

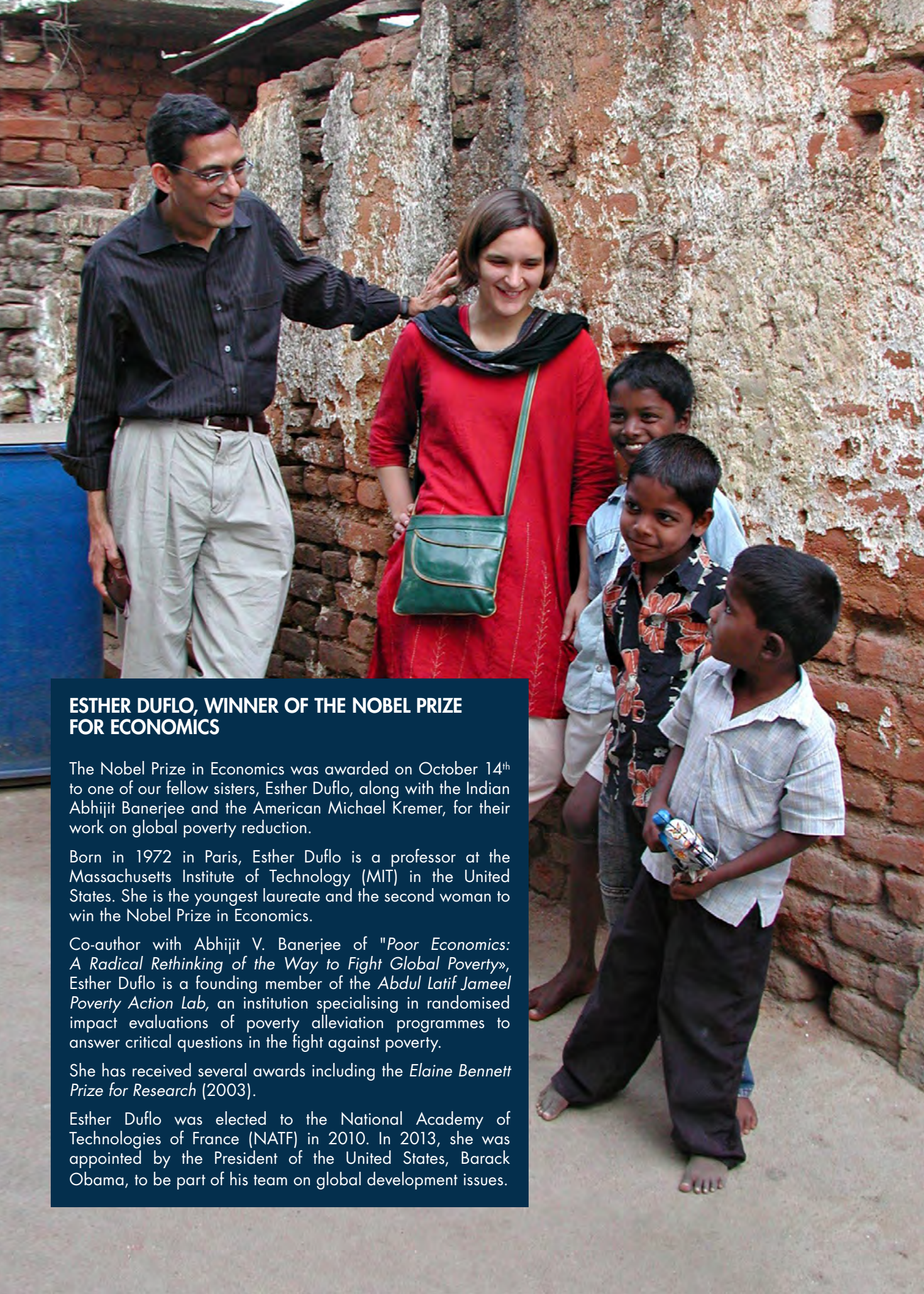
2019 ACTIVITY REPORT

The essentials



NATIONAL ACADEMY OF
TECHNOLOGIES OF FRANCE

SHARING REASONED, CHOSEN, PROGRESS



ESTHER DUFLO, WINNER OF THE NOBEL PRIZE FOR ECONOMICS

The Nobel Prize in Economics was awarded on October 14th to one of our fellow sisters, Esther Duflo, along with the Indian Abhijit Banerjee and the American Michael Kremer, for their work on global poverty reduction.

