STOA Annual Report 2021

European Parliament

Panel for the Future of Science and Technology

EPRS | European Parliamentary Research Service

Scientific Foresight Unit (STOA)

PE 729.527 – July 2022

EN

European Parliament Panel for the
Future of Science and Technology (STOA)

Annual Report 2021

July 2022

The STOA Panel approved this report on 7 July 2022.

The Annual Report was submitted to the European Parliament's Bureau on 15 July 2022.

PE 729.527

Introduction by Ewa Kopacz, Vice-President of the European Parliament responsible for STOA (2019-21)

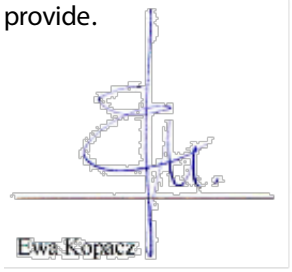
Dear colleagues,

It was an honour for me to be the European Parliament's Vice-President responsible for STOA for the first half of the ninth legislature (2019-2021). The past two and a half years confronted us with unprecedented challenges, in particular the appearance of a deadly pandemic that upended our daily lives and the way we worked and lived as a society. The Covid-19 pandemic reminded us of the critical importance that good scientific knowledge and advice play in sound policy-making. In addition, it served to illustrate how new technologies can allow our societies to function in ways that would have been unthinkable until recently. At the same time, it highlighted the need to take a holistic view of science, technology, society and policy, in order to properly understand the potential impacts of new scientific and technological advancements.

These lessons reflect the very core of STOA's mission. Through its technological assessment and scientific foresight studies, STOA examines cutting edge developments in science and technology in a range of key areas. Authored by top experts in their fields, these studies present scientifically rigorous information in an accessible way, providing independent and impartial assessments of the impacts of these developments, and potential policy options that may be adopted in response. In addition, the events organised by STOA help bring the Members of the European Parliament directly into contact not only with scientists, but also with other key stakeholders and citizens, allowing an open discussion on scientific and technological topics of political relevance to civil society. Media also plays a critical role in such a discussion, especially in times when mis- and disinformation are widespread, as witnessed with the pandemic and the phenomenon of vaccine hesitancy. This aspect is taken up by the activities of the European Science-Media Hub, which helps to foster a dialogue between Members, scientists and the media, while also helping to bring STOA's activities closer to the media and the wider public.

By looking at the medium- to long-term implications of science and technology for society, the economy or the environment, STOA supplies Members with sound, evidence-based scientific advice in their critical role as representatives of the citizens of the European Union. Looking to the future, the role and mission of STOA are more relevant than ever. We are confronted with old and new challenges, such as how to achieve our climate goals, how we should approach emergent disruptive technologies such as artificial intelligence, and how to bolster our healthcare systems in light of the lessons learnt from the pandemic. Sound scientific advice, as promoted by STOA, will remain a key aspect in building our responses to these – science is an essential tool that offers solutions and hope, as opposed to fear and disappointment.

I would like to take this opportunity to express my thanks to the Chair, the Members and the Secretariat of the STOA Panel for their work throughout 2021. While going forward I will no longer have a formal link to STOA after the end of my mandate, I shall keep following it with much interest, and in my work as a Member of Parliament I shall certainly be looking forward to the invaluable scientific advice it will continue to provide.



Vice-President, European Parliament

Preamble by Eva Kaili, Chair of STOA (2017-21)

Ever since its inception in 1987, STOA has played a key bridging role between scientific knowledge and political decision-making. Its rich studies and engaging activities have made STOA well known in the European Parliament, providing its Members with invaluable scientific expertise on which to base their decisions.

It has been a pleasure for me to be Chair of STOA for the past five years, and I look forward to continuing to be involved in its activities, now as the European Parliament's Vice-President responsible for STOA. Despite the challenges posed by the continuing pandemic, 2021 saw STOA thriving in its mission of supporting the work of the Parliament, its committees and its Members through science-based advice in the form of technology assessment and scientific foresight, all the while promoting networking and contacts between Members, scientists, the media and civil society in general.

With global events highlighting the importance of scientific advice, last year was a very productive one for STOA. It saw the publication of 17 technology assessment and 4 scientific foresight studies. These cover a wide range of topics, focusing on the priorities defined by the STOA Panel: examples range from online platforms ('Liability of online platforms' or 'Online platforms: Economic and societal effects'), 5G ('Environmental impacts of 5G' and 'Health impact of 5G') and public health ('EU health data centre and a common data strategy for public health'), to the use of hydrogen ('The potential of hydrogen for decarbonising EU industry') and the Green Deal ('Meeting the Green Deal objectives by alignment of technology and behaviour').

Given the growing importance of AI, STOA continues to engage pro-actively with the topic, not just through regular studies, such as 'Person identification, human rights and ethical principles: Rethinking biometrics in the era of artificial intelligence' to give an example, but also through the work of the recently created Centre for Artificial Intelligence (C4AI). Its purpose is to promote public trust, transparency and reflection on the future development of AI; it provides numerous resources for Members and the public on the subject. In addition, STOA also completed a programme of activities in the context of its formal Partnership on AI with the OECD's Global Parliamentary Network.

Holding events during a pandemic is necessarily a challenging endeavour, but 2021 proved that STOA had fully adapted to the new reality. 15 events took place online over the course of the year, with discussion of not just important aspects of science and technology, but also on topics critical to science, such as academic freedom. STOA also pioneered a new, more streamlined format for shorter events, 'STOA meets experts', aiming to make them more accessible to a wider audience. STOA's annual lecture was once again dedicated to cutting edge technology, this time on 'Edge computing, 6G and satellite communications'.

With scientific communication, but also unfortunately misinformation, so prevalent in the news, the work of the European Science-Media Hub has naturally been extremely important in 2021. It has kept up its role as a trustworthy platform for promoting science-based information for Members, and continued to develop a network among policy-makers, scientists and media. It also focused on aligning its publications with STOA events and studies, promoting STOA activities in ways accessible to a large audience.

STOA's International Advisory Board came of age in 2021, having been created as a conduit for cooperation and exchange with stakeholders and partners on a global scale, and including personalities from academia, international organisations, the private sector, civil society and think tanks. Now with 31 members, it held a first introductory virtual meeting in February 2021, with a subsequent meeting in June, where board members were invited to share their views on the proposed AI act.

Finally, I would like to thank European Parliament Vice-President Ewa Kopacz and STOA Vice-Chairs Christian Ehler and Ivars Ijabs – all respected politicians with foresight, knowledge and influence – with whom I have been honoured to work and with whom I look forward to continuing to collaborate, as well as the Scientific Foresight Unit within the European Parliamentary Research Service (EPRS), for their continued support and commitment to our common work.

Eva Kaili

STOA Chair (2017-2021)

Vice-President, European Parliament

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List of abbreviations

AGRI	European Parliament Committee on Agriculture and Rural Development
AI	artificial intelligence
AIDA	European Parliament Special Committee on AI in a Digital Age
AT	Austria
BG	Bulgaria
C4AI	Centre for Artificial Intelligence
CAP	common agricultural policy
CULT	European Parliament Committee on Culture and Education
DE	Germany
DGA	Data Governance Act
DK	Denmark
DMA	Digital Markets Act
DSA	Digital Services Act
EC	European Commission
ECON	European Parliament Committee on Economic and Monetary Affairs
ECR	European Conservatives and Reformists
EL	Greece
EMPL	European Parliament Committee on Employment and Social Affairs
ENVI	European Parliament Committee on Environment, Public Health and Food Safety
EPP	European People's Party
EPRS	European Parliamentary Research Service
EPTA	European Parliamentary Technology Assessment network
ERC	European Research Council
ES	Spain
ESMH	European Science-Media Hub
ET	Estonia
EP	European Parliament
EU	European Union
FR	France
GDPR	General Data Protection Regulation
GPN	Global Parliamentary Network
Greens/EFA	The Greens/European Free Alliance
HR	Croatia
INAB	International Advisory Board
IE	Ireland
IMCO	European Parliament Committee on Internal Market and Consumer Protection
INTA	European Parliament Committee on International Trade
IT	Italy
ITRE	European Parliament Committee on Industry, Research and Energy
JRC	Joint Research Centre of the European Commission
JURI	European Parliament Committee on Legal Affairs
LIBE	European Parliament Committee on Civil Liberties, Justice and Home Affairs

LV	Latvia
MEP	Member of the European Parliament
MS	Member State
NGO	non-governmental organisation
NL	The Netherlands
NI	non-inscrits (non-attached Members of the European Parliament)
OECD	Organisation for Economic Co-operation and Development
PL	Poland
PT	Portugal
REGI	European Parliament Committee on Regional Development
RO	Romania
S&D	Progressive Alliance of Socialists and Democrats
SEDE	European Parliament Subcommittee on Security and Defence.
S&T	science and technology
STOA	Panel for the Future of Science and Technology
TA	technology assessment
TRAN	European Parliament Committee on Transport and Tourism
WHO	World Health Organisation

Executive summary

After the general disruption caused by the Covid-19 pandemic in 2020, 2021 saw STOA resume a more normal pattern of activity, although still within the constraints imposed by the ongoing public health situation, as witnessed by the online nature of many activities.

In total, STOA published 21 studies in 2021, focusing on the three priority thematic areas defined by the Panel: artificial intelligence and other disruptive technologies; the European Green Deal; and quality of life. These were:

- Digital automation and the future of work
- Liability of online platforms
- The future of crop protection in Europe
- Strategic communications as a key factor in countering hybrid threats
- Online platforms: Economic and societal effects
- Carbon-free steel production: Cost reduction options and usage of existing gas infrastructure
- Environmental impacts of 5G
- Meeting the Green Deal objectives by alignment of technology and behaviour
- Health impact of 5G
- Guidelines for foresight-based policy analysis
- Tackling deepfakes in European policy
- Innovative technologies shaping the 2040 battlefield
- Cost of crop protection measures
- EU health data centre and a common data strategy for public health
- A framework for foresight intelligence
- Pollution and the spread of Covid-19
- The potential of hydrogen for decarbonising EU industry
- Regulating genome editing: Societal hopes and fears
- Key enabling technologies for Europe's technological sovereignty
- Person identification, human rights and ethical principles: Rethinking biometrics in the era of artificial intelligence
- European pharmaceutical research and development: Could public infrastructure overcome market failures?

In addition to the standard studies, STOA kept up a lively rhythm of other publications, with 10 'What if...?' at-a-glance publications providing awareness-raising and thought-provoking overviews of current and relevant techno-scientific trends, as well as 29 blog posts and 18 videos and podcasts.

While STOA was able to organise a large number of workshops in 2021, these had to be held online because of the continuing restrictions due to the pandemic. Variously linked to published studies or held on their own, they covered a wide range of topics of interest in science and technology, such as 'Health and economic benefits of microbiomes', 'Key enabling technologies for Europe's technological sovereignty', 'Energy transition and the EU hydrogen strategy', and 'The International Brain Initiative: Shaping the future of globally coordinated neuroscience'. One event in particular focused on a critical aspect of scientific research itself, namely 'Academic freedom in Europe'. The annual lecture was this time dedicated to 'Edge computing, 6G and satellite communications', and had Professor Vincent Poor of Princeton University as keynote speaker, following a scene-setting speech from European Commissioner Thierry Breton.

As part of its networking effort with key communities in science and technology, STOA maintained its links with the European Parliamentary Technology Assessment network (EPTA), participating in its directors' meeting and its 2021 conference. The year also saw further exchanges with the Joint Research Centre of the European Commission (JRC), with its Director-General, Stephen Quest, participating in a

Panel meeting, and the organisation of a virtual visit to the JRC site in Ispra. Following its establishment the previous year as a means to promote further exchanges with key stakeholders and partners, STOA's International Advisory Board held its first meetings in 2021, including an exchange of views on the AI act.

