Disruption in society – TA to the rescue?

EPTA Report 2022

Synthesis

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TAB
BÜRO FÜR TECHNIKFOLGEN-ABSCHÄTZUNG
BEIM DEUTSCHEN BUNDESTAG

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Preface

Distinguished reader,

this report is the result of a joint effort of members of the *European Parliamentary Technology Assessment* (EPTA) network. The members of the EPTA network advise parliaments in Europe and beyond on the possible social, economic and environmental impact of new sciences and technologies. Currently EPTA has 25 members (13 full and 12 associate). The EPTA network aims to strengthen the role of technology assessment in parliamentary decision-making and to establish links between different TA bodies worldwide.

Using three exemplary topics, we highlight the main theme of this report »Disruption in society – TA to the rescue?«:

(1) critical infrastructures (such as electricity, water supply, Internet) whose failure must be prevented at almost all costs;
(2) autonomous systems that make decisions with potentially far-reaching consequences;
(3) natural areas under severe pressure to »tip over« due to climate change and other human activities.

This report consists of 18 individual contributions of EPTA members giving their unique perspectives on specific aspects of the topics based on their recent experience. In the introductory synthesis, the individual contributions have been analysed and summarised to present overarching themes and to illustrate the various roles EPTA members have taken to support their parliaments in addressing disruptions. The report was produced at the initiative of TAB, which held the EPTA presidency in 2022. The contributions were synthesized by the editorial team: Michel Bermond (OPECST, FR), Reinhard Grünwald (TAB, DE), Walter Peissl (ITA, AT) and Tore Tennøe (NBT, NO).

1 Is disruption the new normal?

»Beware of innovation in politics«, George Washington is said to have uttered on his deathbed. To innovate used to be associated with excessive novelty, without a proper purpose or end.[1] Since then, the status of innovation has changed fundamentally. Revolutionary technologies such as electricity, assembly lines, refrigerators, and cars has been regarded as key to economic and societal progress, and an important subject for policymakers.

The breakthrough of digital technologies, from the PC and the internet to the smartphone and artificial intelligence, has carried the celebration of innovation to new heights. So-called »disruptive innovation« is turning markets and social practises upside-down in media, travel and elsewhere, with AirBnb and Uber as much quoted examples. To its proponents in Silicon Valley, this radical technological change is an inevitable and ultimately progressive consequence of digitalisation. Disruption is trumpeted as the norm.

In parallel, a string of crises has brought to the fore a less benevolent form of disruption, namely major disturbances in society at large. Following the great recession of 2007-2009, not only financial systems, but also trade and international relations were disrupted, and arguably also domestic political discourse in many countries. The COVID-19 pandemic started as a health crisis, but the weight of the disease and the countermeasures soon lead to an economic crisis, and furthermore, a social disruption with strict lockdowns and school closures.

The Russian war of aggression in Ukraine is also a major disturbance to the international order and energy infrastructure in Europe and the rest of the world. With the looming climate and nature crises in mind, it is fair to say that societal disruption seems to be the new normal.

In all the crises mentioned above, technology plays a significant role, either as a root cause, a catalyst, a modifier or a solution. Technology Assessment (TA) explores how current technological developments affect the world we live in and aim to contribute to the formation of public and political opinion. In this report, we analyse and assess three different types of disruption, with different implications for policymaking and society.

Critical infrastructure – interdependent and vulnerable

The first type is the disruption of the very technological systems that we have become dependent on. *Critical infrastructures* – water and energy supply, food, transport, health and communication – are essential to economic, social well-being, national security or even the functioning of society as a whole.

In other words, failures of critical infrastructures must be prevented at almost any cost. The first big challenge is to map out and understand the risks and vulnerabilities at play. One major factor analysed here is the rapid digitalisation of everything; cities are getting smarter, administrative processes are going online, water distribution networks increasingly rely on automation and a

1 Lepore, Jill: »The disruption machine«. The New Yorker, 23 July, 2014. https://www.newyorker.com/magazine/2014/06/23/the-disruption-machine

digital infrastructure, and billions of (embedded) devices are being connected to the internet of things (IoT). Cyberattacks on infrastructure can be made from anywhere in the world, and only needs to succeed once, while the defender needs a 100 percent success rate.

