

Aim of the Report

The current crisis reminds us that history seldom runs smoothly, that the continuation of current trends does not always represent the most probable future and that there are frequent discontinuities. Can these be anticipated? Can we prepare for them? How can we forearm ourselves against threatening discontinuities and shocks? How can we promote those that seem desirable?

The *Vigie 2020 Report* offers an overview of 16 'what-if scenarios' that provide sketches of the global scene over the next 30 years. It explores a number of deep discontinuities and shocks, some of them very probable (environmental change, shifts in the power relations between states etc.), others less so (the advent of a synthetic ecology, the growing influence of religion on politics etc.). These scenarios, which are neither predictions nor forecasts, aim to enlighten the world we are in, so as to enable us to imagine the one we wish to move towards.

The scenarios were written independently of each other and may be read separately. They are complemented by reflections and fictional narratives contributed by creative artists who, in this way, bring imaginative thinking into the report alongside analytical approaches. These scenarios, "as one browses through them, neither reduce the complexity of the world of the future, nor its uncertainty, but they sketch out a cartography of the probable and the unacceptable that is very useful



for putting some order into our questioning and our controversies" (Yannick Blanc, chair of the Futuribles International association).

The Covid 19 crisis has reminded us that anticipating crises is not the same as preparing for them: health crises of this kind had actually been frequently envisaged in foresight studies and works of science fiction. This report is an invitation to readers, then, to ponder the new situations that may emerge in their environment over the medium and long term: do these discontinuities and shocks seem plausible and important to them? Is there a way to work to encourage, curb or influence them? What opportunities do they offer? How can these be seized? What threats do they represent? How can we be forearmed against them? What other potential discontinuities and shocks should we conceive of and take into consideration etc.?

A Cartography of Possible Discontinuities and Shocks to 2040-2050

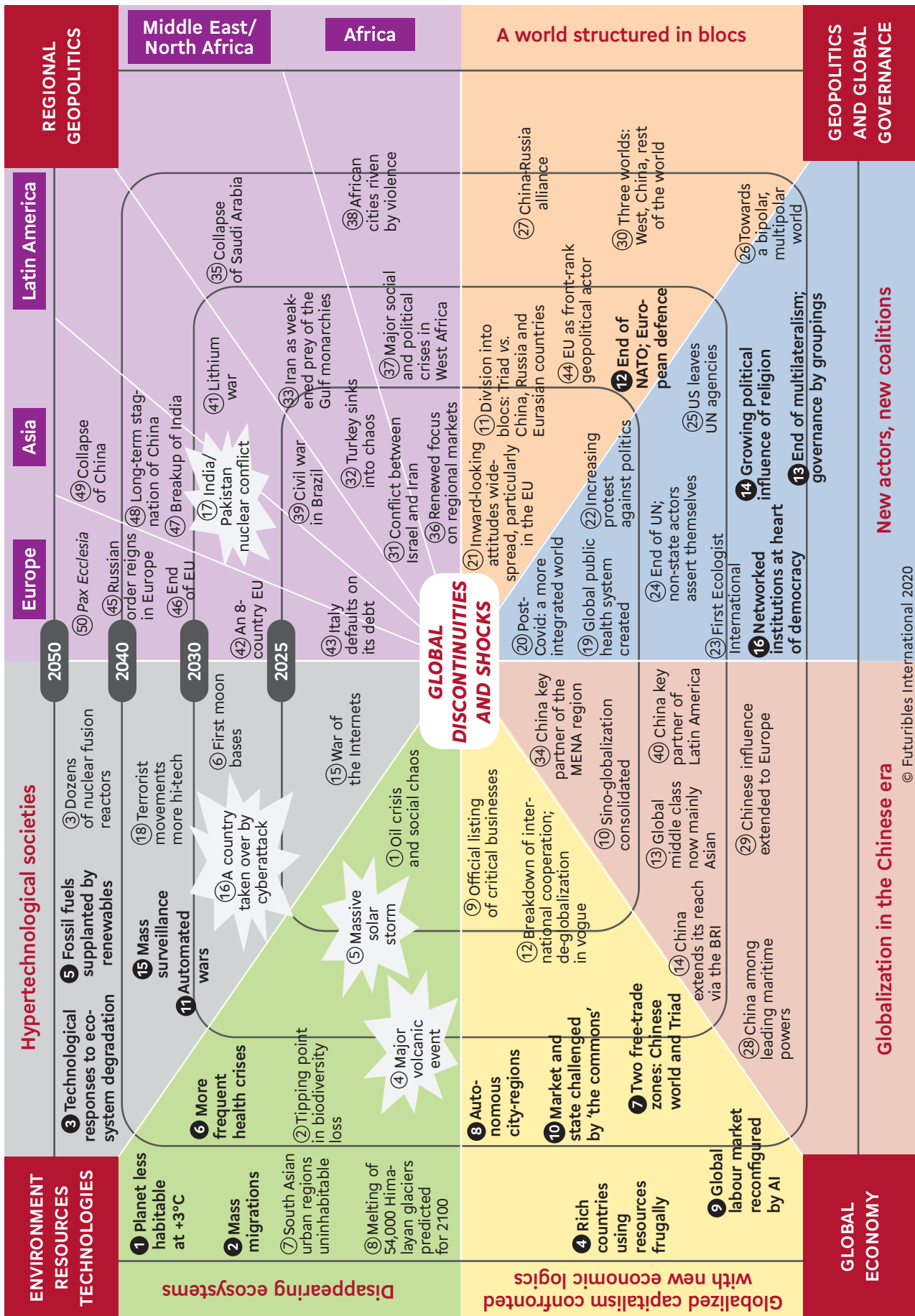
The overall cartography presented here shows the 16 'what-if scenarios' analysed in the report and 50 others which are merely outlined. It positions these in four broad fields and six developmental trajectories (megatrends) for the world economy and geopolitics.