STOA's new Centre for AI (C4AI) continued its activities in 2021, helping Members keep track of developments on AI-related technological trends or legislative files, and completing a programme of activities in the context of its formal Partnership on AI with the Organisation for Economic Co-operation and Development (OECD) Global Parliamentary Network (GPN).

In 2021, the European Science-Media Hub (ESMH) continued to develop a network among policy-makers, scientists and media and to promote science-based information, while also focusing on aligning its publications with STOA events and studies, publishing articles and interviews on its website and producing several video clips. In a year characterised by a flood of new Covid-19 vaccines being put on the market in record time, the ESMH continued its efforts to tackle the phenomena of dis- and misinformation on scientific topics, especially in the context of vaccine hesitancy. The ESMH organised several events in 2021, organising and moderating the 'Science & the media' track of the World Health Organisation's (WHO) first global conference on communicating science during health emergencies, and holding a workshop during the EYE2021, at which 60 scientists, journalists and science communicators from all over Europe debated how to produce quality stories and sound, trustworthy reporting.

1. Scientific evidence for policy-making

The Panel for the Future of Science and Technology (STOA) was established in 1987 as a scientific advisory body to the European Parliament as a whole. Its mission is to provide Members of the European Parliament (MEPs) with independent expert assessment of scientific and technological developments and related policy options, all in the service of informed political decision-making. It conducts technology assessment and scientific foresight to provide Members with a strategic view on techno-scientific developments and their implications across many policy areas affecting society, the economy and the environment in a broad sense, in the near as well as the distant future.

During the ninth parliamentary term (2019-24), STOA has been focusing on the following three priority thematic areas and four priority policy areas:

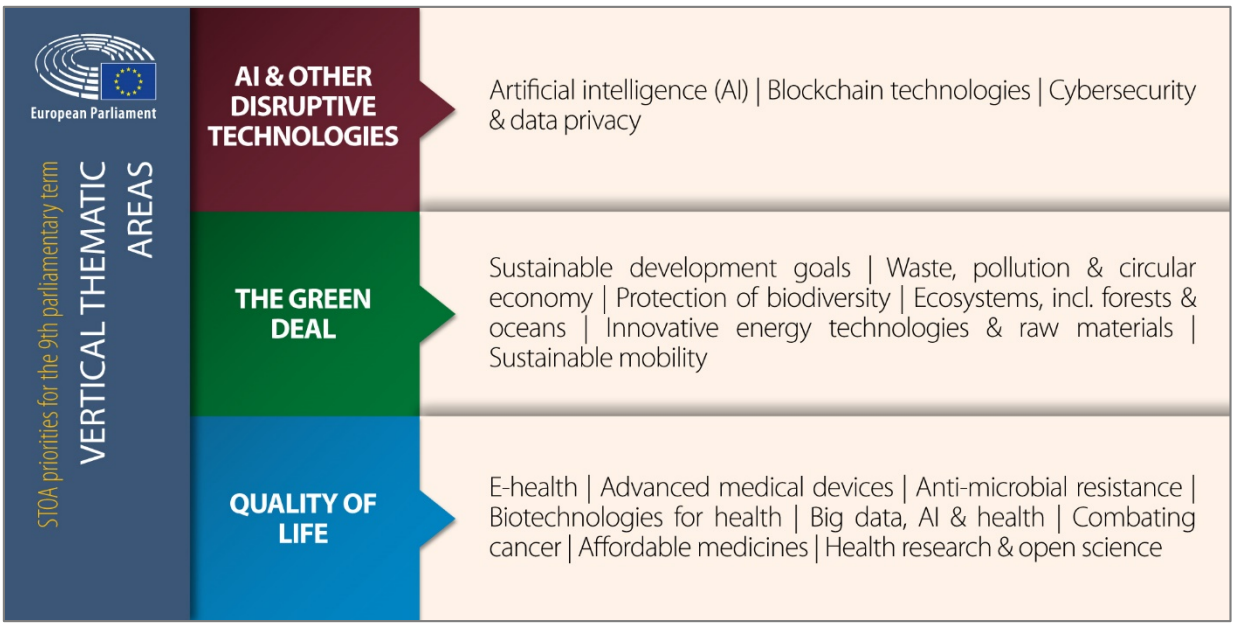
Priority thematic areas:

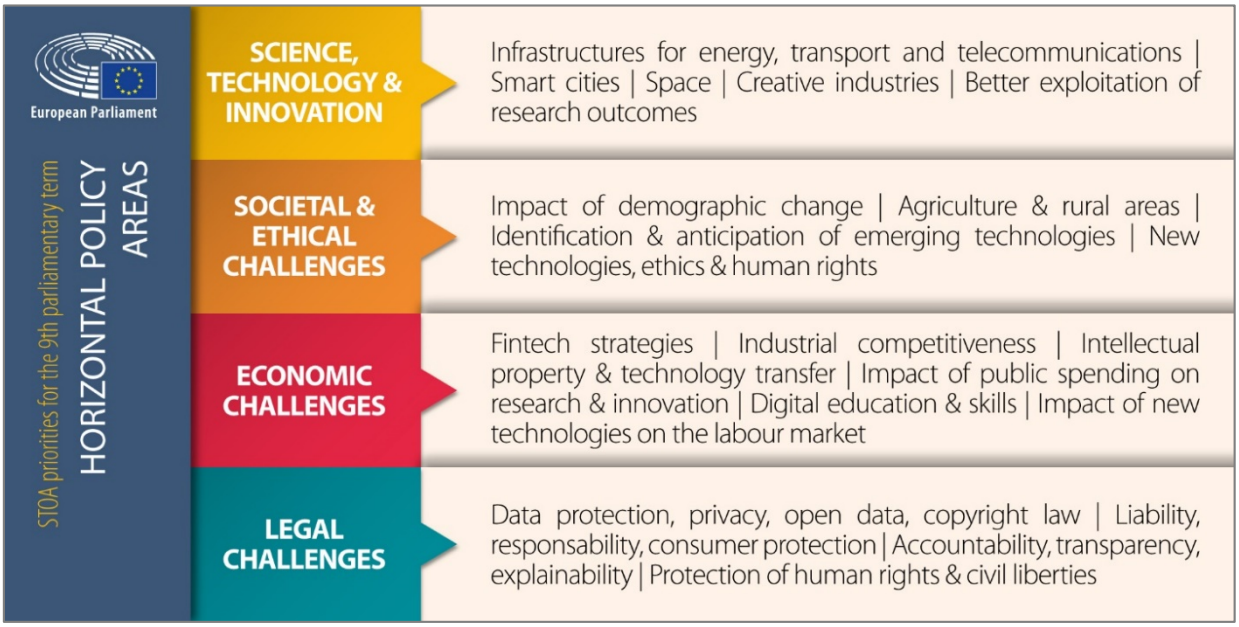
- artificial intelligence and other disruptive technologies
- the European Green Deal
- quality of life.

Priority policy areas:

- science, technology and innovation
- societal and ethical challenges
- economic challenges
- legal challenges.

STOA's activities are wide-ranging, and include technology assessment (TA) and scientific foresight studies, events and visits, with specific kinds of activities performed using dedicated instruments: the European Science-Media Hub (ESMH) and the Centre for Artificial Intelligence (C4AI).





1.1 STOA methods: Technology assessment and scientific foresight

STOA is a member of the European Parliamentary Technology Assessment network (EPTA), which brings together TA offices specialising in providing advice for parliaments. Like other EPTA members, STOA advises the European Parliament on the possible social, economic and environmental impact of new science and technologies.

Technology assessment is the study and assessment of the effects of new technology on society. It is a scientific, interactive and communicative process that aims to contribute to the formation of public and political opinion on the societal aspects of science and technology. According to this definition, TA (i) provides knowledge and is evidence-based; (ii) involves societal interactions with stakeholders; and (iii) includes an element of communication, contributing to the formation of public and political opinion.

In addition, STOA applies a foresight-based approach to its science advice activities. This ensures that the focus is on preparedness for what could happen or could be needed in the future. It puts an emphasis on the possible future impacts of new technological developments on all of society. Basic traits of foresight exploration involve investigating the effects of new technologies on society in a holistic way, namely they are inclusive (stakeholders from the 'broad spectrum'), participatory (including conversations among stakeholders about possible future concerns) and interdisciplinary (in the initial TA as well as in the analysis of the stakeholder views). The foresight element is particularly important when dealing with controversial or complicated issues, such as, for instance, genome editing or climate change.

In 2021 STOA published a manual, 'Guidelines for foresight-based policy analysis', laying down the methodology and key considerations behind its foresight approach. This was further complemented by two publications on a framework for foresight intelligence, looking at horizon scanning and online stakeholder engagement. Additionally, the basic principles of evidence-based policy advice are also explained in the EPRS briefing on 'Evidence for policy-making – Foresight-based scientific advice'.

STOA Panel members – First half of ninth parliamentary term (as of 31 December 2021)

	Panel Member	*Committee*		*Panel Member*	*Committee*
	Ewa Kopacz (EPP, PL) **EP Vice-President STOA Bureau member**			Francesca Donato (ID, IT)	**AGRI**
	Eva Kaili (S&D, EL) **STOA Chair STOA Bureau member**	**ITRE**		Herbert Dorfmann (EPP, IT)	**AGRI**
	Christian EHLER (EPP, DE) **1st STOA Vice-Chair STOA Bureau member**	**ITRE**		Lina Galvez Muñoz (S&D, ES)	**EMPL**
	Ivars Ijabs (Renew Europe, LV) **2nd STOA Vice-Chair – STOA Bureau member**	**ITRE**		Alexandra Geese (Greens/EFA, DE)	**IMCO**
	Atidzhe Alieva-Veli (Renew Europe, BG) *From 21/4/2021*	**EMPL**		Alexis Georgoulis (The Left, EL)	**CULT**
	Anna-Michelle Asimakopoulou (EPP, EL)	**INTA**		Maria Grapini (S&D, RO)	**TRAN**

	Panel Member	*Committee*		*Panel Member*	*Committee*
	Rosa D'Amato (Greens/EFA, IT)	**REGI**		Ivo Hristov (S&D, BG)	**AGRI**
	Marina Kaljurand (S&D, ET)	**LIBE**		Susana Solís Pérez (Renew Europe, ES)	**ENVI**
	Othmar Karas (EPP, AT)	**ITRE**		Hermann Tertsch (ECR, ES)	**ENVI**
	Maria Manuel Leitão MARQUES (S&D, PT)	**IMCO**		Barbara Thaler (EPP, AT)	**TRAN**
	Karen Melchior (Renew Europe, DK)	**IMCO**		Patrizia Toia (S&D, IT)	**ITRE**
	Caroline Nagtegaal (Renew Europe, NL)	**TRAN**		Viola von Cramon-Taubadel (Greens/EFA, DE)	**ITRE**
	Dennis Radtke (EPP, DE)	**EMPL**		Tiemo Wölken (S&D, DE)	**JURI**

Michèle Rivasi
(Greens/EFA, FR)

ENVI

Yana Toom
(Renew, ET)

Until 21/4/2021

EMPL

European Parliament committees

AGRI	Agriculture and Rural Development
CULT	Culture and Education
EMPL	Employment and Social Affairs
ENVI	Environment, Public Health and Food Safety
IMCO	Internal Market and Consumer Protection
ITRE	Industry, Research and Energy
INTA	International Trade
JURI	Legal Affairs
LIBE	Civil Liberties, Justice and Home Affairs
TRAN	Transport and Tourism
REGI	Regional Development

2. STOA activities relating to artificial intelligence and other disruptive technologies

Artificial intelligence (AI) is an increasingly important issue for the European Parliament. During 2021, the Parliament adopted resolutions on AI in criminal law and its use by the police and judicial authorities in criminal matters; in education, culture and the audiovisual sector; and on questions of interpretation and application of international law in so far as the EU is affected in the areas of civil and military uses and of state authority outside the scope of criminal justice. The work of the Parliament's Special Committee on AI in a Digital Age (AIDA) also advanced, including the presentation of a draft report.

