Parliamentary Assembly
Assemblée parlementaire
http://assembly.coe.int

COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

Doc. …
Provisional version
21 May 2021

Research policies and environment protection

Report[1]
Committee on Culture, Science, Education and Media
Rapporteur: Mr Olivier Becht, France, Alliance of Liberals and Democrats for Europe

Summary

Despite significant results, the current policies and efforts of member States to combat climate change and its impacts remain insufficient. The Committee on Culture, Science, Education and Media calls on them to review their research and development policies, in order to give priority to the green economy, energy transition and the circular economy, so as to achieve the goal of carbon neutrality by 2050.

The committee encourages all European countries to develop specific research programmes on recycling and on renewable energies, while designing storage technologies, and ensuring the upgrade of the electricity grid and the security of the energy production and distribution system. It recommends maintaining fundamental research projects – which may lead to the discovery of new sources of sustainable energy – and encouraging, through funding, the pooling of research efforts at national level and public-public, public-private and private-private synergies, as well as co-operation between universities and large companies.

According to the committee, States should consider new forms of research funding, including the possibility of issuing public debt securities, "green bonds" accessible to the general public. The committee also highlights the need for strengthening the European dimension of research policies and expanding "mutually beneficial" co-operation between European countries, as well as between Europe and other regions of the world.

Finally, the committee proposes that the Committee of Ministers set up a framework – an enlarged partial agreement, for example – for Council of Europe countries to pool ideas and research resources for targeted projects, and to establish a bank of strategic resources necessary for the energy transition, to create stocks and manage them in a mutually beneficial way, with a view to strengthening their strategic independence.

[1] Reference to committee: Decision by the bureau, Reference 4532 of 15 September 2020.

A. Draft resolution[2]

1. The United Nations 2030 Agenda for Sustainable Development commits all countries to taking "*urgent action to combat climate change and its impacts*" (Goal 13) while the Paris Agreement calls on them to cut greenhouse gas emissions to reach climate neutrality by the second half of the century. The Parliamentary Assembly is concerned that, despite the significant results achieved, current policies and the level of effort of Council of Europe member States remain below what is required to achieve this result.

2. Climate change, as well as the progressive depletion of resources that are being overexploited, could trigger tragic consequences for hundreds of millions of people, especially the most vulnerable, and undermine social cohesion, democratic stability and peace in all regions of the world. Research and innovation can provide the innovative solutions that are necessary to counter both the impoverishment of the planet and the problem of climate change, and to ensure the sustainable development of our societies.

3. Economic systems will have to change radically if the planet is to be saved. There is a need to rethink an economic model that is too heavily reliant on (over) consumption, to have the courage to take a stand against planned obsolescence of goods and to review consumption habits; clean transport systems must be developed, living spaces reorganised and less energy-intensive homes built. Through individual behaviour and lifestyle choices, it is possible to help contain the demand for energy.

4. The growth of the world's population, social and economic development, which must benefit all, and the new horizons that progress opens up, with the deployment of technologies and activities that have a huge need for energy (such as the expansion of the digital world, artificial intelligence, and the plans to conquer space), make it highly unlikely that there will be a decline in energy consumption. Reducing the carbon footprint of human activities therefore necessarily requires decarbonised energy production, so more research needs to be carried out on the energy sources of the future.

5. The resources that humankind has at its disposal are limited, moreover, and the way those resources are used today is not sustainable. Another key focus of research, therefore, is the circular economy. It is important to learn to reuse and recycle the resources on which existing economic systems so heavily rely, including those required for energy transition, without which development would come to a halt.

6. In order to steer the research effort, it is important to objectively assess all the constraints – economic, social, environmental and temporal – that are apt to make certain paths hazardous and to weigh properly the consequences of our strategic choices. The impact of fossil fuels is disastrous but there is also environmental damage caused by the extraction of the rare metals and minerals indispensable for the development of renewable energy production and storage technologies. Research must be directed at minimising, and if possible avoiding, this damage and any environmental impact that renewable energy production may have, such as visual and noise pollution or the presence of substances that may be hazardous to health.

7. Because of the large-scale deployment of renewable energy, future demand for key raw materials is expected to increase significantly. We should not underestimate the risks to which European countries would expose themselves by becoming dependent on the countries that produce the rare minerals whose widespread use (in the absence of their full recycling) can only lead to increased prices, scarcity and exhaustion. A similar risk arises from the quasi-monopolies that one or a few countries may hold in the processing of these rare minerals and/or in manufacturing components which are essential to European countries' industrial production. Failure to take due account of these risks will only make those countries weaker.

8. In order to ensure the competitive edge and sovereignty of European industry, Council of Europe member States must ensure a secure, sustainable, responsibly-sourced supply of raw materials, but also make choices to increase their autonomy in critical raw materials, and maximise the value of the resources and materials available to them; reusing and recycling can reduce the risk of scarcity and also help to preserve countries' economic independence, or even sovereignty.

9. In a world of interdependencies, technological responses to current problems are perforce multisectoral. Interdependency and complexity lead to co-operation on cross-cutting fields and issues between researchers and other research and development actors and make this co-operation indispensable. In addition, policy solutions (and hence plans) necessarily involve several levels, from local to international, both in their development and in their delivery.

[2] Draft resolution adopted unanimously by the committee on 21 May 2021.

10. Active civic participation and engagement is key to building the green economy; citizen involvement in decision making from the outset is both a democratic requirement and a condition for achieving the desired results: citizens are the drivers of the paradigm shift, and the ones who bring it about through their action. If the ecological transition is to succeed, a collective effort is needed; behavioural economics should make it possible for citizens to co-design the technical solutions and innovations of tomorrow.

11. The Sustainable Development Goals point the way. Policy action must not be diverted from the path of sustainable development, because time is running out. In the view of the Assembly, the process of making market-ready technologies available for sale and upscaling them needs to be supported. At the same time, it is important to dedicate more resources to researching and developing new solutions, while making the best use of existing funding mechanisms and considering new forms of funding.

12. Public finances are under severe strain due to the economic impact of the Covid-19 pandemic and the urgent need to address the social distress that this pandemic has caused among the more vulnerable sections of the population, in Europe and elsewhere. The Assembly considers, however, that when seeking to rebuild our societies and economic systems, it is to tomorrow's world that attention should be directed, not yesterday's. To some extent, the crisis is an opportunity for change, one that we cannot afford to miss. Research and innovation for the green economy must be among the "beneficiaries" of national post-crisis recovery plans.