The first field is that of the availability and quality of the resources essential to human life. At issue here, primarily, are forms of environmental damage (in terms of both climate and biodiversity) and the catastrophes they presage. We also examine different discontinuities and shocks that may ensue from

the adaptation to irreversible change (mass migrations, the conquest of new territories), in order to learn to live within the limits of our ecosystem or, conversely, go beyond the physical limits that confront us today (by way of bioengineering, or going into space etc.) Overall, the discontinuities and shocks explored here have been grouped around two developmental trajectories: the gradual or sudden disappearance of ecosystems and the increasing hold of technologies over societies.

The second field is that of the global economy. The current pandemic has profoundly disturbed its

Cartography of Possible Discontinuities and Shocks to 2040-2050



operation. This is, partly, a one-off shock, but it has served to reveal dysfunctions and deep differences over how we see the world. The discontinuities and shocks envisaged in this field relate to the challenge to the globalization of trade (the rise of the commons, the birth of autonomous city-regions etc.), its potential extension (a reconfiguration of the international labour market through artificial intelligence), its splitting (into two free-trade zones), or its modification under growing Chinese influence. The two structuring trends around which the discontinuities and shocks are grouped are, therefore, 'Globalization in the Chinese era' and 'Globalized capitalism confronted with new economic logics'.

The third field is that of geopolitics and the governance of global issues. The crumbling of the multilateralism inherited from the Second World War and the emergence or strengthening of the position of non-state actors, precisely as the management of global issues (environment, migration, proliferation, health etc.) is assuming ever greater urgency, afford great scope for envisaging new forms of governance of those issues either at a global or a more local level. In this field two major contrasting lines of development emerge. The first is the progressive structuring of the world around solid, competing blocs, taking us into a new cold war. The second, by contrast, brings to the fore the emergence of coalitions of actors (states, non-governmental organizations, enterprises, religions etc.) combining around specific

— and, at times, ephemeral — issues (a particular situation of humanitarian distress, access to vaccines in poor countries etc.).

Part of the cartography also offers a non-exhaustive conspectus of the discontinuities and shocks that may occur at regional levels but have strong repercussions at the global level (war over lithium, Iran falling prey to the Gulf monarchies etc.). Here, in particular, those envisaged offer only a glimpse of what might happen. The aim is not to offer an exhaustive mapping of the possible discontinuities and shocks, and certainly not of 'wild cards' — those high impact, but largely unpredictable events — as they are highly improbable and have an unpredictable time-horizon (nuclear conflict between India and Pakistan, for example).

