social, technological, economic, environmental, political) framework. Then identify second level consequences for the already listed impacts.
5. ANALYSIS: Select a question based on your needs to further explore the identified potential consequences:
 - ☐ Which of the consequences needs further analysis?
 - ☐ What actions should be taken now to deal with possible opportunities and challenges?
 - ☐ Which possible developments should be considered in future strategies/policies?

PREPARATIONS



The Signal Cards database contains almost 100 cards. **Pre-select** a sufficient number of cards to have **2-3 cards per participant** to ensure there is enough time for reading and reflecting without it being overwhelming.



Random selection often works best to ensure variety and broadness of the topics.



For a more focussed discussion it is better to have a **curated selection of Signal Cards linked to the workshop topic and context**. However, try not to narrow the selection too much, as the goal is to encourage thinking beyond familiar topics.



Print the chosen cards (ideally on thick paper, 2 pages per A4 sheet to get A5 sized cards) or paste them as pictures to a digital platform for online workshops.

THE FUNGI ECONOMY



EXTREME

Fungi, once mainly linked to diseases, are now recognised as a sustainable means to produce resilient food, feed, chemicals, fuels, textiles, and materials for construction, automotive, and transportation industries, as well as furniture. As the field grows and consolidates, mushroom and mycelium production will expand, offering potential for rural areas in developing countries.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

XENOTRANSPLANTATION

With a shortage of organs for transplantation, xenotransplantation, or the use of animal-derived organs and cells in humans, has shown promising breakthroughs. Recent emergency authorisations by the US Food and Drug Administration enabled transplants of genetically modified pig hearts and kidneys. Plans for clinical trials are underway, though challenges like costs, immunosuppression, and genetic engineering remain. This opens possibilities for increased access and personalisation of organs. However, the procedure raises ethical concerns, including medical risks and broader metaphysical and social issues.



EXTREME

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

RADICAL TRANSPARENCY



EXTREME

Trust and social capital in societies are decreasing, and the abundance of information has led to increased calls for radical transparency. This involves being explicit about values, open processes, and providing information for scrutiny, such as publishing contracts and sharing salary details. It also includes offering raw content, often through new technologies like livestreaming and body cameras. Currently, radical transparency is driven by strong external pressures on organisations, but it could become the norm.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

HUMAN BODY AS A RESOURCE



EXTREME

Death remains a principal consideration, but bodies can increasingly serve as resources. Voluntary organ donation is often the first thought, but a bill proposed in Massachusetts suggested organ donation in exchange for reduced sentences. Medical progress makes it plausible to donate bodies for gestational purposes, and preserving sex cells from deceased people for posthumous reproduction is also possible. Finally, the revived interest in cryonics, with over 500 people preserved worldwide, highlights the growing interest in using the human body as a resource.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

RADICAL FOOD PRODUCTION



EXTREME

As global food demand rises and climate change makes growing conditions harder, humans are exploring radical methods for better production. New crop varieties cultivated in space could help farmers adapt and boost food supplies. Initial research shows high-quality seeds can withstand challenging conditions. The International Atomic Energy Agency and the Food and Agriculture Organization are analysing seeds exposed to space mutagenesis at the International Space Station. Additionally, underground greenhouses, using geothermal energy, could protect crops from extreme weather and ensure year-round production. Both approaches anticipate increasingly difficult conditions for future food production.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

SOLAR RADIATION MODIFICATION



EXTREME

Increasing voices are advocating alternative 'emergency' options to control global temperature rise. One such option is Solar Radiation Modification (SRM), specifically Stratospheric Aerosol Injection (SAI), which aims to cool the planet by reflecting sunlight into space or allowing more infrared radiation to escape, thereby reducing Earth's temperature. These methods vary significantly and are not ready for deployment. SRM is a complex, controversial, and under-researched technology. However, some scientists and companies are moving towards deployment, with research and discussions occurring at high levels, despite incomplete understanding of the implications. This contradicts the precautionary principle, essential for technologies that modify the atmosphere.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

IN-SPACE MANUFACTURING FOR THE EARTH



EXTREME

Varda Space start-up has been one of the first to launch a compact space factory, consisting of a commercial satellite platform attached to two modules. One module contains equipment for autonomously manufacturing a product, and the other is a re-entry capsule to return the goods to Earth. In-space manufacturing, primarily for the pharmaceutical, semiconductor, beauty, and health industries, benefits from microgravity, ultra-vacuum, and containerless processing at high temperatures to produce high-quality products difficult to make on Earth. Other efforts to move activities beyond Earth's atmosphere include data centres and space-based solar power.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

VALUING ATMOSPHERIC ECOSYSTEM SERVICES

The Earth provides various ecosystem services, but atmospheric services have historically received the least attention. Previously considered less relevant due to their abundance and renewable nature, there is growing recognition of the importance of quality air for breathing, radiation protection, cleansing capacity, warming, direct use, water redistribution, combustion, sound, communication, power, extraction of gases, tourism, and aesthetics. Increased interest in air for CO₂ extraction and utilisation (protein, bio-based chemicals), as well as water extraction or hygroelectricity (electricity from humid air), is changing perceptions of air as a resource.



EXTREME

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

NETWORKED MICROBIOMES



EXTREME

A diverse range of bacteria, fungi, archaea, and viruses, totalling trillions of microorganisms, exist on and in human bodies, forming the human microbiome. This significantly impacts human physical and psychological well-being. All other life forms, such as animals and plants, along with their habitats like soil, air, or water, also contain microbiomes. Previously seen as isolated, recent studies focus on interactions between multiple microbiomes. This broader perspective views individuals as symbiotic consortia of many species and ecosystems, or 'holobionts', prompting calls for microbial ethics to engage thoughtfully with the microbial world that shapes human life.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

HARNESSING BIOELECTRICITY



EXTREME

Researchers are exploring bio-electricity generation. Electric eels can emit enough electricity to genetically modify small fish larvae, enhancing our understanding of electroporation, a gene delivery method. Electroporation uses an electric field to create temporary pores in cell membranes, allowing molecules like DNA or proteins to enter cells. An electrically conductive substrate called eSoil has been developed. Made from plant-derived cellulose nanofibres and conductive polymer PEDOT:PSS, eSoil boosts plant growth by an average of 50% compared to control groups. Unlike previous methods using high-voltage electricity, eSoil requires a safer, energy-efficient low-voltage current for enhanced plant growth.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

SUDDEN COLLAPSE OF CARBON SINKS



The faster than expected disappearance of carbon sinks signals that climate change tipping points are already upon us. Critical ecosystems like forests and rivers, which once absorbed vast amounts of carbon, are now under severe threat. Intensifying forest fires, particularly in northern regions, not only release stored carbon and disrupt ecosystems but hamper future capacity of forests to capture CO₂. Record dry conditions are depleting the Amazon River, threatening biodiversity and reducing its capacity as a vital carbon sink. Global change indicators are flashing direct warnings, highlighting the unprecedented risks to human civilization. With these feedback loops accelerating, urgent massive action is essential to mitigate further damage and protect the planet's remaining carbon-absorbing systems.