13. Accordingly, the Assembly calls on member States to review their research, innovation and development policies, in order to give the highest priority to the green economy, and more specifically energy transition and the circular economy, so as to bring economic development into line with the goal of achieving carbon neutrality by 2050. In this context, the Assembly calls on member States to:

13.1. develop specific research programmes with the focus on:

13.1.1. renewable energies, without forgetting the specific constraints that may hinder large-scale deployment of the relevant technologies, and in particular the importance of developing storage technologies, and the imperative need to upgrade the electricity grid and ensure the security and resilience of the energy production and distribution system, which also require significant research efforts;

13.1.2. the circular economy, including notably the recycling (if not replacement) of critical materials needed for energy transition technologies, and waste-heat recovery and carbon capture and storage (or reuse) technologies;

13.2. maintain fundamental research projects that may lead to the discovery and harnessing of new sources of sustainable, abundant and cheap energy, and ensure that any progress in this direction is discussed within the scientific community;

13.3. take due account of the geopolitical risk, as well as economic, social and environmental constraints, because, alongside sustainable development issues, there is also the question of markets and strategic autonomy, or even national sovereignty;

13.4. encourage, including through funding, collaboration and pooling of research efforts at national level, having regard to public-public, public-private and private-private co-operation and synergies;

13.5. promote co-operation between universities and large companies and foster through incentives the creation of consortia among large companies to work together with publicly funded science;

13.6. develop a technology watch activity in strategic areas to identify innovative projects and support their development and the move to the commercialisation stage;

13.7. put in place funding mechanisms that can be activated with a degree of flexibility and speed, direct research funds towards long-term innovation demands and provide incentives for the creation of research-industry partnerships, with more funding for collaborative projects between research laboratories and industry projects on strategic matters;

13.8. consider new forms of research funding and, in this context:

13.8.1. consider the possibility of issuing public debt securities, "green bonds" accessible to the general public and designed to fund strategic research in the fields of energy transition and the circular economy;

13.8.2. consider supporting the establishment of a national online platform with a selection of innovative projects to which the State would undertake to provide financial support and which would be open to participatory financing;

13.9. strengthen the European dimension of their research policies, and – when possible – encourage and support participation in the European programmes through tools such as better information, advice and assistance in completing the required steps and procedures and financial incentives;

13.10. define core areas where it is crucial to widen co-operation between European countries, but also between Europe and other regions of the world, and design the research framework accordingly, to foster mutually beneficial co-operation and strategic international partnerships, for example to ensure complementarity and greater efficiency in terms of research efforts.

B. Preliminary draft recommendation

1. The Parliamentary Assembly recalls its resolution … "Research policies and environment protection" and it stresses the major geostrategic importance of research and innovation in the areas of green economy, and in particular of energy transition and of circular economy.

2. The economic and strategic stakes behind technological progress may create a barrier to international co-operation in these domains. However, the fight against climate change is an absolutely key issue that concerns all Council of Europe member States: they must all contribute to finding the right solutions and be able to share them.

3. The 27 member States of the European Union are moving in this direction, as the programme *Horizon Europe* and the previous *Horizon 2020* clearly show, but Europe is bigger than the EU and it is important that we be able to work together (for example, through transnational research programmes) on a wider European scale. For the Assembly, the Council of Europe has a key role in this respect, and it should open a new avenue of cooperation to strengthen the ties that unite us and the solidarity between our peoples.

4. Therefore, the Assembly recommends that the Committee of Ministers consider setting up a framework – an enlarged partial agreement, for example – that would allow our countries to move forward together by pooling ideas and research resources for targeted projects; the Council of Europe Development Bank could be involved to provide its expertise and help establish funding mechanisms for these joint research projects. Within this framework, Council of Europe member States could also be encouraged to establish a bank of strategic resources necessary for the energy transition, to create stocks and manage them in a mutually beneficial way, with a view to strengthening the strategic independence of all our countries.

C. Explanatory memorandum by Mr Becht, rapporteur

1. Introduction

1. The economic and development model followed by our societies is steering us towards a disaster foretold, of which the warning signs are clear to see. Not only are we exhausting the natural resources that we need for our lives but also there is not one single ecosystem that has been spared from human intervention and our biosphere is constantly further deteriorating. Climate disruption, with its cohort of harmful effects is one of the most powerful demonstrations of the abyss that lies ahead if we do not change course.

1.1. The need to achieve carbon neutrality by 2050

2. The final document of the United Nations Summit dedicated to the adoption of the post-2015 development agenda "Transforming our world: the 2030 Agenda for Sustainable Development" (adopted by the United Nations General Assembly on 25 September 2015)[3] set Goal 13 "*Take urgent action to combat climate change and its impacts*" and, in that context, called for the integration of "*climate change measures into national policies, strategies and planning*" (Target 13.2). The same document, under Goal 12 "*Ensure sustainable consumption and production patterns*" includes the target "*substantially reduce waste generation through prevention, reduction, recycling and reuse*" (Target 12.5).

3. Following on from these goals, 196 Parties to the *"United Nations Framework Convention on Climate Change"* (UNFCCC), meeting at the COP 21 in Paris, adopted the *Paris Agreement*[4] on 12 December 2015, which entered into force on 4 November 2016[5] and has been ratified by 46 Council of Europe member States and by the European Union. The central aim of this international treaty is to *"strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty"*, including by *"holding the increase in the global average temperature to well below 2°C"* and *"pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels"* (Article 2).[6] To achieve that aim, the Parties are required to cut greenhouse gas (GHG) emissions in order to reach climate neutrality during the second half of the century (Article 4).

4. To implement the Paris Agreement, most of the world's countries have made serious commitments to cut or minimise their emissions; those commitments are known as Nationally Determined Contributions (NDCs). The European Union is striving to set an example and is aiming to hit the objective of zero net GHG emissions by 2050. France and the United Kingdom have already enshrined that objective in law.

5. However, the UNEP Emissions Gap Report 2020 points to the discrepancy between the GHG emission levels resulting from current policies, those envisaged in the current NDCs by 2030 and, above all, those that would enable us to attain the goal of zero net emissions by 2050. According to the report, the current NDCs are woefully inadequate if we are to attain the climate aims laid down in the Paris Agreement: as things stand, they would result in temperature increases of at least 3°C by the end of the century. The Commission of the European Union (EU) indicates a similar finding in its communication of 11 December 2019, which sets out a European Green Deal for the European Union and its citizens.[7]

6. A recent report by EMBER[8] analysed the EU's National Energy & Climate Plans (NECPs),[9] which were submitted by the end of 2019, to assess the planned progress in the electricity sector over the coming key decade. According to the report, the renewable electricity generation will almost double to deliver nearly 60% of EU electricity by 2030; despite this, fossil fuels are still expected to generate about 25% of EU electricity, with coal power only halving over the next decade and no plan to reduce fossil gas. Without corrections, the conclusion of the report is that the EU could not deliver the 55% reduction in total emissions by 2030.