The discontinuities and shocks presented here have essentially as their objective to draw attention to areas of change that seem major to us, yet are currently given insufficient consideration. "In a crisis situation, there is a strong temptation for the decision-maker to set aside speculation about the future and concentrate on the present sequence of problems to be resolved. But when the crisis is both planetary and systemic, each link in the chain of decisions imperceptibly steers choices that impact the future. So this isn't the moment to let up one's vigilance about that future. It is an enhanced attention of this kind that the *Vigie 2020 Report* calls on us to deploy." (Yannick Blanc).

A Guide to Reading the Cartography

The above diagram is inspired by the 'foresight canvas', a foresight visualization tool developed by Michelin's Foresight Unit. The foresight canvas enables us to position the various 'what-if scenarios' according to the time-horizon at which they might occur. Thus the centre of the diagram relates to possible discontinuities and shocks in the 2020s, whereas the outer area corresponds to those that might occur up to 2050. This difference in positioning can be explained by the nature of the subjects involved. For example, it seemed more appropriate, in agreement with the authors, to treat the what-if scenarios associated with climate change or with the economics of 'frugality' as involving a more distant time-horizon (taking account of the relevant types of inertia and the rhythm of change) than those linked to geopolitics or trade.

The canvas displays discontinuities and shocks of three different kinds:

- In the *Futuribles International* report, **16 'what-if scenarios' with a time-horizon of 2040-2050** have been subjected to thoroughgoing analysis. Within the canvas, they are indicated in bold type, preceded by the number as it appears in the report (the number is in white within a black disc: ❶).
- Further to this, **50 mini-scenarios** were considered in the production of the report. They are referred to in plain type, also being preceded by the number which corresponds to them in this part (black number within a black circle: ❶). Some are centred on precise events, others are more complex and arise from the co-occurrence of several phenomena. They are the product of thinking by the *Futuribles* team, investigations or workshops

carried out with the members of the Futuribles International association, its scientific advisers and, in the case of the geopolitical discontinuities and shocks, a panel of experts in international relations.

• Lastly, **wild cards** are represented by light grey star-shaped polygons. These correspond to events with a very major potential impact but an indeterminate time-horizon. Only a few receive a mention here. Very clearly, many others could be identified.

Summary of the 16 What-If Scenarios to 2040-2050

Field 1. Living on a Rapidly Degrading Planet with Limited Resources

1. In 2050 global heating reaches 3°C and changes the habitability of the Earth

By 2050 the international community has not managed to reduce its greenhouse gas emissions. On the contrary, these have continued to grow, further accelerating global heating, which has reached 3°C above pre-industrial-era levels, thereby proving the most pessimistic forecasts right. The various adaptive measures and technologies that have been tried (such as geoengineering) have not been up to the task and a growing number of areas of the planet have become uninhabitable. This mainly includes coastal zones (including cities) submerged by rising sea levels, together with lands in South-East Asia, the Sahel and the Middle East etc. More than a billion people are affected.

At the same time, climate change has also made some new lands habitable. Greenland and Siberia, together with some areas in Northern European countries, have become new Eldorados, attracting both population and investment to farm the agricultural land and extract the geological resources made accessible by the melting of glaciers.

2. In 2050 the management of mass migrations has become the world's number one problem

By 2050 several zones have been declared uninhabitable by the IPCC (International Panel on Climate Change) on account of the effects of climate change. To deal with the ensuing growth in migrant flows, on the initiative of the European Union an international strategy for relocating the affected populations has been put in place by the Platform on Disaster Displacement (PDD). Between 2045 and 2065, almost 850 million people have been moved in this orderly way, mainly in South and South-East Asia, Sub-Saharan Africa and the South Pacific.

