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The Energy Transition Emergency - What is at Stake?

ANNE-FRÉDÉRIQUE PAUL & MARC DELEPOUVE

What kind of energy transition do we want?

A diversity of discourses on energy transition

Many different discourses advocating a change in our energy system have been voiced by various social protagonists. No wonder then that the sum of this multitude of discourses results in different, sometimes incompatible, options for an 'alternative/renewed/modified' energy system. Accordingly, a variety of 'energy transition pathways' towards these changes have been proposed.

Many discourses are mainly focused on the development of new, mostly 'renewable', energy sources. However, it is not just a matter of providing new energy sources and new means of exploitation, storage, and distribution of energy. We think that we should also deal with the questions of the quantity (produced and consumed) and quality (for people and for the earth), that is, with all the components of the energy system from the exploitation of sources to the different uses of energy.

Indeed, we feel that the first and foremost question of the energy transition is not that of its sources or the way in which they are exploited but the question

'What energy system do we want?'

Energy is central to human activity since it has the potential to expand it and make possible new human activities. Furthermore, energy, through human activity, can profoundly change individuals, society, and ecosystems. One could say that energy is at the core of all human life and activity (even though this may not always be apparent, as history has frequently shown).

In human society, energy depends on complex energy system(s): socio-technical system(s) encompassing all the protagonists, structures, networks, processes, and institutions ... that permit the supply of energy and support human activities.

What energy system do we want?

Our position is that the current energy system should be changed to one that is at once:

- ▶ responsible, promoting a just and solidary energy system;
- ▶ and socio-ecologically sustainable.

That is, an energy system that is less harmful to human beings, society, and ecosystems.

An increasing number of citizens and many public figures and institutions have also advocated this goal.

Responsibility

Responsibility is a value that is deeply connected to ethics and involves the questions:

'What is good? What is right? What should we do?'

Humanly and **socially**, one is not only responsible for one's own life, potential, choices, and actions but also for others' life and potential, whether one does or could know them personally. **Ecologically**, one is responsible for the preservation of our environment.

In practice, one ought to develop capacities (that help shape our future), weigh the options, make choices, and act in accordance with these decisions as best as one can, depending on one's knowledge, means, and capabilities.

To expand on this vision, we can cite the Declaration of Human Duties and Responsibilities (DHDR) which was proclaimed in 1998 'to commemorate the 50th anniversary of the Universal Declaration of Human Rights'. Its aim is to strengthen the implementation of human rights under the auspices of UNESCO and the UN High Commissioner for Human Rights. It sees the major challenge for the 21st century as the effective and efficient realisation of human rights for all people. It formulates duties and responsibilities so that all members of the human family can act on the basis of our interdependence.

To our mind, this definition of responsibilities should not be limited to human rights but broadened to include every human dimension: the individual, the societal, that of our shared environment, both in terms of the present and the future.

Solidarity

Solidarity is the basis that grounds 'living together':

- ▶ each person belongs to the same universal community of human beings who share our planet;
- ▶ each person belongs to this society, and each recognises the collective and is recognised by the collective, with all the moral and practical rights as well as obligations this entails.

Solidarity requires:

- ▶ **mutual recognition and acceptance** of our diversity, our values, and aspirations;
- ▶ **mutual aid** in order to develop ourselves, our society, and our environment according to our different values and aspirations.

The collective is, at the same time, dependent on and shaped by the **Commons** (in the sense that the Commons encompasses all the constructed or natural collectively managed entities). Consequently, each has to contribute to the preservation, enrichment, and accessibility of the Commons.

Furthermore, the collective:

- ▶ requires commitment and contributions according to one's means and capabilities;
- ▶ and, conversely, can be depended on by the collective to benefit from this mutual 'care'.

All states and each population can and should contribute with the richness of their diversity to the collective goal of meeting the current and future global challenges. Furthermore, those challenges call for the mobilisation of all states, every population, and each individual.

This necessary general and collective mobilisation cannot be accomplished without major interventions to reduce (ideally to level out) the highly unbalanced power relations as well as the blatant inequalities.

The earth, our common home, is undergoing increasing and irreversible anthropogenic changes that jeopardise life as we know it. We are thus at a major turning point in human history, which requires worldwide and lasting solidarity everywhere.

Framing the question

Before proposing any scheme for an energy transition, we must specify 'what the goals are' and legitimate them; and then we must ask: '*Which kind of energy system do we desire, accept (and actively promote)?*' Only then will it be possible to propose a pathway that could promote and sustain an energy transition that could lead to a 'renewed' energy system.

The first question that we must therefore address is: '*What is at stake?*', with the understanding that the answer is inherently dependent on how we conceive of the state of the world, the direction in which we think it is going, and the direction in which we want it to go.

What is at stake?

In our view (as voiced in a number of energy transition approaches), the ambitious goal of promoting a

more sustainable and less destructive energy system requires that we look at the challenges we collectively face. That is, we need to **frame** and **justify** what it at stake.