This challenge is exacerbated by interdependencies and cascading effects: Damage in one sector (such as electricity) might have a profound impact in a different sector (such as distribution of medicines to patients) and can thus lead to transboundary crises.

How to increase resilience for critical infrastructure is, naturally, the other big challenge. Effective measures might have considerable trade-offs with welfare for citizens, climate policy, or human rights.

Autonomous systems – when humans lose control

Our second type of disruption is about *autonomous systems*. Here the loss of human control or oversight is not a bug, but a defining feature of the technology. Autonomous systems are meant to plan and execute actions with minimal human involvement. The advent of new, powerful models for artificial intelligence such as GPT-3 – which can write prose indistinguishable from a human author[2] – shows that autonomous systems have the potential to disrupt professions and markets, and perhaps lead to forms of inscrutable discrimination.

An even more existential challenge is the introduction of autonomous weapons systems that can perform both target selection, the decision to attack and authorisation of engagement. This might lead to entirely new and unpredictable dynamics in future conflicts. How to maintain a meaningful human involvement in vital decisions, regulate this technology in a situation of fierce competition and secrecy, and be able to analyse the different scenarios, are thus key questions for policymakers.

The disruption of nature

The third, and final, theme in this report is *the disruption of nature*. Environmental historians use the term »the great acceleration« to describe the radical transformation of our relationship with our natural habitat since 1945.[3] Our environment is transformed by our own activities, and human-made climate change is reinforcing this on an even larger scale.

The challenge here is something of a paradox: How can we use science and technology to mitigate a problem that was created by our use of technology in the first place? The case of near-natural forest conversion shows that policy here needs to address many conflicting goals (conservation, species protection, climate mitigation and adaptation, sustainable use of raw materials etc) simultaneously and strategically. Or perhaps we should relinquish control and leave the forest to the self-regulation of the trees and its ecosystem partners?

2 perhaps this piece was produced by GPT-3?!

3 Tooze, Adam: Shutdown. How COVID shook the world's economy, p 291-292. Allen Lane, 2021.

In this report EPTA members present 18 case studies on these three facets of disruption. This provides an excellent overview of the diversity and richness of approaches in the EPTA community to support Parliaments across Europe and beyond to deal with disruptive change.

2 Critical infrastructures – how to avoid disruptions?

Running tap water, full shelves in supermarkets, medical care, cashless payments – these and other essential services have become a given in modern societies. Memories of supply crises date back to the last century and we trust that services that work today will continue to do so tomorrow. However, events such as the international financial crisis, the COVID-19 pandemic and the war in Ukraine have made visible that this feeling may be misleading. These and other threats (e.g. natural disasters, technical failure or human error, cyberattacks) can cause sudden disruptions, damage or failure of critical infrastructures (CI). Given our dependency on CI, major infrastructure failure would cause significant harm to people and result in severe societal disruptions.

In a study of the German TAB in 2011[4] it was demonstrated drastically, that after only a few days, the supply of the population with (vital) goods and services can no longer be secured in an affected area.

- After the onset of the power blackout, some telecommunications and data services fail immediately. Battery powered mobile networks may function for a few days. However, due to the increased volume of calls, these are mostly overloaded.
- Public-law broadcasting corporations are better prepared and are able to continue transmissions. However, citizens are unable to receive broadcasts via their televisions. Radio represents one of the most important information channels.
- Electrically driven transport modes, especially rail transport, either fail immediately or after a few hours.
- Road traffic becomes chaotic, as traffic lights fail and junctions, tunnels and barrier systems are blocked. There are numerous accidents and emergency services encounter major difficulties in carrying out their duties. Since most petrol stations are out of action, most vehicles remain at a standstill and local public transport can only be maintained at a rudimentary level.
- The striking effects are not restricted to the transport sector – if logistics fail, cascading effects will emerge and induce a breakdown in food supply for consumers, nursing facilities, hospitals and the like. In our networked society just-in-time-production and delivery-on-demand prevail. In concrete terms, this means that hospitals, for example, only have supplies of necessary medicines and other important aids for a few days on hand, and if replenishment fails, medical treatments are severely impeded or even impossible. Emergency generators usually only have a fuel supply for a few days. Getting supplies under the circumstances described is a major challenge.