3. In 2050 synthetic ecology and geo-engineering are seen as responses to degrading ecosystems

By 2050 several (private and public) actors have succeeded in deploying an arsenal of technological, chemical and genetic responses to the range of problems caused by climate disruption and general ecosystem degradation. These technologies — and the synthetic ecology that can be generated by using some of them — offer the possibility of maintaining satisfactory conditions of habitability in what would otherwise have been disaster zones. Instead of striving to limit greenhouse gases or reduce their pollution levels, some states (China, USA, Singapore, Japan etc.) and private companies have put their faith in advances in geoengineering and also robotization, chemical biology and gene manipulation to shape their environment and reduce their exposure to environmental change. These technological intervention projects are very diverse in nature. They vary in the extent of their ambition and the different ecosystem levels to which they apply. In 2050, we may distinguish, for example, the tools aiming to:

- control, even partially, an upstream climate factor (rainfall, CO₂ emissions etc.) by acting on the environment (injecting ice particles or aerosols into clouds for the artificial generation of rainfall; using mirrors to reduce the exposure of particular areas to the sun's rays etc.);
- reduce the direct effects on particular territories of some upstream geophysical factors (reducing the melting of glaciers by covering them etc.);
- develop the resistant and resilient capacities of plant and animal species (gene-editing technologies producing plants resistant to pests or drought conditions etc.);
- withdraw from the surrounding environment by creating bubbles that have no interaction with the external ecosystem (cities under glass, artificial islands, underwater cities or cities in space etc.).

Obviously, not all the actors support the full range of initiatives for creating artificial ecosystems. This

situation produces many ethical, diplomatic and physical conflicts. Attitudes vary as a function of the seriousness of the problems faced in different areas and the resources at the disposal of the actors concerned.

4. In 2050 developed countries embark on paths towards a 'frugality' model, showing that this is viable

A handful of developed countries (Denmark, Finland, Iceland, Norway, Sweden, France etc.) have shown that it is possible to reduce their *per capita* consumption of material resources while maintaining (mildly) positive economic growth. This decoupling can be seen across the full range of resources: biomass, fossil fuels, minerals and metals. These 'frugality' strategies involve concerted action between public authorities, companies and consumers. They comprise both voluntary measures and others that are more restrictive. The discrepancy intensifies between those countries on this path towards an economics of frugality and those that retain a productivist model.

5. In 2040 renewable energy sources supplant fossil fuels

In 2040, renewable energies (RE) make up the majority of the world's energy mix. For example, 70% of electricity is renewable and 40-50% is produced from solar or wind power. This break point is in keeping with the International Renewable Energy Agency's scenario for the transformation of the global energy system (IRENA: *Where We Need to Be*).

The International Energy Agency (IEA)'s 'Sustainable Development Scenario', which runs to 2040, aims for a 46% contribution from nuclear and renewables in final energy by that year. In its *Where We Need to Be* scenario, IRENA is looking for 66% of global energy

to come from renewables by 2050. Three particular drivers made this development possible:

- the growth in installed renewable energy capacity (by 2040 there is five or six times the level of production of photovoltaic solar energy and wind power than there was in 2018);
- lower global energy consumption, even though the population continues to grow;
- the electrification of heating and transport.

6. 2040 sees an increase in the number of global health crises

By 2040 the planet is experiencing a greater number of health crises, which has a major impact on the global geopolitical balance. Environmental degradation and poorer human health, overcrowding in cities and mobility that is difficult to control, the appearance or reappearance of new viruses and lethal mutations, scientific research hampered by a lack of resources or inter-state cooperation — these are all so many factors that explain the explosive growth in these increasingly invasive diseases. They are difficult to control on account of their growing unpredictability and variety, and they plunge the world into a state of permanent instability. These violent crises of varying duration have deeply destabilized the political, economic and social functioning of the globalized economy as it existed in 2020, definitively changing the face of human interaction and ways of life by 2040. International cooperation is lastingly interrupted, except where some scientific and medical projects are concerned. Geopolitical balances are restructured around regional powers which apply the same health measures to their zones of influence. Inequalities develop between the countries capable of protecting their populations and the others, and also between individuals in terms of the risks each one runs (depending on place of residence, occupation etc.) and the cost of access to care.