---

[3] This text is available in different languages : https://sustainabledevelopment.un.org/post2015/transformingourworld.

[4] A dedicated page on the United Nations site provides some basic information on the Paris Agreement, together with links to the text of the agreement in several languages.

[5] The state of ratifications may be consulted here.

[6] The agreement is also aimed at building States' capacity to cope with the effects of climate change and make financial flows compatible with low greenhouse gas emissions.

[7] COM(2019) 640 final (of 11.12.2019). The Green Deal is an integral part of the strategy to implement the United Nation's 2030 Agenda and the sustainable development goals."

[8] Vision or division? – What do National Energy and Climate Plans tell us about the EU power sector in 2030? (November 2020).

[9] In its NECPs, each EU member State describes, in an integrated manner, its climate and energy objectives, targets, policies and measures for the period from 2021 to 2030.

7. Acting quickly and effectively in this area is a necessary condition for safeguarding not only the right to a healthy environment, but also the right to decent living conditions for all, and even the right to life itself, as the consequences of climate change, as well as the effects of the progressive depletion of resources we are overexploiting will be tragic for hundreds of millions of people, especially the most vulnerable, and will undermine social cohesion, democratic stability and peace in all regions of the world. We are at a crossroads: the choices we make today will radically determine our tomorrow and that of future generations.

1.2. Scope of the investigation and main avenues of inquiry

8. Policies in the field of research and innovation have a key role to play in guiding and supporting the search for effective solutions and promoting scientific and technical progress as well as corporate choices and social attitudes, making it possible to shift towards a sustainable development model.[10]

9. As the EU Commission points out in its communication of 11 December 2019, "*new technologies, sustainable solutions and disruptive innovation are critical to achieve the objectives of the European Green Deal".* In this connection, the EU Commission has launched Horizon Europe, the EU's framework programme for research and innovation for the period 2021-2027; this programme, in synergy with other EU programmes, will play a pivotal role in leveraging national public and private investments and in promoting green *partnerships* in the field of research and innovation.

10. A report on research policies may seem rather far removed from the themes of human rights, democracy and the rule of law; however we are cutting to the heart of the issue of effective environmental protection. It is research (and the instruments developed through research) that allows us to monitor changes in the state of our planet, to identify problems and to model scenarios regarding the impact of various possible measures. And it is research that can provide us with the innovative solutions we need to counter both the impoverishment of our planet and the problem of climate change, and to ensure the sustainable development of our societies.

11. The aim of my report is to draw the attention of Council of Europe member States to the urgent need to rethink and perhaps refocus research policies, so that they could better serve the goal of reducing GHG emissions[11] and achieving climate neutrality by 2050.

12. In this connection, I will address two key issues. The first concerns the direction that research should take: what are the most important avenues of research and, consequently, what research should be prioritised for funding in order to better arm ourselves and successfully combat climate change? A second question concerns the governance of research policy: what considerations do policy makers need to bear in mind and what should be the cornerstones of the research strategy, in order to optimise its impact?

13. My analysis can cover only some of the many options available and the numerous more specific issues that arise. Without claiming to be exhaustive, I will nevertheless try to highlight a few points which, in my view, require careful consideration, and to identify courses of action that policy makers could pursue to (re)orient research policies towards the objective of a green economy.

14. A profound change in our economic systems is needed if we are to save our planet, and there are many interrelated factors involved. Among other things, to reduce wastage of energy and resources (including our water consumption), we need to rethink an economic model that is too heavily reliant on (over) consumption, to have the courage to take a stand against planned obsolescence of goods and review our consumption habits, to think about how we could better organise our living spaces, our cities and our transport systems, and to design and build homes that require less energy to build and to run, etc.

15. Given, however, the growth of the world's population, social and economic development (which must benefit all and not just a few) and progress itself, with the new horizons it opens up and the new human ambitions it engenders (one only has to think of the energy consumption linked to the expansion of the digital world, and the new plans to conquer space and colonise other planets), it seems to me that any scenarios which assume a decline in energy consumption must be ruled out.

---

[10] For the sake of simplicity, I will henceforth refer to "research", but by that I also mean "innovation" and "sustainable development", the research in question being geared towards the innovations that will make sustainable development possible.

[11] Although reference is often made to carbon dioxide (CO_2), GHGs also include other gases, including methane (CH_4), which is the second most abundant anthropogenic GHG after CO_2, but which is estimated (according to studies carried out in 2017) to have a Global Warming Potential (GWP) 32 times higher than CO_2 on a time scale of one century (not counting induced climate feedbacks).

16. We will need more and more energy. Reducing the carbon footprint of human activities therefore necessarily requires decarbonised energy production.[12] For this reason, with regard to the first issue mentioned above, my analysis will focus first on the energy sources of the future. However, it is important to remember that the way we use resources today is not sustainable; another key focus of research, therefore, is the circular economy. The report will address this aspect with regard to research aimed at the reduction, recycling and reuse of the resources on which our economies so heavily rely, including those required for energy transition, without which development would come to a halt. Lastly, with regard to the governance of research, I would like to address the need to leverage synergies, pooling of efforts and sharing of knowledge at national, European and global levels.

17. I have also based my analysis and proposals on the contributions from the experts who took part in our hearing on 5 February 2021; I am grateful to them for their invaluable assistance in our work.[13]

2. Research into clean energies

18. There are many different pathways we can take to meet the 1.5°C limit, however, in the scenarios modelled by the Intergovernmental Panel on Climate Change (IPCC), all 1.5°C pathways share certain features, including unabated coal use being largely phased out by mid-century, renewables meeting the majority of future electricity supplies and energy use being progressively electrified and made more efficient.[14] Rapid progress in the electricity sector is therefore essential to limiting global warming to 1.5°C.