Born in 1972 in Paris, Esther Duflo is a professor at the Massachusetts Institute of Technology (MIT) in the United States. She is the youngest laureate and the second woman to win the Nobel Prize in Economics.

Co-author with Abhijit V. Banerjee of *"Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty"*, Esther Duflo is a founding member of the *Abdul Latif Jameel Poverty Action Lab*, an institution specialising in randomised impact evaluations of poverty alleviation programmes to answer critical questions in the fight against poverty.

She has received several awards including the *Elaine Bennett Prize for Research* (2003).

Esther Duflo was elected to the National Academy of Technologies of France (NATF) in 2010. In 2013, she was appointed by the President of the United States, Barack Obama, to be part of his team on global development issues.

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HIGHLIGHTS 2019

JANUARY

- **Scientific progress and industrial performance in material mechanics and structures:** seminar in partnership with the CNRS.
- **Facing the technical challenges of agriculture:** the contribution of technology. Joint report with the French Academy of Agriculture.

FEBRUARY

- **Brain-Machine Interface:** a day for the general public at the Cité des sciences et de l'industrie.



MARCH

- **Nuclear Energy and the Environment:** joint report with the French Academy of Sciences and the Chinese Academy of Engineering.
- Notice on the French Environment & Energy Management Agency study "**Trajectories for the evolution of the electricity mix 2020 – 2060**".

Director of publication: Pascal Viginier, President of the National Academy of Technologies of France

Publishing: Catherine Côme - National Academy of Technologies of France

Creation, execution: Benjamin de la Salle

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APRIL

- **The child, the teenager, the family and the screens and apps: a call for reasoned vigilance on digital technologies** of the Academy of Sciences, the National Academy of Medicine and NATF.



MAY

- **Fake news in the food industry.** Conference by Pierre Feillet.

JUNE

- Notice: **linky smart meters: a new technology in every household: issues and concerns.**
- NATF informs the Ministry of Higher Education, Research and Innovation of its proposals for the partnership research and innovation part of the multiannual research programming law.
- CAETS 2019: Engineering a better world - the next 100 years (Stockholm)
- **For a responsible and reasoned management of radioactive materials and waste:** stakeholder notebook in common with the French Academy of Sciences.

JULY

- Support for the **Manifesto for Artificial Intelligence** signed by eight major industrial groups.
- **Big Data: ethical issues** (Communication)

SEPTEMBER

- Colloquium **Marseille and the sea: yesterday, today, tomorrow** - organised in partnership with the Academy of Marseille.
- Frontiers of Engineering (Stockholm, Sweden)

OCTOBER

- **Mastering the hydrogen vector, a strategic challenge for the regions?** Seminar in partnership with the Graduate Institute for Science and Technology (Institut des hautes études pour la science et la technologie - IHEST).
- **Science and Technology in Society - Forum (Kyoto)**
- **Euro-CASE Annual Conference: The future of work - The content of jobs (Oslo)**

NOVEMBER

- 3rd NATF-Convention & Grand Prix: **Future Terrestrial Mobility.**
- **Agriculture facing its technical challenges: the contribution of technologies** - session organised in partnership with the Academy of Agriculture



DECEMBER

- Election of 14 new members.