Field II. Globalized Capitalism up against its Limits

7. In 2040 global trade has been restructured around two free-trade zones: the Chinese world and the Triad

In 2040 the global economy came to be reorganized around two large blocs:

- on the one side, the BRI (Belt and Road Initiative) alliance, comprising China, Russia and a number of East European and East African countries;

- on the other, a Western alliance made up of the USA, the countries of Western Europe, Canada and Mexico, having just one third of the population of the Asian alliance.

Several countries, including India, Japan and the countries of the global South, representing 40% of the world's population, remain 'non-aligned'. This is an option which divides the African continent: while East Africa joins the BRI alliance, the coun-

tries of the Maghreb and West Africa remain non-aligned, as does Latin America.

On the fringes of these groups, lawless spaces continue to exist, in the Sahel and Central Africa, and in the Middle East, which is torn apart by the rivalries between Saudi Arabia, Iran and Turkey.

This reconfiguration marks the end of globalization. These blocs have not made the same technological and ethical choices. Value chains continue to exist within the two alliances, while trade between them is confined to extractive and energy products and to services. International cooperation is restricted to questions relating to the survival of humanity – climate change, pandemics – and security.

8. In 2040 vast territories are structured around autonomous city-regions

In 2040 empires still exist – they still have borders, armies and leaders with media profiles who bestride international summits – but decisions concerning the future of the planet, particularly in terms of climate, energy and food, are taken at another level. This is the level of ‘city-regions’ and ‘town-hinterlands’ which, within the democracies, have appreciably increased their economic and political autonomy. The welfare states, debt-distressed and increasingly ungovernable, have gradually had to accept a transfer of effective rule toward these new entities.

In Western countries, these city-regions have populations of a few million and control territories that seldom extend beyond a radius of 60 miles or so. Their animating centres are metropolises of intermediate size (around 500,000 to three million inhabitants) that are internationally significant. The ‘town-hinterlands’ have populations of 50-300,000 and approximate to basic basins of employment and residence. They are either component parts of city-regions or are independent entities. These two territorial forms function by complementarity between a central urban hub and a surrounding rural area that provides it with part of its energy and food. It is at these two levels that the important decisions are made: on planning, transport, energy loops, food circuits and (economic, social, financial and health-related) resilience strategies. These levels of community have built their political legitimacy on their capacity to deal with these vital issues.

Singapore (with a population of 6 million in 2050) is indisputably the one that has recovered best. Because it had got ahead in terms of ecological

transition, it managed to combine economic influence, energy self-sufficiency and social cohesion. In Europe, the Copenhagen-Malmö-Oresund bio-region is still considered exemplary. It managed to get ahead in combining self-sufficiency in energy and food supply with openness to the world. Its trans-border position also helped it to assert its independence from the Swedish and Danish governments. In Switzerland, the organization of the bioregions slipped naturally into the historical canton structure (26 cantons for 9 million inhabitants). In Italy, the *città slow* network (historic towns with populations below 100,000), developed from the 2000s onwards, has served as a basis for creating new local solidarities. In the UK, the transition town network has played the same role. Bristol, now at the head of this network, has firmed up its position as the counter-model to a London which went into decline when its financial centre, the City, did.

9. In 2040 the rise of strong artificial intelligence has reconfigured the global labour market

While the automation of work has increased regularly in many sectors since the beginning of the 21st century thanks to advances in digital technology, the completion of research into utilizing artificial intelligence (AI) has profoundly changed the nature of work and employment. Within a few years, between 20% and 30% of global jobs have been totally or partially automated. This substitution for human labour has been particularly marked in manufacturing industry, but in some countries the majority of tasks in agriculture, transport, trade and other fields are now also carried out by robots.

This technological revolution has taken place in a context in which there are ever greater environmental constraints and it is becoming even more essential to limit the consumption of energy and raw materials. Reducing the labour component in production costs makes it possible to shorten value chains, with production being shifted as close as possible to consumers. Most consumer goods are now produced, used, repaired and recycled within geographical areas that have populations of a few million. By contrast, the production of immaterial goods is moving in the opposite direction; these are mass-produced on-line by a host of workers competing at the planetary level (crowd workers). A number of occupations partly escape the automation of work, but not its algorithmic prescription. This is particularly the case in the sector of personal care and assistance or in that

of building maintenance; in those fields, human labour cannot be totally replaced, but is severely constrained by the digital tools with which it is organized and managed.

