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ANNUAL SURVEY PAPER ASP 2024

*Can the flap of a butterfly's wings in Brazil
cause a tornado in Texas?*

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*Can the flap of a butterfly's wings in
Brazil cause a tornado in Texas?*

Edward LORENZ (meteorologist), 1972

(The "butterfly effect", a metaphor for
the fundamental phenomenon of sensitivity
to initial conditions in chaos theory)



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LIMINARY

Decision makers today face an overriding responsibility to adapt to ever-changing realities, unfolding at unprecedented rates. In the wake of the Covid-19 pandemic, it became apparent just how quickly and unpredictably assumptions may shift. In response, there is increased global interest, across all sectors, in identifying, understanding and anticipating emerging trends. This seeks to effectively gear up for such transformations, so as to better tackle the challenges of present and future.

Climate change, financial equity, generational value shifts, geopolitical tensions, new development models, Artificial Intelligence, lifestyle reassessments: how do we keep abreast of ongoing trends?

Decision-makers and frontline operators alike have a duty to heighten and broaden vigilance to include key emerging trends* sweeping the globe, and where necessary, swiftly re-invent public policy, so as to mitigate short- and medium-term risks. This proactive capacity is essential to keep pace with the fast-paced changes and disruptions underway.

The aim of this IRES (Royal Institute for Strategic Studies) annual publication, the second following that of 2023, is to inform public and private decision-makers of major emerging trends to consider when drawing up short-, medium- and long-term strategies and action plans.

This overview, the product of the Institute's foresight intelligence exercise, is intended to enhance and complement the major emerging trends of the last twenty years.

While not exhaustive, it focuses on selected key trends within each of the five pillars of the IRES reading grid, and highlights how they impact Morocco, its natural environment, population, business sectors and future.

A digital version of this report is available on the *IRES Intelligence Platform* (<https://www.ires.ma/iip/>).

KEY STRUCTURING EMERGENCES

IRES uses a reading grid for analyzing current and future developments, based on five pillars. Emerging trends identified in the Annual Survey Paper are broken down along these five pillars: Human-centric, Nature-centric, Governance, Exponentiality and Planetization.

For nearly a century, humanity has been undergoing a period of Great Transition: the “*shapers*” that have molded the world for millennia are fading away, giving way to new ones. As evolution accelerates, bringing with it major structural crises, new emergences hint at the contours of the world to come.

In a radically shifting landscape that is ever more vulnerable, uncertain, critical and artificial (VUCA²), three distinct types of change emerge. The signals of such change have been clearly perceptible since the turn of the century. These are outlined here.

HUMAN EVOLUTION AND SOCIETIES

- **Individuals:** Individualism, *Alien Gen* (digital natives and mutants).
- **Human societies:** breakdown of cohesion, freedom/security balance, Liquid Society.

Crumbling human values, strong virtualization of professional life, deteriorating mental health... all these factors impact the way humans live together.

Digitalization has all fundamentally transformed the way in which people live, work and interact - from education and commerce to the media, healthcare and government relations.

Digital platforms have transformed business landscapes, creating new business models built on sharing and convenience (sharing economy, outcome economy).

Rapid advances in disruptive technologies (biotechnology, blockchain, artificial intelligence, etc.) are transforming the way we live, work and travel. Benefits should be optimized and risks controlled.

- **Power management:** Democracy, Governance, Collective Intelligence, *Soft Power*.

Geostrategic reconfigurations heralding a new world order, the loss of confidence in political elites across the globe, and a proliferation of information sources demanding heightened vigilance in the face of fake news, all call for a rethinking of governance at both national and international levels.

CHANGING CIVILIZATIONS AND INTERACTION WITH NATURE

- **Anthropocene:** Civilization founded on exploiting and controlling nature (essentially for economic purposes).
- **Accelerating progress towards planetary limits**, notably with global warming and the degradation of biodiversity, raises the urgency of reassessing our relationship with nature.
- **Planetization:** Appropriation and utilization of the planet.

Globalization gives way to a new globalism in which virtually anywhere on the planet is accessible to anyone.

Global water crisis, coastal artificialization, metropolization... all plead for new, environmentally-friendly economic models. Faced with the climate crisis, an increasing number of governments and businesses have launched initiatives to cut carbon emissions and foster sustainable development and the energy transition: renewable energies, the circular economy, sustainable agricultural practices, etc.

CHANGING TECHNOLOGIES AND HUMAN ACTION

- Increasingly digitalized technical instruments.
- Biotechnologies altering the human genome.
- Generalized integration of Artificial Intelligence.
- Next tech: future development of nuclear fusion, generalized application of additive manufacturing, virtualization of human activity (metaverses, augmented reality, cyber protection, etc.).

Artificial intelligence and robotic automation are spreading across a whole range of sectors, from autonomous vehicles to personal virtual assistants and advanced manufacturing, shaping the future of work.

Similarly, advances in human genome sequencing, gene therapy and biotechnology, supported by Artificial Intelligence expansion into healthcare, contribute to delivering more personalized, accurate and effective healthcare.

This overview of major emerging trends is updated annually with newly identified ones, and presented in this new IRES collection, to provide national public and private decision-makers with an up-to-date, foresight perspective on national, regional, and international contexts.

ANNUAL SURVEY PAPER: DIRECTIONS

Emerging trends identified in this report are broken down along the five pillars of the IRES reading grid:

- **Human-centric:** developments and aspirations that help reshape Humanity, in its uniqueness and its sociability, its relationship to technology, to work to its living environment...
- **Nature-centric:** a different relationship with the living world, a more environmentally friendly economy and a less consumer-oriented lifestyle; the realization that we need to take care of nature and all living things.
- **Governance:** all processes for managing collective action, based on *bottom-up* action, and mobilizing and motivating "agents" (concerted action, *soft power*).
- **Exponentiality:** all structural phenomena that accelerate exponentially, including information and communication technologies, digitalization, demographics, economic competition, financialization, social inequalities,
- **Planetization:** disruptive new stage of progress, during which a state of globalization (post-globalization) coexists with a new awareness of the planet's "living" quality, as a biosphere of which humans are but one component.

A summary presentation (**radar**) is featured at the start of the book (page 9), presenting all these items, broken down by reading grid pillar.

The presentation of each emergence is articulated as follows:

(i) Pillar of interest, (ii) Title, (iii) Definition, (iv) Outline of emergence and current situation, (v) General issue, (vi) Interest/consequences for Morocco.

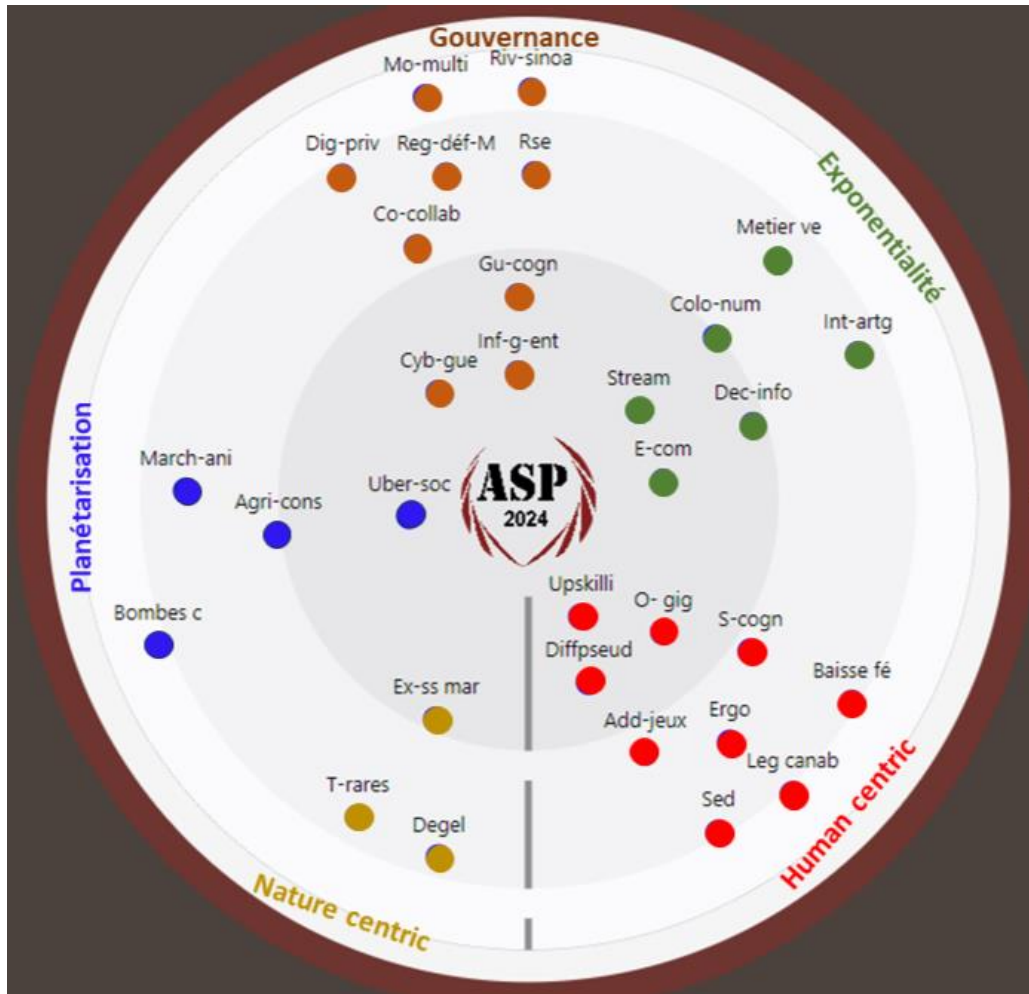
Emerging issues are listed in alphabetical order within each pillar. The aim is to identify as wide a range of areas as possible.

The paper's conclusion summarizes major trends reviewed, before identifying useful insights that national public and private players could draw from in defining their strategies.

A glossary of terms marked with an asterisk appears at the end of the book.

This publication is supplemented, every two months, by newly identified **emerging concepts**, available from the IRES Intelligence Platform (<https://www.ires.ma/iip/>).