FOR AN INCLUSIVE ACADEMY OF TECHNOLOGY

Our motto: *For reasoned, chosen and shared progress* encourages us to share, not only with decision-makers but with all our fellow citizens. We must both defend technologies, faced with all kinds of objections which very often have no real justification, and respond to citizens' questions, in particular by constantly integrating an ethical dimension into our work.

To help us adopt this inclusive approach, for the second year in a row we conducted a survey of the French to find out how they feel about technological advances. This study confirms the appeal, but also the concerns about new technologies, particularly on environmental issues. For about 50 % of French people, technological progress is one of the causes of climate change. However, the fight against global warming and the protection of the environment in general will not be possible without the contribution of technologies - for example, how to store intermittent renewable energy on a large scale or how to reduce greenhouse gas emissions for food production, health care, transport, housing, industrial production, etc. There is therefore a real mission for our academy to provide information on the consequences of the development of technologies, particularly those that are controversial, such as employment, with the destruction/creation/transformation of (new) professions, (new) companies or (new) sectors. Giving answers to these legitimate questions is a political challenge. The new European Commission has emphasised the concern about the environment with the rapid adoption of the Green Deal. It also defines a new balance between competition policy and industrial policy. We welcome the election of one of our members, Thierry Breton, as European Commissioner in one of the key posts.

If we look at the global context, we see an unprecedented technological acceleration, characterised by not only speed, but also, scale, particularly in physics, digital sciences and biology. In this context, France



Pascal Viginier, President of the NATF

has undeniable assets, thanks to the technological progress and breakthrough innovations it generates in many sectors and the many world-leading positions and companies it has in each of the Academy's divisions.

In order to be as close as possible to the challenges linked to technological and societal changes, the Academy has been reorganised into ten divisions, four of which are devoted to new themes: "Culture, Leisure;" "Industry and Services;" "Security and Defence;" "Technologies, Economy and Society". We have had a busy academic year: a total of eight reports, three quarterly Foundation reports, our contributions for the Parliamentary Office for the Evaluation of Scientific and Technological Choices (OPECST) and four contributions to the SAPEA (*Science Advice for Policy by European Academies*) reports for the European Commission.

Giving all citizens the benefit of progress also means promoting technological professions among young people. However, in France, unlike in other European countries, particularly Germany, very few young people go into these professions where there is a real lack of young talent and skills. Supporting technology is also a way to create jobs. Finally, we must also be attentive to the impact of current developments on skills, on gender inequalities - in this respect, we are pleased to have shifted our recruitment policy towards gender parity. We should also not neglect the impact on developing countries.

2020 will be the year of the transition to "adulthood" for our academy, which will celebrate its 20th anniversary. Our work is increasingly being viewed, and therefore potentially criticised and controversial. We must therefore systematically listen to the expression of ethical issues, contradictions by the various stakeholders and concerns by French people in all their diversity, and seek answers.

Created at the dawn of the 21st century, the National Academy of Technologies of France (NATF) is also heir to the Age of Enlightenment. Its motto, *For reasoned, chosen and shared progress*, calls for technological development at the service of mankind, the environment and sustainable growth.



> IDENTITY

Technological innovations are at the heart of most of the major challenges facing society: providing access to training and employment for the greatest number of people, building a healthcare and health system that can meet the needs of a growing population, making a successful energy transition and adapting to climate change...

On all these issues, NATF makes proposals and recommendations to public authorities and socio-economic actors.

Thanks to the diverse expertise of its members, the academy offers an original perspective on issues related to technologies and their interaction with society. It conducts its work in complete independence and places the societal and ethical dimension of technologies at the heart of its thinking. The following topics are examples of this approach:

- improvement of the health and diet of French people;
- the fight against unemployment, particularly youth unemployment, through educational transition, initial and lifelong technological education and training for the jobs of the future;
- the energy transition to combat climate change;
- the digital transformation of all sectors of activity;
- the technological upgrading of SMEs and their growth into mid-sized enterprises (MSEs);
- the mobility and transport of tomorrow;
- biotechnologies and their economic potential;

- development assistance to the least developed countries;
- regional economic development and job creation through technology.