10. In 2040, from the local to the global, the commons are seen as a growing alternative to the market and the state

The exploitation of material and immaterial resources is no longer based on market mechanisms. In order to guarantee access to the greatest number, while at the same time ensuring their conservation, a growing number of resources are managed as 'commons'. In other words, the conditions of access to those resources are not freely determined by their owners, particularly in terms of price. Nor are those resources administered by the public authorities and they are not, therefore,

regarded as public services (their management cannot be delegated to private actors). A resource that is regarded as common is shared by a community which defines the rules for its use and conservation and manages it on that basis:

- in the case of local resources: shared parks and gardens, public spaces, but also neighbourhoods and entire towns or cities;

- in the case of immaterial resources: knowledge, software, art works — and also major scientific and technical advances;

- in the case of global resources: provisions for conserving environmentally protected zones — and also for the shared governance of resources.

The governance of resources at all levels is, therefore, revolutionized in terms of priorities (accessibility and protection take precedence over economic profit) and actors (the role of civil society becomes crucial).

Field III. Geopolitics, Governance and the Reconfiguration of Powers

11. In 2040, the era of automated warfare

Lethal autonomous weapons systems (LAWS) use sensors of various kinds and digital algorithms to identify, seek out and destroy the target without any manual control of the system. Though the sensors certainly exist today, artificial intelligence is not yet developed enough to manufacture LAWS.

In 2040, warfare is totally automated. The political and military authorities conduct warfare from command centres. They have programmed their automata to meet war-fighting objectives of whatever kind: to destroy the enemy's command centres; to disarm the enemy by wiping out its armed forces, whether these are automata or human-directed machines; and to carry on industrial warfare by destroying the opponent's economic and industrial capacities. On the battlefield, machines have free rein to decide how to implement the mission assigned to them. The doctrine on the use of battlefield robots may fall within the scope of a legal use of armed force, with war-fighting objectives that are proportional to the political end-goal and consonant with the rules of humanitarian law. Robots may also be entirely dependable, acting within the context of operation prescribed for them, without technical faults that would cause them to move beyond that field of action.

12. In 2040, the end of NATO, a trans-atlantic crisis and the emergence of European defence

The USA has withdrawn from NATO, regarding it as a deadweight that failed to provide it with greater security, since the Europeans refused to stand alongside the USA as a military counterweight to China. At the same time, EU member states are gradually adopting a common independent defence strategy, based on a budget earmarked for the purpose, as they can no longer count on the Americans' security guarantees.

13. In 2040 the major global issues are dealt with by groupings of private and public actors

Multilateral governance is paralyzed by the tensions between the USA and China. In response to the increased range of international challenges and the ensuing risks of destabilization, a new regime of international governance has arisen. In the event, this is much more pragmatic and multifaceted, since it is based on a wide diversity of public and private actors: states, territorial communities, NGOs, enterprises etc. These are grouped in organizations and associations of limited size, defending diverse interests or hoping to offer an alternative

to a multilateral governance that has come to seem ineffective, generative of inequality, and an instrument of Western democracies.

As a result, private actors (NGOs and corporations) have ever greater influence. NGOs represent the claims of civil societies which lack trust in the ability of political leaders to act in the general interest. These NGOs are organized around platforms relating to their particular causes and they take part in the great international summits alongside states. Corporations, even if they still remain in the background, use their leverage and international dimension to exert influence and assert their positions. Some are formed into larger groupings to act directly, either by engaging on specific issues (so-called 'benefit corporations') or negotiating directly with those involved in governance, both public and private (e.g. in the battle against climate change or for privacy).

14. In 2040 religions exert their influence as sources of inspiration and legitimation in the field of politics

The relative loss of credibility on the part of governments, incapable of meeting the essential needs of populations and providing them with a sense of identity, has opened up opportunities for religious ideas to exert influence. In China, after the fall of the Communist system, the new regime has held up religious references as sources of legitimacy, meaning and public morality. In the rest of the world, the absence of new grand narratives or credible ideological projects has opened up a space for religious messages that appeal to the wisdom of the past or offer new approaches. The scale of political, economic, social, ecological and health problems prompts a quest for future visions based on more solid principles than competition for power. Religious organizations try to influence political decision-making or to provide concrete assistance where necessary.