19. In this respect, energy transition poses a new problem: the challenge is no longer to identify and learn how to efficiently exploit new energy sources in addition to the fossil sources dominant at present, in order to satisfy growing demand, but rather to replace, as quickly as possible, the fossil fuels - natural gas, coal and oil - on which energy production still largely depends.[15]

20. The challenge to go to zero carbon emissions is huge: it could be easy to reach a share of 50% electricity production by renewables, but then the question is how to go to 75%, and "*the last 25% becomes very very difficult*".[16]

2.1. Going for solar, but not exclusively

21. Solar radiation, wind, waves, tides, marine or river currents and the heat from the Earth's core are all sources of clean energy for which technologies exist, albeit with different degrees of maturity. In theory, each of these sources has the potential to provide us with an abundance of clean energy, but all face obstacles to their development.

22. It is highly likely that a good energy mix is the right solution for an effective and rapid energy transition, at least for the next few decades. At the same time, conditions (including constraints arising from the level of socio-economic development) and opportunities (e.g. those related to local resources) may vary greatly from one country to another and from one region of the planet to another. This observation is of little help when it

---

[12] Since there is already an excessive amount of GHGs in our atmosphere and energy transition is taking longer than hoped, we will also need to be able to remove some of them in order to make the balance of GHG emissions "zero" (or even, after achieving this goal, negative, at least for a while). One very important area of research, therefore, is CO_2 capture and storage or reuse. It will not be possible to explore this aspect in depth, however.

[13] The minutes of the hearing are available here ; the experts who participated are:

- **Mr Robby Berloznik**, Member of the TEC-UNFCCC (Technology Executive Committee of the United Nations Framework Convention on Climate Change); Senior Adviser, Flemish Institute for Technological Research (VITO) – Director, Programme of the Global Science Technology and Innovation Conferences (G-STIC);
- **Mr Pierre Laboué**, Research fellow at the French Institute for International and Strategic Affairs (IRIS), France;
- **Ms Nathalie Lazaric**, Economist, Director of Research, National Centre for Scientific Research (CNRS) at the Research Group in Law, Economy and Management (GREDEG) – Joint CNRS / Côte d´Azur University;
- **Mr Patrice Simon**, Professor at the University of Toulouse III - Paul Sabatier; Deputy Director of the Research Network on Electrochemical Energy Storage (RS2E) of the French National Centre for Scientific Research (CNRS), France;
- **Mr Karl W. Steininger**, Professor of Climate Economics and Sustainable Transition, Wegener Centre for Climate and Global Change (WEGC) and Department of Economics, University of Graz, Austria.

[14] See the IPCC Special Report on Global Warming of 1.5 ºC and the In-depth Q&A document related to this report.

[15] According to the "World Energy Balances: Overview" (Statistics report, July 2020) of the International Energy Agency (IEA), fossil fuels accounted for more than 81% of the world energy production in 2018 (as in 2017).

[16] The quotation is of Steven Chu, Professor of physics and of cellular and molecular physiology at Stanford, Nobel physicist and former U.S. Secretary of Energy. See here the Stanford News of 22 May 2018 on "What does the future of energy look like? Stanford scientists weigh in". Eight Stanford researchers, including Professor Chu, shared in short videos how, among the many developing options, they envisioned the world becoming less reliant on fossil fuels.

comes to guiding research, however.

23. More broadly (and focusing, too, on forms of global sharing), towards which source(s) of clean energy should we be directing our attention, if not exclusively, then at least chiefly? Although wind currently comes top of the list (after hydropower, which cannot be the solution, however) in terms of global production of clean electricity, solar seems to offer the greatest potential in both the short and the longer term.

24. The arguments in favour of solar energy are essentially as follows:
- as a source of energy, solar radiation is extremely easily accessible, freely available everywhere and to everyone, and just a small fraction of this energy is sufficient to meet the global demand for energy, without fear of shortages, for the rest of our planet's existence;
- producing electrical energy from solar radiation does not in itself cause pollution; it is emission-free (including noise-free) and the process itself does not generate waste or consume water;
- electricity production using photovoltaic techniques is modular and can be located as close as possible to the point of consumption, both in urban areas and in remote areas with low population densities, where other technologies would be less suitable; in particular, technological advances and nanotechnologies already offer the prospect of solutions that should enable photovoltaic systems to be seamlessly incorporated not only into glass surfaces, but into surfaces of any type, including flexible ones, even fabric;
- the International Energy Agency already considers PV to be the cheapest source of energy.

25. Although all these arguments strike me as very compelling, they do nevertheless need to be examined in greater depth, mainly for two reasons: the first one is that the development of solar (like other renewable sources) is not without its problems; the second reason is that, de facto, other industries are already up and running and taking root (including in terms of economic development and jobs) and, since they too can contribute to the goal of carbon neutrality, it would be foolish to disregard them completely.

2.2. The challenges of energy transition

26. In order to be able to make informed choices about which avenues of research should be pursued, and so steer the research effort, it is important to objectively assess all the constraints – economic, social, environmental and temporal – that are apt to make certain paths hazardous. There is doubtless an element of risk in any research and innovation policy, but it is important to understand and evaluate it, so as to accept only that part of the risk which is unavoidable, in the absence of viable alternatives. It is also important to understand the consequences of our strategic choices: only by moving forward with full knowledge of the facts, and having clearly identified the pitfalls, can we achieve our goals.

27. For example, the electrification of transport is undoubtedly crucial both for achieving climate neutrality and for improving the quality of life in our urban centres; hence the focus on electric cars. That in turn, however, requires us to produce the (clean) electrical energy needed to charge the batteries in electric cars. If the electricity in the grid is produced from fossil sources, having cars that are (as we say) "clean" to run does not really reduce the carbon footprint of mobility: the footprint has merely been displaced. This brings us back to the issue of primary energy production from clean sources.

28. Renewable energy sources are already available, and the various technological achievements and scientific innovations aimed at making better use of them have been enthusiastically received; exploiting renewables is not yet that straightforward,[17] however, and it is the job of research to provide us with the right answers.

29. Among the most obvious constraints that could hold back energy transition are the costs: the cost of research and experimentation, the cost of production facilities (to be created or adapted) and of the products themselves (including the cost of basic materials and specialised labour), along with the costs involved in upgrading the electricity grid.

30. Minimising costs is one of the challenges of research. This obviously involves looking at the entire cycle and all the factors involved in the production and distribution or storage of renewables. For now, however, cost is no longer a major obstacle, in Europe at any rate, because in the case of certain "mature" technologies, especially in the solar and wind sectors, these costs are now very competitive.