> VALUES

PROGRESS

The Academy is committed to promoting technological progress in the interest of the public good. It takes its approach to progress to the Government and decision-making bodies in France as well as to European and international think tanks. In Europe, this is done notably via Euro-CASE and its new SAPEA programme for scientific advice to the European Union. Internationally, we use the framework of CAETS for Asia, the United States and Africa.

IMPARTIALITY

The documents produced by the Academy are validated by the plenary assembly following a process that guarantees their quality and impartiality. The publications also refer to points that the state of knowledge does not allow to be decided with sufficient certainty or that are controversial. Members of the National Academy of Technologies are elected by their peers on the basis of scientific and technical excellence, following rigorous recruitment procedures.

OPENING

The Academy contributes to the governance of technological issues, in particular through the involvement of its members in deliberative and decision-making bodies (law on multiannual research programming, the Parliamentary Office for the Evaluation

of Scientific and Technological Choices, the National Research Agency, etc.). The Academy involves outside personalities in its deliberations. The relevance of its analyses is also based on a good knowledge of best practices around the world. Its integration in European and international academic networks allows it to *benchmark* its work.

> STRATEGY

The National Academy of Technologies of France implemented its 2025 strategy in 2019:

1. ENHANCING ITS RELATIONS WITH THE ECONOMIC WORLD

The Academy has set itself the strategic goal of strengthening its link with the business world. A Senate of personalities, business leaders and representatives of the economic world, chaired by Jean Pierre Raffarin, former Prime Minister, was created in May 2019. The missions of this advisory body are to inspire the National Academy of Technologies when it needs guidance for its work; to extend the Academy's influence in all sectors of the economy; to help develop attractiveness of technological fields and to anticipate the needs for new technological skills.

Composed of an initial core group of about ten members appointed for three years, the new Senate will eventually bring together about fifty active business leaders.

2. DEVELOPING ITS ECOSYSTEM OF EXPERTS

Ten fields of action essential to the development of the country have been defined and constitute the new working structure of the Academy in 2019. One of the objectives of setting up this organisation into divisions and project groups is to develop the participation of external experts - academic or industrial.

3. STRENGTHENING ITS DIALOGUE WITH EDUCATION AND TRAINING STAKEHOLDERS

NATF promotes the teaching of technology in its different aspects in the education of young French people. The Academy is heavily involved in the National Education system. Our endeavours have contributed to introducing technology teaching in the second year of the general and technological track (introduction of "digital science and technology" training) and also to strengthening the place of environmental and climate-related technologies in education, starting in middle school. The Academy had also its fair share in the success of introducing more digital technologies in high school.

4. STRENGTHENING ITS COOPERATION IN EUROPE AND INTERNATIONALLY

The Academy has strengthened its activity within Euro-CASE. 2020 will see the activation of the Africa Club. Support for digital training is already underway with the National Polytechnic Institute Félix Houphouët-Boigny in the Ivory Coast and an organisation of the "Frontiers of Engineering" type is being set up for Africa, in liaison with the Quai d'Orsay, the French Development Agency (AFD) and NATF's Education and Training division. With China, our cooperation is continuing on three themes: *hydrogen, additive manufacturing and tuberculosis*. The Academy continues its active participation in the International "Council of Academies of Engineering and Technological Sciences" (CAETS) and takes responsibility for organising CAETS 2022 in Paris.

5. DIVERSIFYING RESOURCES

The NATF Foundation successfully continued to develop its activities, with management costs falling sharply and a higher proportion of project financing. In 2019, the Academy benefited from €0.5M of its own resources, coming from its foundation and the new Senate.