MAPPING OF EMERGENCES 2024



HUMAN-CENTRIC	NATURE-CENTRIC	GOVERNANCE	EXPONENTIALITY	PLANETIZATION
<p>Add-jeux: Online Gambling Addiction</p> <p>Baisse fé: Declining male fertility</p> <p>Diffpseud: Rampant Pseudoscience</p> <p>Ergo: Occupational therapy</p> <p>Leg canab: Legalization of Cannabis</p> <p>O-gig: Online gig workers</p> <p>S-cogn: Cognitive overload</p> <p>Sed: Sedentary behavior</p> <p>Upskilli: Upskilling</p>	<p>Ex-ss mar: Deep Sea mining</p> <p>Degel: Thawing of the cryosphere</p> <p>T-rares: Rare earth crisis</p>	<p>Co- Collab: Collaborative warfare</p> <p>Cyb-gue: Cyberwarfare</p> <p>Dig-Priv: Digital Privacy</p> <p>Gu-cogn: Cognitive warfare</p> <p>Reg-déf-M: Renewed military spending</p> <p>Inf-G-Ent: Increasing influence of MNCs in global governance</p> <p>Mo-multi: Multiplex World</p> <p>Riv-SinoA: China-U.S. Rivalry</p> <p>RSE: Corporate Social Responsibility (CSR)</p>	<p>Colo-num: Digital colonization</p> <p>Dec-info: Cloud Computing</p> <p>E-Com: E-Commerce</p> <p>Int-ArtG: Generative Artificial Intelligence</p> <p>Métier ve: Green jobs</p> <p>Stream: Streaming (Video games, Podcasts, ...)</p>	<p>Agri-cons: Conservation agriculture</p> <p>Bombes C : Carbon Bombs</p> <p>March-ani: Animal health market</p> <p>Uber-soc: Uberization of society</p>

DECLINING MALE FERTILITY

Declining male fertility describes noticeable drops in semen sperm concentration, altered sperm motility, volume, morphology and vitality, as well as modified sperm pH, or a combination of any of these factors.

According to the World Health Organization¹, infertility has affected approximately one in six people worldwide in recent decades. Studies, based on the exploration and measurement of male fertility criteria, show that average sperm concentration in the semen of the general male population fell from 99 to 47 million per milliliter in 1973-2011, a drop of roughly 53%².

This drop in fertility is attributable to a number of factors: environmental causes, such as exposure to harmful chemicals; modern lifestyles and stress; individual medical conditions, such as hormonal imbalances and infections; chemotherapy treatments³; and genetic and individual predispositions⁴.

Declining male fertility may have significant repercussions on demographic trends and the configuration of family structures. Tackling this issue is fundamental to ensuring the right of couples to start a family.

Declining male fertility is now a major public health issue in Morocco. A recent study of 1,265 infertile couples⁵ showed that infertility was male in origin in 45.2% of cases. While infertility treatment for couples is standardized⁶, "Plan Santé 2025"⁷ does not appear to give specific attention to this issue, which is often still taboo for men.

Hence, the opportunity for holistic and effective measures to tackle declining male fertility, while at the same time raising public awareness of this issue.

LEGALIZATION OF CANNABIS

The legalization of cannabis* refers to the process by which the legislative or regulatory bodies of a country or region amend their laws to allow the legal use of cannabis, otherwise prohibited by narcotics legislation.

There are multiple reasons for legalizing cannabis, including economic benefits (additional tax revenues, job creation), social benefits (reduced crime, better management of drug-related problems) and medical benefits (medical and therapeutic use for a variety of pathologies).

According to a report by the United Nations Office on Drugs and Crime (UNODC), 219 million people worldwide used cannabis in 2023⁸.

The degree and nature of legality of cannabis use varies considerably from one country to another. In Europe, 21 countries allow the medical use of cannabis, including Germany, which legalized it for recreational use in 2024.

In Africa, Lesotho authorized the cultivation of medical cannabis in 2017, followed by South Africa, which decriminalized personal use in 2018. Morocco, on the other hand, legalized the cultivation of cannabis for therapeutic purposes in March 2021. Other African countries, notably Eswatini, Ghana, Malawi, Nigeria, Zambia and Zimbabwe, are considering legalizing cannabis to join the rapidly expanding international legal cannabis market.

The global medical cannabis market grew significantly over the past decade, notably in Europe and North America. It is projected to generate \$56.7 billion by 2026⁹.

Despite the economic potential, cannabis cultivation has significant environmental repercussions. Controlling environmental conditions alone demands energy requirements that can make up to 85% of the crop's total carbon footprint¹⁰. Also, the expansion of cannabis-growing areas often comes at the expense of wooded areas, exacerbating deforestation¹¹.

Morocco is the world's leading producer of cannabis¹². This crop, nicknamed "Kif", has traditionally played a significant role in society. It is used in a range of sectors, including food (cereals), technology (lighting, textiles and paper) and medicine.

Following legalization in early 2021, Bill 13-21, passed in July 2021, created the "Agence Nationale de Réglementation des Activités relatives au Cannabis" (ANRAC). This agency is responsible for overseeing legal uses of cannabis and steering the national strategy in cultivation, production, processing and sales, primarily for medical, pharmaceutical and industrial uses. Only seeds certified by this Agency are accepted, thus excluding GMO seeds extensively employed elsewhere in the world.

2023 saw the first cannabis harvest legally cultivated under ANRAC control (294 metric tons). A number of initiatives have since sprung up in the Kingdom to exploit the full potential of cannabis. For example, a project to legally cultivate the "Beldia" endemic Moroccan strain is currently underway in Kétama, near Al Hoceima¹³.

Developing the economic potential of cannabis nevertheless needs to consider environmental imperatives, notably in terms of combating deforestation and controlling the carbon footprint.

OCCUPATIONAL THERAPY

Occupational therapy* is a paramedical discipline that seeks to develop and optimize the ability of disabled patients to carry out daily activities independently, through personalized care, mobility assistance and communication support.

According to the World Health Organization, more than one billion people live with a disability¹⁴, accounting for some 15% of global population. This proportion is forecast to grow as a result of ageing demographics and accelerating chronic illnesses.

Occupational therapy, a profession officially established in the late 20th century, is particularly widespread in Canada, the United States, Australia and France. In France, for instance, the number of occupational therapists has doubled in the past ten years¹⁵.

Occupational therapy draws on the development of bionic prosthesis technologies (robotic arms, artificial legs, bionic hands, walking robots, etc.), paving the way for new rehabilitative options. The cost of such devices, however, remains a major challenge.

Technological advances, including virtual reality (VR) and augmented reality (AR), also open up new rehabilitation options and approaches. Occupational therapists now seek to incorporate such advanced technologies into their practice, to enhance patient autonomy and quality of life.

Occupational therapy opens up new perspectives for better care of people with disabilities. It is essential that it be developed.

In Morocco, occupational therapy was introduced as a specialty at the "Institut de Formation des Cadres de Santé" (IFCS) in 2016. Physical therapy and rehabilitative medicine, however, have a substantial shortage of qualified occupational therapists, and this needs to be remedied. It is also critical to stay at the cutting edge of technological advances, in order to harness and benefit from new therapeutic practices.

ONLINE GAMBLING ADDICTION

Gambling addiction, also known as Ludopathy¹⁶, is a behavioral disorder that involves a persistent and uncontrollable desire to bet on the outcome of sporting events or to gamble, even in the face of unfavorable results. This practice stimulates the brain's reward system in a similar way to addictive substances, impairing the afflicted person's personal, family and professional development.

The advent of the Internet has further exacerbated this phenomenon by digitizing many forms of gambling, e.g., lotteries, sports betting, cards and dice, and eliminating the need to physically go to gambling venues (ticket offices, stores, casinos, etc.).

Today, the online sports betting market continues to expand globally, and this trend will likely persist in the foreseeable future. In 2028, the market is projected at \$109 billion, up from \$63 billion in 2023¹⁷.

This growth raises concerns as to the impact of gambling on public health, underscoring the imperative for greater regulation of the gambling industry to adequately safeguard vulnerable individuals, particularly minors.

The number of gamblers in Morocco in 2021 is estimated at 3.3 million, 40% of whom are identified as excessive risk gamblers¹⁸.

In recent years, leading industry players including "Marocaine Des Jeux et des Sports" (MDJS), the National Lottery, "Société Royale d'Encouragement du Cheval" (SOREC) and casinos report facing intense competition from offshore gambling sites, which attract some ten times the overall traffic of legal platforms.

Furthermore, sports betting regulations in Morocco do not extend to online bookmakers, exposing individuals to risks associated with engaging in offshore gaming and the security of their personal data.

In the same vein, the national addiction strategy for 2018-2022, drafted by the Ministry of Health, fails to fully account for addictive gambling behaviors. Added to this are social protection organizations that do not consider addictive behaviors as illnesses to be covered.

Faced with this situation, action should be envisaged to better supervise online gambling and combat addictive behavior, while raising players' awareness of associated risks.

ONLINE GIG WORKERS

Online Gig Worker literally means an online worker paid by the task, operating as a freelancer to execute assignments subcontracted from client companies, via online platforms¹⁹.

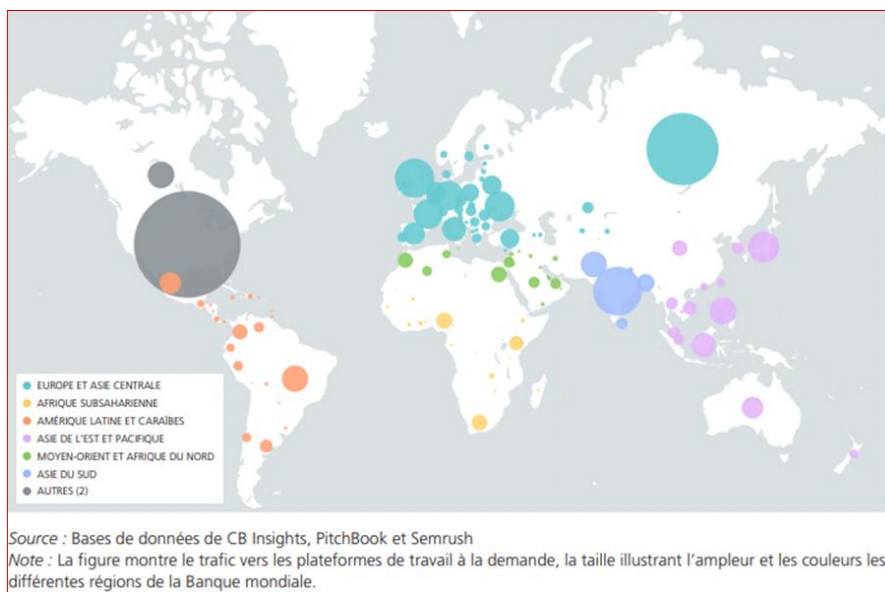
On-demand online work falls into two categories: simple, low-paying "micro-tasks", open to all, and more elaborate projects, comparable to freelance* work, requiring specific skills.