4 https://publikationen.bibliothek.kit.edu/140085927/120049880

According to the European Critical Infrastructure Directive[5] »critical infrastructure« means an asset, system or part thereof located in Member States which is essential for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people, and the disruption or destruction of which would have a significant impact in a Member State as a result of the failure to maintain those functions«. CI include the sectors of water and energy supply, food, transport, health and communication. Broader definitions can vary from country to country and include, in addition to the above, the sectors of waste disposal, finance and insurance, media and culture, and governmental administration.

All these sectors are more or less interconnected and increasingly dependent on each other. This dependency has been reinforced by digitalisation, which helps on the one hand to manage complex systems more smoothly and efficiently, but on the other hand raises the dependency on communication networks and electricity. At the same time, energy systems are under stress due to the need to drive the energy transition away from fossil fuels to renewables. This has introduced another level of complexity into the systems. Interdependencies also increase the likelihood of cascading effects, in which damage in one sector has an impact in completely different areas and can thus lead to cross-section crises.

The examples in this report show that EPTA members have been working on CI for a long time and contribute to raising awareness of the potential societal consequences of CI damage. While some are generally concerned with CI and issues of electricity supply, digitalisation and communication (DE, AT), others focus on digitalisation and energy transition issues (NL). Particular attention is also paid to cybersecurity issues and the vulnerability of IoT systems (NO, EP). Communication in the event of a crisis should be as secure and simple as possible, which leads to the question to what extent modernisation and standardisation can help (PT). The electrification of the transport sector (SE), which in turn has repercussions for other systems, is analysed as contribution to achieving the 2030 climate goals. Finally, the EPTA-member from Wallonia was directly involved in the ex-post analysis of the flooding in 2021 in order to draw conclusions for future emergency planning.

The complexity of CI implies a relatively high number of involved stakeholders. Due to the cross-sectoral structure of CI, in most countries there is a shared responsibility between public institutions (federal ministries, regional authorities, task forces, etc.) and private companies providing CI services. A widespread problem is that pressure to save money in public budgets and the prioritisation of the efficiency paradigm in private companies are causing systems to »dry up«. Often savings are made on maintenance and renewal work or the provision of backup systems that are used only at rare occasions. When it comes to physical parts of the CI, such as dams, this could have direct catastrophic consequences. For the software parts of CI this is perhaps even more problematic, as it may compromise the security of the systems and provides easier targets for cyber attackers.

Institutional responsibility on CI issues is usually based on national or regional regulation. This in turn builds in part on the ECI Directive 2008/114/EC 1, which is also supplemented at the European

5 2008/114/EG https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:345:0075:0082:EN:PDF

level by the European Programme for Critical Infrastructure Protection (EPCIP).[6] As the COVID-19 pandemic has shown, global interconnectedness can very quickly lead to disturbances and even disruptions in key areas of society, suggesting that regaining European sovereignty in industrial and technological matters should be a top priority.

Societal and political importance

Citizens become aware of the paramount importance of the CI especially when a failure or worse, a disaster happens. The floods in Wallonia and Germany in July 2021 were such a catastrophe. Various attacks on the IT infrastructure of regions, municipalities, universities and other public institutions that disable public services for days, weeks or even months are further examples. At the same time, tales about looming large-scale blackouts in the power supply are booming and are also being fuelled in the media. This reduces the perceived level of security among the population and creates a sense of unease.

The COVID-19 pandemic has revealed that modern societies turn out to be less stable and more vulnerable to sudden shocks than many had assumed. Recent attacks on underwater gas pipelines in the Baltic Sea made very clear to almost everyone how vulnerable modern societies are. Therefore protection of CI is a high priority in many European countries. In most of them cybersecurity was predominant since the early 2020ies.[7] Some measures, which were meant to raise security, turned out to be problematic from a human rights perspective and fuelled discussions on data protection, privacy, freedom of speech etc. in several countries.