Since the European Commission unveiled its proposal for a regulation laying down harmonised rules on AI (the AI act) in April 2021, debates and discussions about AI in Parliament have increasingly focused upon its strengths and weaknesses in view of the negotiations that are due to start in 2022.

Questions relating to employment, platforms, space and terrestrial management, strategic communications, 5G, deepfakes, ethics and technological sovereignty were all high on the policy agenda and STOA contributed to these debates with a range of studies on cutting edge trends in digital and disruptive technologies.

The events and publications described below have made a substantial contribution to policy debates on AI and disruptive technologies in the European Parliament and beyond.

2.1 STOA technology assessment project | Digital automation and the future of work

Lead Panel Member: Eva Kaili (S&D, EL)

Project duration: Started in September 2019; published in January 2021; presented to the STOA Panel on 26 February 2021

Relevant to European Parliament committees: EMPL, LIBE, JURI, ITRE, AIDA

Relevant European Parliament files: Artificial intelligence act (2021/0106(COD)); Report on artificial intelligence in a digital age (2020/2266(INI)); Framework of ethical aspects of artificial intelligence, robotics and related technologies (2020/2012(INL)); Civil liability regime for artificial intelligence (2020/2014(INL)); The right to disconnect (2019/2181(INL))

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Current developments in digital technologies, including AI, are expected to have a major impact on the job market, with some seeing the possibility of a 'world without work', while others think their effect will be more transformative, modifying the nature of work instead. In order to look at the possible job market of the future, STOA commissioned a study to look at the nature, scope and possible effects of digital automation. Reviewing relevant literature and framing technological change in its historical context, the study recognises that the impacts on work and employment are multifaceted. It recognises both opportunities and risks, identifying threats such as an unequal distribution of the risks and benefits associated with digital automation.

Ultimately, the study argues technological change is non-deterministic in its nature and effects: there is no guarantee that digital technologies will destroy jobs, nor any certainty that these technologies will lead to more and better jobs. Therefore, the suggested policy options, summed up in the

accompanying STOA options brief, aim to maximise the scope and breadth of the benefits from digital technologies, going beyond skills and training to propose wider reforms through a new digital social contract, seeking a human-centred approach based on industrial democracy and social partnership.

2.2 STOA technology assessment project | Liability of online platforms

Lead Panel Member: Christian Ehler (EPP, DE)

Project duration: Started in February 2020; published in February 2021

Relevant to European Parliament committees: IMCO, LIBE, JURI, ITRE, AIDA

Relevant European Parliament files: Artificial intelligence act (2021/0106(COD)); Report on artificial intelligence in a digital age (2020/2266(INI)); Resolution on automated decision-making processes: ensuring consumer protection and free movement of goods and services (2019/2915(RSP)); Framework of ethical aspects of artificial intelligence, robotics and related technologies (2020/2012(INL)); Civil liability regime for artificial intelligence (2020/2014(INL))

Online platforms play a key role in the digital economy and are assuming ever greater societal importance as well. This has sparked a significant public debate on the issue of their responsibility and liability, particularly where it involves the detection and removal of illegal material, in the context of an existing EU liability framework that is complex and not always best adapted to dealing with the novel issues related to these platforms.

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This STOA study reviews the existing legal and regulatory framework and the incentives for platform users and third parties to detect and remove illegal material. It looks at the notion of online platforms, categorises them, and maps the whole range of platform liabilities. In doing so, an important distinction is made between liabilities connected with the activities performed or the content uploaded by users, and alternative sources of liability, such as contractual liability towards users, as well as that deriving from infringements of privacy and data protection law.

In the presented policy options, which are also discussed in the accompanying STOA options brief, the study advocates a technology-specific, problem-based and functional approach to regulation, presenting six non-mutually exclusive proposals on a scale of increasing interventionism, ranging from preserving the status quo, through self- or co-regulation to statutory legislation, along with possible modifications to secondary liability.

2.3 STOA workshop | Use of AI, big data and space technologies in terrestrial management

Lead Panel Member: Maria-Manuel Leitão-Marques (S&D, PT)

Date: 23 February 2021

Relevant to European Parliament committees: ITRE, IMCO, AIDA

Europe is an important actor in the domain of space, with new opportunities being created by the application of AI to the large datasets generated by the likes of the EU's Earth observation programme Copernicus, but its citizens still lack awareness of EU space initiatives, capabilities and possibilities. At this STOA event chaired by MEP and STOA Panel Member Maria Manuel Leitão Marques (S&D, PT), attendees were welcomed by Manuel Heitor, Minister for Science, Technology and Higher Education of Portugal, on behalf of the Portuguese Presidency of the Council, and were able to follow a showcase of projects, covering the monitoring of land cover and use, the oceans, and human carbon dioxide emissions, and smart city applications.

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The combination of AI and Earth observation offers great potential to respond better to major societal and policy challenges. This was the subject of the follow-on discussion with four experts, which highlighted the need for better dissemination, the inequality reduction potential of making important data easily accessible to citizens, the importance of cooperation at local and regional level, and the role to be played by national policy in the development of applications. The event was closed by Lina Gálvez Muñoz (S&D, ES), MEP and STOA Panel member, who introduced inclusiveness, in particular with regard to gender, as an additional key element of the green and digital transitions.

2.4 STOA technology assessment project | Strategic communications as a key factor in countering hybrid threats

Lead Panel Member: Ivars Ijabs (Renew, LV)

Project duration: Started in October 2019; published in March 2021; presented to the STOA Panel on 20 November 2020

Relevant to European Parliament committees: SEDE, AIDA

Relevant European Parliament files: Resolution on the EU's cybersecurity strategy for the digital decade (2021/2568(RSP)); European Cybersecurity Competence Centre (2018/0328(COD))

The hybrid threat concept attempts to synthesise a complex and evolving phenomenon, where state and non-state actors use diverse means and tools to perturb the normal functioning of democratic states and institutions, and influence their decision-making in pernicious ways, particularly using the amplifying power of digital technologies.

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Following a request from the SEDE subcommittee, this STOA study looks into the use of strategic communications, seen as the use of systematic series of sustained and coherent activities to promote and sustain particular types of behaviour, to counter this

kind of threat. The study starts from a theoretical description of hybrid threats, and then goes on to make an analysis of diverse case studies, describing the geopolitical context in which the hybrid threat exists, its main features, the mechanisms relating to strategic communications used by the victim to counter the hybrid threat, and its impact and consequences. The study concludes with a comprehensive set of policy options aimed at improving the EU response to hybrid threats.

2.5 STOA workshop | Policy options for the ethical governance of disruptive technologies

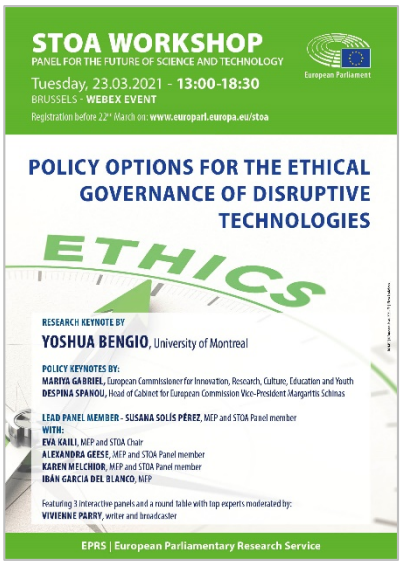
Lead Panel Member: Susana Solís Pérez (Renew, ES)

Date: 23 March 2021

Relevant to European Parliament committees: ITRE, JURI, LIBE, ECON, IMCO, CULT, EMPL, AIDA

Relevant European Parliament files: Artificial intelligence act (2021/0106(COD)); Digital services act (2020/0361(COD)); Digital markets act (2020/0374(COD)); Data Governance Act (2020/0340(COD)); Data act (2022/0047(COD))

STOA partnered with three EU-funded Horizon 2020 projects – SHERPA, SIENNA and PANELFIT – representing a €10 million investment in research by the EU, to host this online workshop.



In her opening remarks, Susana Solís Pérez (Renew, ES), MEP and Lead STOA Panel Member for this event, emphasised the need for Europe to take the lead in the creation of a legal framework enabling the development of a responsible innovation ecosystem in the field of AI. Despina Spanou, Head of Office of the European Commission Vice-President for Promoting our European Way of Life, Margaritis Schinas, presented the Commission's upcoming legislative and policy plans in the domain of AI, which put forward a risk-based, technology-neutral, holistic approach consistent with the European way of life. The keynote speech was delivered by Yoshua Bengio, University of Montreal, one of the world's leading experts in artificial intelligence, who focused on the need to promote and facilitate the sharing of knowledge and data for the public good, which in effect could strengthen the social dimension of AI.

Mariya Gabriel, European Commissioner for Culture, Education and Youth, and Eva Kailli (S&D, EL), MEP and STOA Chair, brought the event to a close, with Eva Kaili reiterating the importance of strengthening a harmonised EU-wide approach to the design and development of future and emerging technologies prioritising ethical and social values to enrich and improve society. In her view, the discussions had highlighted the importance of interdisciplinary collaboration and working with end-users to develop solutions that protect EU values, democracy and fundamental rights.

2.6 STOA technology assessment project and workshop | Online platforms: Economic and societal effects

Lead Panel Member: Eva Kaili (S&D, EL)

Project duration: Started in February 2020; published in March 2021; presented at a workshop on 30 March 2021

Relevant to European Parliament committees: ITRE, IMCO, LIBE, EMPL

Relevant European Parliament files: Digital markets act (2020/0374(COD)); Digital services act (2020/0361(COD))

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Online platforms play an increasingly central role in our economy and society. Their growth, propelled by the network effect of their activities and their data-driven business models, their economic dominance and pervasive data collection, has sparked a broad public debate. This STOA study assesses the economic and social effects of online platforms, finding evidence of a positive impact. It goes on to look at existing regulation and enforcement at European level, identifying a set of issues that are not currently fully addressed, and emphasises the need to strengthen current law enforcement and regulation of the platform economy. In conclusion, the study proposes policy options, outlined in the accompanying STOA options brief, covering competition and innovation, working conditions and labour markets, consumer and societal risks, and environmental sustainability.

This topic was further taken up in a workshop organised by STOA to coincide with the release of the study, whose focus can be summed up by one of the main statements made: 'Online platforms play an increasingly central role in our lives, and a clear and enforceable set of principles is needed to safeguard the benefits society draws from them'. The event, chaired by MEP and STOA Chair Eva Kaili (S&D, EL), saw three keynote addresses, from Nicolas Schmit, European Commissioner for Jobs and Social Rights, and MEPs Sylvie Brunet (Renew, FR) and Deirdre Clune (EPP, IE), who variously spoke about innovation, labour rights and consumer trust in the specific context of online platforms and existing and proposed regulation, a topic that was then further discussed by a panel of eminent experts. This motto was again taken up by Ms Kaili in her closing remarks, in which she emphasised the need for Europe to take the lead in securing the interests of workers, citizens and users alike.

2.7 STOA technology assessment project | Tackling deepfakes in European policy

Lead Panel Member: Eva Kaili (S&D, EL) and Ivo Hristov (S&D, BG)

Project duration: Started in November 2020; published in July 2021; presented to the STOA Panel on 15 October 2021

Relevant to European Parliament committees: IMCO, LIBE, JURI, AIDA, CULT

Relevant European Parliament files: Artificial intelligence Act (2021/0106(COD)); Report on artificial intelligence in a digital age (2020/2266(INI)); Digital services act (2020/0361(COD))

Cutting-edge artificial intelligence techniques have enabled the production of highly realistic videos that manipulate how people look, and the things that they appear to say or do. These fabrications are commonly referred to as 'deepfakes'. STOA commissioned a study to examine deepfakes and to develop and assess a range of policy options focusing in particular upon the proposed AI and digital services acts, as well as the General Data Protection Regulation (GDPR).