15. In 2040, in the name of the general good, mass surveillance becomes commonplace

Given the rise of security threats, a growing risk-aversiveness and the surveillance potentialities of the personal services provided by digital technologies, individual freedoms are tightly circumscribed. The mass collection of personal data and the surveillance of individuals are seen as guaranteeing a general interest redefined around notions

of physical health and well-being, environmental protection, sound management of the public purse, etc.

It is, for example, mandatory, if you want access to life insurance, to be equipped with physical sensors that register your every action, your hours of sleep and exercise and your food consumption. Some public places are inaccessible without showing your most recent health assessment. A number of states, together with some big corporations, adopt a modified version of the Chinese social credit system. The scores assigned to individuals enable their behaviour to be steered in certain directions, so that everyone is a 'good citizen' in terms defined by the authorities or by consensus conferences. For those who refuse to yield to these new demands for transparency and monitoring, just two options remain: pay more dearly to protect your privacy or accept exclusion from certain locations and services. In this way, society is deeply segmented between different levels of acceptance of this 'protection vs. freedom-and-privacy' trade-off.

16. In 2040 Western democracies have reconfigured themselves thanks to networked institutions

The legitimacy of elected authorities has consolidated itself at the local level but grown ever more precarious at the national level. This situation has come about because of the operation of systems of contributory democracy, a doctrine which sees participation in decision-making as being based not on expressing views or opinions but on active contributions to the development and implementation of local responses to collective needs. The 'right to differentiation' enabled the regions to present themselves as protectors of a 'territorial democracy'. In France, the Parliament, after a period of defensiveness in which it contested the legitimacy of citizen assemblies, has assumed a role of regulator and umpire over the deliberative tumult created by the multiplicity of forums. The Senate, now elected by regional constituencies, has consolidated its role as the chamber of regions and territories. The National Assembly, its members recruited mainly from associations and the professional world, is becoming the chamber of intermediate bodies. In this context of institutional proliferation, and after a succession of health and food emergencies and increasingly serious climate catastrophes, two democratic models are at odds with each other as they seek to stand up to the power of authoritarian countries.

— The ‘transparent executive’ model, which regards itself as consonant with republican tradition, concedes very extensive freedom to regional and local authorities in the management of public services, social solidarity, education and culture, but keeps national governmental and strategic power in the hands of a strong executive under the direct authority of a head of state elected by universal suffrage. As a balancing factor, the head of state’s action is subject to rigorous audit and accountability procedures that are carried out by independent authorities. The Court of Justice of the European Union has become a Supreme Court and performs the function of overseeing these authorities. The creation of laws is a product of the balance between the executive’s decision and case-law.

— The model of regulated deliberation asserts the cardinal value of democratic vitality, anchored in the deliberative experience of regional communities. Executive power is exerted, following the Eur-

opean Commission model, by a government elected for the duration of the legislature at the same time as the National Assembly (the municipal executive model). In France, going back to a literal interpretation of Article 5 of the 1958 Constitution, the President of the Republic, elected by universal suffrage for a longer term than the legislature, “shall ensure due respect for the Constitution and shall assure, by his arbitration, the proper functioning of the public authorities and the continuity of the state.” In other words, he does not lead the executive, but possesses appointment power over the regulatory authorities — the number and competences of which have continued to expand — and a power of arbitration with regard to their decisions.

In these two models, the democratic character of the institutions is no longer underpinned by the central place of the parliamentary regime but by the balance between multiple powers — a balance ensured by strong regulatory authorities.

Conclusion

These scenarios explore the trajectories that events may take that would lead us, via phases of crisis that accelerate or alter the course of events, to situations fundamentally different from those which currently pertain. They are based on an analysis of long-term developments that permits of disconti-

nuity, but they also incorporate chance events that may produce it. Combined with this are analytical sections that present a rationale for the possibility of these discontinuities and fictional sections (drawing on the work of science fiction authors) to lend them plausibility. ■

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