3 Autonomous systems – human in the crosshairs of the machine

Autonomous systems are software-based or robotic systems that can plan and execute actions without or with minimal human involvement. Autonomous systems are being introduced at an accelerating pace in many different areas, where they often redefine the rules of the game, heavily impacting economic and social wellbeing in many countries around the world. This is foreseeable, for example, in transportation (autonomous cars, ships, trains and aircraft) and, in the future, possibly in care for the elderly and the sick (care robotics). But pure software systems are also in use, for example in the form of algorithmic decision-making systems in finance (determining creditworthiness of customers), human resources (applicant screening and selection) or, for example, in the penal system (determining the probability of recidivism).

Actions of autonomous systems can have significant consequences. Accidents of self-driving cars with fatalities have been reported and stirred public debates about the impacts of autonomous cars on society. Another current example is the Dutch child benefit scandal, in which the tax agency wrongly accused 26,000 parents of fraud, based solely on the assessment of an algorithmic system. This highlights a central topic in the political debate: how to prevent algorithmic systems from

6 https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0786:FIN:EN:PDF

7 See the European NIS Directive (2016/1148) https://eur-lex.europa.eu/eli/dir/2016/1148/oj and the respective national implementations.

discriminating against specific groups in society (gender, sexual orientation, age, ethnic origin, religious beliefs or other).

Autonomous weapon systems (AWS) are of particular concern, because literally decisions of life and death are involved. Sending autonomous systems onto the battlefield and exploiting their advantages, for example their speed of evaluating sensor data, without having to endanger the lives of one's own soldiers, sounds attractive from a military point of view at first glance.

Automation and autonomy are already used today for a wide range of functions in weapon systems (including searching and identifying potential targets using sensor data, tracking targets, prioritizing and determining when to attack them). The expansion of autonomous functions of weapon systems is therefore on the agenda in all technologically advanced countries. However, until now, target selection, the decision to attack and finally the authorisation of the weapon engagement are carried out by a human commander or operator.

An AWS would be able to perform all of these steps, including target selection and engagement, on its own with no (or minimal) human involvement. Proponents of this development argue that AWS may have humanitarian benefits, since military operations could be carried out more precisely, thus better protecting civilians and civilian infrastructure. Critics, on the other hand, express concerns as to whether it would be ethically justifiable, politically responsible and permissible under (international) law to delegate decisions on the life and death of humans to machines. The development and possible use of AWS would also entail security policy risks as well as the danger of armament spirals and uncontrolled proliferation of potentially risky technologies.

The increasing use of automated and future autonomous weapons systems might represent a paradigm shift that will revolutionise warfare in the 21st century. International preventive arms control efforts to contain the obvious risks of AWS are currently making little headway. Among other things, some states point out that not enough reliable knowledge is yet available to weigh up the opportunities and risks of AWS. The original task of technology assessment is to analyse possible impacts of the development and deployment of AWS and thus provide the orientation knowledge urgently needed for this difficult assessment. This is a major challenge, as technological development is very dynamic.

Situation in different countries

In many countries, (semi)autonomous systems are developed and used on a pilot scale in a wide variety of sectors, such as finance, healthcare, agriculture, mobility, energy, social security and the military domain.

Currently a number of countries use weapon systems with some degree of autonomy, for example short-range air defence systems that can operate in a purely automatic mode to intercept incoming projectiles (e. g. rockets, artillery and mortar shells). Even if this can be classified as an autonomous weapon system, there is still quite a long way to go until weapon systems enter the scene that can move freely in a cluttered, dynamic and hostile environment and carry out complex missions on their own.

A step in this direction are weapon systems like the British Dual Mode Brimstone guided missile, which can search a specific area to identify, track, and strike vehicles using sensor data. Uncrewed air, sea, and land-based vehicles designed for weapons delivery can operate with a high level of autonomy. Most developments have been in the aerial domain. Currently the UK operates the MQ-9 Reaper, several others are under development, some of them designed to operate in a swarm. Uncrewed offensive weapons are not used to make firing decisions without human authorisation, although this technical capability exists.