Texts adopted in 2019

- **Facing the technical challenges of agriculture. The contribution of technology.**

A joint report with the French Academy of agriculture, voted on January 9th

The French agricultural sector remains the leading one in Europe, but its share in terms of value in the European Union's agricultural production is declining. Similarly, France is no longer the leading European agricultural and food exporter. Economic precariousness is escalating and the evolution of agricultural practices raises both societal and environmental questions. Faced with these findings, the French Academies of Technologies and of Agriculture analysed how technological solutions such as genetics and plant improvement, crop protection and pest control, crop weed control, agricultural machinery, robotics and sensors, and digital technologies could meet these challenges.

- **Nuclear Energy and the Environment**

A joint report with the French Academy of Sciences and the Chinese Academy of Engineering, voted on March 13th

In a second joint study on nuclear energy issues, the three academies focused on the environmental impacts of nuclear energy in normal and accident situations, including waste management, providing a comprehensive analysis of these issues which are essentially similar in France and China. As the economics of energy production, which is also an important factor for the future, is determined by quite different local and regional conditions in the two countries, it was decided not to address this issue.

- **Notice on the ADEME study "Trajectories for the evolution of the electricity mix 2020 - 2060".**

Notice voted on 13th March

In its latest assessment of the evolution of the electricity mix up to 2060, the French Environment and Energy Management Agency (Agence de l'Environnement et de la Maîtrise de l'Énergie - ADEME) formulates recommendations that the Academy has assessed. The National Academy of Technologies is fully in line with the policy of development of renewable energies, but the success of this policy presupposes realistic assumptions. The conclusions of the ADEME study must therefore be taken with caution when it comes to public policy decisions.

- **The child, the teenager, the family and the screens and apps. Call for reasoned vigilance on digital technologies**

A joint report with the French Academy of Sciences and the National Academy of Medicine, voted on May 15th

The increasing use of computers and all screen-based tools by young children and adolescents is a cause for concern. Overexposure to these digital tools can affect brain development in younger people. It can lead to behavioural abnormalities, sleep disturbances or attention problems in teenagers. Families and teachers have a role to play in reducing the risks of uncontrolled screen and apps use.

- **The Linky communicating meters. New technology in every home: issues and concerns**

Notice voted on 12th June

The deployment of communicating electricity meters (Linky meters) is one of the recommendations of the Grenelle Environment Round Table. However, this meter gives rise to many misunderstandings, disputes and polemics within society.

In a Notice voted on 12 June, NATF considers that the deployment of Linky and the renewal of the ENEDIS information system carried out in parallel are an exemplary technical success, achieved in a very complex regulatory environment.



Linky smart meters are a positive step forward for a new shared and optimised use of electricity networks and contribute to the continuous improvement of their operation. The deployment of Linky meters will enable sophisticated management of the electricity distribution network at the level of territories and consumers (Smart grids). It is therefore essential for a successful energy transition.

- **For a responsible and reasoned management of radioactive materials and wastes**

Notice in the form of an actor's notebook, in common with the Academy of Sciences, voted on June 12th

Envid by many foreign countries, France benefits from a coherent set of laws on the management of radioactive materials and waste, setting the framework for studies and research on deep geological disposal of long-lived nuclear waste and specifying the procedures for creating a reversible deep geological disposal facility for high-level waste (HLW) and intermediate level long-lived waste (ILW-LL).

The 4th edition of the National Plan for the Management of Radioactive Materials and

Waste brought important new elements on three essential points: the operation of the Cigéo project for the deep geological disposal of HLW and ILW-LL ; the decision to suspend the development of the Astrid fast neutron reactor, which opens the essential question of whether the plutonium resulting from the processing of spent fuel can be valorised, or whether it should be qualified as waste; the limits of the current strategy for the disposal of very low-level waste (VLLW), highlighted by the first dismantling operations.