EXTREME

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

PERSONAL SCIENCE AND SELF-EXPERIMENTATION

Personal science involves answering personal health questions through self-research. The rise of personal medical data and new discoveries has encouraged daring self-experiments. Some technologies enable DIY pharmaceutical production. The Anarchist Four Thieves Vinegar Collective uses machine learning to map chemical pathways and suggest reactions to create molecules, producing costly medicines at lower prices. This also applies to pharmaceuticals that are hard to access or controversial. The collective believes everyone has the right to repair their body, even if it means bypassing professional advice.



EXTREME

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

OVERSIMPLIFYING EDUCATION



EXTREME

A trend towards simplification is emerging. Culture and education are being diluted to boost accessibility instead of helping people engage with complex ideas. Examples include renaming spider species in Finland to reduce fear and stigma. Another is an 'emotional bookshop' in Naples that arranges books by emotions rather than topic. Growing reliance on AI, edutainment and gamification risks oversimplifying public discourse, while the market for educational products expands, as with Netflix's 'Adolescence' in UK school curricula. Meanwhile, news avoidance is rising, raising doubts about our commitment to depth.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

REVERSAL OF CHRONIC DISEASES



EXTREME

Medicine is entering a new era that aims not just to treat disease but to reverse it. For chronic conditions such as type 2 diabetes, heart disease and hypertension, the goal is to remove symptoms, normalise biomarkers like blood sugar and blood pressure, and reduce reliance on drugs through lifestyle change. This process draws on better nutrition, regular exercise, stress management, good sleep and strong social ties. Regenerative medicine complements this shift by repairing or replacing ageing cells and tissues through cell and gene therapies, engineered organs and implantable devices.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

AUGMENTED REALITY MISINFORMATION

Augmented reality (AR) technologies open a seamless window onto our surroundings. They integrate features into glasses, cameras and other gadgets, and allow us to curate what we see. For instance, the 'Pride Vision' camera developed before the 2024 Upper House elections in Japan could detect candidates who support marriage equality by scanning their posters. Instagram influencer @benfluncer explores how AR glasses could give users control over adverts, blocking street ads and replacing them with preferred images. As AR becomes integral to daily life, tackling disinformation and misinformation in AR will be essential to protect especially younger users from online manipulation.



EXTREME

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

LIVING UNDERWATER



EXTREME

For decades, underwater living has fascinated science fiction enthusiasts. The Deep project aims to turn this vision into reality by establishing a permanent human undersea presence by 2027. Currently based in a former UK quarry, the project is developing subaquatic habitats. Vanguard, the first habitat, will soon host three people for short-term missions. It will provide experience to develop Sentinel, a more ambitious habitat for six people at depths of up to 200 metres. The project seeks a network of underwater bases supported by submarines, promising advances in marine science as climate change makes alternative living spaces more attractive.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

DEFENCE-FIRST BUSINESS MODELS



EXTREME

Leading consumer technology companies are pivoting from ‘non-military’ policies to ‘defence-first’ models. Between June and July 2025, the Pentagon awarded USD 800 million (USD 200 million each) to OpenAI, Google, Anthropic and xAI for ‘agentic AI’—autonomous systems for multi-step mission planning and vulnerability detection. Meta’s 2025 partnership with Anduril repurposes Reality Labs’ VR/AR into EagleEye battlefield systems on the Lattice command-and-control platform. In September 2025, Spotify founder Daniel Ek announced he would become executive chairman in January 2026 to build ‘defence supercompanies’ through his EUR 600 million stake in Helsing. Dual-use AI, venture cycles and private funding erode civilian oversight.

WHAT HAPPENS WHEN THIS SIGNAL IS PUSHED TO EXTREME?

COMMUNITY PSYCHOLOGY



With increasing focus on mental health, community psychology is now used to understand collective emotions, thoughts, and feelings. This perspective views community wellbeing as more than just individual wellbeing. It emerges from shared living experiences, including spatial and social inequalities, multiple settings and scales, and temporal choices and legacies. It also considers sustainability and inter-generational issues.

INFLECTION

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

META-CITIES



INFLECTION

For the first time, a significant part of the workforce can contribute to a city's economy without living there. The "Meta City" concept has emerged—networks of distributed communities acting as a single unit, linked to a global economic hub. These communities, in different time zones and locations, function together with a distinct structure. London and New York lead this trend, with other networks emerging. As cities grow into Meta Cities and aim to serve all citizens, including physical, digital, and non-human parties, their governance also requires new models.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

THE GIFT ECONOMY



INFLECTION

The term 'sharing economy' often refers to commercial platforms like Uber and AirBnB, but it also includes the rising trend of non-reciprocal giving, lending, and skill-sharing, integral to collaborative consumption. Platforms such as 'Buy Nothing', which grew to 5 million participants across 7,000 communities during the pandemic, and Freecycle, with 9 million members in over 5,000 local groups, exemplify this shift. As people transition from users to providers in collaborative consumption, the focus moves from utilitarian values to prosocial and altruistic ones.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

NEUROMORPHIC ENGINEERING



INFLECTION

Neuromorphic engineering involves designing computing technology inspired by biological neural systems. It replicates aspects of these networks as analogue or digital forms on electronic circuits, enabling deep-learning algorithms. Its main advantages include energy efficiency, speed, robustness against local failures, and learning capabilities. Beyond electronic devices, neural network hardware can be developed from any controllable physical system, such as optical or mechanical systems.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

WORKING ANIMALS' PERSONALITIES



INFLECTION

Animals play a vital role in ecosystem services like pollination, seed dispersal, pest control, and ecotourism. Efforts are ongoing to integrate animals into service provision in human-made environments, using circular business models like sheep mowing lawns or crows cleaning cigarette butts. As tasks become more cognitive, research into animal personalities—behavioural differences consistent over time and context—can help identify and collaborate with animals of different traits.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

ENGINEERING



INFLECTION

Designing the end of a product or service is crucial for a circular economy and the transition approach, where phasing out unwanted practices is as important as introducing sustainable ones. The role of an "endineer" is to consider the phasing out and off-boarding processes in the initial design. This phasing out should create a satisfactory experience when removing the product/service from one's life, including its disassembly, recycling, and emotional engagement. As transformation requires changes to lifestyles and processes, designing and celebrating finales can change consumer attitudes.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