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The full STOA study sets out the key features of deepfake technologies, their technical, societal and regulatory context, and their impacts at individual, group and societal levels, before setting out a range of policy options targeting legislative files that are currently under debate at the European Parliament. These options are also presented in the accompanying STOA options brief.

2.8 STOA technology assessment project | Innovative technologies shaping the 2040 battlefield

Lead Panel Member: Ivars Ijabs (Renew, LV)

Project duration: Started in July 2020; published in July 2021; presented to the STOA Panel on 25 June 2021

Relevant to European Parliament committees: SEDE, AIDA

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Looking towards 2040, the global innovation and technology landscape is expected to evolve significantly, driving change in the nature of warfare as well as in the capabilities, concepts and doctrines employed by actors on the battlefield. This future battlefield will be shaped by the interaction of technology with various political, social, economic, environmental and technological strategic trends. Following a request from the SEDE subcommittee, this study provides an assessment of the risks, challenges and opportunities relating to the new and emerging technologies that are most expected to shape the future battlefield up to 2040. These include AI, machine learning and big data; advanced robotics and autonomous systems; biotechnology; technologies for the delivery of novel effect; satellites and space-based technologies and assets; and human-machine interfaces.

The study presents the implications stemming from consideration of individual technologies, as well as cross-cutting analysis of their interactions with broader political, social, economic and

environmental trends. In doing so, the study highlights in its policy options a need for EU institutions and Member States to pursue a broad range of capability development initiatives in a coherent and coordinated manner, ensure the development of an agile regulatory and organisational environment, and guide investments in the technologies most relevant to the European context.

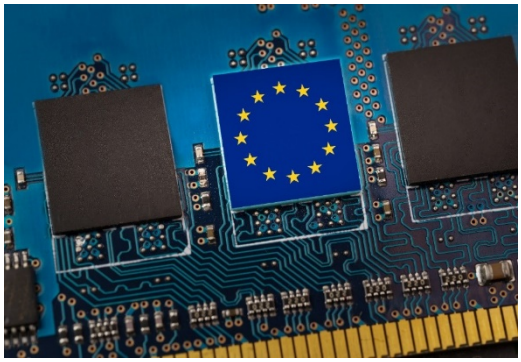
2.9 STOA technology assessment project and workshop | Key enabling technologies for Europe's technological sovereignty

Lead Panel Member: Ivars Ijabs (Renew, LV)

Project duration: Started in August 2020; published in December 2021; presented at a STOA meets experts event on 15 June 2021

Relevant to European Parliament committees: ITRE, IMCO, INTA, SEDE, AIDA

Technological sovereignty is an important ambition of the EU and its relevance has been highlighted by recent world events, not least the Covid-19 pandemic and its associated impact on many value chains. This STOA study looks into the six key enabling technologies (KETs) defined in EU industrial policy, which are critical for an interconnected, digitalised, resilient and healthier European society, as well as being important for the EU's competitiveness and position in the global economy. These KETs are: advanced manufacturing, advanced (nano)materials, life-science technologies, micro/nano-electronics and photonics, artificial intelligence, and security and connectivity technologies.



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The study proposes a definition of technological sovereignty for the EU, and analyses how the EU is performing in developing and protecting ownership and know-how in these critical technologies, especially in comparison with strong global players such as China and the United States of America. Based on the challenges identified in the analysis, it discusses policy options for strengthening the EU's technological sovereignty.

The study was complemented by an online event organised by STOA, chaired by MEP and STOA Second Vice-Chair Ivars Ijabs (Renew, LV). It featured a presentation of the study by one of the authors, Michael Flickenschild, from Ecorys, and a second presentation by Daniel Fiott, of the European Union Institute for Security Studies.

2.10 STOA technology assessment project | Person identification, human rights and ethical principles: Rethinking biometrics in the era of artificial intelligence

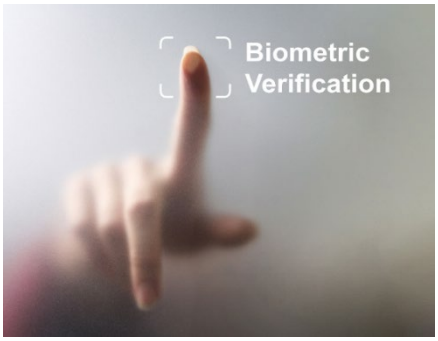
Lead Panel Member: Eva Kaili (S&D, EL)

Project duration: Started in October 2020; published in December 2021; presented to the STOA Panel on 15 October 2021

Relevant to European Parliament committees: ITRE, IMCO, JURI, LIBE, AIDA

Relevant European Parliament files: Artificial intelligence act (2021/0106(COD)); Report on artificial intelligence in a digital age (2020/2266(INI)); Framework of ethical aspects of artificial intelligence, robotics and related technologies (2020/2012(INL))

This STOA study looks at the impact of biometrics in the era of AI, focusing on the connections between person identification, human rights and ethical principles. In the context of the AI act, the study looks at the different AI systems making use of biometric data, and their regulatory framework. It identifies gaps in the proposed legal approach, and cautions that overlooking developments not centred on the use of biometric data for identification of individuals may lead to serious impacts on fundamental rights and democracy.



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The study proposes several policy options, based on clarifying concepts used and applicable regulation, establishing safeguards, and the outright ban of some practices. These options are also covered by the accompanying STOA options brief.

3. STOA activities in relation to the European Green Deal

With the potential to play a key role not only in ensuring Europe's Covid-19 recovery in the short term, but also in addressing long-term climate change threats, the European Green Deal (EGD) remained one of the priority thematic areas of the STOA Panel in 2021.

The EGD aims to cut carbon emissions while also achieving economic growth not tied to resource use and ensuring that no one is left behind. Ranging across eight policy areas – biodiversity, sustainable food systems, sustainable agriculture, clean energy, sustainable industry, building and renovating, sustainable mobility, eliminating pollution and climate action – the deal represents an unprecedented effort to review more than 50 European laws and redesign public policies.

For the EU to reach its target of reducing emissions by 55 % by 2030, the Commission proposed a 'fit for 55' package of new and revised legislation in July 2021. It will revise the EU's climate and energy legislation, including proposals on emissions trading, effort sharing between EU countries, land use sector and forestry, renewable energy and energy efficiency among others.

In September 2021, the Commission adopted a communication setting out the concept of the New European Bauhaus, including a number of policy actions and funding possibilities. The purpose of the project is to accelerate the transformation of various economic sectors, such as construction and textiles, in order to provide all citizens with access to goods that are circular and less carbon intensive. The New European Bauhaus brings a cultural and creative dimension to the European Green Deal, aiming to demonstrate how sustainable innovation can offers tangible, positive experiences in our daily lives.

The events and publications described below have made a substantial contribution to policy debates on the European Greed Deal in the European Parliament and beyond.

3.1 STOA foresight project | The future of crop protection in Europe

Lead Panel Member: Herbert Dorfmann (EPP, IT)

Project duration: Started in October 2019; published in February 2021; presented to the STOA Panel on 10 December 2020

Relevant to European Parliament committees: AGRI, ENVI, IMCO, INTA, DEVE

Relevant European Parliament files: A farm to fork strategy for a fair, healthy and environmentally friendly food system (2020/2260(INI)); EU biodiversity strategy for 2030 (2020/2273(INI)); Farm to fork strategy – the key role of farmers and rural areas (2020/2542(RSP))

This STOA study aims to present an overview of crop protection options for European farmers, which might enable them to work sustainably while securing food production, preserving biodiversity and maintain their incomes. The EU is committed to achieving sustainability in agriculture, implying a reduction in the usage of traditional plant protection products based on synthetic chemicals. Achieving this will likely require a combination of many of the novel crop protection practices presented in the study, which also analyses their impacts. These include precision agriculture, new plant breeding techniques, biocontrol methods, induced resistance, diversified crops, and enhanced mechanical practices.

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In presenting its policy options, the study underlines the fact that effective crop protection policy requires a systems perspective, and needs to be in harmony with related areas, such as phytosanitary policy, the entire crop production system, the supply chain, and international trade relationships. Furthermore, not only must impacts be weighed against the objectives of the common agricultural policy and the European Green Deal, the successful implementation of policies depends on the extent to which they align with the interests of stakeholder groups, including farmers, suppliers, supply chain partners, consumers and NGOs defending societal interests.

3.2 STOA activities related to the EU strategies for energy system integration and for hydrogen

STOA technology assessment project and workshop | Carbon-free steel production: Cost reduction options and usage of existing gas infrastructure

Lead Panel Member: Tiemo Wölken (S&D, DE)

Project duration: Started in November 2020; published in April 2021; presented at a workshop on 1 March 2021

Relevant to European Parliament committees: ENVI, ITRE

Relevant European Parliament files: Resolution on a European Strategy for Hydrogen (2020/2242(INI))

STOA technology assessment project and workshop | The potential of hydrogen for decarbonising EU industry

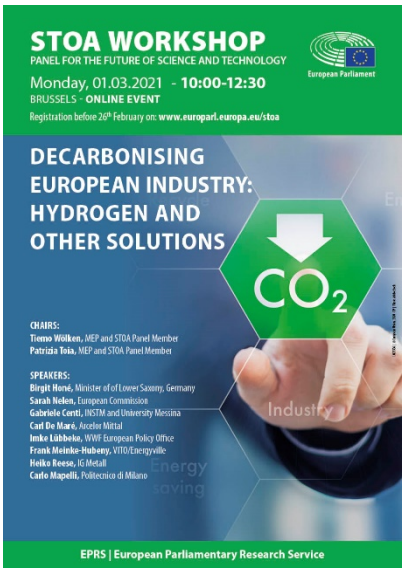
Lead Panel Member: Tiemo Wölken (S&D, DE)

Project duration: Started in March 2021; published in December 2021; presented to the STOA Panel on 16 July 2021; presented at a STOA meets experts event on 2 July 2021

Relevant to European Parliament committees: ENVI, ITRE

Relevant European Parliament files: Resolution on a European Strategy for Hydrogen (2020/2242(INI))

EU strategies for energy system integration and for hydrogen have been in the limelight in recent months and a related report, drafted by the ITRE committee, was adopted by the Parliament's plenary in May 2021. Furthermore, the European Commission is now proposing a 'fit for 55' legislative package to fundamentally overhaul the EU's climate policy architecture and put the EU on track to deliver on its 2030 climate target of 55 % reduction in greenhouse gas emissions. This is expected to be followed by further debate and even by a fundamental decision by the European Council on the key features of an EU climate policy framework. The European Commission has set out a new vision for a digitalised, integrated and circular energy system, driven by electrification, powered by renewables, and relying on energy efficiency and on reducing energy waste. This implies quickly scaling up renewable hydrogen production, driving down the costs and boosting demand in hard-to-abate sectors to make Europe the global hydrogen powerhouse with a set of ambitious targets: 6 GW of electrolysers installed by 2024, and 40 GW by 2030.



STOA has engaged in a series of activities on these topics. In December 2020 STOA published a briefing on 'The potential of hydrogen for decarbonising steel production', which was followed in March 2021 by the online event 'Decarbonising European industry: hydrogen and other solutions' and in April 2021 by the publication of the study 'Carbon-free steel production: Cost reduction options and usage of existing gas infrastructure'. This last study explains the differences between alternative processes, their cost structures and the potential for further cost reductions, as well as the wider consequences of switching to hydrogen in this key industrial sector.