31. The cost of developing and bringing to market the various technologies being explored is a major consideration for policy makers and it is important to remember that we are looking for solutions that work globally and not just for rich countries. However, these costs now need to be put into perspective and should

[17] For further details, I will refer to my note on renewable energy, doc AS/Cult/Inf (2021) 06.

not be the overriding concern: the decision-making process about how we invest in energy - including in research - must reflect and prioritise the need to respond rapidly to environmental degradation and the climate crisis.

32. An important element - and another area for research - is energy performance, or more precisely the "energy return on investment" (EROI), i.e. the amount of final usable energy (produced by a plant over its life cycle) divided by the amount of energy used to obtain it (including the energy used to build and operate the plant). The EROI thus provides a measure of the energy efficiency of a project. Renewable energy technologies are already outperforming fossil fuels,[18] but that should not hinder research efforts to further improve the energy performance of equipment, both in terms of efficiency and life span.

33. The performance of the equipment and its life span are also considerations, together with the materials used, in assessing another very significant aspect: environmental impact. We are all aware of the disastrous impact of fossil fuels but it is also important to fully appreciate the damage caused by the extraction of the rare metals and minerals used in the various types of renewable energy production and storage equipment. European societies refuse to accept these costs, but they exist nevertheless, and are being borne by populations in other parts of the world. Ignoring these costs (or underestimating them, for the sake of a clear conscience) will not advance the environmental cause at the global level. It may be that, at this stage of the energy transition at any rate, these costs are something we just have to accept, but research must be directed at reducing them as far as possible: alternatives need to be found and promoted.

34. In addition to the pollution and other environmental damage caused by mining, policy makers cannot ignore other forms of environmental impact that renewable energy production may have. Examples include the visual and noise pollution from wind farms, or the risks posed by the fracking techniques used (until now at any rate) to exploit geothermal energy. The presence of substances that may be hazardous to health (such as lead, for example) must also be taken into account. These are factors that ought to be considered in research policies in order to move towards solutions that can minimise this impact.

35. When we talk about equipment, we are talking not only about equipment that captures renewables and converts them into electrical energy, but also about the equipment that may be necessary to store electrical energy and then distribute it. It is important to remember here that what is needed is energy on demand. Fossil fuels and nuclear power are well suited to this requirement. Nuclear power plants and thermal power plants that use fossil fuels (within the limits of their capacity) can produce and distribute electricity in a modular way, according to needs, without waste and without disruption.[19]

36. Wind and solar power cannot guarantee regular production of electricity (the latter is dependent on sunshine and wind intensity, which are subject to major fluctuations depending on whether it is night or day, and what season it is) that can be modulated according to demand (which in turn varies with the time of day and time of year). When production is insufficient, it has to be supplemented and when it is intense, the energy produced is not (entirely) fed into the grid or used immediately. In order not to waste this energy - and in order to be able to use it when production levels are low - it must be stored. Today, the cost of storage technologies (i.e. batteries) is fairly low, so storage is a solution that could be suitable for daily (day-night) cycles. Storage, however, comes with its own set of challenges and constraints: for example, it does not seem to be a feasible solution for offsetting the large seasonal fluctuations in photovoltaic energy production.

37. The importance of this issue is magnified by the fact that moving to a carbon-neutral economy means using electrical energy for (almost) everything, and in particular for transport and heating. This will greatly increase demand for electricity, and make it absolutely essential to have both a steady flow of energy and electricity networks that are robust, resilient and secure. Here again, research and infrastructure development has a key role to play in exploring the various options for decentralising energy production, injecting surplus energy produced by individuals into the main grid, creating mini-grids and interconnecting them, or even the possibility of intercontinental and interhemispheric grid connections.

38. This last option was presented to our committee as a potential solution to the problem of seasonal fluctuations in photovoltaic energy production[20] and as a way to move towards a global clean energy system. To go in this direction, Professor Steininger listed some issues for research and innovation policy, e.g.:

---

[18] A short article by Bruno Detuncq and Bernard Saulnier entitled *L'énergie et le taux de retour énergétique*, published online by "*le Soleil numérique*" 26 February 2021 (updated on 27 February) provides some interesting figures.

[19] Among renewable energy sources, hydropower (produced by hydro plants using the force of water) makes it possible to match electricity production to needs easily and in real time; geothermal plants offer the same advantage.

[20] At the hearing on 5 February 2021, Professor Steininger told us that winter production was only 1/4 to 1/8 of summer production. One possibility therefore was to produce and store enormous quantities of excess electricity in summer, to be used in winter; the alternative – which was much cheaper – was to connect to the other hemisphere and exchange electricity, to the mutual benefit of regions in both hemispheres. Transmission cables would be used year-round,

- engineering, physics and groundworks of intercontinental and deep-sea cable transmission.

39. This option is attractive in economic terms and in terms of mutual development. However, it requires close international collaboration, as well as a very high level of mutual trust between the partners, both for securing delivery of the project (which also requires the various stakeholders to simultaneously expand their production capacity) and for managing the energy transmission system. It also raises the issue of the security and resilience of the system, because - beyond the goodwill and reliability of the partners - we unfortunately live in a world where the threat of terrorism is ever present and damaging an energy transmission system seems to be easier than repairing it.

40. Professor Steininger noted that there is currently significant demand for hydrogen/renewable electricity in industry and it referred to "circular carbon management", explaining that demand for steel production conversion and cement industry carbon capture and use (CCU) alone would by far exceed remaining additional renewable electricity capacity in many countries, not mentioning other demands (transport, household heat pumps, other industry). Here, the research issues would be the alternatives to hydrogen (as there were a lot of conversion losses) for selected applications and the integrated systems of functionalities and accordingly the integrated renewable energy systems. These remarks provide us with a first example of an interconnection between the matter of energy transition and that of the circular economy.

41. Finally, research to develop current renewable energies and reduce their environmental footprint should not prevent us from looking at new energy sources in parallel. Indeed, we are only in the 21st century and humility must incline us to think that there are probably sources of energy in nature that humans have not yet discovered. Thus, the knowledge and mastery of atomic energy are less than a century old and it is very likely that further discoveries remain to be made. This requires strengthening basic research efforts on the energies of the future and ensuring exchanges within the scientific community on any progress that might prove interesting in this regard. Similarly, it is important that states, despite the health crisis and its economic costs, do not abandon scientific research projects that will perhaps develop our knowledge towards the future control of sustainable, abundant and cheap energy.