There is a massive investment into development of increasingly autonomous systems in some countries, e. g. in the Netherlands for (armed) sensor systems. The UK strives for AI-capable systems for military applications across the land, air, sea, and cyber domains. Systems are in use or development for military applications including intelligence, surveillance and reconnaissance, data analysis, and weapons systems.

As a reaction to Russia's war of aggression Germany decided that 100 billion Euro will be provided, in order to modernise the armed forces and to close existing capability gaps immediately. A considerable part of this fund will be invested in the armament of Heron TP uncrewed drones, and in the development of the European Future Combat Air System. FCAS is a »System of systems« which consists of a new combat aircraft, envisaged to work together with unmanned components, so-called remote carriers (manned-unmanned teaming) and an Air Combat Cloud, which ensures real-time information for all involved subsystems.

Stakeholders

There are various stakeholders contributing to the research and discourse around automation in military technology and its future implications. These include think tanks, academic stakeholders (universities, research funding bodies), NGOs, the ICRC.

The UK Government expresses its ambition in a comprehensive Defence AI Strategy, that the Ministry of Defence (MoD) published in June 2022, which sets out how it plans to adopt and exploit AI. To this end the UK Government recently established a Defence AI Centre (DAIC) to coordinate the UK's development of AI-enabled technologies for defence.

In contrast to the UK, the German Armed Forces keep a low profile in the public debates on the issue of AWS. The only publicly available official document that deals at length with AI in the Bundeswehr is from 2019 and focusses only on the land domain. One of the reasons for this seems to be that there is currently no consolidated government position on AWS presumably because of differing views by the Ministry of Defence and the Foreign Office.

A very special approach is visible in the Netherlands: Research and innovation in the domain of AI is pushed forward in a collaborative way by the government together with private and civil society actors in form of public private partnerships like the »Dutch AI Coalition« (NL AIC). Ethical, legal and social aspects (ELSA) are included at a very early stage. Through field and innovation labs the government aims to »stimulate viable AI solutions for societal challenges«, including a Defence ELSA Lab.

Legislation in place and in consideration

A number of existing laws regulate the use of autonomous systems like algorithmic decision systems, such as the General Data Protection Regulation, administrative law, procedural law and sectoral laws. Apart from the national level, the EU is a key player in terms of stimulating responsible innovation in the digital domain. A range of existing policies, frameworks, regulations and principles are relevant to the technologies and challenges related to autonomous systems. In the last two years some groundbreaking documents were issued: Declaration on European Digital Rights and Principles (proposed January 2022), Path to the Digital Decade (proposed September 2021), AI Act (proposed April 2021), 2030 Digital Compass: the European way for the Digital Decade (proposed March 2021), Lisbon Declaration – Digital Democracy with a Purpose (adopted 2021)

Very relevant for AWS is the upcoming AI Act, that specifies requirements regarding transparency, explainability and accountability of high-risk AI systems. However, debate remains if these requirements are sufficient.

The European Parliament (EP) took a weighty stand when it adopted the resolution on AWS, that called for the adoption of an EU common position on lethal autonomous weapon systems that ensures meaningful human control over the critical functions of weapon systems. It was stressed that the EU's role in global disarmament and non-proliferation efforts needs to be expanded, that the EU needs to speak in relevant forums with one voice and that best practices should be shared on the matter of lethal autonomous weapon systems, to garner input from experts, academics and civil society. The EP calls for an EU legal framework on AI with definitions and ethical principles, including its military use.

Societal and political debate

The societal and policy debate on autonomous systems in general started in many countries around 2013 – 2015. In the beginning, for example in the Netherlands, it focused mainly on the fear of mass unemployment due to the rise of robotics. After that, the debate broadened up to more ethical, societal and legal issues relating to AI. Gradually, safeguarding human rights and public values became a more prominent part of Dutch digitisation policy. The latest discussion points are non-discrimination, explainability and accountability.

In terms of AWS, the national debates are very much shaped by national self-perception with regard to military affairs and its significance for foreign policy. For example in Germany there has been a lot of controversy in Parliament and in public fora about the question whether Germany should procure armed UCAVs (Unmanned Combat Aerial Vehicles). After years of fierce debate, the Bundestag decided in 2018 to procure optionally armable Heron TP drones by way of leasing them from the Israeli manufacturer. Only this year it was finally decided that the option to arm the Heron TP will actually be used. A similar debate took place in the Netherlands: In April 2022, the Dutch Parliament has agreed that the Dutch army is allowed (in specific circumstances) to arm unmanned drones. Up until then, unmanned vehicle areas were only allowed to gather intelligence.