According to a World Bank study, the number of online on-demand workers grew 9-fold in just 8 years, from 48 million workers in 2015 to 435 million in 2023, equivalent to over 10% of the global workforce²⁰.

Compounding this trend, the Covid-19 health crisis amplified the trend, manifest in the exceptional growth of freelance income worldwide in 2019-2020, notably, in three Asian countries: the Philippines (+208%), India (+160%) and Japan (+87%)²¹.

While developed countries still dominate the online job market, demand in developing countries grows faster, with the emergence of multiple local platforms. Sub-Saharan Africa is the region where this growth has been strongest: +130% in 2016-2020²².

Global distribution of online on-demand work platforms, by traffic volume



This new type of workplace, driven by widespread Internet access, opens up the labor market to a broader public, particularly young people aspiring to digital careers and those who have historically been marginalized.

Morocco has much to gain from tapping into this emerging trend, and promoting online on-demand work among its youth (32% of total population in 2021 aged 15 to 34)²³.

This requires an effective and incentivizing legal framework to drive young people towards this new form of employment. This would contribute, at least in part, to reducing unemployment.

On-demand online working would also provide young people, and particularly women, with greater freedom to organize their time, balancing personal and professional life, while letting them put skills to good use in a variety of activities and projects, irrespective of geographical constraints.

RAMPANT PSEUDOSCIENCE

Pseudoscience refers to practices, methods and beliefs that use logical discourse, but fail to employ proper scientific methodology, and lack supporting evidence, plausibility or confirmed scientific status²⁴.

"False science" today relies on technological means that provide a broad and instantaneous distribution channel, including social networks. Widespread use of social media, made possible by ubiquitous internet access and smartphones, enables fake news to travel and spread swiftly worldwide, leaving users exposed to unreliable news and misinformation, as most social media platforms are under no obligation to verify the information they share.

The world also faced an unusual context in recent years, with a succession of crises: global warming, the Covid-19 pandemic, escalating armed conflicts, etc.

These crises provided a context where scientific truths, conspiracy theories* and subjective opinions intermingle, to create pseudoscientific narratives that increase confusion and, crucially, distrust of official information channels.

The intentional propagation of false information is now frequently used as a means of generating profits, influencing behavior or harming organizations and even states, by jeopardizing public order.

Fostering critical thinking and educating people in the use of social networks and the media are imperative to safeguard against threats emanating from pseudoscience.

Moroccan society is particularly vulnerable to pseudoscience, not least because of relatively high adult illiteracy rates - albeit on the decline - and cultural beliefs that predispose some citizens to accept all kinds of arguments, even the most unsound ones.

Morocco should therefore develop a legislative framework and a code of ethics governing the dissemination of information online, to actively address this challenging reality and enhance the resilience of Moroccan society in the face of misinformation.

SEDENTARY BEHAVIOR

Sedentary behavior refers to any waking behavior with an energy expenditure below or equal to 1.5 metabolic equivalents* (METs), while sitting, reclining or lying down. Common sedentary behaviors include watching television, playing video games, using the computer, driving and reading²⁵.

Over the course of the past century, worker activity has shifted decisively towards more sedentary tasks²⁶. Transportation and the growing use of screens have also contributed to shaping an increasingly sedentary lifestyle.

In the same vein, the World Health Organization (WHO) estimates that 31% of the global population fails to engage in sufficient physical activity²⁷.

Worldwide, sedentary lifestyles are the fourth leading risk factor for non-communicable diseases, and the second most preventable risk factor after tobacco. According to the WHO estimates²⁸, it is the main cause of 3.2 to 5 million deaths a year worldwide. Sedentary lifestyles are also responsible for around 27% of cases of diabetes, 30% of cases of ischemic heart disease and 21% to 25% of cases of breast and colon cancer.

A study published in 2020²⁹ suggests that high levels of sedentary behavior correlate negatively with cognitive function, depression, disability and quality of life.

To actively combat the growing sedentary behavior problem, we need to rethink modern lifestyles. Public spaces should be better adapted to active mobility (walking, cycling), workplaces should include and encourage the practice of sports, and the school system should increase the space and time devoted to physical and sporting activities.

In Morocco, according to a Ministry of Health study conducted in 2018³⁰, over 20% of the population fell short of WHO-recommended daily physical activity thresholds, with the proportions highest among urban residents, women and the elderly.

Steps should therefore be taken to promote physical activity and combat sedentary habits among Moroccans, through awareness-raising and prevention campaigns designed for different population segments, based on the WHO's "Physical Activity and Sedentariness Guidelines"³¹.

SURCHARGE COGNITIVE

Cognitive load refers to the load of information that working memory can process at any one time. Cognitive overload occurs when a task requires more cognitive resources than an individual has available, producing errors and requiring more time to complete³².

The theory of cognitive load, formalized by John Sweller, identifies three types of cognitive load³³:

- Intrinsic: linked to task complexity.
- Extrinsic: caused by the way the information is presented.
- Essential: related to in-depth understanding of the task.

Cognitive load is based on the human information processing model, which distinguishes three types of memory: sensory memory, working memory and long-term memory. Of these, working memory is responsible for a host of cognitive functions, including attention, learning and reasoning, etc.

However, the capacity of this memory is limited. It can process 5 to 9 items simultaneously, according to George A. Miller's magic number³⁴. This memory plays a crucial role in filtering and sorting information for storage in long-term memory.

Poor cognitive load management, through excessive or over-complex information, may lead to impaired performance and learning, errors and mental fatigue, thereby developing a state of cognitive overload, which correlates with a range of conditions, notably the individual's expertise, input methods and disruptive mental states such as stress or anxiety³⁵.

In Morocco, taking cognitive load into account in education and training would help optimize learning by adapting teaching methods to learner abilities, thus promoting better assimilation of knowledge³⁶.

UPSKILLING

Upskilling refers to a process of upgrading and perfecting professional qualifications. Upskilling enables employees to improve skills in their current profession and field of activity³⁷.

According to the World Economic Forum, the 2020s should see an upsurge in "Upskilling". Some 44% of workers' current skill sets will be disrupted by 2030.

This disruption stems largely from the transformation of industry, driven in particular by Artificial Intelligence and other advanced text, image and voice processing technologies³⁸. By 2030, it is forecast that 23% of jobs worldwide will have changed as a result of these technological transformations³⁹.

Only 0.5% of global gross domestic product (GDP) is allocated to adult continuing education in 2024. Yet a recent study suggests that investment in training today's workers would boost global GDP by \$6.5 trillion by 2030 (or 6% of 2023 global GDP)⁴⁰.

Investing in an education geared towards future needs would generate a further \$2.54 trillion over the same period (i.e. 2% of 2023 global GDP). These figures illustrate the enormous economic potential of investing in lifelong learning to stimulate national economic growth.

Morocco should strive to harness upskilling to bridge workforce skills-gap, at a time of sweeping technological and other mutations.

The experience of Georgia could serve as an example. The country cut unemployment to an all-time low in 2022⁴¹. This achievement is largely the result of the "Georgia Skills Accelerator" program⁴². Launched in 2021, the program is based on solid public-private collaboration, designed to support skill acquisition and adaptation in selected economic sectors.

NATURE-CENTRIC

DEEP SEA MINING

Deep Sea Mining (DSM) is the business of extracting minerals* and metals from the seabed*. This begins with prospecting and exploration and culminates in the refining of ores ⁴³.

The drive to slash carbon emissions is driving up demand for vital elements of the energy transition, including copper, cobalt and nickel. The International Energy Agency projects a thirty-fold increase in global demand for these minerals, used to power electric vehicles and battery storage, by 2040⁴⁴.

The International Seabed Authority (ISA), the body responsible for regulating seabed activities, has signed 31 exploration contracts with 22 public and private contractors ⁴⁵. China, Russia, Japan, India, Norway, France and Germany are some of the countries in the running.

An international conference was held in Kingston in July 2023⁴⁶, to draw up a mining code governing seabed mining, encompassing technology, finance and the environment. While no consensus was reached, a roadmap was nevertheless produced to implement the code by 2025.

An increasing number of governments ⁴⁷ and non-governmental organizations support moves towards a moratorium, precautionary break or ban on deep-sea mining, be it in international waters, national waters or both.

Mining the seabed successfully is a major challenge that calls for a combination of advanced technology, extensive scientific insight and proper regulation before it can be implemented.

Morocco, with both Atlantic and Mediterranean seaboard, has a 3,500 km coastline - the longest in Africa - and an exclusive economic zone* of over one million square kilometers. It could propose an African Union-level definition of pan-African legislation⁴⁸, for the sustainable exploitation of the continental submarine environment.

This binding regional framework would then be incorporated into the existing body of international regulations, forming a framework for blue diplomacy. It would include measures for international scientific cooperation, to leverage best practices in seabed management and mining.

RARE EARTHS CRISIS

Rare earths* are a group of 17 chemical elements, used in high-tech devices, in renewable and clean energy industries (batteries, wind turbines) as well as in cutting-edge civil (consumer electronics, computers) and military technologies (lasers, radars, missile guidance systems, etc.).

The rare earths crisis is mainly the consequence of a virtual Chinese monopoly on the extraction of these materials. As early as 1927, China identified the economic potential of rare earths, before it began mining them in the 1960s. Classifying the industry as "critical" in 1990⁴⁹, China encouraged investment and restricted exports, while maintaining lax environmental standards and cheap labor⁵⁰.

In 2023, China held 44% of the world's rare earth reserves, followed by Vietnam (22%), Brazil (22%) and Russia (21%). At that time, China produced over 70% of the world's rare earths, against 14% for the USA, 6% for Australia and 4% for Burma⁵¹.