A workshop on 'Energy Transition and the EU Hydrogen Strategy', chaired by MEP and STOA Panel member Tiemo Wölken (S&D, DE), took place on 2 July 2021, featuring a presentation of the opinion presented in June by the EC's Group of Chief Scientific Advisors and SAPEA, and a discussion anticipating the presentation by the European Commission of the 'fit for 55' legislative package. STOA continued its work on the subject through the preparation of the study 'The potential of hydrogen for decarbonising EU industry', which was released in December together with an interview with its lead author, published on the website of the ESMH, a short 'what if...' paper and a podcast. This study provides an update on the state of play of hydrogen use in the EU economy, determines current policies and gaps, and proposes policy options to fill these gaps enabling the replacement of fossil fuels, particularly in hard-to-decarbonise sectors such as energy-intensive industries and long-distance transport.

3.3 STOA technology assessment project | Environmental impacts of 5G

Lead Panel Member: Ivo Hristov (S&D, BG) and Michèle Rivasi (Greens/EFA, FR)

Project duration: Started in April 2020; published in June 2021; presented at a STOA meets experts event on 31 May 2021

Relevant to European Parliament committees: ENVI, ITRE

Relevant European Parliament files: InvestEU programme ((2020/0108(COD)); Resolution on the EU security union strategy (2020/2791(RSP)); Programme for the Union's action in the field of health for the 2021-2027 period ('EU4Health' programme) (2020/0102(COD)); Strengthening Europe in the fight against cancer – towards a comprehensive and coordinated strategy (2020/2267(INI)); Connecting Europe facility 2021–2027 (2018/0228(COD))

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Telecommunication networks use radio-frequency electromagnetic fields (EMFs) to enable wireless communication. These networks have evolved over time, and have been launched in successive generations. The latest, 5G, will operate at frequencies that were not commonly used in previous generations, changing the exposure of wildlife to these fields. This study reviews the literature on the exposure of vertebrates, invertebrates and plants to radio-frequency EMFs in anticipation of this change. The review shows that dielectric heating can occur at all considered frequencies (0.4-300 GHz) and for all studied organisms. Summarising the results of a series of studies of radio-frequency EMF exposure of wildlife, the review shows that several studies into the effects of radio-frequency exposure on invertebrates and plants in the frequency bands considered demonstrate experimental shortcomings. Furthermore, the literature on invertebrate and plant exposure to radio-frequency EMFs above 6 GHz is very limited. The authors conclude that more research is needed in this field.

3.4 STOA technology assessment project | Meeting the Green Deal objectives by alignment of technology and behaviour

Lead Panel Member: Ivars Ijabs (Renew, LV)

Project duration: Started in September 2020; published in July 2021; presented to the STOA Panel on 23 April 2021

Relevant to European Parliament committees: ITRE, ENVI

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Creating a climate-neutral and resource-efficient European economy requires deep transformation of mobility and food systems. This transformation will have significant behavioural impact on citizens and society at large. In this context, STOA commissioned a study on interlinkages of the European Green Deal policies and food consumption mobility use in Europe.

The study examined options for deploying relevant technologies to help Europeans shift to more sustainable behaviour in their food consumption and mobility use and therefore facilitate the implementation of the European Green Deal objectives.

3.5 STOA technology assessment project | Cost of crop protection measures

Lead Panel Member: Herbert Dorfmann (EPP, IT)

Project duration: Started in February 2021; published in September 2021

Relevant to European Parliament committees: AGRI

Relevant European Parliament files: CAP revision

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Existing, new and emerging crop protection practices, including mechanical techniques, precision agriculture, biocontrol, plant breeding, induced crop resistance, application of ecological principles to increase biodiversity and use of 'green' plant protection products, could help to reduce the use of conventional plant protection products and were described in an earlier study. This STOA study provides cost estimates for various alternative crop protection practice options in the EU.

4. STOA activities in relation to quality of life

Quality of life is one of three STOA priority thematic areas for the ninth parliamentary term (2019-2024). Quality of life has become an important overall objective in healthcare, but also in a general political context. As a broad concept, it is firmly established at an individual level as an indicator of physical health and material well-being, but it is also strongly influenced by interactions with psychological, spiritual and social variables.

Definitions of quality of life call upon subjective perspectives and objective indicators, and involve physical, social and environmental aspects. Personal values, living arrangements, economic conditions, and culture are cited as influencing quality of life, which is measured as degree of happiness, life satisfaction, ability to function etc. Given the widespread use of the concept, varying definitions, and multiple outcome indicators, quality of life is an important subject of inquiry for policy-makers.

In 2021, STOA organised a large number of events and studies in this field, as reported here. These events and publications represent a considerable contribution to policy debates on several aspects of quality of life, in the European Parliament and beyond.

4.1 STOA workshop | The need for better EU policies for health

Lead Panel Member: Alexandra Geese (Greens/EFA, DE)

Date: 22 April 2021

Relevant to European Parliament committees: ENVI

The Covid-19 pandemic has shone a spotlight on the need for better EU policies for public health, especially in relation to diagnostic testing and the sharing of healthcare data. That was the subject of this STOA workshop, which featured discussions on – but not limited to – the impact and challenges of the new in vitro diagnostics regulation (IVDR) and the Commission's proposal for a European health data space. The event was jointly organised by STOA, the Biomedical Alliance in Europe (BioMed Alliance), the European Hematology Association (EHA), the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM), and the European Society of Cardiology (ESC). It included speakers from a range of backgrounds, including policy-makers, experts from the European Commission and health professionals representing medical associations.

4.2 STOA workshop | Health and economic benefits of microbiomes

Lead Panel Member: Eva Kaili (S&D, EL) and Othmar Karas (EPP, AT)

Date: 11 May 2021

Relevant to European Parliament committees: ENVI, AGRI, ITRE, IMCO

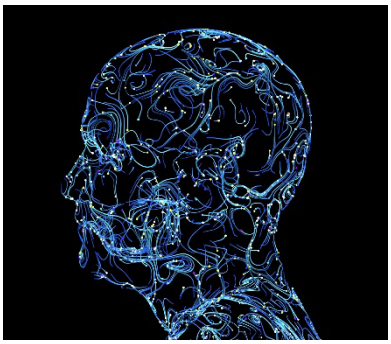
The human being has evolved with microbiomes and they are an integral part of life on Earth, although they have been relatively absent from the public consciousness. Scientific evidence of the last two decades shows the vital importance of microbiomes in our lives. The STOA workshop on the 'Health and economic benefits of microbiomes', provided an insight into the importance of microbiomes in human, animal and environmental health, and how they could contribute to mitigating pollution and climate change, and boosting the European economy. Speakers illustrated the wide variety of applications and impacts of microbiomes and highlighted the ways in which their regulation at EU level could be improved.

4.3 STOA technology assessment project | Health impacts of 5G

Lead Panel Member: Ivo Hristov (S&D, BG) and Michèle Rivasi (Greens/EFA, FR)

Project duration: Started in April 2020; published in July 2021; presented at a STOA meets experts event on 31 May 2021

Relevant to European Parliament committees: ITRE, ENVI



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The upcoming deployment of 5G mobile networks will allow for significantly faster mobile broadband speeds and increasingly extensive mobile data usage. At the same time, a change is expected in the exposure to electromagnetic fields (EMF) of humans and the environment. This STOA study addresses the current knowledge regarding both carcinogenic and reproductive/developmental hazards of radiofrequency as exploited by 5G.

In the EU, 5G will use two lower frequency bands (at 700 MHz and 3.6 GHz), similar to those used for 2G to 4G technologies and which have been investigated in both epidemiological and experimental studies. For these bands, the study finds that EMFs are probably carcinogenic for humans, affect at least male fertility and may have possible adverse effects on the development of embryos, foetuses and newborns. In addition to the previous two lower frequency bands, 5G also uses a higher band at 26GHz. For these higher frequencies, the review found no adequate studies either in humans or in experimental animals.

4.4 STOA technology assessment project | EU health data centre and a common data strategy for public health

Lead Panel Member: Eva Kaili (S&D, EL)

Project duration: Started in October 2020; published in September 2021; presented to the STOA Panel on 19 March 2021

Relevant to European Parliament committees: ENVI, ITRE, JURI

Relevant European Parliament files: European Health Data Space (2022/0140 (COD))

The Covid-19 pandemic has highlighted the importance of the availability of good data for public health decision-making. However, it also revealed that the EU has no clear health-data architecture, with the lack of harmonisation resulting in a lack of comparable national data, compounded by the absence of an EU-level centre for data analysis and use. Through extensive desk research and interviews with key actors, this STOA study finds that there is currently no comprehensive health data governance at EU level, and very few Member States could be said to have it at national level either.

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The study looks at a potential centralised governance structure for dealing with large EU public health crises, in the form of an EU health data centre, outlining possible functions and characteristics, relations with Member States and use of advanced technologies, such as AI. The policy options put forward, which are also the object of a STOA options brief, examine different potential combinations of functions and institutional frameworks for an EU health data centre, as well as possible solutions for a common strategy for health data, with the potential to significantly alter public health in the EU.

4.5 STOA workshop | Putting the 'e' in e-health

Lead Panel Member: Marina Kaljurand (S&D, ET)

Date: 21 September 2021

Relevant to European Parliament committees: ENVI, ITRE, JURI

Relevant European Parliament files: European Health Data Space (2022/0140 (COD))

Scientific input is crucial to ensure that health policy initiatives lead to better public health outcomes for patients. Awareness of this has been accelerated greatly by the need for a shared response to the Covid-19 pandemic. Countries collect public health information in databases produced by different healthcare providers, such as hospitals, inevitably creating database distribution issues. This raises a critical question – how to safeguard patient health records and accelerate transparency and (cost) efficiency in health care?

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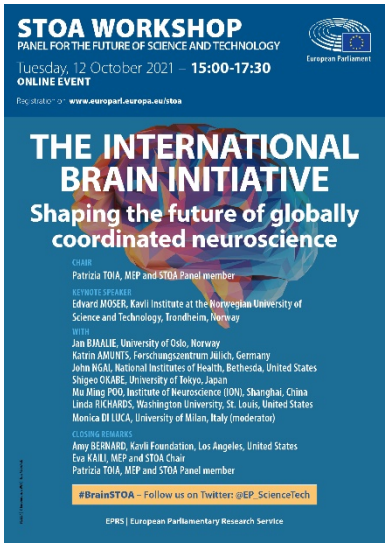
This STOA workshop, chaired by MEP and STOA Panel Member Marina Kaljurand (S&D, ET), debated possible avenues towards tackling this issue, discussing the use of blockchain and AI, and the European health data space, and presenting the case study of Estonia.

4.6 STOA workshop | The International Brain Initiative: Shaping the future of globally coordinated neuroscience

Lead Panel Member: Patrizia Toia (S&D, IT)

Date: 12 October 2021

Relevant to European Parliament committees: ENVI



Over the last two decades, the field of neuroscience has expanded massively, tackling complex topics with profound implications for health, society, and politics. Technological developments have enabled simultaneous understanding of very large neural populations. At the same time, new techniques in combination with large-scale data methods have made it possible to examine the finer details of brain organisation, and to integrate different levels of knowledge. This offers hope that science may achieve a deep understanding of how human beings act. Understanding the neural basis of brain function will also open the way for prevention, diagnosis, and treatment of neurological and psychiatric disorders that currently have no cure.

Opportunities for and challenges in neuroscience research collaborations were discussed in a STOA workshop, where the International Brain Initiative (IBI) was presented. The IBI facilitates communication and exchange of experiences among major brain initiatives formed in the past decade around the world. IBI participants represent numerous disciplines, such as biology, medicine, mathematics, physics, chemistry, engineering, and computer science. Such a variegated community of researchers will bring to light important discoveries addressing common goals and objectives in neuroscience. The workshop saw a keynote speech by Professor Edvard Moser, the winner of the 2014 Nobel Prize in Physiology or Medicine, followed by an overview of the IBI and a discussion panel of scientists from across the globe.