DIPLOMATIC IMMUNITY CHALLENGED



INFLECTION

The immunity of diplomatic posts and staff is less certain in current geopolitical conflicts. Two recent attacks on diplomatic sites highlight this: the bombing of Iran's consulate in Damascus and police entry into Mexico's embassy in Ecuador. Meanwhile, 'Havana syndrome', a mysterious illness among US diplomats, has been linked to Russian activity. Diplomatic immunity is increasingly questioned just as the role of diplomacy becomes crucial for maintaining peace in a fragmented world.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

INHERITANCE ECONOMY



INFLECTION

People in advanced economies are expected to inherit about USD 6 trillion in 2025, around 10% of GDP, twice the 1960s share. In France alone, inheritance until 2040 is estimated at EUR 9 trillion, or EUR 667 billion per year. With slower economic growth and high asset prices, especially housing, inherited wealth increasingly outweighs earnings from work. This may raise inequality, weaken social mobility and reduce the effectiveness of economic policy. The 'Great Wealth Transfer' has prompted proposals for new inheritance-tax models and even universal inheritances for young adults.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

SCIENCE AUTOMATION



INFLECTION

The automation of scientific inquiry uses robotics in laboratories to run experiments with minimal human intervention. In chemistry, biochemistry and materials science, such automated science factories can work faster, safely and accurately, with greater reproducibility. They rely on AI for synthesis, evaluation and characterisation. The A-Lab at the Lawrence Berkeley National Laboratory is an automated lab where AI-guided robots synthesise and analyse materials and optimise research. Biofoundries and cloud labs let scientists submit experiments remotely. Growing automation will raise ethical challenges for aligning science with societal values and public trust.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

CENSORING MEAT AND DAIRY PRODUCTS



INFLECTION

Recently, health risks of meat consumption have attracted wide public attention. Meat eating is also increasingly seen as an ethical choice linked to animal welfare and climate change. These attitudes now appear in children's literature, where authors promote sustainable, compassionate lifestyles. The creators of the Finnish series 'Tatu and Patu' have removed references to meat and dairy from new editions, countering food industry marketing such as product placement. Similar changes include ending smoking in 'Lucky Luke' comics and removing offensive language from Roald Dahl's books. EU meat industry reactions resemble past tactics of the tobacco industry in resisting regulation efforts.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

SUSTAINABLE DEVELOPMENT GOAL FOR SPACE



INFLECTION

The UN 'Space2030' agenda seeks to enhance the role of space and integrate it with other sectors. The United Nations Office for Outer Space Affairs highlights how space activities support the 17 Sustainable Development Goals. Growing satellite constellations, commercial use of low Earth orbit and rising space debris, light pollution and emissions have prompted calls for a dedicated SDG on space. A 'space for all' approach should guide governments, space agencies and industry to use Earth's orbit sustainably. Any future space SDG must balance environmental, social, economic and political concerns while promoting exploration and enabling inclusive global participation in space.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

A LOOMING END OF MASS TOURISM



INFLECTION

Rising environmental risks and costs are undermining the traditional model of mass tourism. Heatwaves, wildfires and extreme weather are making destinations such as Mediterranean beaches and tropical islands less predictable and safe, while also increasing operational and insurance costs for tourism infrastructure. Governments are responding by internalising these risks through taxation and regulation, for example Hawaii's higher tourist taxes to fund climate adaptation and disaster-resilience measures. At the same time, global natural catastrophe losses now exceed USD 100 billion a year, forcing insurers to revise risk models. Travellers may face higher prices, limiting access to overseas holidays and deepening inequalities.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

STRATEGIC AND INSTITUTIONAL IGNORANCE



INFLECTION

As trends of turning away from evidence-based approaches grow, interest increases in the role of ignorance at individual and collective levels. At the individual level, deliberate ignorance is the conscious choice not to seek or use information; it can hinder or support decision making. At the organisational level, institutional ignorance arises from entrenched structures or cultures that block knowledge sharing and critical thinking. Managers use strategic ignorance to simplify complex choices, protect existing beliefs and avoid accountability. Non-knowledge is now seen as an institutional feature that, once acknowledged, can expose uncertainty and stimulate inquiry.

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

CLIMATE GHETTOS AND HAVENS



Increasingly frequent fires, floods and other extreme weather events linked to climate change increasingly shape decisions on where people buy property and settle, and more broadly affect human settlement patterns. Some cities brand themselves as 'climate havens', areas seen as less exposed to sea level rise, water scarcity and other climate impacts, and as having infrastructure to manage growth. In contrast, 'climate ghettos' concentrate marginalised populations in high-risk areas because of displacement, climate gentrification and socioeconomic inequality. No place will escape climate impacts, but uneven exposure may fuel social conflict and strain climate adaptation policies and spatial planning.

INFLECTION

CAN THIS SIGNAL POINT TO A MAJOR TURNING POINT?

EMBEDDED FINANCE



DISRUPTION

As online commerce and digital payment methods become the norm, many production and service companies and platform ecosystems are including financial services in their offerings—accounts or wallets, payments, and lending—to serve their customers (both businesses and consumers). This process is simplified with banking as a service (BaaS) provided by fintech companies and can include 'buy now, pay later' lending models or embedded insurance. This model is projected to grow fivefold over the next five years, from USD 200 million to USD 1.3 billion. Starbucks exemplifies this new model with its mobile app, where over 24 million members load more than USD 10 billion annually, with over USD 1 billion stored as unused card value.

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

TOKENISATION OF OWNERSHIP



DISRUPTION

Distributed ledger technologies are driving a trend to virtually fragment real-world assets into tradeable shares or digital tokens. These smaller, more affordable units offer increased liquidity and investment opportunities, with blockchain platforms providing a secure, transparent way to store and transfer tokens. The primary focus is on real estate markets, but experiments are also occurring in art, agricultural production (like tokenising a cattle ranch), insurance, automotive, and other sectors. The Boston Consulting Group estimates the industry could be worth USD 16 trillion in the future. Fractional ownership could transform the sharing economy, shifting from shared consumption to shared ownership.

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

COGNITIVE LIBERTY



DISRUPTION

With significant advancements in technology and brain implant safety, non-invasive brain monitoring, and neurotechnology applications are increasingly used beyond the medical field. Employee surveillance tools, or "bossware," utilise neural sensors to gather productivity and well-being data from workers' brains, promising increased productivity and safety, as offered by start-ups like InnerEye or Emotive. These "brain wearables" (earbuds, headbands, watches, tattoos) are also marketed as consumer devices promising improved focus, reduced cravings, creativity, or relaxation. Significant ethical issues arise, particularly concerning privacy. The concept of cognitive liberty is emerging to protect our freedom of thought, mental privacy, and self-determination over our brains and mental experiences.