Growing demand and limited supply of rare earths led to a crisis, the first signs of which became apparent in 2010⁵², leading importing countries to seek alternatives to secure supply chains⁵³ and limit dependence on China⁵⁴, with little success. Still today, the European Union is almost totally dependent on China for rare earth supplies.

According to the International Energy Agency, global demand for renewable energies is set to increase by a factor of 7 between 2020 and 2040⁵⁵, driving up demand for rare earths, which could further exacerbate the already existing crisis.

According to Morocco's Office National des Hydrocarbures et des Mines (ONHYM), the Kingdom's southern regions hold substantial rare earth resources. A roadmap for managing critical metal operations, to meet future challenges facing the sector⁵⁶, would help enable the sustainable extraction of these resources.

In this respect, Morocco should continue prospecting for rare earths throughout its territory, preserve strategic and critical ores and forge cooperative ventures to secure rare earths supplies for the clean energy industry, the energy transition, and beyond.

THAWING OF THE CRYOSPHERE

According to the Intergovernmental Panel on Climate Change⁵⁷, the thawing of the cryosphere* refers to the melting and contraction of the Earth's ice and snow cover. These include ice sheets, ice shelves, sea ice (pack ice), permafrost*, mountain glaciers, continental snowpacks and seasonal snow.

Thawing of the cryosphere has several manifestations. These include accelerated melting of ice sheets, rising sea levels, disruption of ecosystems and habitats, increased frequency and intensity of extreme events, and disruption of hydrological cycles.

These different effects can also be interconnected. For example, melting glaciers disrupt hydrological cycles, leading to significant variations in water availability. Over the past 50 years, melting glaciers and reduced snow cover have led to a reduction in natural water reserves of some 27,000 billion cubic meters⁵⁸.

Rising permafrost temperatures also lead to increased release of methane and carbon dioxide⁵⁹. Melting permafrost in the northern hemisphere could also release some 800,000 metric tons of mercury by 2100⁶⁰. Mining opportunities opened up by thawing would also release ancient viruses and bacteria, creating the risk of disease outbreaks and pandemics.

The thawing of the cryosphere presents enormous environmental and health challenges. Measures to mitigate and adapt to this ongoing phenomenon are needed worldwide.

Morocco, with an arid to semi-arid climate, has no significant cryosphere. However, sea-level rises, caused by changes in the Earth's cryosphere, accentuate the effects of coastal erosion and endanger Moroccan coastal towns, with two-thirds of the country's beaches already affected⁶¹.

Snow cover is also of vital importance to the geomorphology, hydrology and socio-economics of seven rain-fed* watersheds⁶². Climate change shortens the duration of mountain snow cover, jeopardizing the survival of mountain ecosystems and water resources.

Morocco should therefore devise and implement a strategy to adapt to the thawing of the cryosphere, drawing on all relevant stakeholders across the country.

GOVERNANCE

CHINA-U.S. RIVALRY

The China-US rivalry is essentially a geopolitical and geo-economic competition between the two countries. The rivalry could disrupt supply chains, leading to increased de-globalization, resurgent inflation and further instability in global value chains and markets.

The United States expanded its global political and economic power in the aftermath of World War II. By 1960, US GDP accounted for 60% of global GDP⁶³.

Back in the Cold War, China was in the Soviet camp, while the United States led the Western camp. China-US relations nevertheless normalized in 1979. China's economic development continues unabated since then, notably following Deng Xiaoping's economic reforms of 1982, which gradually opened China up to global markets.

From the early 2000s onwards, the United States formalized trade relations with China under the *U.S-China Relations Act*⁶⁴, allowing the two countries to further expand trade.

As a result of its export-led economic policy, China became the world's second-largest economy in 2010, surpassing Japan⁶⁵. China-US trade relations have since gradually grown strained, particularly under the Trump presidency.

The trade rivalry saw a recent US industrial policy decision to restrict technology exports, namely via the *CHIPS Act*⁶⁶, with the aim of preventing China from gaining access to American microprocessors.

Geopolitically, the rivalry transpires in part in the militarization of the South China Sea. The risk of open conflict remains low, however, given the economic interdependence of both countries.

Escalating China-U.S. rivalry creates challenges for developing and emerging countries, who need to work with both sides without antagonizing either.

Morocco, a traditional US ally, does not shy away from allying itself with major emerging powers, notably China, with which it established a strategic partnership in 2016. Morocco's policy of diversifying alliances helps it keep pace of geopolitical changes in a volatile and uncertain world, while safeguarding its strategic autonomy and not aligning its foreign policy with a given foreign power when this does not serve its fundamental national interest.

The Kingdom should therefore continue to forge closer commercial ties with the United States, on the one hand, and with China and other emerging countries on the other, to safeguard supply chain stability and gain a prime position in global value chains.

COGNITIVE WARFARE

Cognitive warfare refers to the use of information as a weapon, to influence public opinion and, in turn, adversary institutions. NATO defines cognitive warfare as *"the manipulation of public opinion, by an external entity, to influence public and government policies and destabilize public institutions"*⁶⁷.

Information warfare was used in the Cold War as part of "psyops" (psychological warfare) operations, aimed at propagating information against the enemy on its territory. In recent years, the rise of cyberspace means information spreads across the globe in a matter of seconds, thereby magnifying the scale and impact of cognitive attacks⁶⁸.

Several traditional and emerging powers, and even extremist movements, now use cognitive attacks to destabilize political, economic and social systems in target countries, by confusing public opinion⁶⁹.

Cognitive warfare is now a formidable weapon at the disposal of groups and countries seeking to destabilize a target country. It has therefore become essential to include cognitive warfare as a potential threat to a country.

Morocco, like other countries the world over, is not immune to the threat of cognitive warfare. To best tackle this emergence, the Kingdom should adopt a comprehensive approach: further enhance national cybersecurity resources; establish a framework for identifying cognitive warfare through clear definitions; implement educational policies focused on fact-checking, to limit the effect of media bias, thus protecting public opinion from misinformation.

Furthermore, close cooperation with GAFAMs, via partnerships, would be useful for controlling online content and, in turn, combating cognitive attacks⁷⁰.

COLLABORATIVE WARFARE

Collaborative warfare refers to the synchronization of digital systems and resources (Artificial Intelligence, Machine Learning, Cloud, Data centers, etc.), military vehicles with embedded technologies (drones, tanks, fighter jets, etc.) and intelligence and information of all types, making them available for automated and real-time military action. This means resources collaborate across multiple environments (land, air, sea, space, cyberspace)⁷¹, as part of a centralized warfare system.

The U.S. Air Force already employs collaborative warfare extensively in theaters of operation. There are plans to procure 1,000 support UAVs and implement a Combat Cloud for the new 6th-generation fighter jets built in the years ahead⁷². The Scorpion program in France, launched in 2014, seeks to optimize communication within the army⁷³, while other programs, such as Liaison 16, Conect@Aero and Axon@V⁷⁴, provide inter-corps communication within the French Armed Forces.

Despite progress, collaborative warfare has yet to reach its full potential in the absence of a unified network, and efforts are underway to bring about full communication between all army corps.

At European Union level, Thales is developing the LATACC (Land Tactical Collaborative Combat) program, associating actors from 13 member states, and drawing on 49 million euros in funding from the European Commission. It aims to build a centralized warfare network between regional armed forces with a view to fostering more widespread collaborative warfare⁷⁵.

Collaborative warfare, dubbed the war of the future, enables seamless coordination of actions between forces in the field, as well as between different components of the armed forces. It is essential for armed forces wishing to secure a comparative battlefield edge over adversaries, minimizing uncertainty and increasing the precision of field operations.



Source: Ministry of the Armed Forces -France-. Army (2022). Presentation of the SCORPION program

In Morocco, Act 10-20 of July 14, 2020, on the Defense Industry, authorizes the development of a national defense industry within a robust legislative framework⁷⁶. This helps Morocco innovate, with centralized weapon systems and networks that combine human and digital resources, to be best equipped in the global race for collaborative warfare. This will enable the national defense system to better adapt to the handling of unfamiliar environments by leveraging data derived from sensors, thereby further illuminating decision-making processes and enhancing command functions.

CORPORATE SOCIAL RESPONSIBILITY (CSR)

Corporate Social Responsibility (CSR) refers to the deliberate (or imposed) incorporation by corporations of social, environmental and economic issues into their business operations and stakeholder relations and interactions.

CSR dates back to 1953, when US economist Howard Bowen - considered its founding father - published "*Social Responsibilities of the Businessman*". By the late twentieth century, CSR began to establish itself progressively within US corporations.

CSR debates first emerged in Europe in the 1990s, alongside the "sustainability" and "durability" movements. The concept was further developed in the wake of the 1992 Rio Conference⁷⁷, in a context of growing corporate awareness of social, economic and environmental issues.

CSR recently expanded in Europe to include governance (compliance with the law, transparency and ethics). ESG (Environmental, Social and Governance) criteria were introduced as part of the Green Pact for Europe, in 2019. The same criteria have since been adopted in a number of African countries, particularly in the banking and financial sector.

By 2021, 88 nations reported adopting the International Organization for Standardization's ISO 26000⁷⁸ standard, which establishes CSR guidelines. A further 17 countries are in the process of adopting the standard, underscoring the growing importance of CSR worldwide.

Now seen as an essential strategic tool for companies, CSR opens new markets, enhances brand image in the eyes of stakeholders and positions businesses as socially responsible.

The United Nations Global Compact (Global Impact)⁷⁹ calls on companies, associations and non-governmental organizations the world over to adopt socially and environmentally responsible attitudes, with a view to sustainable development and transparency.

The challenge is to transform CSR principles and/or ESG criteria into tangible actions that contribute to solving social, environmental, ethical and economic challenges facing human societies.

In Morocco, His Majesty King Mohammed VI urged businesses and investors back in 2005 to incorporate social responsibility objectives and indicators into their strategies⁸⁰.

Public authorities and the private sector have taken a number of steps in this direction, such as defining a CSR Charter for the Confédération Générale des Entreprises du Maroc (CGEM)⁸¹ and introducing a CSR label scheme in 2007.

By 2024, a total 124 companies held the CGEM CSR certification⁸², demonstrating their commitment to meeting social and environmental criteria. CSR adoption, however, is still held-back by persistent challenges, notably difficulties in effectively implementing these criteria, that need to be remedied through awareness-raising campaigns, incentives and support measures.