- **Big Data: ethical issues**

Communication approved on 3rd July

The Ethics, Society and Technology Committee selected sectors of human activity in which Big Data are, or will be, considerably changing practices and raise ethical questions: social networks, targeted advertising, e-commerce, health, agriculture and food, financial services, security, public policy... The study took approximately two years. The report brings together a set of contributions which, for each of the sectors considered, identify the pitfalls to be avoided and propose an approach geared towards meeting the needs of individuals and society as a whole.

Annual NATF-Convention and Grand Prix *Terrestrial mobility of the future*

On 18th November, the 3rd edition of this event brought together three hundred participants at the *Maison de la Chimie* in Paris around the topic of major transformations in the land-based mobility sector: electrification of vehicles, development of autonomous vehicles, digitalisation and evolution of services and uses.

The Grands Prix of the National Academy of Technologies were awarded to two young start-up:

- Mob-Energy, whose charging robots enable all car park operators to offer an electric car recharging service without installing a single terminal.
- Groupeer Technologies, whose ticketing solution for school transport meets both child safety and economic efficiency requirements.

Thematic sessions

The future of industrial SMEs. How do you get them to upgrade their skills? Focussing on the sectors or territories?

The child, the teenager, the family and the screens and apps. Call for reasoned vigilance on digital technologies

A revolution in units of measurement

Around logistics

New workers and new workplaces by 2030

Hydrogen (decarbonated): a key element in the ecological transition?

Transport, construction and urban planning: value conflicts

Agriculture facing its technical challenges: the contribution of technology

Panel discussions 2019

Gilles Brégant, Director General of the National Frequency Agency

Guillaume de Seynes, Managing Director, Upstream and Investments Division, Hermès International

Xavier Bertrand, President of the Hauts de France Regional Council.

Antoine Petit, President and Chief Executive Officer of CNRS

Martine Liautaud, Founding President of the Women Initiative Foundation

Bernard Duverneuil, President of Cigref

Annual seminar

Technologies for health: from innovation to its integration into the healthcare system

The annual seminar provided an opportunity to take stock of the societal, economic and organisational changes brought about by the introduction of new technologies in the health field. Issues such as cost/benefit to citizens, financing of innovation, access to data to benefit from the contributions of new computational approaches and ethical dimensions were addressed.

Conferences & Symposia

Piloting an object through brain activity, public session at the *Cité des Sciences et de l'Industrie* (Paris La Villette)

CAETS 2019: *Engineering a better world - the next 100 years*, à Stockholm (Sweden)

Science and Technology in Society Forum in Kyoto (Japan)

Euro-CASE Annual Conference: *The future of work - The content of jobs* in Oslo (Norway)

Frontiers of engineering symposium in Stockholm (Sweden)

PARTNERSHIPS

FRANCE

The National Academy of Technologies helps to inform public choices in innovation policy.

In particular, at the request of the Ministry of Economy and Finance and the Ministry of Higher Education, Research and Innovation, the Academy contributed together with the National Council of Industry to a benchmark for the ranking of France and its industrial sectors on a set of key technologies for the future.

At the request of the Ministry of Higher Education, Research and Innovation, the Academy has issued recommendations aiming at improving the measures taken by public authorities in order to better prepare France for the socio-economic changes brought about by technological innovations.

MESRI has also sought the Academy's advice in the context of the development of the new Law on Multi-Year Research Programming.

The Parliamentary Office for the Evaluation of Scientific and Technological Choices (OPECST) regularly calls on the expertise of NATF to shed



further light on its studies, at hearings or in the form of written contributions. In 2019, the Academy gave its views on satellites and the services they provide; on new trends in energy research (renewable energies); on the contribution of science and technology to the restoration of Notre-Dame de Paris; and on energy production by the agricultural sector.

INTERNATIONAL

DELEGATE

Bruno Revellin-Falcoz

DEPUTY DELEGATE

G rard Creuzet

In 2019, the international outreach of the National Academy of Technologies has intensified, thanks to the development of relations with new countries and the intensification of work within CAETS and Euro-CASE.