4.7 STOA workshop | Medical devices made of substances: Opportunities and challenges

Lead Panel Member: Patrizia Toia (S&D, IT)

Date: 16 November 2021

Relevant to European Parliament committees: ITRE, ENVI

Relevant European Parliament files: Regulation on medical devices (2017/745, 2020/0060(COD))

Substance-based medical devices (SBMDs) are health products with physicochemical properties and without a pharmacological, immunological or metabolic mode of action – such as nasal and eye sprays, cough syrups, hand and vaginal creams, and toothpaste. To ensure these devices are safe to use, they were recently placed under new classification rules by the EU Medical Devices Regulation, which applies from May 2021.

This STOA workshop explored the new regulatory framework and presented current research on non-pharmacological health products. MEP and Panel Member Patrizia Toia (S&D, IT) highlighted the difference between SBMDs and pharmacological products. In the first panel, on the science of SBMDs, Prof. Marco Racchi addressed non-pharmacological modes of action, Prof. Annamaria Staiano addressed the role of SBMDs in paediatrics, and Prof. Peter Malfertheiner presented their role in gastrointestinal diseases. The second panel focused on the regulatory aspects of SBMDs. Olga Tkachenko, policy officer at the European Commission's DG SANTE, presented the Medical Devices Regulation. Oliver Hartmann, from the Association of the European Self-Care Industry, discussed the industry perspectives. Finally, Emiliano Giovagnoni, Innovation and Medical Science Director of Aboca, introduced innovation opportunities. MEP Simona Bonafè (S&D, IT) noted the EU's political will to recognise the role of SBMDs in disease prevention and treatment.

4.8 STOA technology assessment project | Pollution and the spread of Covid-19

Lead Panel Member: Rosa D'Amato (Greens/EFA, IT)

Project duration: Started in October 2020; published in December 2021; to be presented to the STOA Panel in 2022

Relevant to European Parliament committees: REGI, ITRE, ENVI

This STOA study analysed just under 6 000 articles (published up to May 2021), looking at the role of pollution and air quality factors in the transmission of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and in the geographical differences in Covid-19 propagation. There is consistent and increasing evidence that SARS-CoV-2 spreads by airborne transmission and it is possible that different variants have different environmental sensitivities. Safer indoor environments are essential, not only to protect unvaccinated people and those for whom vaccine immunity has decreased or failed, but also to prevent vaccine-resistant variants or novel airborne threats that may appear at any time. The study suggested enhancing monitoring networks and research systems tailored to characterising bio-aerosols and their physical and chemical constituents.

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4.9 STOA scientific foresight project and workshop | Regulating genome editing: Societal hopes and fears

Lead Panel Member: Herbert Dorfmann (EPP, IT) and Andrius Kubilius (EPP, LT)

Project duration: Started in February 2021; published in December 2021; process presented and discussed at a workshop on 15 April 2021

Relevant to European Parliament committees: AGRI, ENVI

Relevant European Parliament files: Envisaged revision of EU legislation on GMO

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This report was written to inform the committees of the European Parliament about the challenges of genome editing in the 21st century, and the societal hopes and concerns surrounding its possible implementation to support European food production. The higher precision of new genetic techniques (NGTs) raises the question of whether they should be treated differently or even exempt from the current GMO Directive. NGTs (mainly CRISPR-cas9) are the subject of controversy, as some believe they will bring improvements to crop production, while others worry about potential problems associated with their use. These concerns were identified in a STOA foresight study, including an online survey and workshop with stakeholders from diverse fields affected by NGTs.

4.10 STOA technology assessment project | European pharmaceutical research and development: Could public infrastructure overcome market failures?

Lead Panel Member: Patrizia Toia (S&D, IT)

Project duration: Started in November 2020; published in December 2021; presented to the STOA Panel on 16 December 2021

Relevant to European Parliament committees: ITRE, ENVI

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The Covid-19 pandemic has highlighted some critical issues in how the European pharmaceutical industry sets its research and development (R&D) priorities. In addition, the EU institutions have limited leverage to address market failures affecting the functioning and regulation of the EU pharmaceutical market. The current public policies and regulatory system seems insufficient on different concerns, namely: 1) disconnection between corporate R&D choices and public health priorities; 2) mismatch between (largely publicly funded) open-science practices in fundamental research and the patent system protecting investors; 3) excess returns for financial investors in the pharmaceutical industry arising from government-subsidised R&D; 4) oligopolistic market power on the supply side, and issues of affordability of medicines; 5) lack of optimisation studies following market authorisation; 6) information asymmetries in the public procurement of medicines. This STOA study suggests the need to explore new policy approaches based on more direct public intervention, with the creation of a new European player with a public mission in pharmaceutical R&D and biomedical innovation.

5. STOA activities in science, technology and innovation

Over the course of 2021, STOA developed several activities that are transversal to science and technology, rather than falling within any specific thematic areas. These involved science funding at EU level, as well as a first foray into what should be a continuing look into the critical topic of academic freedom.

Of specific importance to the work of STOA, last year also saw a range of publications on the topic of foresight, helping to further systematise its methodology.

5.1 STOA workshop | Exploring synergies between Horizon Europe and regional policy

Lead Panel Member: Christian Ehler (EPP, DE)

Date: 2 February 2021

Relevant to European Parliament committees: ITRE, REGI

EU policy promotes innovation with the aim of triggering economic dynamism. This entails improving research and innovation (R&I) capacities, addressing territorial inequalities, and improving coordination at all levels. Achieving this requires closer coordination of research, cohesion and education policies at EU level. Besides the recovery plan, Horizon Europe and the structural funds are the two most important EU funding sources for R&I. Horizon Europe focuses on European R&I excellence. Structural fund investments are built around regional innovation eco-systems. Supporting synergies in the implementation of Horizon Europe and the structural funds may maximise scientific, economic and societal impact. However, the process of identifying potential synergies and exploiting them is sluggish, owing to complex interactions between different innovation actors, as well as rules and time frames that vary between EU-funded programmes. All these issues were discussed during this workshop, with contributions from several institutional speakers.

5.2 STOA workshop | Academic freedom in Europe

Lead Panel Member: Christian Ehler (EPP, DE)

Date: 9 November 2021

Relevant to European Parliament committees: ITRE, CULT, LIBE

The scope for EU action to respond to current challenges to academic freedom is not always clear. Members of the European Parliament addressed this question at a STOA conference, which looked at ways of building on several European initiatives focusing on academic freedom, such as Article 13 of the EU Charter of Fundamental Rights, the Bonn Declaration on Freedom of Scientific Research, and the League of European Research Universities (LERU) advice paper 'Academic freedom as a fundamental right'.

The event was organised by STOA with the support of the European University Association (EUA) and served to clarify the definition of academic freedom and frame the challenges in the EU context while aiming to identify ways to address them. In addition to the conference, an official STOA mission to Budapest took place on 3-5 November 2021, led by STOA Second Vice-Chair Ivars Ijabs (Renew, LV) and included visits to the Central European University (CEU) and other institutions, to acquire first-hand experience of their current operating conditions and activities in the context of discussions on academic freedom.

5.3 STOA scientific foresight project | Guidelines for foresight-based policy analysis

Lead Panel Member: Ivars Ijabs (Renew, LV)

Project duration: Started in March 2021; published in July 2021; presented to the STOA Panel on 28 May 2021

Relevant to European Parliament committees: All Committees represented in STOA

Policy analysis examines and assesses problems and determines possible courses for policy action to tackle them (policy options). In highly complex or controversial contexts, evidence-based policy options might not be socially acceptable. Here, policy analysis can benefit from a foresight-based approach, which helps investigate the issue holistically and assess potential evidence-based policy options against societal concerns.

« A foresight-based approach helps to investigate the issue holistically. »

This is especially important in a parliamentary setting, as it enables analysts to consider stakeholder views, societal expectations and concerns, as well as geographical differences when assessing policy options.

This manual provides a methodology for the foresight process and foresight-informed policy analysis. It offers four guidelines and six basic components for foresight-based policy analysis.

5.4 STOA scientific foresight project | A framework for foresight intelligence

Lead Panel Member: Ivars Ijabs (Renew, LV)

Project duration: Started in September 2020; published in November 2021; presented to the STOA Panel on 28 May 2021

Relevant to European Parliament committees: All Committees represented in STOA

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The first part of this STOA study looked at horizon scanning, a tool for foresight intelligence, and how it may be used in support of STOA's work. The study explains what it is and includes a set of five horizon-scanning reports or 'radars', built with the resources of Futures Platform, a professional trends knowledge platform that collects and analyses information on phenomena such as technology, trends and signals, using AI-based tools and a team of foresight experts to anticipate future developments. The STOA study used these trends and signals to build a set of trend radars with a view to testing the feasibility of adding horizon scanning activities to STOA's methodological toolbox. The radars cover the world after Covid-19, disruptive futures, the Green Deal, food, and geoengineering.

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The second part of the study deals with stakeholder engagement for strategic and practical purposes of the STOA Panel's activities. It analyses online engagement methods and tools and their suitability for brainstorming meetings, as well as for technology assessment and foresight projects. To gain insight and experience in the use of online methods for stakeholder engagement, these were implemented in an ongoing STOA project. For this purpose, STOA selected a typical foresight study, investigating a complex issue that is the subject of controversy: genome-editing techniques for the future of farming in Europe. Experts from the Danish Board of Technology Foundation guided the STOA team in setting up and running the procedure for this project.

This report assesses the efficiency of online alternatives to foresight brainstorming meetings with colleagues, MEPs, experts and selected stakeholders. These alternatives include traditional surveys (to ascertain societal concerns about possible future technological developments) and simple variants of Delphi-type surveys.

6. STOA annual lecture | Edge computing, 6G and satellite communications

This year, STOA's annual lecture focused on critical technologies that, with the roll-out of artificial intelligence and the dramatic increase in new capabilities and online solutions, are bound to have an unprecedented effect on our lives. It is estimated that the explosion in the number of connected devices will result in there being more than 500 billion of them worldwide by 2025 – nearly 100 smart objects per inhabitant of the planet. In this context, the event investigated the problem of jointly optimising communication efficiency and resources over wireless networks to leverage massive distributed data and computational resources.

The event was moderated by MEP and STOA Chair Eva Kaili (S&D, EL), who began by highlighting the European commitment to developing critical technologies and the relevance of semiconductors for achieving strategic autonomy for Europe in the future geopolitical arena. Ms Kaili also referred to the emerging European deep-technology start-up scene and discussed the digital Europe programme, which will provide strategic funding to tackle the challenge of making Europe greener and more digital.

Following this introduction, the European Commissioner for the Internal Market, Thierry Breton, delivered a scene-setting speech on the subject of edge computing, 6G and satellite communications. He argued that, as Europe moves forward on critical technologies, it is necessary to establish clear and robust rules enabling everyone to benefit from innovation. Commissioner Breton remarked that Europe's digital sovereignty, industrial leadership and resilience are conditioned on the capacity to develop these critical technologies. He went on to provide an overview of the multiple initiatives related to digital technologies that Europe is pursuing to meet its current needs and face the ongoing change, as well as the industrial data revolution. He specifically mentioned initiatives such as the artificial intelligence act (AI Act), the digital services act (DSA), the digital markets act (DMA), the data act and the data governance act (DGA).

Commissioner Breton considered 6G to be a game-changer, which was expected to dramatically increase performance, capacities and signal response time standards. Development of this new technology would be conditioned by its cybersecurity dimension, for which the European Commission would be providing an equivalent updated version of the 5G security toolbox. He further commented on the dedicated initiative on space-based connectivity, to be launched in 2022. Providing broadband access for everyone in Europe and the whole African continent, its infrastructure will integrate quantum encryption features and low-orbiting satellites.