CYBERWARFARE

Cyberwarfare refers to the disruption of information systems by cyberattacks targeting military, civilian and/or technological objectives⁸³.

Arguably the first cyber-attack occurred in 1986, when East Germany targeted MILNET⁸⁴ to access to confidential information⁸⁵.

Digital technology expansion and the growth of the Internet, have created an ever- expanding, and consequently increasingly vulnerable, cyberspace. The cost of cyberattacks went from \$3,000 billion to \$8,400 billion in 2015-2022⁸⁶.

The Ukraine war is a particularly vivid example of the stakes attached to cyberwarfare worldwide. Ukrainians have to deal with a host of everyday problems arising from cyberattacks. They sometimes lose access to ATMs, the Internet and even electricity⁸⁷.

State and non-state actors alike use information as a form of cyber warfare, manipulating public opinion via fake news, bots and troll factories⁸⁸.

Cyberwarfare is increasingly employed as a means of destabilizing adversaries or perpetrating fraud. This is fueled by the ubiquitous Internet, everywhere. As a result, governments and businesses alike have a duty to develop cybersecurity systems to guard against cyberattacks and protect their information systems⁸⁹.

Recognizing the importance of protecting information systems, Morocco initiated a cybersecurity strategy in 2011, and created the Direction Générale de la Sécurité des Systèmes d'Information (General Directorate of Information Systems Security) in the same year, tasked with analyzing, auditing, monitoring, controlling and advising on information systems, and with regulatory oversight.

Despite the Kingdom's efforts in this area, its' information systems faced at least 52 million cyberattacks in 2023, according to international cybersecurity consultancy "Trend Micro Incorporated"⁹⁰. To guard against the proliferation of such attacks, the General Directorate of Information Systems Security (DGSSI) unveiled its new national cybersecurity strategy for 2030 in July 2024⁹¹.

Implementation should reflect current technological advances. Particular attention should be paid, in parallel, to the training of human capital and R&D to stay up to date in the field of cybersecurity.

DIGITAL PRIVACY

Digital privacy encompasses steps to protect personal data ⁹² from unauthorized access, breaches of confidentiality and abuse in cyberspace⁹³.

The emergence of digital technologies and the growing use of social networks and online platforms have given rise to significant concerns regarding digital privacy. This digital exponential growth has enabled tech giants to develop business models predicated on the mass collection and analysis of personal information.

Greater utilization of personal data inevitably results in misuse, as exemplified in the *Cambridge Analytica*⁹⁴ and *Pegasus* spyware⁹⁵ scandals, highlighting the importance of protecting digital privacy.

Breach of privacy potentially leads to serious consequences, including identity theft, reputational damage, online harassment and manipulation of public opinion.

Additionally, emerging technologies such as Artificial Intelligence and Big Data analysis blur the boundaries between online and offline prejudice, with ever more powerful algorithms progressively taking control of web user privacy, with no consent from the user, who is often ill-informed of such practices.

The key is to strike a proper balance between innovative digital applications and safeguarding individual privacy rights, while investing in infrastructure and education to harness the full potential of Big Data in an ethical and secure way.

Recognizing the importance of this emergence, Morocco established the Commission Nationale de Contrôle de la Protection des Données à Caractère Personnel (CNDP) in 2009. This Commission is charged with ensuring "respect for the fundamental rights and freedoms of individuals with regard to the processing of personal data"⁹⁶.

The CNDP is also charged with informing economic operators of the rules and mechanisms governing the transfer of personal data abroad. The Commission also provides "legal and technological intelligence. It tracks, studies and analyzes technological, economic, legal and societal trends and changes that may impact personal data protection in Morocco"⁹⁷.

The issue of national data protection is further fleshed out in a number of legal and regulatory frameworks, notably Law 09-08* on the protection of personal data.

INCREASING INFLUENCE OF MNCS IN GLOBAL GOVERNANCE

The growing influence of large corporations refers to the steady ascendancy of multinationals over states and other non-governmental players in the global governance system.

Global numbers of multinationals soared from 7,000 in 1972⁹⁸ to over 145,000 according to most recent *European statistical business registers*⁹⁹. Apple, for example, reported revenues (\$383 billion) greater than Portugal's GDP in 2022¹⁰⁰.

Multinationals today operate across multiple jurisdictions, so that they can design, register Intellectual Property and sell in developed economies, while at the same time opting for low-tax or low- production-cost countries to circumvent unfavorable multilateral, regional or local regulations¹⁰¹.

Transnational corporations' ability to directly invest and create jobs and economic growth gives them considerable leverage over countries. They can also influence intergovernmental organizations indirectly, by lobbying governments.

Multinationals are not, however, omnipotent players in global governance. NGOs and civic organizations can damage the interests of multinationals through activism (boycott campaigns, demonstrations, damage to reputation, etc.).

In 2009, Morocco signed the OECD Declaration on International Investment and Multinational Enterprises, making it easier for MNCs to do business in the country¹⁰².

The growing influence of MNCs requires national authorities to adjust public policies and investment magnet strategies, to tap into the huge technological and direct investment potential of large MNCs, while controlling the negative impacts they can have on the national economic fabric and public finances.

MULTIPLEX WORLD

The concept of a multiplex world, introduced by Amitav Acharya in his work *"The End of American World Order"*, refers to a world where various actors play their own games in parallel on different world stages. It can be seen in the gradual replacement of Western hegemony and a substantial rise in regionalism in many parts of the world.

This new world, increasingly decentralized and favoring cooperation around recognized regional powers, seeks regional solutions attuned to local realities, in a spirit of open, shared leadership.

Acharya uses a country's "capacity to interact"¹⁰³ to show how the world is increasingly multiplex. Between 1945 and 2000, the United States took part in 40% of all new treaties signed, whereas from 2006 to 2017, this share fell to 22%¹⁰⁴, attesting to the emergence of new international cooperation frameworks.

In this multiplex world, international relations are no longer limited to a simple balance of power between great powers. On the contrary, multiple influential players now emerge, ranging from nation-states to multinationals, NGOs, social movements and even terrorist groups.

This diversity of geopolitical actors is transforming global power and influence dynamics.

One key feature of this multiplex world is a growing interdependence between nations. Global challenges such as climate change, pandemics and economic crises require collective responses, making multilateral cooperation indispensable. For example, the management of water resources and migration requires countries to work together, even in the face of political friction.

A multiplex world also brings opportunities. It drives innovation and creativity in solving global problems. Digital platforms, for example, enable ideas and best practices to spread quickly, fostering collaboration between a variety of players. The multiplex world is now a fact for every country.

However, the trend towards a multiplex world poses significant challenges to the smooth functioning of international cooperation. Complex international relations give rise to conflicts of interest, making decision-making more difficult. Also, the rise of nationalism and populism in many countries makes international cooperation more problematic, as governments often prioritize national agendas to the detriment of a collective approach.

Morocco is at a strategic crossroads in this complex world. The country has developed a proactive diplomacy, forging relations with a range of global powers, including the European Union, China and the United States. This openness lets the Kingdom play a mediation role in regional crises as well as strengthening its alliances.

Morocco also faces global challenges such as climate change and migration, which require concerted responses. It took significant initiatives, particularly at the United Nations Climate Change Conference (COP22) in Marrakech and at the Global Compact for Safe, Orderly and Regular Migration, where it called for global action on the environment and migration.

In terms of the economy, Morocco strives to broaden partnership ties and enhance its attractiveness as a hub for investment in Africa and as a gateway to Europe. Free-trade agreements and infrastructure upgrades attest to Morocco's determination to fully integrate the global economic fabric.

In fact, under the inspired vision of His Majesty King Mohammed VI, may God Assist him, the Kingdom has pursued an African policy that has seen a surge in the number of political, economic and trade agreements signed with African countries (over 1,000 in the last twenty years)¹⁰⁵. And so, with these multiple accords in place, Morocco already occupies a prominent place in this multiplex world.

The Royal Initiative for Atlantic Africa, a prime example of successful regionalism, is part of this same strategy of stepping up Morocco's economic integration with the rest of Africa. It seeks to promote shared prosperity between Atlantic and Sahelian African countries. It consolidates the Kingdom's position as a regional geostrategic leader in an increasingly complex world.

RENEWED MILITARY SPENDING

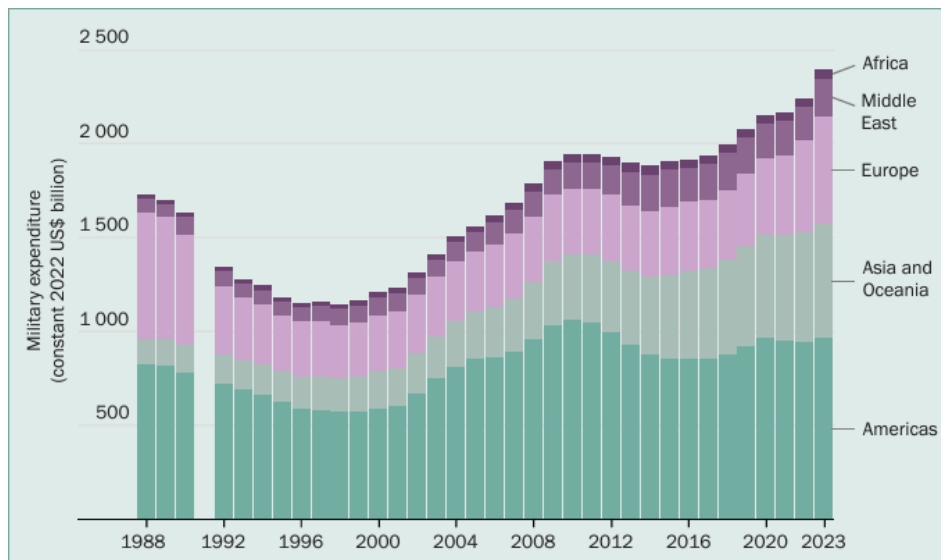
According to US think tank *International Institute for Strategic Studies*, military spending is seeing a global resurgence today. Global defense expenditure rose 9% from the 2019-2022 period in 2023¹⁰⁶, and is set to continue climbing in 2024. This trend stems from the proliferation of zones of instability and armed conflict across a number of regions.