We identified seven major stakes that should be addressed individually and as a whole.

Ecosystem preservation

A growing number of people are seeing or directly experiencing the increasing **global and irrevocable changes in their environment that have deep impact on people, societies, infrastructure and nature.**¹

A wide range of unrelated analyses confirms this observation, pointing to increasing frequency, intensity, and diversification of change and damage, and a growing number of places affected.

It is true that ecosystem changes are 'normal' in the sense that, on a geological scale, ecosystems are not

¹ We will use the expression 'ecosystem **changes**' instead of the often found 'ecosystem **degradation**'. In fact, these changes are more often globally detrimental to the continuation of current human activity, health, and/or environment, in short, to humanity's future. However, the earth has undergone numerous dramatic changes, which can hardly be labelled either good or bad. Changes simply lead to different stases that can be more or less hospitable to human beings...

and never were stable; they go through phases of relative stability ('stasis' with slow and progressive changes following a relatively linear path) interspersed by periods of dramatic changes leading to very different (and unpredictable) new stases.

Historical data show that from the end of the 17th century (which corresponds to the advent of the industrial revolution), **environmental changes are accelerating while becoming increasingly diverse and extensive.**

- ▶ **The changes observed up to now have been very diverse**, involving climate, ecosystems, soils, water flows, biodiversity... indeed every ecological dimension studied so far appears to be affected.
- ▶ These changes are **already affecting human activities**, and they are **beginning to destabilise whole societies, sometimes even directly threatening human life**. The acceleration, diversification, and intensification of these systemic changes are thought even to worsen the already observed destructive effects on human beings and their societies.
- ▶ **If humans are affected by these ecosystem changes, they are also one of its main causal agents**. There is wide agreement around the idea that people and their activities (or at least the activities of certain groups of people) are a significant causal factor in these changes.²

Being highly dependent on the exploitation of fossil energy resources (ranging from coal to non-conventional hydrocarbons), **our current energy system is a significant causal factor in these changes**. Specifically, the current intensive exploitation of fossil fuels constitutes a major source of ecosystem disruption (along with being a source of pollution as well as many tensions and conflicts).

Consequently, any reflexion on energy transition should be aimed at preserving our environment by

promoting an ecologically sustainable energy system.³

In particular, we have to deal with the climate change (in Europe, as an example, almost 80% of greenhouse gas emissions have to do with the energy system⁴). For this purpose, one immediate and concrete goal is to rapidly curb (and ideally stop) the use of fossil fuel in Europe. Another important goal is to drastically reduce the energy system's waste production (radioisotopes, contaminated materials, used batteries, discarded solar panels, etc.). Finally, it is also important to limit the destructive consequences of producing certain kinds of 'renewable' energy (for instance, the ecosystem destruction due to dam construction, or the reduced soil fertility, the degradation and depletion of the water resources, and pollution resulting from the production of certain kinds of agrofuel).

The maintenance and/or improvement of health and the standard of living

Human-caused environmental change is also accompanied by two other phenomena that directly affect human health and well-being, some of which are even **life-threatening**.

- ▶ The first is the generation of **pollution** (whether chronic or acute, localised or widespread).
- ▶ The second is the **depletion and/or degradation of a wide range of 'natural resources'**⁵ (water, soil, food, raw material, land, biodiversity...) crucial for sustaining human life, activities, and societies.

In many of these changes, the energy system is widely recognised as playing a direct or indirect role, sometime a very important one (in particular through the exploitation of both fossil fuels and radioactive material).

At the same time, the energy system plays an instrumental role in the improvement of health, well-

² For this reason, the name 'anthropocene' has been proposed to define the current geological age; it would follow the 'holocene', which is marked by the global impact of the advent of agriculture, which we can trace back 10,000 years, the emergence of agriculture being the first historical human-defined geological age characterised by the worldwide impact of the human species). The anthropocene is marked by global and widespread geological changes brought about by humans and their activities. These changes are, for most scientists, a consequence of the industrial revolution and its subsequent developments.

³ A sustainable energy system in this context means an energy system that allows the preservation of ecosystem diversity and productivity, which are two key elements making up the environment, the natural resources, and the ecosystem upon which human beings and their societies depend.

⁴ According to estimates of the European Environment Agency: http://www.eea.europa.eu/fr/pressroom/newsreleases/ghg_inventory_report-fr

⁵ The importance for us relies in these 'natural resources', as well as their fragility and vulnerability, their overexploitation, degradation and depletion, and their appropriation, is most often a (direct) consequence of their status as 'natural resources, there for our benefit'. That is why we would like an acknowledged and official change of their status from that of (commodified) 'resources' to that of a **'Common'** (that is, all the natural or constructed elements that are shared and collectively managed).

being, and capacities, and it must continue to play this role, everywhere in Europe and in the world. Nevertheless, there are currently a great many people suffering from energy shortage/deprivation (whether due to a lack of availability or unaffordability), and the quality of life of these people would be improved by easier access to energy services.