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

TREE EXTINCTION CRISIS



Reforestation programmes are vital for climate change mitigation, carbon capture, and renewable energy targets. However, many poorly managed projects have negative consequences. One issue is "phantom forests"—failed initiatives to plant millions of trees. Another problem is the spread of invasive tree species, harming ecosystems and incurring costs. Additionally, climate-induced tree mortality is rising due to pathogens, droughts, heatwaves, fires, bark beetles, and pollution. The Global Tree Assessment indicates that one-third of the world's tree species are threatened with extinction, highlighting a tree extinction crisis.

DISRUPTION

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

WEATHER MANIPULATION AND ITS CONSPIRACIES



Climate change is causing more extreme weather events, particularly destructive tornadoes, prompting renewed interest in weather modification. Norway-based OceanTherm suggests cooling the sea surface by piping chilled water from below 200 metres. Another proposal is aerosol injection, which involves injecting water-attracting particles into the atmosphere to reflect sunlight and trigger rainfall. However, questions arise about governance, unintended climate consequences, and potential conflicts from altering cyclone paths. Despite previous failures, these ideas continue to be explored. At the same time, recent extreme weather in Dubai, the UK, and the US has led to conspiracy theories about governments manipulating weather for political purposes.

DISRUPTION

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

DISASTER AND CRISIS INEQUALITIES



Lately, in a fast-changing world where 'polycrisis' has become a buzzword, EU policymakers still promise a transition to a fair and sustainable future. Yet disruptions do not affect everyone equally. The 2008-2009 financial shock struck southern Europe hardest, fuelling economic and political crises, inequality, social unrest and distrust in institutions. Covid-19 has hit poorer people hardest, as they have poorer health, cannot easily work remotely and often lack adequate housing and healthcare. Climate change also widens inequalities, for example through deadly heatwaves, creating a long-term systemic policy challenge for Europe.

DISRUPTION

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

GLP-1 LOW CONSUMPTION ECONOMY



The growing use of GLP-1 weight-loss drugs such as Ozempic is reshaping consumer behaviour and market dynamics. By suppressing appetite and cravings, these medicines cut demand for high-calorie snacks, sugary treats and other foods bought for pleasure rather than nutrition, pushing food and beverage companies to rethink product portfolios and marketing. Beyond groceries, effects reach airlines, retail, fashion and other consumer sectors as shifting habits influence spending. Emerging evidence shows GLP-1 users spend less on dining out and indulgences, and more on wellness, fitness and lifestyle services. This 'GLP-1 economy' is changing what people buy and how they organise life.

DISRUPTION

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

PRODUCING AUTHENTICITY



Perceived authenticity is a valued trait in politics, management, entertainment and branding, as it relates to trust and loyalty. With growing mistrust, digital media and virtual environments, the search for ways to elicit authenticity is intensifying. To strengthen political authority, measurement scales can focus on consistency, intimacy, ordinariness and immediacy. Experiencing authenticity contributes to self-regulation, healthy relationships, psychological wellbeing and consumer behaviour. As people feel an increasing lack of authenticity, the market responds with authenticity training and authenticity leadership courses, which promise more genuine communication, more transparent decision-making and closer alignment between personal values and public roles in modern societies.

DISRUPTION

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

THE WEAPONISATION OF VISUAL DATA



Images are no longer mainly tools of human persuasion but operational inputs for autonomous violence. In this emerging 'post-representational' regime, visual data from smartphones, satellites and social media is harvested as training data and real-time targeting input for AI-enabled weapons. This collapses the boundary between civilian observation and military participation. As autonomous systems select and attack targets on the basis of 'generalised target profiles' built from visual datasets, every image of a person or place becomes potential ammunition in automated kill chains. The visual commons is being militarised in ways that current legal and ethical frameworks cannot govern.

DISRUPTION

WHAT CAN THIS SIGNAL DISRUPT IN OUR SOCIETIES?

CONSUMERS-TRADERS



EMERGING

Consumers are increasingly becoming producers (or prosumers) in a do-it-yourself, circular, and side-job economy, and they are also taking on the role of traders. Second-hand resale is rising significantly in sharing-economy platforms and social marketplaces, particularly in second-hand fashion, with sustainability objectives. Investment trading apps have made trading stocks, currencies, and crypto assets accessible to many people on a small scale. New business models are emerging based on energy resale; for example, Vehicle-to-grid (V2G) systems allow feeding energy stored in electric car batteries back to the electricity network.

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

NEUROECONOMIC EVIDENCE FOR POLICY



EMERGING

Neuroeconomics and social neuroscience, using brain imaging, provide insights into the neural mechanisms underlying decision-making processes and social behaviour. This field aims to address questions vital to policy implementation. Neuroeconomic data characterise choices at both individual and market levels, aiding in the development of new neurocomputational models of decision-making. This approach has been used to examine factors influencing climate change risk assessment, individual actions, social preferences, and collective action in environmental and energy policies.

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

OCEAN INDUSTRIALISATION



EMERGING

The rapid growth of the marine economy leads to an increase in the number and intensity of economic activities, known as the 'blue acceleration', and heightens pressures such as acidification, marine heatwaves, plastic pollution, and ecological connectivity. These activities—oil and gas extraction, renewable energy production, pipelines and cables, shipping, tourism, fisheries, aquaculture, blue biotechnology, and sand and mineral extraction—often conflict, though sometimes they are mutually beneficial, with various forms of marine spatial planning and governance. New aquaculture techniques, deep-water fishing, mining, and geoengineering ideas will further intensify these pressures.

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

AWESCAPES



EMERGING

In a world full of stimuli, people seek ways to escape and rest. Some enjoy nature and peacefulness, but a growing number long for more stimulating experiences. Yearning for moments that transcend daily life, people seek 'awescapes'—instances of jaw-dropping wonder. Companies try to bring consumers closer to these moments through disruptive green encounters or monumental installations, while virtual worlds offer endless alternatives. Whether numbed by isolation, burned out by grind culture, or shocked by crises, people long for re-enchantment. Awe, now a cutting-edge research subject in emotional psychology, may improve resilience and combat burnout. Awescapes may bring relief but could lead to stimulus overload.

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

EXTENSIONS OF CITIZENSHIP



EMERGING

The concept of citizenship extends beyond the nation-state to global, digital, and environmental domains, linked to education, rights, and obligations. In the EU, a 2023 Eurobarometer showed 72% of interviewees feel they are EU citizens, but only 58% were aware of their rights. The United Nations defines global citizenship as the social, political, environmental, and economic actions of globally minded individuals. Climate and digital citizenships emphasise rights and responsibilities in these domains. Another form of citizenship - Tuvalu, threatened by climate change, seeks to preserve its nation and culture digitally as a 'digital nation'.