Several countries, notably NATO members, have increased defense budgets in the wake of Russia's invasion of Ukraine in February 2022. The United States, for example, raised its military spending by 2.3% from 2022, to over \$900 billion in 2023¹⁰⁷.

In Europe, Germany intends to increase its military budget by 0.5% of GDP to reach the 2% target set by NATO¹⁰⁸. France plans to allocate a total of €413 billion to defense by 2030, the biggest increase in 60 years¹⁰⁹, while Poland plans to devote over 4% of GDP to military defense by 2024¹¹⁰.

Asia, meanwhile, set a record in 2023 with over \$510 billion invested in defense, a surge mainly driven by the militarization of the South China Sea. In March 2023, China increased defense spending by 7.2% from 2022¹¹¹. Meanwhile, in August 2024, Taiwan earmarked \$19.1 billion (3% of GDP) for its defense budget, the highest in its history¹¹².

These increases in arms budgets could destabilize more world regions and lead to more direct conflict.



Source: Trends in World Military Expenditure, 2023. Stockholm International Peace Research Institute (SIPRI).

Morocco allocates between 3% and 4% of GDP to defense. Spending is driven by a need to continue upgrading and enhancing military capabilities, defend territorial integrity and counter potential threats in an unstable regional context. It is worth noting that, in line with a new strategic sovereignty paradigm, the Kingdom recently embarked on the development of a military and defense industry.

EXPONENTIALITY

CLOUD COMPUTING

Cloud computing refers to the use of networks of interconnected remote servers, generally accessible via the Internet, to store, manage and process data¹¹³.

Cloud Computing is an essential component of IT in today's digital age, particularly with the rise of Big Data. Indeed, the volume of digital data created or replicated worldwide has increased by a factor of 30+, from 2 zettabytes (or one billion terabytes) in 2010 to 64 zettabytes in 2020¹¹⁴.

Furthermore, in less than a decade, Cloud Computing revenues grew considerably worldwide, from \$145 billion in 2017 to \$561 billion in 2023, a jump of over 200%. Revenues are expected to hit \$1,266 billion by 2028¹¹⁵.

In 2023, North America alone accounted for 40% of the global cloud computing market¹¹⁶. Asia, however, leads the way in the adoption of Cloud Computing solutions¹¹⁷. In 2022, the *Global Cloud Ecosystem Index*, ranked Singapore as the world's fastest-growing cloud-based economy¹¹⁸.

Cloud Computing is both an opportunity for IT companies to build resources, and a challenge in terms of digital sovereignty and data protection.

The industrial value of remote data center installations in Morocco grew 33%, from \$93.5 million in 2018 to \$124.6 million in 2023. The figure for 2033 is projected at \$259.9 million¹¹⁹. The Kingdom should capitalize on this emerging trend and promote the Cloud as part of its new strategy "Maroc Digital 2030"¹²⁰.

While replacing physical servers with virtual ones offers advantages, notably improved IT performance, it is also essential to strengthen the role of the National Commission for the Supervision of Personal Data Protection (CNDP) in raising awareness, monitoring and ensuring compliance of virtually stored data processing processes with the requirements of Law 09-08.

DIGITAL COLONIZATION

Digital colonization refers to one country exerting control over another's sovereignty (political, economic or social) through digital means (networks, connections, etc.)¹²¹.

According to French Senate report "*L'union européenne, colonie du monde numérique?*", digital colonialism is defined by the fact that a country can no longer control its digital data, thereby exposing itself to dominance and perhaps even digital underdevelopment.

The United States and China are the world's two digital powerhouses. GAFAM are the armed wing of North American "digital colonialism"¹²². Similarly, China asserts its digital power through BATX¹²³.

These digital giants built business models centered on the harvesting of personal data to accumulate capital and monitor populations at the same time, in order to extend their digital influence around the world¹²⁴.

The social networks owned by these companies are also tools of influence, providing digital public spaces that shape public debate, spread misinformation, exacerbate manipulation, drive boycotts and contribute to dismantling the value generated by traditional media¹²⁵.

Developing countries are particularly vulnerable to digital colonialism. According to the World Bank, sub-Saharan Africa faces major digital challenges, stemming from poor connectivity and insufficient digital infrastructure, a lack of skilled manpower and inadequate public policies and legislative frameworks, all of which are likely to impede its sovereign digital development and drive the region to source digital content from outside¹²⁶.

A number of national digital strategies have already been implemented in Morocco: e-2010, Maroc Numérique 2013, Maroc digital 2020, etc.¹²⁷. Despite digital advances, gaps remain in digital infrastructure and regulation.

Alongside implementing the 2030 digital strategy, and to secure an independent national digital space, the Kingdom needs to adopt a comprehensive digital policy comprising a multi-pronged approach.

At the structural level, this requires massive investment in digital infrastructure and future technology¹²⁸.

National cyber-security policy should be further enhanced, to secure networks by investing in advanced technological cyber-security tools¹²⁹, and thus boost digital user confidence.

At the legislative level, ensuring that the digital space protects rights and freedoms, and notably personal data, is a sound course of action.

To this end, the National Commission for the Supervision of Personal Data Protection's prerogatives should be enhanced via consolidated legal, administrative and technical mechanisms, inspired by similar bodies elsewhere in the world¹³⁰, enabling the institution to protect Moroccan citizen data more effectively and, consequently, contribute to the Kingdom's digital independence¹³¹.

Finally, with regard to continental cooperation, the feasibility of creating regional data centers in partnership with African countries ought to be explored, to protect the interests of digital users in Africa and the continent's cyberspace.

E-COMMERCE

E-commerce or electronic commerce encompasses all commercial transactions carried out remotely via electronic interfaces¹³².

This new selling channel has come into its own primarily as a result of the near-ubiquitous global availability of the Internet. According to the International Telecommunication Union, 66% of the world's population used the Internet in 2022, up from just 16% in 2005¹³³.

E-commerce transactions amounted to \$5,800 billion in 2023¹³⁴, i.e. 6% of global GDP¹³⁵. Asia leads the ranking of global e-commerce markets, with total revenues of nearly \$1,700 billion, some \$800 million ahead of e-commerce revenues in the USA¹³⁶.

Asia's top position goes to China, with revenues of over \$935 billion in 2023¹³⁷. Australia, Oceania and Africa, on the other hand, achieved far lower revenues, under \$40 billion¹³⁸.

This surge in e-commerce is associated with the proliferation of social networking platforms, spurring the emergence of influencer marketing, i.e., harnessing the recommendation power of influencers* and digital content creators for commercial purposes, to target the millions of Internet users who seek product inspiration and advice on a daily basis.

In less than a decade, influencer marketing revenues grew exponentially worldwide, from \$1.7 billion in 2016 to \$21.1 billion in 2023, i.e., an increase of 1141%¹³⁹.

E-commerce has established itself as an effective alternative means of developing sales both at home and abroad. Promoting e-commerce means expanding market size and generating employment opportunities for young graduates.

Morocco too has seen a boom in e-commerce. According to the "Centre Monétique Interbancaire", e-commerce online payment transactions using bankcards went from 1.67 million for a value of 910.8 million dirhams in 2013¹⁴⁰, to 28.1 million for a value of 9.6 billion dirhams in 2022¹⁴¹, i.e., a 954% increase.

The Kingdom stands to capitalize on this emerging trend by promoting e-commerce among its youth, notably through investment in digital education, support programs for entrepreneurs seeking to start an online business, and fostering digital inclusion. This would generate more wealth, create additional jobs and absorb a portion of the informal sector into the national economy.

GENERATIVE ARTIFICIAL INTELLIGENCE

Generative Artificial Intelligence is a branch of Artificial Intelligence that enables computers to create images, texts, photos and videos autonomously, whereas "traditional" Artificial Intelligence simply analyzes data to make predictions¹⁴².

Generative models have been used to analyze numbers since the 1950s¹⁴³. In an increasingly interconnected world, the abundance of data and the power of computers and algorithms have accelerated the development of Generative Artificial Intelligence.

The emergence of this disruptive technology was signaled by the 2014 release of the "*Generative Adversarial Network*"¹⁴⁴ which enables machines to generate content without human intervention. This breakthrough paved the way for Large Language Models (LLMs), which draw on a vast data set to generate text in human language.

A prime example of LLM is GPT-1, created in 2018, followed by the improved version ChatGPT in 2022. Both were developed by US firm Open AI. Other firms have since followed in ChatGPT's footsteps, including Llama by Meta (2023), Gemini by Google (2023), etc. McKinsey calculates the annual value of this industry at \$6,100 to \$7,900 billion¹⁴⁵.

Generative Artificial Intelligence offers a wide range of applications, from chatbots* for customer assistance to personalized digital content creation. In education, it paves new avenues for pedagogical innovation.

The adoption of Generative Artificial Intelligence raises significant challenges. In addition to the risk of job destruction, it exposes users to threats such as misinformation and invasion of privacy. Moreover, algorithmic biases and imperfect models lead to the propagation of false information.

Regulatory frameworks, such as the "EU AI act" and the "US Executive AI Act", as well as the "UN AI Task Force", co-sponsored by the USA and Morocco, are essential to regulate this technology and control its impact

Morocco recognized the importance of Generative Artificial Intelligence very early on, setting up initiatives to promote its development, notably research centers, public-private partnerships and educational programs.

With this in mind, the Kingdom intends to "*develop a Generative Artificial Intelligence system compatible with its own specific needs*"¹⁴⁶ in collaboration with US firm Open AI. This initiative deserves a genuine national strategy for Generative Artificial Intelligence.

GREEN JOBS

Green jobs are jobs that help preserve the environment, whether in traditional sectors such as manufacturing and construction, or in new emerging sectors such as renewable energies¹⁴⁷.

These forms of employment today offer practical initiatives, on a global scale, to adapt to the effects of climate change, boost energy efficiency, reduce greenhouse gas emissions, minimize waste and pollution, while actively working to preserve and restore ecosystems¹⁴⁸.

According to the International Renewable Energy Agency, the number of people working in renewable energies worldwide has risen from 7.3 million in 2012 to 13.7 million in 2022, an 88% growth over a decade¹⁴⁹.