In the UK there is much less hesitation in this respect, as long as, like the Defence AI Strategy of the UK Government states, weapons which identify, select and attack targets have »context-appropriate human involvement«. However the question remains, what exactly is meant by that.

The key question of what kind of human involvement or control is required in order that AWS can be operated conforming with international humanitarian law and with ethical principles is debated internationally under the roof of the CCW (Convention on Certain Conventional Weapons) in Geneva. But the current situation is not very favourable for an international agreement on any kind of arms control issue. This is a serious problem in the context of the CCW, since decisions can only be taken by consensus. The currently most likely outcome of the ongoing talks is therefore a complete failure. This means that other forums than the CCW must be sought for actors willing to strive for some kind of regulation of AWS.

4 Nature under pressure – human as a disruptive force

Rapidly advancing climate change, the rising world population and the overexploitation of natural resources are putting nature and its ecosystems under massive pressure. The age in which we live is therefore also referred to as the Anthropocene – an age in which humans are shaping the earth on a geological scale, often with disruptive force.

Global forests, being particularly sensitive, diverse ecosystems, are especially affected by this development. They are not only resources of global significance, and thus an economic factor, but also fulfill central functions for the preservation of biodiversity and climate protection (CO_2 storage). Forests provide habitat for 80 % of amphibian species, 75 % of bird species and 68 % of mammal species, and tropical forests contain about 60 % of all vascular plant species on the planet.

Forests are crucial for mitigating climate change. They contain more than half the global carbon stock in soils and vegetation. Despite a continued reduction in area, forests still absorb more carbon than they emit mainly due to reforestation and improved forest management.

In addition, forests have a range of other positive impacts on local and global climate, by affecting albedo and regulating atmospheric humidity. This helps, for example, to keep certain areas habitable in the hot summer months. Not to forget the social uses like recreation and hunting.

Due to its enormous importance, Catalonian, German and Greek EPTA bodies devoted their contribution to this topic.

At first glance, Catalan forests seem to thrive: since 1990, the forested area has increased by approximately 30%. But actually the outlook is grim. The forest sector contributes only a marginal percent to GDP, Catalan forests' ability to provide ecosystem services is declining, intensive resource extraction in some regions, while abandoning others, is compromising biodiversity levels. Furthermore, like other Mediterranean regions, Catalonia is subject to intense and frequent wildfires.

In Germany, forests today face threats, which are the consequence of a series of actions taken starting more than 200 years ago. Largely deforested landscapes were quite typical of Germany

around 1800. From around the middle of the 19th century, large areas were afforested with fast-growing spruce and pine stands, mainly for economic reasons. Today, forest ecosystems are once again facing a major challenge: the extreme drought years since 2018, together with storms and bark beetle infestations could lead to a complete destabilization if the current forest ecosystems do not become more resilient.

Different to these two broader views, the contribution of Greece is focused on wildfire management. The damages and effects of fire on ecosystems is diverse and there are references to alterations in the composition of species, in the roots of trees and soil, and in the properties of water infiltration after fire. In addition, under current climate change, it is expected that extreme rainfall events may accelerate soil erosion in burnt areas.

Other topics are equally typical of the »Nature under pressure« theme. Surrounded by the ocean, Japan has had a serious problem with marine litter, which primarily consists of plastic waste, since around 2000; therefore, the NDL contribution is all about plastic waste management. TA-Swiss decided not to focus on a specific environment but on the consequences of a global phenomenon; therefore, it submitted two contributions on some specific aspects of greenhouse gas (GHG) emissions.

The solutions: straightforward or complex?