Africa

By setting up an Africa Club, NATF is giving concrete evidence of its desire to strengthen its ties with this continent, in particular by organising an event of the type "Frontiers of Engineering", where a group of young French and African engineers is supervised and mentored by high-level experts. The objective is to promote the local creation of *start-ups*.

NATF also participates in the work of the Inter-Academy Development Group.

Germany

NATF and acatech maintain regular relations that cover the whole range of technological activities in both countries. Following a joint study on national public perceptions of technology, the two academies supported the *Manifesto on the Future of Industry in Europe* signed by the two governments.

CAETS

The Council of Academies of Engineering and Technical Sciences (CAETS) now brings together 30 countries around the world. Its annual conference was held in Stockholm (Sweden), dealing with four main themes:

- information and communication technologies,
- energy and climate,
- cities of the future,
- education.

CAETS has strengthened the activities of its permanent platforms, particularly the one dedicated to energy.

NATF has officially announced that in 2022 the annual CAETS conference will be held in France.

China

Work with the Chinese Academy of Engineering (CAE) has intensified and now focuses on five themes:

- nuclear energy and its environment, with the publication of a joint report;
- hydrogen;
- additive manufacturing;
- tuberculosis, with the organisation, in conjunction with the Chinese Academy of Medical Sciences and the French National Academy of Medicine, of a seminar on tuberculosis and the organisation of health systems in the two countries;
- the system for detecting dermatological pathologies.

Korea

NATF participated in Seoul in the CAETS Energy Committee activities organised by the National Academy of Engineering of Korea (NAEK) and is contributing to the preparation of CAETS 2020 to be held in Seoul on the theme of the *Smart Society*.

Euro-CASE

Euro-CASE is an association that brings together the academies of technology and engineering of twenty-three European countries and of which NATF is a founding member.

SECRETARY GENERAL

The Secretary General, Yves Caristan, has been reappointed for a new mandate.

EXECUTIVE BOARD

The Chairman of the Board, Reinhard Hüttl, was reappointed for a further term.

Representatives of NATF:

Bruno Revellin-Falcoz
G rard Creuzet

Euro-CASE Work platforms

Several members of the NATF contribute to the work of Euro-CASE work platforms:

Energy (*Energy Platform*)

With the participation of Jean-Fran ois Minster, Bernard Tardieu, G rard Grunblatt.

This group has published a report entitled *Energy Transitions in Europe - Common Goals but Different Paths*¹, available on the Euro-CASE website.

Engineering Education

With the participation of G rard Creuzet

This working group is finalising a report on *Challenges and Opportunities for Future Engineering Education in Europe*. It also initiates a reflection on *The future of work and young people*.

The future of work

This platform should be initiated in 2020 under the leadership of the Norwegian Academy of Technology.

Young people and engineering and technology academies

This platform should be initiated in 2020, under the guidance of the Royal Academy of Engineering of Great Britain.

Annual conference

The Euro-CASE Annual Conference 2019 was organised by the Norwegian Academy of Technological Sciences (NTVA) in Oslo on the theme: *The Future of Work and the Future of Jobs*. The conference was very interesting indeed and informed the theme of a future Euro-CASE platform.

On June 8th, the Croatian Academy of Engineering (HATZ) will host in Zagreb the 2020 edition of the Conference, dedicated to the *Challenges of European Energy Transition*.

SAPEA

Launched in 2017, the *Academic Consortium Science Advice for Policy by European Academies* (SAPEA) is part of the European Commission's Scientific Advice Mechanism, which is funding it with  6 million over five years. SAPEA is based on the collaboration of five European academic networks: Academia Europaea, the European Federation of Academies of Sciences and Humanities (ALLEA), the European Academies' Science Advisory Council (EASAC), the Federation of European Academies of Medicine (FEAM) and Euro-CASE.