Nearly two-thirds of these jobs are in Asia, with China alone accounting for 41% of the global total. These are mainly jobs in the solar photovoltaic, bioenergy, hydroelectric and wind power industries¹⁵⁰.

At the Dubai Climate Summit (COP28), over 100 countries agreed to triple their renewable energy capacity by 2030¹⁵¹, which should significantly expand green jobs. IRENA, for one, forecasts that the number of jobs in renewable energies could reach 38.2 million by 2030¹⁵².

The substantial job creation potential of green jobs offers real opportunities for reducing unemployment and successfully completing the energy transition through clean energy production and consumption.

Morocco, which in 2009 introduced a new energy model based on energy efficiency, aspires to cut energy consumption by 20% by 2030 and increase the share of renewable energies in national electricity production to 52%¹⁵³.

Concurrently, the country drew up its Low Carbon Strategy 2050 in 2020¹⁵⁴. Successful implementation of this strategy should generate green employment, underscoring the value of investing in green skills training and adapting the labor market accordingly.

At the same time, the Kingdom should make innovation a core factor in the success of its energy transition, by promoting initiatives such as the "Accelerator of Green Growth and Jobs" project¹⁵⁵, initiated in 2023. This project seeks to spark creativity in green technologies, so as to foster an equitable green economy that generates wealth and jobs for young people.

STREAMING (VIDEO GAMES, PODCASTS, ...)

Streaming is the activity of consuming multimedia content (entertainment, games, news, etc.) online, deferred or live, via internet platforms (YouTube, Netflix, Spotify, etc.). Streaming audiovisual content was born in the 1990s, following the creation of the Internet in 1983. It began in 2005 with YouTube, which paved the way for other platforms in the following years: Spotify (2006), Netflix (2007), Hulu (2007), Amazon Prime (2016), Disney+ (2019), Paramount+ (2021) etc.

The digital revolution has changed the way users consume media, displacing traditional channels (television, radio, etc.). Streaming audiovisual content (film, music, television via the Internet) has grown exponentially as a result of the widespread availability of high-speed Internet networks and the proliferation of screens.

S&P Global reports that revenues generated by the multimedia streaming industry¹⁵⁶ in the United States rose from \$2 billion in 2010 to over \$80 billion in 2023¹⁵⁷. Furthermore, while 76% of Americans reported watching television via cable or satellite in 2015, the figure has dropped to 56% in 2021, according to a Pew Research Center study¹⁵⁸.

This emerging trend is also evident in video games. The share of users in the UK reporting that they stream or download video games grew from 3% in 2013 to 32% in 2018¹⁵⁹. Streaming also has a strong impact on the music industry: the share of music revenues derived from streaming grew from 29% in 2011¹⁶⁰ to 63.3% in 2023¹⁶¹. *Custom Market Insights* forecasts streaming industry revenues to exceed \$256 billion in 2032, up from nearly \$60 billion in 2023¹⁶².

Streaming is advancing by leaps and bounds, generating ever-increasing resources for industrial firms operating in this field. Regulating and taxing this new sector are major challenges.

In Morocco, the streaming industry continues to grow exponentially. Overall streaming audiences have overtaken television audiences since 2021 (53% vs. 41%)¹⁶³. A number of Moroccan streaming companies have been set up to meet this growing demand.

Recognizing the exponential growth of this industry, the "Direction Générale des Impôts", through Article 115 bis of the 2024 Finance Law requires "non-resident distance service providers" to "register via the electronic platform specifically dedicated to this purpose and obtain a tax identifier" to pay relevant taxes¹⁶⁴. Other similar initiatives should be encouraged to regulate this emerging sector in Morocco.

PLANETIZATION

ANIMAL HEALTH MARKET

The animal health industry includes the manufacture and distribution of products such as vaccines, drugs, feed, diagnostics, medical devices and other products and services related to animal health¹⁶⁵.

This market covers a broad range of animals, including pets such as dogs and cats, farm animals such as cattle and poultry, and laboratory animals. Primary customers in this market include veterinarians, pet owners, farmers and other animal health specialists.

Growing demand for meat and dairy products¹⁶⁶, rising spending on animal health, a surge in zoonotic diseases^{*167} and pet ownership¹⁶⁸ are all factors that drive the animal health market.

Global animal health market revenues in 2016 amounted to roughly \$30 billion, up almost \$10 billion from 2008¹⁶⁹.

The animal health market faces several challenges, arising on the one hand from a changing regulatory framework for product use and innovations in animal health, and on the other from surveillance and research into zoonotic diseases and parasites.

According to the World Organization for Animal Health, 1.7 million undiscovered viruses are present in mammals and birds, of which around 850,000 could potentially be zoonotic¹⁷⁰. This poses a significant health risk.

In Morocco, the "*One-Health*" concept, designed to address the Nexus of human, animal and environmental health, came up during the health crisis. Implementation is still at a preliminary stage, however, and has yet to be incorporated into national programs, particularly those aimed at combating zoonotic diseases and preventing risk factors linked to non-communicable diseases¹⁷¹.

CARBON BOMBS

The expression carbon bomb or climate bomb is the nickname given to fossil fuel extraction projects (coal, gas and oil), projected to generate over 1 gigaton of CO₂ over their remaining lifespan¹⁷².

There are 425 sites worldwide currently engaged in the extraction of fossil fuels, either already in operation or in the start-up phase¹⁷³. The ten countries with the largest number of sites are China, the USA, Russia, Saudi Arabia, Australia, Qatar, Canada, India, Iraq and Brazil, each with ten sites¹⁷⁴.

These fossil fuel extraction projects raise global concerns in the fight against climate change, as their lifetime emissions could be twice as high as the carbon budget threshold of 1.5°C¹⁷⁵, thus jeopardizing the climate goals set out in the Paris Agreement.

The deactivation of carbon bombs must become a priority in climate change mitigation policies. So far, the Conferences of the Parties (COP) have primarily focused on reducing greenhouse gas emissions.

Morocco is not directly involved in investments related to carbon bombs. However, it has implemented measures to mitigate the effects of climate change and aims to reduce its carbon dioxide (CO₂) emissions by 13% by 2030¹⁷⁶.

While significant progress has been made in the development of renewable energy, the country's reliance on fossil fuels remains high (nearly 90%)¹⁷⁷. The transition to a low-carbon economy presents a complex challenge, requiring ongoing efforts and international cooperation.

CONSERVATION AGRICULTURE

According to the UN Food and Agriculture Organization ¹⁷⁸, conservation agriculture is a farming system that minimizes soil disturbance, maintains permanent vegetation cover and diversifies plant species. This farming practice enhances biodiversity and natural biological processes both above and below ground, contributing to the efficient use of water and nutrients, while sustainably improving crop production

The adoption of conservation agriculture is on a global upswing, with 78 countries reporting adoption in 2016, up 42 countries from 2009¹⁷⁹. Areas under conservation agriculture have also expanded. Total land area under conservation agriculture accounted for 14.7% of the world's total cultivated land area in 2019, up from just 12.5% in 2016¹⁸⁰.

Despite rising adoption rates of conservation agriculture, this farming system still faces many challenges. The transition to no-till* methods can be complex for farmers accustomed to traditional techniques. In addition, the initial investment required to acquire specialized no-till equipment can be considerable. A lack of knowledge and training in conservation agriculture practices can also hinder its adoption.

Conservation agriculture could become more widespread as the world's population is projected to reach 9.7 billion by 2050, increasing demand for food and feed by 70%¹⁸¹.

Conservation agriculture has been a constant focus of agricultural research in Morocco since the 1980s. Today, no-till is recognized as a resourceful approach to ensuring sustainable agricultural production while preserving natural resources (soil and water), and is promoted as part of the new "Génération Green 2020-2030" agricultural strategy. This strategy seeks to promote conservation agriculture on 1 million hectares by 2030.

Alongside benefits for natural resources, a cost-of-production analysis shows that no-till saves between 500 and 900 dirhams per hectare over conventional methods.

UBERIZATION OF SOCIETY

The Uberization of society refers to the transformation of traditional economic models into a new model that enables direct and instantaneous contact between customers and service providers (whether companies or individuals) via digital platforms¹⁸².

What we have here is "*a rapid shift in the balance of power thanks to digital technology*"¹⁸³. This is "*a new economic model tied to the digital economy*", a competitor that "*can swiftly threaten and challenge an old model of the traditional economy*"¹⁸⁴.

The business model of outsourcing platforms rests on four pillars:

- extensive outsourcing of production to independent producers, where the platform simply coordinates and acts as a trusted third party;
- advantageous balance of power for the platform, due to the large number of independent producers;
- large-scale deployment using digital technologies;
- interchangeability between producers and consumers, as producers can also be private individuals.

Uberization platforms have emerged as a result of ubiquitous internet, smartphone penetration, changing urban lifestyles and a growing demand for new sources of income, made easier by self-employed status.

Uberization has already transformed a number of business sectors, including transport (Uber, Blablacar), hotels (Airbnb, Booking), catering (Deliveroo, Glovo), book publishing and distribution (Amazon Publishing), etc.

Uber, the ride-hailing company, for example, is now present in nearly 70 countries worldwide, generating a net income of over \$37 billion in 2023¹⁸⁵.

The challenges of uberization are diverse, prompting social and economic debates on workers' rights, social protection, platform regulation and the exacerbation of inequality in the digital age.

With the rise of the digital economy in Morocco, uberization expands in a variety of sectors, including transport, catering, real estate and the medical field, and spills over into other areas. The current tax framework, however, raises several questions, especially in light of the far-reaching implications of these activities on employment, labor relations and people's quality of life. It would therefore be pertinent to update the legal and regulatory frameworks governing the employment market and social protection, to bring them into line with these new working methods.

CONCLUSION

This second Annual Survey Paper, issued as part of the IRES foresight intelligence mission, not only consolidates the 2023 analyses, but also identifies further emerging trends, mapping them against the five pillars of the IRES reading grid for variables shaping the future: *Human-centric, Nature-centric, Governance, Exponentiality and Planetization*.

This consistency in the methodology for analyzing emerging trends offers the advantage of facilitating the synthesis of possible evolutions in the key issues of the future that is taking shape before our very eyes. Moroccan decision-makers (both public and private) should not only anticipate this possible future, but make it their own and, pro-actively, prepare for it decisively by aligning short- and medium-term actions with the horizon that lies ahead.