Solutions sometimes look rather straightforward – at least in their broad principles. Greece identified unmanned aerial vehicles (drones) as a promising way for burned land to be reforested and anti-erosion measures to be implemented. Drones are able to »sow« large numbers of tree seeds on a daily basis, covering, in a short time, very large areas, as well as areas which are particularly difficult to access. Switzerland hopes that the so-called »Negative Emissions Technologies« (NET) can help to offset the residual GHG emissions, as they are designed to remove CO_2 from the atmosphere and store it through biological and technical processes or use it as feedstock. In the agricultural sector, vegetal substitutes to milk and meat can be found, reducing environmental pressures of animal agriculture.

Sometimes however, straightforward solutions do not exist. Considering the complexity of forests as an eco-socio-system, this is not surprising. The key challenge is to rethink forest management principles in order to design a true multifunctional process, where climate change mitigation, biodiversity conservation and the development of a circular bioeconomy are taken into account.

Concepts are being developed, e.g. in Catalonia attempt are made to internalise forest externalities in the economy and to complement traditional forestry revenues with payment of ecoservices. In Germany the paradigm of »permanent forestry« evolved, which avoids clear-cutting, instead only single targeted trees are felled and classical forest protection measures are kept to a minimum. But to put these concepts into praxis is easy to say but hard to implement.

Orientation of public policies

Dealing with these extremely important environmental issues, governments usually use the full range of available tools. On a strategic level, framework policies are put in place. For instance in 2021, the Catalan Government approved the *Catalan Bioeconomy Strategy 2030 (EBC 2030)*. Its

main goal is to promote the sustainable development of the Catalan economy by promoting the production of local renewable biological resources. Another example is the Japanese *Resource Circulation Strategy for Plastics* (RCSP) to promote plastic resource circulation, published in May 2019.

These strategies are then enacted by legislation like the Japanese *Plastic Resource Circulation Act* (PRCA), which aims at encouraging voluntary efforts by all stakeholders involved in whole lifecycle of plastics, from designing products to disposing plastic waste. In 2023, Switzerland will organize a referendum in order to decide whether CO2 storage should be entirely national or could be possible abroad; directives for implementing NET could be included in the overall *CO2 Act* revision, due by 2025.

With the strategic framework and supporting legislation in place, direct action can follow suit focusing on specific issues. That is the case in Greece with the project »Study of the Adjacent Environment and Characteristics of the Selected Areas for Drone Seeding«. Another Example is the Catalan EBC 2030 which is accompanied by an Action Plan to be executed 2021-2023, structured around seven strategic objectives.

Societal and political debate

Decisions to be made on how to meet the challenges of »Nature under pressure« affect the interests of numerous stakeholders. Governments, municipalities, businesses, consumers, environmental groups, etc. have very different views in some cases. It is therefore not surprising that a lively, sometimes even heated, debate would emerge in society.

In Germany, the debate unfolds on the very principles of commercial forest use and active forest management, especially the question of the extent to which reforestation of damaged areas with non-native climate-resilient tree species should be permitted. Nature conservation associations and ecologists are calling for a fundamental paradigm shift, arguing that the forest, as a natural ecosystem, can only develop its self-regulatory powers if it is largely left on its own. It is demanded to withdraw up to 30% of the forest area from any use. Forestry companies and forestry associations oppose this and point out – supported by parts of the scientific community – that natural processes cannot keep up with the speed of climate change and that human intervention is therefore urgently needed.

Tensions arise about the (proven or alleged) consequences of the considered policies as well. Carbon sequestration in trees and surface soils involves reversing deforestation, reforestation, increasing soil carbon levels and enhancing wetlands; this opens up great debates in Switzerland about the implementation of these practices for agriculture and land use. Here a clear interlink exists to the topic of plant-based alternatives to meat and milk. If traditional pastoral practices in alpine regions were hindered, the landscape would change drastically, and the ecological benefits of lifestock production would disappear (for example, it contributes to biodiversity if it is sustainable and extensive).

5 Parliamentary Technology Assessment to the rescue?

In these current times of multiple crises and looming disruptions, what can Parliamentary Technology Assessment (PTA) do to help guiding our societies into calmer waters? The main task of PTA is to provide the political decision-making process with a current and reliable scientific basis. Technology assessment is valuable by demonstrating possible implications of technologies and thereby initiating public debate. PTA develops options for action and analyses their impacts to support Members of Parliament to make informed decisions.