3. Research into the circular economy

42. There will be no sustainable development without a radical change toward circular economy. Within the EU framework this is clearly perceived: the European Commission has adopted a new Circular Economy Action Plan - one of the main blocks of the European Green Deal, Europe's new agenda for sustainable growth.

43. The circular economy is a model of production and consumption aimed at extending the life cycle of products, to reduce the use of raw materials and waste production to a minimum. When a product reaches the end of its life, the objective is to recover as many of its materials as possible and keep them within the economic cycle, thereby creating further value without consumption of other resources.

44. Therefore, circular economy is opposite to the traditional, linear economic model consisting in a take-make-dispose pattern, and to planned obsolescence. It is about "closing the life-cycle" of products, services, waste, materials, water and energy, according to the approach which is be resumed with the "three RS": *Reuse*, *Repair* and *Recycle*.[21]

45. Developing the circular economy is a necessity. It stems firstly from the fact that the resources (not only energy resources) that we use are limited; reusing them reduces the risk of scarcity and in some cases (such as rare minerals) also helps to preserve the economic independence, or even sovereignty, of our states. This need is rendered all the more obvious by the fact that our economic model is also based on the perishable nature of the goods on the market and therefore on the need for users to replace them periodically; an economic model that should be questioned.

46. No less urgent is the need to move towards a circular economy in order to protect the environment. One only has to think of the growing difficulties encountered in managing non-recycled waste and the pollution

transporting energy in alternating directions. A combination of suitable locations in Europe, and for example in Australia, Saudi Arabia, Israel and South America could perfectly serve the current load profile of Europe, the best use of the transmission cable being when it connected areas with roughly equal economic activity levels.

[21] As Professor Steininger explained to us, a circular economy can be designed to adhere to three key principles of our transition towards a climate-neutral production and consumption system (meeting SDGs 12 and 13): the principles of inversion, integration and innovation. See, in this respect, the minutes of the hearing of 5 February 2021.

generated by its dispersal in the soil or the sea. An example that immediately springs to mind is plastic: finding a method for breaking down all plastic materials quickly, cheaply and in an environmentally-friendly way and then reusing their basic components would be a major step towards a true circular economy. To exemplify, among the research topics of the CNRS in France (research that also includes the social sciences),[22] I would like to insist on processes for the recovery of critical metals and rare earths.

47. A recent report on Raw materials demand for wind and solar PV technologies in the transition towards a decarbonised energy system, issued by the Joint Research Centre (JRC) of the European Commission, identifies possible actions to avoid raw material shortages, including recycling and substitution of critical materials, enabled through dedicated R&I programmes.

48. Directive 2006/66/EC requires at least 50% of the materials contained in waste batteries and accumulators to be recycled and imposes an obligation on producers to collect waste batteries at their own expense, before recycling them either by their own means or with the help of a specialist partner. The recycling of electric car batteries is an - entirely appropriate - obligation for all car manufacturers, therefore. There is a growing awareness in the automotive industry of the economic as well as the environmental challenges of battery recycling and in particular of the chemistry of lithium-ion batteries (or even cells), and therefore of lithium, but also of other metals such as cobalt, nickel or manganese.

49. The idea is to delay recycling as long as possible, by reusing batteries that no longer meet the requirements of an electric car, and then reusing as much of the raw materials obtained from recycling as possible in a "short loop", to make new batteries for electric vehicles. This reduces the extraction and transportation of new resources; in this circular business model, moreover, the lithium-ion battery gains additional value and so helps to reduce the cost passed on to buyers of electric cars.[23]

50. The example I have just mentioned also allows me to take up some of the points made by Ms Lazaric, which I think are particularly relevant. First of all, the economic impact of the circular economy should not be overlooked: in France, studies by the National Institute for Statistics and Economic Studies (INSEE) point to the considerable job creation potential of the green economy, which includes the circular economy and renewable energies: the circular economy sector is the one with the fastest-growing added value and the highest number of patents.

51. In addition, great entrepreneurial drive is being exhibited by major groups, start-ups and other circular economy players, such as co-operatives and all the social and solidarity economy bodies that are operating at the local level, are involved in social and innovative experimentation, employ social inclusion-based approaches and provide context-based local solutions in view of the major challenges of the circular economy.

52. The impact should also be noted – in this case beneficial impact – of regulation: environmental regulation (on energy and renewable energy but also on waste and recycling of plastics) has prompted industry to act, has brought about innovations and technological solutions, and has encouraged research on new scientific issues.

53. And also, it is essential to generate the conditions for a social acceptance of innovations, and therefore to recognise the importance of research in the human and social sciences to determine the social acceptability of innovations, as well as research into behavioural economics and into environmental preferences, to ensure that the circular economy could fit into a supply/demand dynamic.

54. Finally, the role of areas and regions should not be disregarded, as they are the drivers of that economy and of the social and solidarity economy; a top-down approach should be avoided, and the focus should be on the players that introduce innovative solutions in areas and regions and back them up, in order for the circular economy to be able to really have a social impact and reduce inequalities, which was a major challenge for the circular economy and ecological transition.

---

[22] Among other examples, Ms Lazaric mentioned: green chemistry in the durability of materials (R1), self-repairing materials (R2), chemical recycling of polymers and purification mechanisms and processes (R3).

[23] In 2018, the European Commission signed an innovation deal with several European manufacturers aimed specifically at encouraging the reuse of lithium-ion batteries before they are recycled. The Renault group, for example, has been deploying its lithium-ion batteries in stationary energy storage in an effort to extend their life cycle as far as possible; see here the article entitled "*Les enjeux du recyclage des batteries de voitures électriques*"; and here *the article on "L'économie circulaire de la batterie du véhicule électrique*".

4. Some thoughts on the governance of research policy

4.1. The need to consider geostrategic issues

55. The production and storage of renewables - and in particular solar and wind energy - requires large amounts of rare metals and minerals. According to the JRC report on "Raw materials demand for wind and solar PV technologies in the transition towards a decarbonised energy system" in a high-demand scenario, demand for many key materials is expected to increase significantly compared to today (e.g.: demand for germanium would increase 86 times; demand for indium, gallium, tellurium, cadmium, and selenium would increase between 36 and 40 times; and for neodymium, praseodymium, dysprosium and terbium between 14 and 16 times). This would put considerable pressure on materials supply. The report accordingly stresses that continuous assessment of future demand for key raw materials is necessary to ensure uninterrupted supply chains that facilitate the large-scale deployment of renewable energy in line with the strategic objective of carbon neutrality by 2050.