The most striking new emerging trends relate to the following aspects.

On the "**Human Centric**" pillar:

- ▶ **Work is set to become increasingly flexible**, opening up a host of opportunities for remote employment for young people (**on-demand workers**), while at the same time calling for new skills (**Upskilling**) that students and workers need to have to adapt to new occupations across economic and social sectors.
- ▶ New external factors shape **attitudes and behaviors**, such as **pseudoscience** which, like fake news, spreads swiftly via information technology, and has the capacity to seriously disrupt the effectiveness of public policies with target audiences. Added to this is **the addiction to gambling**, notably online, which, in addition to damaging household savings, exerts harmful effects on the brains of its followers, potentially reducing productivity and attachment to human and social values. Good management of the cognitive load of employees and learners is also a new reality that needs to be taken into account, to prevent depressive mental states.
- ▶ Current changes in the area of human health are mixed.
 - A sedentary lifestyle, fostered by the irruption of information and communication technologies into people's daily lives and by the ease of transport, contributes to a reduction in physical exercise, and is thus a risk factor for the development of numerous diseases such as diabetes.
 - The decline in male fertility, a major public health challenge, should be addressed as part of national health policy.
 - Investment in occupational therapy should be envisaged to improve the management of disabilities.
 - The legalization of cannabis, alongside its economic impact, opens the way to new therapeutic solutions, provided consumption and the effects of cannabis cultivation on the natural environment are properly regulated.

On the "**Nature-Centric**" pillar:

- ▶ **The thawing of the cryosphere**, i.e., the melting and shrinking of the Earth's expanses of ice and snow, poses enormous environmental (extreme phenomena, water shortages) and health (risk of re-emergence of ancient diseases) challenges and calls for effective adaptation strategies.
- ▶ **The shortage of rare earths**, arising from the race to acquire them, is of particular concern to countries fully committed to their energy transition and constantly seeking to secure their energy supplies, while actively pursuing their exploration programs for these critical materials.
- ▶ **Subsea mining**, set to expand considerably over the next few years, also under the impetus of the energy transition, needs to be better regulated, while appropriating the best available scientific and technological knowledge.

On the "**Governance**" pillar:

- ▶ **Corporate Social Responsibility (CSR)** is now a fundamental consideration in the management of any company. It incorporates requirements related to ethics and transparency. The challenge is to transform CSR principles and/or ESG (environmental, social and governance) criteria into tangible actions that contribute to resolving the social, environmental, ethical and economic challenges facing human societies.
- ▶ **International relations** are shaped by the emergence of **multiple influential players**, ranging from nation-states to multinationals, NGOs, social movements and even terrorist groups. A multiplex world emerges, featuring a slowdown in globalization and the emergence of regionalism, favoring the search for innovative solutions adapted to local realities. All this takes place against a backdrop of intensifying China-US rivalry, which profoundly impacts global geo-economics.
- ▶ **In the area of defense and security**, emerging trends include a global resurgence in military spending from 2022 onwards, and the adoption by many countries of a collaborative combat doctrine.

Another imperative is to develop strategies to deal with cognitive warfare, which seeks to destabilize states through mass manipulation, and cyber-warfare, which makes malicious use of the full sabotage potential of information and communication technologies. Last but not least, the protection of digital privacy of citizens is equally important, from a comprehensive civil defense perspective.

On the "**Exponentiality**" pillar:

- ▶ **The emergence of green jobs** opens up a huge reservoir of job creation for countries around the world, provided they develop human capabilities and stimulate creativity in green technologies.
- ▶ **Emerging information and communication technologies** include: Generative Artificial Intelligence, which if mastered properly could become an asset rather than a job-destroying force; streaming (video games, podcasts, etc.), which generates a wealth of resources. Finally, digital colonization- a proven risk that needs to be addressed, including through regional cooperation to create continental cyberspaces, including one for Africa.

On the "**Planetization**" pillar:

- ▶ **The animal health market** is booming, driven by growing demand for meat and dairy products, rising spending on animal health, the increase in zoonotic diseases (diseases transmissible from animals to humans) and pet ownership.
- ▶ **The Uberization of society** is underway in the personal services sector, with customers and service providers (companies or individuals) now in direct, instantaneous contact via digital platforms. The opportunities generated by this trend favor the emergence and expansion of start-ups.
- ▶ **In the area of sustainable development**, conservation agriculture makes progress and deserves to be supported, to speed up the achievement of the 2015-2030 Sustainable Development Goals. As regards carbon bombs, while developing countries are not directly involved in any such investment projects for the time being, they should continue efforts to expand renewable energies to successfully complete the transition to a low-carbon economy.

An emergence occurs whenever a higher degree of organization and integration appears in the Universe. The possible number of emergences is, of course, as yet undetermined.

Juignet Patrick, Philosopher, Publishing Director of "Philosophie, science et société" (Philosophy, science and society)

GLOSSARY

Term	Definition
Cannabis	<p>The Cannabis plant (<i>Cannabis sativa</i> L.), a member of the <i>Cannabaceae</i> family, is native to Central Asia and widely cultivated in other regions such as Canada, the United States and Africa¹⁸⁶.</p> <p>This plant contains a psychoactive substance, delta-9-tetrahydrocannabinol (THC), as well as other similar compounds. These substances are usually consumed by inhalation, ingestion, drinking or vaporized inhalation for recreational and medicinal purposes, due to their psychoactive effects.</p>
Chatbot	<p>Also known as a "conversational robot", a Chatbot is a computer program designed to carry on a conversation with a human user, whether in writing, by voice or via a chat window. Chatbots are used, in particular, in customer service, personal assistance, training, etc.¹⁸⁷.</p>
Conspiracy theory	<p>Alternative explanation asserting that world events and phenomena are the result of secret manipulation by powerful groups. It favors intuition and belief over scientific evidence, and is characterized by a distrust of institutions, a simplification of reality and an absence of solid evidence. Conspiracy theories exploit cognitive biases, such as confirmation bias, the Dunning-Kruger effect and the need for consistency. By reinforcing pre-existing beliefs and offering simple explanations, they satisfy a deep-seated need to make sense of the world¹⁸⁸.</p>
Cryosphere	<p>Derived from the Greek "kryos" (meaning cold, ice), the cryosphere refers to all areas of the earth's surface and seas where water is in a solid state¹⁸⁹.</p>
Deep-sea mineral deposits	<p>There are three types of commercial value located between 400m and 6.5km depth:</p> <ul style="list-style-type: none"> • Polymetallic nodules are small grey balls containing nickel, manganese, copper and cobalt found between 3 and 6.5 km from the abyssal plains¹⁹⁰; • Polymetallic sulfides are generally found at depths of 1 to 4 km in the vicinity of hydrothermal springs and hot springs on oceanic ridges¹⁹¹; • Ferro-manganese crusts are metallic layers composed of iron and manganese oxides incorporating elements such as cobalt, platinum, titanium, vanadium and zirconium. They are located at depths of between 400 and 4000m¹⁹².

Emergence	A phenomenon that can lead to the inflection of a major trend, a discontinuity or the birth of a new trend. It is often linked to the emergence of new players, a change in a player's role in the system, new modes of behavior or sociability, etc. ¹⁹³ .
Exclusive Economic Zone (EEZ)	Band of sea or ocean located between territorial waters and international waters, over which a riparian state (sometimes several states in the case of shared management agreements) has exclusive rights to exploit resources ¹⁹⁴ .
Freelancer	Self-employed worker who performs specific tasks for different organizations, rather than working all the time for a single organization ¹⁹⁵ .
Influencer	A person who is active on social networks through the creation of content, and who has a significant notoriety that enables him or her to share opinions, activities and consumer habits and thus exert an influence on Internet users who follow him or her ¹⁹⁶ .
Law 09-08	Enacted in Morocco in February 2009, this law aims to provide effective protection for individuals against abuses of data use that could undermine their privacy, and to harmonize Morocco's personal data protection system with those of partners, notably in Europe. The law also establishes a National Commission for the Protection of Personal Data (CNDP) ¹⁹⁷ .
Metabolic equivalent (MET)	Derived from "Metabolic Equivalent of Task", this unit measures the intensity of physical activity. A MET unit is defined by energy expenditure while seated and at rest (3.5ml/O2/kg). Physical activities are those corresponding to an energy expenditure equal to or greater than 2 METs ¹⁹⁸ .
No-till	Also known as zero-till or direct seeding, no-till is a conservative method of soil and crop management, where the seed is applied directly to the untreated soil. The herbicides used to eliminate weeds before, after and during cultivation are the least polluting possible for the soil, which must always be covered. Unlike conventional farming, where the soil is ploughed before each sowing, direct seeding preserves soil structure and vegetation cover ¹⁹⁹ .
Occupational therapy	The term occupational therapy has its origins in ancient Greek, with "ergon" meaning "work and action" and "therapia" referring to "treatment"

Permafrost	A natural, geological phenomenon referring to soils whose temperature remains below freezing 0°C for two years or more. It stores twice as much methane CH ₄ and carbon dioxide CO ₂ as the Earth's atmosphere; quantities of greenhouse gases that account for about 15 years of human emissions ²⁰⁰ .
Rainfall regime	A hydrological regime with a double input: liquid rainfall, mainly in autumn and winter, and snowmelt, which complements the rainfall input and occurs in spring. This regime differs from the nivo-pluvial regime, whose main input is snowmelt. ²⁰¹
Rare earths	The rare earths comprise 17 chemical elements: Lanthanum; Cerium; Praseodymium; Neodymium; Promethium; Samarium; Europium; Gadolinium; Terbium; Dysprosium; Holmium; Erbium; Thulium; Ytterbium; Lutecium; Scandium; Yttrium ²⁰² .
Seabed	The seabed refers to the deepest part of the earth's substratum beneath the oceans and seas. They constitute a geological expanse, encompassing various types of landforms ²⁰³ and are home to a variety of ecosystems. The seabed harbors considerable deposits and strategic natural resources, such as nickel, copper, manganese and cobalt.
Zoonotic disease	Also known as "Zoonosis", refers to any infectious disease that passes from animals to humans, whose pathogens may be of bacterial, viral or parasitic origin. It is spread to humans through direct contact, food, water or the environment ²⁰⁴ .

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