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

MILITARY GRADE SOCIETY



As the definition of what is considered 'critical infrastructure' broadens to include an ever-growing range of assets, the demand for military-grade protection will intensify. This shift will require advanced security features to guard against threats such as cyberattacks, terrorism, war, and natural disasters, including increasingly extreme weather events and phenomena like earthquakes. The drive for more resilient infrastructure will lead to the use of cutting-edge technologies and robust design principles to ensure durability and adaptability. By prioritising military-grade protection, societies can improve preparedness, reduce vulnerabilities, and secure essential services, fostering stability in an unpredictable world. However, these enhanced measures may make many societal infrastructures less inclusive due to the need to profile users to deter potential disruptors.

EMERGING

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

CHRONOWASHING



EMERGING

More structured and organised approaches to thinking about the future, such as foresight or futures literacy, have gained popularity. The UN Pact of the Future highlights strategic foresight capacities in public and international institutions to ensure long-term planning, with countries like the UAE using it as part of their soft power in global affairs. However, as more future scenarios emerge, accusations of ‘chronowashing’ arise. This involves focusing on long-term thinking and superficial solutions, distracting from urgent issues like extractivism, racism, inequality, and environmental injustice.

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

PUBLIC WANTS MORE CLIMATE ACTION



The COP30 conference in November 2025 highlighted weaker national commitments to phasing out fossil fuels and a wider retreat from ambitious climate goals. Yet a UN Development Programme survey shows that 80% of people worldwide want stronger political action, and 86% want countries to set aside geopolitical disputes and cooperate on climate change. This consensus contrasts with growing conflict, nationalism and efforts to roll back green regulation. Another study found that 2024 United Nations Environment Assembly attendees underestimated global willingness to devote 1% of income to climate action by half.

EMERGING

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

GOVERNING VERTICAL SPACES



Local governments in many Chinese cities can sell air rights, the right to build above a set height on a specific plot of land. The government of Pingyin County, Jinan, Shandong Province, sold to Shandong Jinyu General Aviation Co., Ltd. a 30-year concession to operate and maintain its low-altitude economic projects for CNY 924 000 000 (about USD 130 000 000), which may be the first sale of urban air rights. As the sky above cities becomes a traded commodity, such business must follow clear rules. Cities therefore need strong governance of vertical spaces to protect public interests and safety.

EMERGING

WHAT HAPPENS WHEN THIS SIGNAL BECOMES MORE WIDESPREAD?

MULTI-SENSORY DIGITAL



HACK

The visual, audio, and haptic input/output elements are crucial for immersive digital experiences like augmented or virtual reality. Increasing research is focusing on digitising other senses. Thermal and vibrotactile stimuli can simulate wetness, liquid, or wind sensations when combined with visual and sound effects. Digital taste is achieved through electrostimulation, and digital scent technologies enable users to smell in digital environments. These techniques will also influence information experience design, shaping how people engage with information.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

HOLOGRAM BREAKTHROUGHS



HACK

Breakthroughs in holographic projection, the virtual representation of 3D images in the real world, are making this technology more applicable for everyday telepresence. More realistic holograms are being created using three-dimensional scattering-assisted dynamic holography (3D-SDH), offering over three orders of magnitude greater depth resolution. Tensor holography efficiently allows real-time hologram creation, while new AI algorithms reduce costs and complexity in crafting 3D representations of humans or objects. This technology can aid volumetric 3D printing, microscopy, medical imaging, and visualisation. In the long run, it can foster remote services and the dematerialisation of consumption.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

PURPOSEFUL HOUSEPLANTS



HACK

Literal "power plants" are small, leaf-shaped generators that produce electricity using wind and rain. These generators, combining various small-scale sensors and electrodes, can be placed among fake plant leaves, offering a new source of clean, self-powered energy for cities and homes. If integrated into real plant leaves, opportunities expand further. In biological computing, plants are being transformed into data storage to reduce digital infrastructure's carbon footprint. Non-fungible plants (NFPs) encode digital data in their DNA, potentially forming decentralised eco-data centres. NFTrees in the metaverse are digital twins of real trees' health data, allowing human purchase and plant-directed spending. Such innovations assign new roles to plants, possibly earning them income.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

GAMIFYING VOTING



HACK

Gamification, or using game mechanics to boost participation, is increasingly applied in digital government tools, especially at the municipal level. It engages citizens in consultations, shares information, and encourages sustainable behaviours. To address declining voter turnout, gamification is explored in politics, particularly the voting process. VoterCat, created during a 'Code the Vote' hackathon, turns voting plans into an engaging adventure. In US elections, campaign apps use gamification for voter outreach, awarding points for sharing campaign info. Meanwhile, the voting process is gamified, with political gambling markets gaining popularity and 'horse race' election coverage – focusing on winning odds rather than policy positions.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

NEUROAESTHETIC INTERVENTIONS



HACK

Neuroaesthetics research examines brain, body and behavioural responses to art and sensory experiences, supporting health, well-being and learning. Social isolation during Covid increased appreciation for the arts. Ireland extended the Basic Income for Arts programme, paying EUR 325 per week to 2 000 randomly selected artists. A Dutch neurological study using eye-tracking and MRI scans found brain stimulation was 10 times stronger when viewing real art in museums than posters. This highlights the potential of linking health, social and education policies to cultural and creative sector initiatives.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

DIRECT-TO-DIVICE SATELLITE SERVICES



Direct-to-device (D2D) communication in satellite networks connects smartphones and Internet of Things (IoT) devices without relying on terrestrial infrastructure, using cellular technology (4G, 5G). Building space-based rather than terrestrial infrastructure for digital services will challenge telecommunication business models and bring space infrastructure directly to users. Providing space products to consumers sparks imagination. Reflect Orbital promises 'sunlight as a service' via a constellation of orbiting mirrors that beam sunlight after dark. Although the business model targets solar power stations, its consumer-focused marketing made the idea go viral.