56. The European Commission "Orientations towards the first strategic plan for Horizon Europe" points to the need to ensure the competitive edge and sovereignty of EU industry (p. 70). Assuming that the current mines or known deposits of these minerals can meet exponentially growing demand over a sufficiently long period (which is probably not the case), we should not underestimate the risks to which we would expose ourselves by becoming dependent on the countries that produce these rare minerals whose widespread use (in the absence of their full recycling) can only lead to increased prices, scarcity and exhaustion.

57. Failure to take due account of these risks in research policies, with a view to countering them, will only make us weaker. Energy transition must be accomplished whilst preserving our economic independence and, ultimately, our sovereignty. We need to take account not only of economic, social and environmental constraints but also of the geopolitical risk in the approach to research innovation and work in the area of the energy transition, because, alongside sustainable development issues, there was also the question of markets and strategic autonomy.[24]

58. The above-mentioned report by the JRC identifies possible actions to avoid raw material shortages; these include diversifying their supplies, expanding trade agreements, and promoting new mining activities. I would however insist on two other key recommendations therein: increasing recycling and substitution of critical materials, enabled through dedicated R&I programmes, which should be considered whenever possible and economically feasible.

59. In this last respect, it is a pity, in my view, that an innovative project such as the one involving sodium-ion battery technology should be experiencing visibility and financing difficulties that are hindering the transition from prototype production to larger-scale manufacturing aimed at bringing the product to market; and it would be an even greater pity if the French company that developed this technology thanks to governmental and EU funding were to find itself forced (for lack of alternatives) to accept the tempting offer it has received to move to China.[25] Cases like these should be a wake-up call to us and it is vital that policy makers demonstrate consistency and foresight.

60. Going in the right direction, the European battery alliance (the "Airbus of batteries") is not repeating the mistake made with solar panels:[26] the European Union is investing in the development of supply, and innovation and research are central to the alliance. The plan places emphasis on the environmental aspects of batteries, on the circular economy and on eco-design; this can ultimately enable Europe to develop a competitive advantage and defend its own interests. For example, eco-design and recycling would not only limit the environmental footprint of batteries but also enable resources not found on the continent of Europe (but in China, India, etc.) to be recovered. Research nonetheless has to be done to set up urban mines, thus supporting, at the same time, local European industry.

[24] Thus, the shift to an entirely electrified vehicle fleet cannot be accomplished without careful reflection on the balance of power between Europe and China. See the minutes of the hearing of 5 February 2021 and figures provided by Mr Laboué in this respect.

[25] I am referring here to the project developed by the company TIAMAT, which was presented to us by Professor Simon at our hearing on 5 February 2021. See the proceedings of this hearing for further details of the project and the potential of this technology which in my opinion ought to be supported.

[26] The European Union had subsidised demand while China had supported supply, resulting in the European solar panel market being completely crippled by extremely competitive supplies from China.

4.2. Pooling research efforts at national and international levels

61. Whatever the strategic direction of research, working in synergy and pooling research efforts is essential. The collaborative approach affords an opportunity to better address three types of difficulties:

- the complexity and multidimensional nature of the problems in question, which require multiple skills and areas of expertise that the various stakeholders often possess only in part;
- the delays inherent in exploration and the need to test solutions so as to select only processes and products which show promise, delays that the collaborative approach can help overcome through task sharing (including according to respective expertise);
- the costs involved in research, experimentation and evaluation of proposed solutions, and in product development and marketing, all of which involves a degree of financial risk that is very difficult for players to bear on their own.

62. Professor Simon gave us the example of the Research Network on Electrochemical Energy Storage (RS2E) and of the virtuous circle created by laboratories carrying out basic research and, through the establishments specialising in technology transfer, transferring it to the industrial partners. In his opinion, the major European research projects should draw on the structuring of research at the national level and should strengthen the joint funding of laboratory-industry projects on strategic matters. In such projects, laboratories very quickly identify innovative developments and start-ups are there to take on the risk inherent in innovation and grow rapidly with the support of the major companies to develop academic-industrial collaboration; therefore from the outset, synergies need to be strengthened between laboratories and industry on issues identified.

63. In the same vein, Professor Steininger highlighted that pooling of efforts, to get cross-company value-added chains working is crucial. Common research can be the leverage to foster such collaboration. A successful transformation to a green economy involves effective solutions in individual subsystems, but the connection of subsystem solutions is also crucial; therefore, research governance needs to foster and support work on these connections.

64. In order to enhance collaboration, synergies and pooling of efforts at domestic, European and global levels, Professor Steininger proposed to value the role of science. Co-design, co-creation, co-production between scientists and stakeholders is already broadly taking place and science could partly act as a “neutral” information broker between society and even policy, on the one hand, and industry on the other; it could provide a dialogue platform for information exchange. However, new skills are needed for science reaching out to practitioner-policy dialogues and stakeholder dialogue processes and transdisciplinary research should be fostered.

65. Regarding public-private synergies, he considers that national and European research funds needed to be geared more towards long-term innovation demands.[27] He also advocates co-operation between universities and large companies and the creation (which should be fostered with incentives) of consortia among large companies to work together with publicly funded science. Finally, he underlines the importance to define core areas (e.g. renewable energy) where co-operation outside the EU is crucial and to design the research framework accordingly, to allow for such co-operation for mutual benefit.

66. Mr Laboué reminded us that China’s spending on R&D already exceeds that of the European Union: no European country is in a position on its own to release sufficient investment capacities or offer a large enough market without the development of synergies with other European countries. In this regard, the projects of common European interest (IPCEIs), such as those concerning batteries, can play a key role to trigger European synergies throughout the value chain.

67. More broadly, there are many European programmes in which all stakeholders, even small players, could take part; it may be possible for national authorities in EU countries to strengthen the European dimension of their research policies, and to encourage and support participation in these programmes through tools such as better information, advice and assistance in completing the required steps and procedures and financial incentives.

68. Ms Lazaric widens our horizon in two important directions. First, public action (at all levels) should not lose sight of the “common good”; therefore private interests should not take precedence over public interests and thus relegate the common good and the sustainable development goals to the back burner. Second, concerning international research, many players from sub-Saharan Africa or South East Asia were completely

[27] For example, he suggests targeting not only carbon capture and storage but also carbon capture and use to really have a circular economy.

absent when it came to the subject of the decarbonised economy: co-operation agreements should be put in place to include all absent players and enable them to participate in international research.