This was followed by a discussion also moderated by Ms Kaili with the participation of several Members of the European Parliament. Eva Maydell (EPP, BG) commented on the legislative instruments required to make all these technologies future-proof, as well as on the role of industry and public-private partnerships (PPP). Maria-Manuel Leitão Marques (S&D, PT) highlighted several points relating to international cooperation and the need for strategic autonomy.

As keynote speaker, Vincent Poor of Princeton University explained the motivation behind 6G and its new requirements, in addition to its performance metrics such as communication speed and efficiency. He also discussed the new paradigm shifts that are expected, and several application scenarios and key sectors that could be particularly impacted by 6G. Professor Poor also presented some network security concerns for 6G and how they could be addressed, concluding with a review of enabling technologies and some comments on the way in which 6G will affect future communication networks.

The event continued with brief interventions from renowned experts in the field. Yuanyuan Yang, of the United States National Science Foundation/Stony Brook University, gave a presentation of the challenges and opportunities posed by the use of smart devices, applications and edge computing. Eleni Diamanti of the French National Centre for Scientific Research (CNRS) followed, speaking about the two pillars of quantum technologies: quantum computing and quantum communication. She stated that quantum technologies offered a new paradigm for processing information and how we conceive infrastructure, especially concerning cybersecurity. Finally, Gerhard Fettweis, of TU Dresden, pointed out that 5G provides the basis for remote control of robots, or what is known as personal mobile robotics. As coordinator of the 5G Lab Germany, he clarified the various implementation issues from the European perspective. In his view, all industry will be robotised, so we need to develop trust, authenticity, privacy, accountability and availability of our technologies according to EU values.

Ms Kaili then kicked off the discussion with questions regarding blockchain, security, trust, 5G and the cloud. Ms Maydell commented on the challenges regarding changes in requirements for internet communication and the growing need for standards. Ms Leitão Marques mentioned the Gaia-X project and its chances of becoming an effective European cloud. The discussion was especially oriented towards the EU's role and its capability to drive a human-centric approach for safe exploitation of the opportunities created by these critical technologies. A sustainable digital transformation is bound to have a significant impact on our technological, economic and societal development. It is imperative, according to the participants in the discussion, that the EU maximise the opportunities offered by digital and communication technologies while managing the risks, to ensure citizens have adequate access to safe, secure, inclusive and cost-effective solutions. The panellists agreed that the next five years would define the role of the different players in the area and that there was a need for action to ensure the EU remains ahead in this global competition.

Ms Kaili concluded the annual lecture by pointing out that critical technologies will definitely transform the world, offering new opportunities for all citizens. She added that Europe is leading the way to human-centric innovation, therefore it is important to make sure that other countries follow the same path, because technologies go beyond physical borders.

7. Presentations to the STOA Panel

During their meetings in Strasbourg plenary weeks, or in an online or hybrid format under the extraordinary measures adopted as a consequence of the global pandemic, the members of the STOA Panel usually hear presentations of the results of ongoing STOA projects and provide feedback and further guidance for completing the reports. STOA continued this activity undiminished under the emergency measures.

The presentations occasionally address ad hoc science and technology topics of interest to Panel members, as in the case of the exchanges of views with Stephen Quest, Director-General of the Joint Research Centre (JRC), on 29 January 2021, and Maroš Šefčovič, European Commission Vice-President for Interinstitutional Relations and Foresight, on 16 September 2021.

The following projects were presented to the STOA Panel during its meetings in 2021:

- Digital automation and the future of work
- EU health data centre and common data strategy for public health
- Meeting the Green Deal objectives by alignment of technology and behaviour
- A framework for foresight intelligence and guidelines for foresight-based policy analysis
- Innovative technologies shaping the 2040 battlefield
- The potential of hydrogen for decarbonising EU industry
- Person identification, human rights and ethical principles: Rethinking biometrics in the era of artificial intelligence
- Tackling deepfakes in European policy
- Privacy and security aspects of 5G technology (study published in 2022)
- European pharmaceutical research and development: Could a public infrastructure overcome market failures?

8. Networks and collaborations

8.1 STOA attendance at EPTA meetings

As a founding member of the European Parliamentary Technology Assessment network (EPTA), established in 1990, STOA has always taken an active part in its activities, including the annual directors' and EPTA Council meetings. STOA held the rotating EPTA presidency in 2018.

EPTA directors' meeting, 26-29 April 2021, online

During the meeting under the Netherlands 2021 EPTA presidency, participants gave an update on the current situation concerning Covid-19 in EPTA member countries.

STOA and the other participants presented and discussed the national reports by all EPTA member organisations, including information on the development of technology assessment methods, new projects, milestones and plans for the future.

EPTA conference, 9 November 2021, online

The topic of 2021 EPTA conference was: 'COVID-19 pandemic: Drawing lessons to strengthen societies'.

Worldwide, countries have dealt with the Covid-19 pandemic differently. At the conference, the Rathenau Instituut and its international colleagues, all part of the EPTA network, presented a report addressing the following questions: What political and social discussions have there been regarding the role of technology, science and innovation? What can we learn from these discussions for future pandemics and other societal challenges?

8.2 Visit to the Joint Research Centre at Ispra

Following a formal invitation extended to Members by the Director-General of the JRC, Stephen Quest, at the STOA Panel meeting of 29 January 2021, eleven Panel members took part in a virtual visit of the JRC at Ispra on 16 March 2021. After a welcome by Mr Quest, Members were able to follow presentations on some of the research being done covering the three priority thematic areas of STOA. The visit concluded with a virtual tour of some of the JRC laboratories at Ispra.

8.3 Events co-hosted or held with the patronage of STOA

STOA also co-hosted or gave its patronage to two events that were organised by third parties.

The first was a workshop on Sustainable finance: How AI can help account for climate risks, held on 9 November 2021. This was organised by EU40, the network of young European parliamentarians, under the patronage of STOA. The event explored how machine learning could help markets identify and price climate risks in order to set more ambitious climate goals, and examined the risks of delegating sustainable finance decisions to autonomous systems.

The second event was the Athens Roundtable on artificial intelligence and the rule of law, which was organised by The Future Society and ELONtech and held on 6 December 2021. The roundtable focused on AI and human rights, international regulatory developments, AI standards and benchmarking, civil liability and regulatory compliance.

9. STOA International Advisory Board (INAB)

STOA is eager to cooperate and exchange with stakeholders and partners within the European Parliament, the global parliamentary community and beyond. To this end, on 10 July 2020, the STOA Panel decided to appoint an International Advisory Board (INAB) for the remainder of the ninth parliamentary term (2020-2024).

At its meeting of 15 October 2020, the Panel agreed on a list of world-renowned individuals who were invited to join the STOA INAB, including personalities from academia, international organisations, the private sector, civil society and think tanks. It will focus in particular upon STOA activities in the area of artificial intelligence (AI), including its Centre for AI (C4AI).

The Board now has 31 members. It is chaired by European Parliament Vice-President Eva Kaili on behalf of STOA, and met virtually for the first time on 5 February 2021. This meeting served to introduce the Board to the STOA Panel, get Board members acquainted with each other and set out a framework for the Board's future activities.

A subsequent meeting was held on 24 June 2021, with Board members invited to present their views on the AI act and discuss them with the STOA Members. Participants welcomed the legislative proposal as a timely and necessary step in the right direction, broadly agreeing with its aims and approach while raising several points that they felt might require further reflection and discussion during the negotiation period. A detailed summary of the meeting was published on the EPRS Blog.

10. Communication

10.1 Publications

STOA publishes studies and briefings relating to individual projects. STOA studies report on project methodologies and findings, and assess a number of options for policy-makers to consider. Short, concise and to-the-point 'options briefs' summarise the policy options assessed in four pages.

In addition, since 2015, the Scientific Foresight Unit (STOA) has regularly published two-page 'at-a-glance' notes as EPRS publications. These are intended as awareness-raising and thought-provoking overviews of current and relevant techno-scientific trends, always in the form of 'What if ...?' questions. Each of these 'What-ifs' (see next table) concerns one trend and consists of three sections: trend description, exploration of the potential impacts and developments, and anticipatory law-making.

Title	Publication date
What if we could engineer the planet to help fight climate change?	February 2021
What if consumers could use devices to sequence DNA?	May 2021
What if objects around us flocked together and became intelligent?	June 2021
What if we chose new metaphors for artificial intelligence?	June 2021
What if we could fight coronavirus by pooling computing power?	July 2021
What if deepfakes made us doubt everything we see and hear?	September 2021
What if the internet failed?	September 2021
What if new drug delivery methods revolutionised medicine?	October 2021
What if ecolabels could nudge us to choose greener food?	November 2021
What if hydrogen could help decarbonise European industry?	December 2021

In 2021 STOA was also responsible for or participated in other EPRS publications:

- Participatory foresight: Preventing an impact gap in the EU's approach to sustainability and resilience, EPRS briefing
- European Health Emergency Preparedness and Response Authority (HERA): Pre-legislative synthesis of national, regional and local positions on the European Commission's initiative, EPRS pre-legislative briefing
  Cities in a globalised world: Exploring trends and the effect on urban resilience, EPRS study

10.2 Other dissemination channels

STOA is increasingly using social media and other channels to communicate its activities. This includes STOA's own Twitter account (@EP_ScienceTech), and blog posts on the EPRS blog, which report on news, projects and events in an accessible manner. STOA also continues to produce regular podcasts, often based on its short awareness-raising publications ('What if ...?' notes), and videos. STOA events are live webstreamed and often accompanied by live tweeting from @EP_ScienceTech, enabling simultaneous interaction with stakeholders, experts and citizens.

2021 in numbers:

46	**29**	**18**
Publications	**Blog posts**	**Videos and podcasts**
(37 in 2020)	**(25 in 2020)**	**(17 in 2020)**
>3 800	**>233 640**	**>3 000**
Participants at 20 STOA events	**Views on the blog and website**	**Twitter followers**
(>2 500 in 2020)	**(>120 000 in 2020)**	**(>2 000 in 2020)**

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	@EP_ScienceTech	
	linkedin.com/company/european-parliamentary-research-service	
	youtube.com/user/MySTOA	

11. Centre for Artificial Intelligence (C4AI)

To intensify its activities in the field of AI, STOA launched its Centre for AI (C4AI) on 19 December 2019. C4AI provides expertise on the possibilities and limitations of AI and its implications from an ethical, legal, economic and societal perspective. 2021 was a busy year for C4AI with a range of events and publications set out in Chapter 2 of this annual report. It also provided support for Members to keep track of developments on key technological trends and legislative files, including the AI act and wider digital policies such as the NIS2 Directive, the data governance act, the digital markets act and digital services act.

The C4AI has an online presence on the STOA C4AI webpage where it provides regular updates including a repository of publications and online resources on AI prepared by STOA and other EPRS services, a legislative overview covering European Parliament resolutions and other EU policy documents relating to AI, and an AI glossary providing an explanation of key terms.

In addition, STOA completed a programme of activities in the context of its formal Partnership on AI with the Organisation for Economic Co-operation and Development (OECD) Global Parliamentary Network (GPN). The GPN is a hub for legislators and officials from parliaments around the world to share experience, identify good practices and foster international legislative cooperation. It includes a Parliamentary Group on Artificial Intelligence, and benefits from proximity with the OECD's AI Policy Observatory and Global Partnership on AI.