HACK

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

LIVING UNDERWATER



HACK

For decades, life underwater has fascinated science fiction enthusiasts. The Deep project aims to turn this vision into reality by 2027, establishing a permanent human undersea presence. Based in a former UK quarry, it is developing subaquatic habitats. Vanguard, the first, will soon launch and house three people for short-term missions. It will inform the design of the larger Sentinel habitat, for six people on long-term missions at depths of up to 200 metres. Linked habitats and submarines could revolutionise marine science and offer climate-resilient living space.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

ILLUSION OF IMMORTALITY



HACK

Gadgets that track our biometrics are becoming more precise and measure a wide range of indicators, making the quest for immortality seem closer. Medical digital twins may push this further. Cardiac digital twins already simulate a patient's heart in remarkable detail, and cognitive twins may soon propose personalised mental training before age-related decline. Tech billionaire Bryan Johnson shows how only the wealthy can pursue extreme anti-ageing regimes, while one insurance company rewards healthy sleep habits. In the United States, a loose regulatory environment may expand supplement coverage, deepening an illusion of immortality, at least for the rich.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

DESIGN FOR UPGRADABILITY



HACK

Retrofitting and repurposing are increasingly popular in creating circular approaches and adapting to new circumstances. In cities, more commercial and office spaces are converted into housing as a practical response to the housing crisis. As work and retail move online, this reuse of existing infrastructure reduces urban sprawl and helps revitalise communities. However, many buildings were not designed to be adapted. The same applies to most new products and services. Designing for upgradability embeds future modification from the earliest conceptual stages, through modularity and changeability. In time, repairability and durability may give way to adaptability and upgradability as core principles instead.

HOW CAN THIS SIGNAL HACK OUR SYSTEMS?

EMODIVERSITY AND COMPLEX EMOTIONS



NOVELTY

Emotion is integral to human decisions, enhancing and sustaining reasoning. We cannot separate the two; thus, in policy-making, we should consider policymakers' emotions and citizens' emotional needs. Sentiment analysis and emotion detection have been applied to large datasets, mostly social media. Most current approaches focus on simple emotions, but the role of complex and diverse emotions is increasingly explored. Emodiversity (richness of emotional experience) and complex emotions (mixed emotions, meta-emotions) are linked to integrating complex information, creating new expressions, and wiser reasoning. As we understand them better, future policy narratives are likely to be based on more complex and diverse emotions.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

STORYLIVING



NOVELTY

Storytelling and narratives are essential communication tools. Storyliving adds an experiential element, allowing participants to live through stories via interactive, embodied, and immersive experiences. Virtual reality lived stories can enhance learning, teaching empathy, and healthcare. It is a valuable tool in journalism and corporate and political communications. In these stories, there is no teller; the audience has some agency but not full control and can access multiple perspectives. Storyliving is not limited to the virtual world. Disney plans a storyliving residential community with hospitality, entertainment, and design features to immerse inhabitants in the Disney universe.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

DREAM-SHAPING



NOVELTY

Influencing and inducing dreams has long attracted interest, and new technologies are being developed to make it possible. During hypnagogia, the stage of sleep when the brain transitions to unconsciousness, it is most suggestible to external prompts. Targeted dream incubation uses sensory stimulation with a glove-like device to induce specific prompts at sleep onset. Another approach involves using pre-sleep stimuli, such as virtual reality tasks, to influence dream content, while transcranial alternating current stimulation induces lucid dreams. These methods can interrupt nightmares and address anxiety disorders. However, brands are experimenting with embedding advertising prompts in consumers' dreams.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

TRAUMA-INFORMED POLICIES



NOVELTY

Trauma-informed approaches recognise that trauma affects mental wellness, cognition, and decision-making. This approach is based on six principles: safety; trustworthiness and transparency; collaboration and mutuality; empowerment, voice, and choice; peer support; and intersectionality. Initially developed in healthcare, social services, and education, it provides a framework for various policies. For example, by viewing food insecurity as trauma, these principles can enhance a city's food system resilience. Trauma-informed design and computing apply these principles to designing spaces and technologies that might trigger trauma. It's increasingly relevant in journalism and organisational development, and is applicable in all fields involving people.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

HUMANOID ROBOTS AT WORK



NOVELTY

Industry and services have successfully incorporated robotic automation in manufacturing and tasks like logistics, inspection, maintenance, and surface cleaning. However, advances in humanoid robots could disrupt roles focused on human interaction, not just manual, repetitive tasks. Walking, talking machines will soon serve as guides, companions, and deliverers. Companies are exploring various approaches to creating and utilising humanoid robots. This trend may significantly impact the job market, affecting job availability and the need for new skills, such as supervising service robots in customer care.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

ADOLESCENTS ON FINANCIAL MARKETS



NOVELTY

Increasingly, teenagers aged 13 to 17 are investing in financial and cryptocurrency markets through online apps, often via custodial or parents' accounts. A US study shows that 23% of teens in this age group are already investing, with 75% believing it is important. The UK Financial Conduct Authority reports that 8% of 13- to 16-year-olds hold high-risk crypto assets, sometimes confusing gambling, trading, investing, and entertainment.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

GRIEF TECH



NOVELTY

Emerging AI technologies offer a form of 'digital afterlife', creating avatars or chatbots of deceased loved ones for grieving individuals. These 'grief tech' services include AI-generated messages, interactive avatars, and VR-based recreations, enabling ongoing interactions. Innovations like QR codes on graves link to digital profiles, while some services combine AI with therapy to mimic a loved one's presence. However, these technologies raise ethical concerns, including privacy, consent, and psychological effects. Critics argue they exploit grief, risk manipulation, and blur humanity's boundaries. As personal data grows, AI recreations become more realistic, deepening these issues.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

CELLULAR INTELLIGENCE



NOVELTY

Biology's multiscale architecture, from molecular networks to cells, tissues, organs, whole bodies, and swarms, can be seen as collective intelligence solving problems at cellular, tissue, and whole-organism levels. This approach suggests examining tissues, organs, and molecular pathways for learning and proto-cognitive abilities, such as training cells for specific gene expression levels, physiological states, or anatomical outcomes. From this perspective, cancer could be analysed as an intelligent species.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

BIOBOTS



NOVELTY

Biobots are engineered entities that combine living matter with biocompatible artificial materials, blurring the line between robotics and biology. This emerging technology is mainly developed for healthcare, such as tissue healing and targeted drug delivery, but is also used for environmental monitoring and cleanup, and could extend to research and defence. Types include biohybrid robots that use muscle cells to move fabricated structures, cyborg organisms that integrate electronics into animals or plants, and organoid-based biobots, multicellular human-cell assemblies that move autonomously and interact with their environment for sensing and repair.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

DIGISEXUALITY



NOVELTY

As sex-related technologies such as robotics, AI companions and virtual reality develop, the concept of digisexuality is gaining recognition. It refers to sexual experiences that digital tools facilitate or mediate. These began with dating apps, sexting and online pornography and now include virtual reality sex and sex robots that may replace human partners, sexually. Digisexuality is emerging as an identity for people who see technology as central to their sexuality and who may not seek human partners. Non-judgemental discussion is needed to understand its effects on connection and isolation.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

MEMORY EDITING TECHNOLOGIES



NOVELTY

Memory modification technologies have been developed to alter existing memories by changing their emotional tone, implanting false memories or deleting them, using psychological techniques, pharmaceuticals and devices. The ability to erase distressing memories and traumatic flashbacks could help treat various mental health conditions. Neuromodulation and optogenetic technologies, in animal testing, show promise but struggle to target specific memories. A recent study has weakened old aversive memories by reactivating newer positive memories during sleep. These technologies raise substantial ethical concerns, including risks to emotional development and personality. What if smartwatches could monitor sleep and reset memories that no longer serve us?