5. Final remarks and proposals for action

69. Mr Berloznik urged us to frame the discussion on research policy in the current context: a "world of change", where changes are rapid, including within the Science, Technology and Innovation (STI) and knowledge systems; a world whose constituent parts are interdependent. Interconnections must be taken into account, both in decision making and in the quest for technological answers to current problems, and these answers are perforce multisectoral. At the same time, policy solutions (and hence plans) necessarily involve several levels, from local to international, both in their development and in their delivery.

70. The current complexity is also due to the increasing number of actors in the STI system. Alongside traditional actors, governments, universities and the private sector (the so-called "triple helix"), citizens and communities have entered the fray, contributing to the development of new ideas and approaches. Citizen participation is, in this context, both a democratic requirement and a condition for achieving the desired results: citizens are the drivers of the paradigm shift, and the ones who bring it about through their action.

71. Interdependency and complexity trigger cross-cutting fields and issues-oriented co-operation between researchers and Research and Development (R&D) actors, and make this co-operation indispensable; for example, water issues, climate resilience, energy and resource management go hand in hand. New R&D communities (“virtual” but also “spatial” ones) are established around the emerging issues; for example, in the field of energy, there is a concentration of knowledge in specific places, where universities, research institutes and start-ups were working together to build knowledge, and usable, efficient and effective technologies and solutions.[28] These developments meant new governance challenges. Not only funding and how to distribute funding but also how to cope with these new complexities.

72. Against this turbulent backdrop, the Sustainable Development Goals point the way. Support for these goals and awareness of the need to build a sustainable future for our children are rapidly gaining ground in our societies: they should inspire our action plans, and guide efforts and funding priorities for research, innovation and development.

73. In this respect, I agree with Mr Berloznik that the future is for “sustainable solutions-targeted policies". Our policy action must not be diverted from the path of sustainable development; at the same time, this action must remain pragmatic and effective, and must be aimed at concrete solutions, because we are running out of time.

74. We should start from existing solutions, i.e. existing effective, market-ready technologies and help them to go on the market and upscale them. This requires new and creative approaches.[29] Similarly, at national level, we need to make the best use of existing funding mechanisms and organisations that are already promoting and supporting new approaches. An interesting idea[30] is to develop a technology watch activity in strategic areas (based on start-ups) and to consider possible innovations in order to identify the best of them and support their development.

75. To support innovative projects and the move to the commercialisation stage, significant funding and/or the development of partnerships with industrial manufacturers is required. There is thus a need for funding mechanisms that can be activated with a degree of flexibility and speed and for incentives to create research-industry partnerships of this kind.

76. It may seem tactless or naive to talk about increasing spending at a time when the public finances in all countries are under severe strain due to the economic impact of the Covid-19 pandemic and the urgent need to address the social distress that this pandemic has caused among the more vulnerable sections of the population, in Europe and elsewhere. When seeking to rebuild our societies and economic systems, however, tomorrow's world is precisely the one we should be looking to, not yesterday's. To some extent, the crisis is an opportunity for change, one that we cannot afford to miss. Research and innovation for the green economy must be among the "beneficiaries" of national post-crisis recovery plans.

[28] Mr Berloznik gave the example of EnergyVille in Flanders.
[29] Mr Berloznik gave the example of the “Green Climate Fund”, a financial mechanism of the UNFCCC and of the Paris Agreement, which was funding incubators and accelerators, specifically targeted at picking up existing, sustainable, technologies and seeking to push them on the market.
[30] It was presented by Professor Simon.

77. Among the possible financing solutions, consideration should perhaps be given to issuing public debt securities aimed at strategic research in the fields of energy transition and the circular economy: "green bonds" to be promoted among the general public. Also, staying with the idea of leveraging civic engagement, governments might consider supporting the establishment of a national online platform with a selection of innovative projects to which the State would undertake to provide financial support and which would be open to participatory financing. Banks might conceivably support such a project, or at least undertake to inform and advise their clients about the existence of these participatory schemes.

78. Furthermore, active civic participation and engagement is key to building the green economy. If the ecological transition is to succeed, a collective effort is needed and all our citizens must be involved, not at the end of the chain but from the outset. Behavioural economics should not make corrections at the end of the process but make it possible to co-design technical solutions and the innovations of tomorrow. Citizens must know that they are protagonists and not merely spectators.

79. Research and innovation in the areas of energy transition and of circular economy are of major geostrategic importance. The choices we make must also take into account the risk to our industry of blindly and hastily adopting technology that we have not sufficiently mastered and the dangers of dependence in the supply of raw materials or strategic components, which would undermine European political autonomy.

80. The economic and strategic stakes behind technological progress may, in certain cases, create a barrier to international co-operation in the domains of energy transition and circular economy. It is however dangerous to turn one's back on close collaboration in these research fields. The fight against climate change is an absolutely key issue that concerns us all; we must all contribute to finding the right solutions and be able to share them.

81. We must begin by making greater efforts along these lines within the European framework. The 27 member States of the European Union are moving in this direction, as the programme *Horizon Europe* and the previous *Horizon 2020* clearly show, but Europe is bigger than the EU and it is important that we be able to work together (for example, through transnational research programmes) on a wider European scale.

82. In this respect, I see a key role for the Council of Europe, a new way of working to strengthen the ties that bind us and the solidarity between our peoples: I suggest we think about creating a framework – an enlarged partial agreement, for example – that would allow us to move forward together by pooling ideas and research resources for targeted projects. Perhaps the Council of Europe Development Bank can also contribute its expertise and help create funding mechanisms for these joint research projects. Some thought could also be given to creating a strategic resource bank, to create stocks and manage them in a mutually beneficial way, so as to strengthen the strategic independence of all our countries.

83. By the way, it is probably not sufficient, even if it is necessary, to move in the right direction in Europe if other regions lag behind; the impact of inaction or inefficiency in other parts of the world will in any case be global, because the consequences of climate change are global. Here again, pooling efforts can become an instrument not only for shared sustainable development but also for peace and friendship between peoples.

84. Reducing the effects of climate change by developing renewable energies, by discovering new energies and by inventing methods of recycling all raw materials, all this through scientific and technological research, is a fascinating challenge for Europe and for the world. Saving the planet is not incompatible with progress and is even achieved largely through progress. Imagining ways of working together between states in the Council of Europe, in accordance with our statutes, could be a way of working for our Organisation; European citizens expect strong answers in the field of the environment and, in the spirit of European construction, it is the de facto solidarity that we will be able to create, today at the level of Greater Europe, which will bring people together and ensure that peace is maintained in the coming decades.