In particular, throughout the first half of 2021, STOA and the OECD jointly produced a podcast series which built upon the 2020 joint event and video to examine some aspects of AI development and policy in more detail, with key experts from the field. The first podcast explores the role of international cooperation in AI governance, and includes an extensive conversation between MEP and STOA Chair Eva Kaili (S&D, EL) and Anthony Gooch, Director of Public Affairs & Communications at OECD and Chair of the GPN, as well as contributions from Jeremias Prassl, Deputy Director of the Institute of European and Comparative Law, University of Oxford, and Kate Crawford, AI scholar and author of the book *'The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence'*. The second podcast focuses on innovation, regulation and the role of citizens, and includes contributions from MEP and STOA Panel Member Lina Gálvez (S&D, ES) and MEP Deirdre Clune (EPP, IE), as well as Andrea Renda, Senior Research Fellow and Head of Global Governance, Regulation, Innovation and the Digital Economy at the Centre for European Policy Studies (CEPS). The third and final podcast is oriented towards AI ethics, in particular how to move from principles to practice, and features MEP and STOA Panel Member Anna-Michelle Asimakopoulou (EPP, EL) and Lorena Jaume-Palasi, founder of the Ethical Society and member of the STOA International Advisory Board.

12. European Science-Media Hub

In 2021 the European Science-Media Hub (ESMH) continued to develop a network among policy-makers, scientists and media and to promote science-based information. It has also kept up with its activities to make Members better aware of scientific issues attracting media attention, and keep the press community abreast of scientific issues discussed within the European Parliament. The ESMH continued to promote the role of science in emergencies through the publication on its website of numerous articles and interviews with experts.

In 2021 the ESMH focused on aligning its publications with STOA events and studies. The ESMH promoted the STOA activities with tools more accessible to a large audience: citizen-friendly publications and interviews, audio-visual products, infographics and an enhanced dissemination on social media.

The ESMH produced several video clips promoting key activities of the STOA Panel during the first half of the ninth parliamentary term, such as the annual lecture, the Centre for AI, the event on academic freedom and others.

The team continued its efforts to tackle the phenomena of dis- and misinformation on scientific topics, especially in the context of vaccine hesitancy. The regular interviews and media reviews were complemented with list of fact-checking initiatives and reports on false narratives on social media.

2021 was marked by the arrival on the market of a number of new Covid-19 vaccines, developed in record time. To demystify the matter of which were ready, which had been authorised and where, and how they worked, the ESMH published both an article and a table (available in 24 languages) for more clarity and better understanding. The ESMH also interviewed leading experts about the COVAX programme – which aims to get everyone in the world vaccinated; the pressure on science journalism; and what governments and hospitals can do to respond to health crises more effectively. The ESMH also looked into the risks for scientists who communicated publicly about the health emergency.

On 8 October 2021, during the European Youth Event (EYE2021), the ESMH organised a workshop entitled 'Telling stories on climate change: Has the corona crisis changed the debate?' Held within the EU Generation Media Labs session, the workshop replaced the annual ESMH Summer School (cancelled because of the pandemic). It focused on the impact of the pandemic on reporting on climate change and featured talks by communication experts on science and the environment, whom the ESMH also later interviewed: Alok Jha, correspondent from *The Economist*; Simon Clark, You-Tuber, and Joachim Allgaier, researcher on science communication and misinformation. The event was opened by MEP and STOA Panel member Tiemo Wölken (S&D, DE). Around 60 scientists, journalists and science communicators from all over Europe debated how to produce quality stories and sound, trustworthy reporting.

The key message that came out of the debate on 'Science and misinformation: The first pandemic in the digital age', held online on 22 March 2021, in cooperation with the European Parliament Liaison Office in Lisbon, is that disinformation cannot be eradicated. It is possible to fight it, though, and control its spread, or even prevent it from reaching the most 'vulnerable' — those most susceptible to believing

false information. The event was part of the 'Science Media Days' series, organised by the ESMH in different EU Member States.

On 16 June 2021, the ESMH organised and moderated the 'Science & the media' track of the WHO first global conference on communicating science during health emergencies. The WHO event convened representatives of the multidisciplinary science communication community to reflect upon challenges and good practices in health science communication and promote innovative, effective solutions for the future. The ESMH session featured a debate on different experiences and lessons learnt in dealing with the pandemic in different countries, with three EU science journalists driving the discussion: Kai Kupferschmidt (DE), Vera Novais (PT) and Adeline Marcos (ES).

The ESMH published an interactive knowledge map on 5G that addresses this complex topic in a new interdisciplinary, interactive and playful way, looking at the new technology from different angles: from the technology itself and the politics surrounding it, to business, health concerns, cybersecurity and its impacts on society. The idea was to present all these issues and the interlinkages among them as objectively as possible in a wider context.

The copious content – equivalent in terms of size to an 80-page publication – is presented in a visually attractive, non-linear way, allowing the reader to explore information across different layers and zoom in for more detail as wished.

Through its open call for expressions of interest (CEI) for experts in the field of science communication, the ESMH has established a community of 65 science writers.

Finally, the ESMH continues to use the European Media Monitor (a JRC tool for media monitoring) to produce its weekly Media Review (previously Press Review), a selection of science and tech news on traditional and social media, as well as thematic reports on selected scientific topics.

ESMH | EUROPEAN SCIENCE-MEDIA HUB
Bringing scientists, journalists and policymakers together : communicate better sound science to all!

1 YEAR OF THE ESMH IN NUMBERS

JANUARY 2021- JANUARY 2022

Our online publications

47 articles
on science and tech topics

68 interviews
with experts

Our monitoring activities

13 media reviews

27 stakeholder monitoring reports

4 reports
on disinformation narratives in social media

Virtual events with journalists

'The first pandemic in the digital age'
50 journalists attended

Joint event with the WHO on science communication


Our community
>600 subscribers
to our publications
+20.1%
new subscribers each year
53 nationalities
Our website
~ 138 000 unique visitors
since January 2020
~ 206 000 views
since January 2020
Our partnerships
(Since the launch of the ESMH website)
49 authors/journalists
237 experts/scientists
KEEP IN TOUCH WITH THE ESMH
EUROPEAN SCIENCE MEDIA HUB
More than 500 institutions, NGOs, media outlets, journalists, scientists' organisations, researchers, institutions & other stakeholders subscribe to our publications.

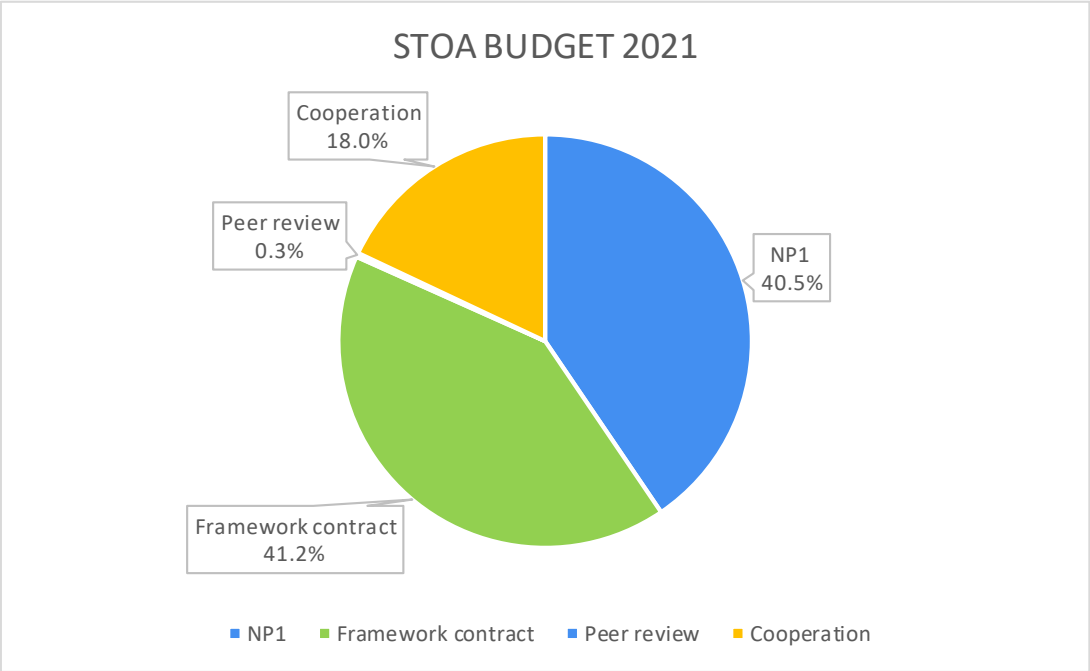
13. Implementation of the STOA budget

For the calendar year 2021, the budget assigned by the European Parliament to the European Parliamentary Research Service (EPRS) provided for up to €650 000 for use on STOA-related activities (European Parliament budget line 3210-02).

In 2018, STOA concluded a new framework contract, covering the four years from 2018 to 2022, which was signed with 18 contractors within five different policy areas (eco-efficient transport and modern energy solutions; sustainable management of natural resources; potential and challenges of the information society; health and new technologies in the life sciences; science policy, communication and global networking).

In 2021, two new studies were launched within this framework contract, one within LOT1- Eco-efficient transport and modern energy solutions and the other within LOT3 – Potential and challenges of the information society. In addition to reopening the framework contract, the STOA 2021 expertise budget was also used for direct contracts, which require a simplified procedure and are quicker to implement. In total, 15 studies were launched with negotiated procedures with one candidate.

In 2021, STOA committed €428 120 (66 % of the expertise budget available) to conduct 17 different projects, organise workshops, peer review outsourced studies, and establish cooperation with other international stakeholders.



14. STOA administration

STOA is administered by the Scientific Foresight Unit (STOA) within the Directorate for Impact Assessment and European Added Value, which itself forms part of the Directorate-General for Parliamentary Research Services (EPRS) of the Secretariat of the European Parliament. The STOA Unit consists of the STOA Secretariat, the Scientific Foresight Service, and the European Science-Media Hub (ESMH). The STOA team members are listed below.

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Wolfgang Hiller

Head of Scientific Foresight Unit (STOA)
Theo Karapiperis (until 30 April 2022)
Marcus Scheuren (from 1 May 2022)

Luísa Antunes (from 1 October 2021)
Philip Boucher
Andrés García Higuera
Mihalis Kritikos (until 17 May 2021)
Nera Kuljanic
Zsolt G. Pataki
Gianluca Quaglio (until 15 October 2021)
António Vale (from 18 October 2021)
Lieve Van Woensel (until 31 May 2021)

European Science-Media Hub (ESMH)
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Emilia Bandeira Morais
Vitalba Crivello
Eszter Fay
Carolin Nijenhuis

Assistants
Rachel Manirambona
Marie-Noëlle Mpolesha Misenga
Edita Ramasauskaite (until 31 July 2021)
Michal Hubar (from 15 October 2021)

STOA trainees

The STOA Unit actively uses the Schuman scholarship scheme to offer vocational training to high-potential and recent university graduates. In addition, the unit accepts those seeking a traineeship as part of their studies or for the advancement of their careers. Each trainee works closely with an administrator and so becomes involved in most of the tasks and challenges they face: participating in meetings with Members and other stakeholders, and organising workshops and studies on science and technology topics. They are also normally able to travel to the European Parliament in Strasbourg to attend one plenary part-session (not possible for most of 2020 or 2021). Trainees thus become acquainted with the whole EU policy-making process.

During 2021, the following trainees worked with STOA:

Marcos Fernandez Alvarez (Spain, October 2020 - February 2021)

Aikaterini Mavrona (Greece, October 2020 - February 2021)

Virginia Mahieu (Belgium, March 2021 - October 2021)

Carl Pierer (Austria, March 2021 - October 2021)

Laia Delgado Callico (Spain, October 2021 - February 2022)

Liliia Hrytsai (Poland, October 2021 - February 2022)

Evan McNamara (Ireland, October 2021 - February 2022)

This Annual Report of the European Parliament's Panel for the Future of Science and Technology (STOA) for the year 2021 provides a comprehensive account of EP activity in promoting understanding of and research in the fields of science and technology assessment. The STOA Panel comprises 27 Members of the European Parliament (MEPs) representing 11 parliamentary committees.

This is a publication of the Scientific Foresight Unit (STOA)
EPRS | European Parliamentary Research Service