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

ROBOT METABOLISM



NOVELTY

Developments in robotics are moving towards machines that can grow by consuming other machines. Most robots today cannot increase in size or complexity, adapt, or repair themselves. Truss Link, a modular robot capable of self-assembly and self-reconfiguration, claims to be the first to enable robot metabolism. This process uses only a robot's own abilities, plus parts and power from similar robots, to grow or adapt without external machinery. Future robots could then become truly self-sufficient, fixing damage, adapting to new tasks and surviving in places humans cannot reach, while mimicking how natural systems grow, heal and adapt over long periods.

WHAT OPPORTUNITIES CAN THIS SIGNAL BRING?

MODULAR MANUFACTURING



The reorganisation of supply chains and the increasing volatility of the business environment have led companies to adopt more agile production and distribution strategies. Modular manufacturing, where production is divided into modules and easily rearranged, follows the trend of the fast-growing modular construction sector. Instead of achieving economies of scale with large plants, a modular approach starts at a smaller scale for testing and demonstration, then builds hundreds or thousands of modules in distributed systems. Nestle Foods plans modular food processing factories in Africa and Asia, while Nokia has developed a factory-in-a-box concept—a manufacturing space in large cargo containers.

TRANSFORMATIVE

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

ADVANCED FRUGAL INNOVATION



TRANSFORMATIVE

Frugal innovation typically focuses on simplifying solutions and reducing costs for bottom-of-the-pyramid markets. However, there is increasing interest in advanced constraint-based innovations promoting sustainability and resilience. These advanced frugal innovations rely on sophisticated engineering, involving research, design principles, and systemic optimisation to create novel products and services. Technologies like 3D printing, mobile applications, cloud computing, machine learning, and artificial intelligence can significantly aid these innovations. In a world of limited resources, financial and human constraints, and technological and geopolitical disruptions, competitive advantage may arise from advanced frugal innovations with fewer dependencies and lower maintenance.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

FOOD DEMOCRACY



TRANSFORMATIVE

The concept of food democracy addresses “the transformation of established structures, processes, and practices of food governance, i.e., the way in which common and collectively binding goals are formed, agreed upon, and implemented.” Democratic control over the food system links to other ideas about its functioning “ food sovereignty, food justice and food citizenship . Many citizen-based food initiatives aim to empower the actors involved and new tools are being created which enable policy makers, stakeholders and citizens to talk about and operationalise social justice, for example within an urban food governance context.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

HUMAN WASTE REVOLUTION



TRANSFORMATIVE

Dubbed the ‘economics of excrement’ or the ‘urine revolution’, novel methods for on-site sanitation treatment are emerging. Urine diversion, which separates urine in the toilet, holds particular promise. Urine treatment technologies can enhance nutrient, phosphorus, and nitrogen recovery while also boosting energy production, thereby supporting the circular economy and agriculture. Transitioning from off-site, water-borne sanitation systems with treatment plants to on-site systems requires a significant shift in both sanitation design and public attitudes.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

BATTERY-FREE ENERGY STORAGE



TRANSFORMATIVE

The world is set to add as much renewable power over 2022-2027 as it did in the past 20 years, according to the International Energy Agency. This makes energy storage increasingly important, as renewable energy cannot provide a steady, uninterrupted flow of electricity. Beyond batteries, other energy storage systems are being developed, including electrochemical (supercapacitors), electrical (superconducting magnetic energy storage), thermal modules, and mechanical (compressed air, hydro storage, flywheels) or combined in hybrid systems. Although these technologies still need significant improvements, they will likely play a more important role in the energy transition.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

EVOLUTION OF KINSHIP STRUCTURES



TRANSFORMATIVE

Younger generations will have more living great-grandparents and fewer cousins. In 1950, a 65-year-old woman had an average of 41 living relatives. By 2095, a woman of the same age will have only 25. As societies age, family structures will change. With longer life spans, grandparents may play bigger roles in families and stay longer in the workforce. Some companies offer grandparental leave as childcare costs rise and fewer relatives are available. However, they may also need care themselves. Young people struggle to afford homes and often stay with parents longer. Families will need to adapt to having more older members.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

MORAL OFFLOADING TO AI



TRANSFORMATIVE

Despite concerns about AI, many trust it when vulnerable. A University of California study found two-thirds of people changed their minds in simulated life-or-death decisions based on a robot's advice. This shows excessive trust in AI and a tendency to avoid responsibility during crises. Participants followed the robot's advice, despite warnings about its limited abilities and potential errors. The robot influenced decisions in two-thirds of cases. Similar to cognitive offloading (relying on external aids to reduce mental effort), moral offloading may rise as artificial moral agents emerge. Greater reliance on them could lead to societal issues like moral deskilling, hindered moral progress, and responsibility gaps.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

MILITARY GRADE SOCIETY



TRANSFORMATIVE

As the definition of 'critical infrastructure' broadens to cover more assets, demand for military-grade protection will grow. Advanced security will be needed against cyberattacks, terrorism, war and natural disasters, including more extreme weather and events such as earthquakes. This push for resilience will spur the use of cutting-edge technologies and robust design to ensure durability and adaptability. Prioritising military-grade protection can enhance preparedness, reduce vulnerabilities and secure essential services, supporting stability and continuity. However, stricter security may also reduce inclusiveness, as profiling is used to deter potential disruptors.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

TIME POLICIES FOR SUSTAINABILITY AND DEMOCRACY



As governments look beyond purely economic metrics of wellbeing, interest in time policies has grown. The 2021 Barcelona Declaration on Time Policies defines control over one's own time as a right of all citizens and calls to 'develop and implement time policies that advance towards a healthier, more equal, more productive and sustainable society'. Policies should treat time as a scarce resource, tackle time poverty and assess time impacts. Greater time flexibility can improve health, sustainability, productivity, equity, care, education and democratic participation.

TRANSFORMATIVE

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

RITUALS FOR CHANGE



Beyond religion, rituals are structured behaviours with symbolic meaning that give more purpose to routine actions. In digital detox and social media use, rituals can provide meaningful structure to everyday interactions and support behaviour change. They can be personal, reinforcing agency and goals, or communal, strengthening group cohesion and collective identity. Companies already build everyday rituals into marketing and workplace experiments. Understanding and shaping such rituals can help change behaviours and support desired policy outcomes.