The contributions of the EPTA member institutions featured in this report show that there is a range of functions that they have performed for their parliaments:

The »technology radar«

In many countries, PTA serves as a »technology radar« for parliaments, eg. by monitoring international developments of various socio-technical innovations (NO, AT). An approach used frequently in many variants is foresight. STOA (European Parliament), for example, has adopted foresight practices for studies of science and technology-related policy issues that are complicated and/or have a controversial nature. This applies particularly to areas where clear-cut policy options are difficult to formulate, or the controversial nature of the issue can hinder the acceptance of policies. An ambitious concept of a »crisis radar« is currently being developed by TAB (DE), aimed at strengthening the resilience of society, politics and the economy by means of crisis early detection. Early studies on power outages (NL and DE) contributed to a heightened awareness of the increasing vulnerability of modern societies.

The »what-if« generator

Even tough PTA is a forward-looking activity it is hardly ever about predicting what the future will look like. Typically, PTA approaches possible future developments by generating »what-if« scenarios. Good examples can be found in projects that mapped possible consequences of an assumed large-scale failure of the core digital and/or electrical infrastructure (NO, DE). Scenario methods are particularly well suited to investigate dynamics in systems and how they play out. An essential question for PTA is to what extent scenarios like this are sufficiently integrated on a national political level.

The »wide-angle-lens«

TA, as an intermediary between different stakeholders, can also influence the processes of emergency planning and response. Those directly involved in the processes are often so preoccupied with their own systems and dynamics that communication with others falls short. However, it has been shown, especially through the creation of »big picture« plans and related training, that this intersectoral and interdisciplinary interaction with stakeholders, significantly increases collaboration in the event of an emergency and thus contributes to improved resilience.

The long tradition of some EPTA members in the field of digitalization, information technology and security research (NL, AT) induced very early public debates on problematic developments with respect to fundamental rights and democratic deficits, but also opened up the perspective to a

broader platform of public values, such as human dignity, equity and equality, autonomy, balances of power and sustainability (NL).

The »sense dog«

PTA has very successfully adopted the role of a »sense dog«, putting issues on the agenda before they become virulent. For example early 2017, the Rathenau Instituut (NL) concluded in a report entitled »Urgent upgrade« that the government, industry and society were not yet adequately prepared to deal with the arising ethical, legal and societal issues digital technologies raise. All actors needed to take action to steer the digital society in the desired direction. This report turned out to be a pivotal publication, as it initiated political and public debate on digitalisation on a large scale in the Netherlands.

A »helping hand« for Parliamentary scrutiny

Some activities of POST (UK) can be described more like a »Sherpa«, very directly supporting parliamentary activity including scrutiny of the Government's defence AI strategy and other committee inquiry work.

A »step stone« for a safe tread

A very similar role is performed e. g. by TAB (DE), which delivers solid and reliable assessments as background information and reliable footing on issues of parliamentary concern (»step stone«).

The »open street map« for policy options

Finally, one of the most important roles of PTA is to develop and assess a variety of policy options that improve the capacity of society to deal with disruption. E. g. by making supply chains more resilient and the industrial and social environment capable to adapt, tackling all possible challenges of the new situation. The main task remains to provide Parliaments with a balanced and easily understandable summary of the potential outcomes of alternative policy options. Thereby contributing to increasing resilience by supporting the preparedness of policy makers to face disruption.

The point of departure for this report is the notion that societal disruptions are becoming more frequent, pervasive, and related to technology. This does not mean, however, that they are inevitable. The disruption we have described are all ultimately human made, and can be mitigated, shaped, or even averted by our own actions and political decisions.

In this report EPTA members present 18 case studies on these three facets of disruption. This provides an excellent overview of the diversity and richness of approaches in the EPTA community to support Parliaments across Europe and beyond to deal with disruptive change.

The final authority to judge the usefulness of PTA is – of course – the Members of Parliament and Parliaments as a whole. Given the enormous demand for PTA studies by all EPTA Parliaments in recent years, combined with the steadily increasing number of EPTA members around the world, the authors of this report are not afraid of the verdict.«