Download
Euro-CASE position
papers

¹ Energy Transitions in Europe – common goals but different paths

SAPEA aims to bring together the independent scientific expertise of more than one hundred European academies from over forty countries. Several reports have been prepared with the collaboration of NATF in 2019: *Carbon Capture and Utilisation; Micro- and Nano-plastics; Transforming the Future of Aging*.

Within the framework of SAPEA, Euro-CASE and the European Commission are considering a study on energy in Europe.

United States of America

The National Academy of Engineering of the United States of America (NAE) presented the *Grand Challenges of Engineering Scholars Program*, a scholarship programme related to the sustainable development goals defined by the United Nations, organised with the Chinese Academy of Engineering and the UK Royal Academy of Engineering. The National Academy of Technologies of France will participate in this annual meeting in 2020.

India

The two academies of technologies - French and Indian - have decided to continue their cooperation by making an inventory of themes for potential future studies in order to set up joint working groups.

Japan

The sixth edition of the STS Forum in Kyoto (*Science and Technology in Society Forum*) was, as usual, chaired by Prime Minister Shinzo ABE.

NATF participated in this meeting which brought together more than 1200 participants.

On the programme of the forty sessions and associated events figured the following topics:

- energy and environment,
- ICT and smart cities,
- innovation,
- health,
- resources,
- education.

Poland

On the occasion of the 100th anniversary of scientific relations between France and Poland, the National Academy of Technologies of France and

the Ministry of Foreign Affairs, together with the Polish Academy of Sciences, organised a conference in Paris on the theme of mathematical modelling in bioinformatics.

United Kingdom

Exchanges with the UK Royal Academy of Engineering (RAEng) continued. RAEng presented its actions in relation to the sustainable development objectives defined by the UN. Cooperation with NATF is being explored on certain topics. The reorganisation of the two academies to better understand the major technological challenges of the future was also discussed, with the creation of the *National Engineering Policy Centre* under the direction of RAEng and the creation of divisions within the French Academy.

Switzerland

NATF and the Swiss Academy of Engineering Sciences (SATW) exchanged views on their respective work in the fields of artificial intelligence and energy transition, with the aim of a joint working session in 2020.

FRONTIERS OF ENGINEERING

The Europe-US exchange cycles organised by Euro-CASE and the US National Academy of Engineering (NAE) aim to bring together young engineers and scientists from Europe and the United States.

The latest symposium, organised by the Royal Swedish Academy of Engineering Sciences (IVA) and the NAE, was held in Stockholm on 18-20 November 2019. More than sixty engineers under the age of 45 discussed cutting-edge developments in the Internet of Things and 5G, systems approaches for a clean environment, production by *smart* industry and the evolution of materials engineering through advances in imaging technologies. The exchanges between participants were particularly constructive.



Plenary Assembly

As a political and deliberative body, the Assembly adopts notices and reports, approves the general guidelines and the work-programme. It is composed of full and emeritus members.

On 4th December 2019, the plenary assembly elected 14 new members, bringing the number of academics to 338.

Bureau

As an executive body, the Bureau is composed of the president, the vice-president, the general delegate and the outgoing president. The Chairman of the Planning Committee participates.

Academic Council

The Academic Council is an advisory body for decisions put to the vote of the assembly. It is composed of the 4 members of the bureau, 5 ex officio members and 7 elected members.

Divisions

Ten divisions have established working groups for analysing the major technological issues of our time. Systemic analysis is the preferred method, as is risk/opportunity analysis and social acceptability. Each report answers an ethical question.

- Food and Health
- Culture, leisure
- Education, Training, Employment and Labour
- Energy
- Environment and the impact of climate change
- Housing, mobility and cities
- Industry and services
- Digital
- Security and Defence
- Technologies, economies and societies

Inter-divisional project groups on topical technological issues may also be set up by the Bureau.

Studies carried out at the request of institutions, public authorities and partners may, where appropriate, be the subject of an emergency adoption procedure.



International contacts



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