TRANSFORMATIVE

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

NETWORK LITERACY



We are witnessing a major shift in how knowledge is produced, checked and experienced. Digital platforms shape what we know, feel and believe. This calls for new network literacy that joins technical skill with civic and ethical awareness. Alongside digital, AI and media literacy, it explains the networked world and helps students read platform dynamics, algorithmic influence and how digital settings shape reality. This shift also brings 'networked citizenship', where people co-create meaning and influence in emotion-driven, data-heavy systems of 'subscription slavery' that erode autonomy and agency for citizens today.

TRANSFORMATIVE

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

INTERSPECIES COMMUNICATION



TRANSFORMATIVE

AI and advanced sensing technologies are enabling breakthroughs in decoding and responding to animal communication. Using large-scale data collection, bioacoustics and machine learning, researchers identify structured communication patterns in whales, dolphins, birds and bees. Initiatives such as Project CETI and the Earth Species Project, and patents sought by companies such as Baidu, move beyond pet 'translation' gadgets towards ecosystems understood as communicative networks. This emerging field offers new tools for biodiversity monitoring, animal welfare and disaster preparedness, but raises ethical and legal issues for EU digital and environmental policy.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

INSTITUTIONALISATION OF INDIGENOUS AUTHORITY



TRANSFORMATIVE

Global environmental governance is entering a phase where Indigenous Peoples are shifting from stakeholders to institutionalised governance actors. Article of the Convention on Biological Diversity recognised Indigenous knowledge in the 1990s, but by late 2025 this becomes operational and structurally embedded. The first formal meeting of the UN Subsidiary Body on Article 8 in October 2025 created a permanent mechanism for Indigenous participation and benefit-sharing, including through the Cali Fund on digital sequence information. These hybrid models will reshape EU law, research governance and green-transition projects.

HOW CAN THIS SIGNAL CHANGE HOW WE THINK AND ACT?

GREEN TRANSITION POLICIES FOR THE 1%



CONTRADICTION

Present and future innovations offer solutions and freedoms but can create new inequalities when social, ethical and accessibility considerations are overlooked. As the richest 1% capture an increasing share of newly created wealth, they gain access to powerful tools beyond the reach of most. This applies to genome editing for therapeutic and enhancement purposes and access to longevity treatments. It is also evident in tech billionaires building private luxury bunkers or engaging in vaccine tourism to secure privileged positions amid rising man-made and natural disasters.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

HUMAN-SWARM TEAMING



CONTRADICTION

Robotic swarms, coordinated robots performing collective tasks, have rapidly developed recently. They have diverse applications, including exploration, search and rescue, surveillance, agriculture, air defence, area coverage, real-time monitoring, wireless services, and goods delivery. These swarms utilise swarm intelligence, where intelligent behaviour emerges from element interactions. Semi-autonomous swarms, controlled by humans, are reliable, effective, and ethically sound, but require effective human-swarm interaction. These systems resemble herding, with humans providing high-level planning and AI handling task-level planning and execution.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

SYNECOCULTURE



CONTRADICTION

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 artificial creation of ecosystems for cultivating a rich diversity of crops (200 species, 700 varieties in 1000m²) for year-round sustainable harvests while also enriching local biodiversity. 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.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

CRIMILEGAL POLITICAL ORDER



CONTRADICTION

The crimilegal order is a hybrid political system where moral, legal, and social boundaries blur between legality-legitimacy and illegality-criminality. In Latin America, over 13% of people live in areas where criminals like paramilitary groups, vigilantes, drug cartels, and gangs assume state roles, governing territories and populations. They maintain public services, infrastructure, and justice systems. An unstable geopolitical situation, regional conflicts, and weakening states may strengthen this trend elsewhere.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

SOCIETAL ASPECTS OF PAIN



CONTRADICTION

The notion of pain is increasingly seen as both a personal and societal issue. Socioeconomic, psychosocial, and behavioural factors, along with social stressors like economic insecurity, are strongly linked to pain. This has led to calls for governments to include pain as an indicator in wellbeing debates. Conversely, some argue that modern "painless civilisation" systems, which focus on comfort and pleasure while eliminating pain and suffering, deprive people of life's joys, a fundamental source of meaning. This trend could result in a society overwhelmed by pleasure.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

SLOW SCIENTISTS IN FAST SCIENCE



CONTRADICTION

The slow science movement mirrors the broader slow movement's call to decelerate life, prioritising quality over quantity and valuing rewarding and pleasurable aspects. It responds to the pressure for faster publishing in science. However, the COVID-19 pandemic highlighted the need for rapid evidence collection, and machine learning is increasingly speeding up scientific processes, potentially improving living standards and addressing societal challenges. Scientists' roles should evolve to consider longer timescales and broader perspectives, focusing on quality and higher-order evidence in science, and promoting teamwork and interdisciplinarity.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

WOMBFARE



CONTRADICTION

Geopolitical tensions highlight the role of population growth in projecting power and maintaining territory. India overtaking China in 2022 as the most populous country has made headlines, while many nations face population decline. In political demography, there's extensive analysis of migration weaponisation, but the weaponisation of population growth is gaining recognition. This can significantly influence ethnic, religious, and international conflicts. 'Wombfare' refers to using fertility as a political weapon to overpower rival ethnic and religious groups. Both religious and secular groups employ it to gain political influence, as differing demographic growth rates can lead to state collapse and violent conflict.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

DETERIORATING LATE ADULthood CONDITIONS



CONTRADICTION

Current demographic and healthcare trends indicate a significant increase in the number of people aged 65 and over with complex health issues and limited resources. Providing appropriate health services will be challenging due to workforce shortages, budget deficits, and the shift from 'cure-seeking medical care' to 'cure-and-support seeking medical care'. Older individuals will also be disproportionately affected by climate change and pollution. Additionally, the pension-to-average wage ratio in the EU is projected to decrease from 43% to 36% by 2070. Retirees with high private debt, such as ultra-long mortgages, face economic insecurity and may increasingly rely on the gig economy.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?

COPYRIGHTSELF



CONTRADICTION

AI applications raise new copyright issues when creating content from existing data. The growing use of AI-generated material prompts questions about protecting works and updating regulation so that AI companies respect creators' intellectual property rights. People also face new risks when online pictures and videos become raw material for AI fakes. Denmark plans to tackle deepfakes by granting people copyright over their body, facial features and voice, giving wider protection than the EU's AI Act or sexual-exploitation laws. This 'copyright to our bodies' could empower individuals but also drive extreme privatisation and new markets for licensed digital likenesses and identities.

WHAT TENSIONS DOES THIS SIGNAL SUGGEST?