Taken together, ecosystem changes, pollution and the depletion and/or degradation of nature lead to the **deterioration of everyone's health and well-being** (not to mention the direct threat to their integrity or lives) **while simultaneously reducing individual and collective capacity and prospects**.

We therefore maintain that in order to preserve and promote health and a decent standard of living a desirable energy transition should not only be **made more sustainable but also more benign** in terms of people, societies, and ecosystems.

Respecting fundamental social rights

Conceptions of health, capacity, and a decent standard of living vary from one society to another and from one person to another. However, in our view, everyone should have real access to the fulfilment of his or her basic social rights, independently of the wide range of people's aspirations, values, and beliefs. By basic social rights – in other words, **'fundamental social rights'** – we mean effective access to food, potable water, healthcare, education, transportation, and decent and sanitary housing.

The energy transition we advocate is one that makes possible adequate access⁶ to the energy system that, if all the other necessary conditions have been met, **sustainable satisfies the vital needs associated with fundamental social rights** (food, potable water, healthcare, education, transportation, and decent and sanitary housing).

For a number of countries, insufficient and unreliable energy production, difficulties of distribution, and/or

unduly high prices in terms of the people's financial means constitute major obstacles to the satisfaction of these fundamental social needs. At present, there are still an estimated 1.2 billion people deprived of electricity⁷, of which 620 million are in sub-Saharan Africa⁸.

Furthermore, with the way energy is now produced from biomass, agrofuel directly competes for resources with food production (as well as other essential agricultural production such as wood, interest molecules, etc.). This has direct and dramatic effects on the price and the sheer quantity of food available and, thus, is a factor in malnutrition. In 2015, an estimated 800 million people are still undernourished globally (even though this number has been declining since the 1990s⁹). Moreover, social and environmental problems and tensions emerge where agrofuel is produced through intensive, industrialised, and financialised agriculture that replace local practices and often resorts to land, water and workforce grabbing.

Promoting a socio-ecologically sustainable energy system

The most commonly used and cited definition for **'sustainability'** is derived from the definition of **'sustainable development'** (which is not the same thing¹⁰) formulated in the Brundtland Commission: **'the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs'**.

This definition has often been associated with the iconic Venn diagram showing sustainable development at the intersection of ecology, society, and economy. The diagram was published in 2005 in the IUCN's 2005–2008 Programme¹¹ and was meant to emphasise the need to better integrate the three objectives, with action to redress the imbalance between dimensions of sustainability.

6 Access means both the **availability** (the possibility of access) and the **actual possibility** of accessing and benefiting from the energy system **when and where needed**.

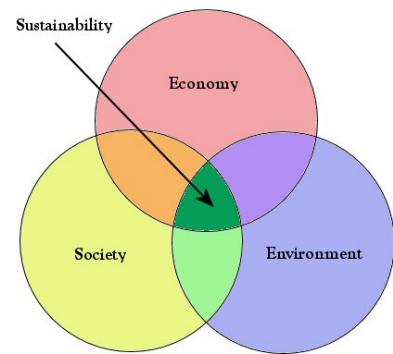
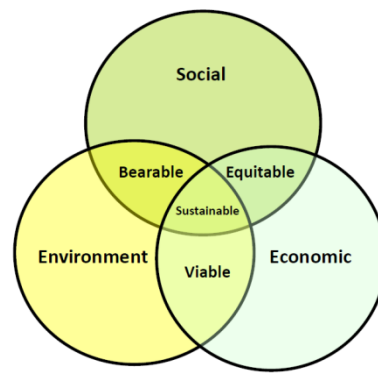
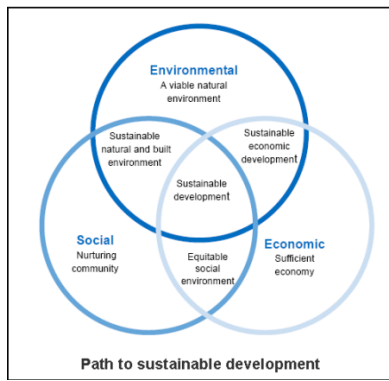
7 <http://www.banquemondiale.org/fr/news/feature/2013/05/28/Global-Tracking-Framework-Puts-Numbers-to-Sustainable-Energy-Goals>

8 <http://www.developpement-durable.gouv.fr/L-Agence-internationale-de-L41647.html>

9 **Undernourishment** means that a person is not able to acquire enough food to meet his or her daily minimum dietary energy requirements over a period of one year. The FAO defines hunger as synonymous with chronic undernourishment. <http://www.fao.org/hunger/en/> and <http://www.fao.org/hunger/key-messages/en/>

10 **Sustainability** is an ideal state, while **sustainable development** is a trajectory that actually aims at bringing human activity and life closer to this ideal.

11 http://cmsdata.iucn.org/downloads/programme_english.pdf



Examples of Venn diagram illustrating sustainable development (note that the content of the circle at the top in the three different sections is different; this difference can voluntarily or involuntarily indicate or influence a specific point of view giving more importance to the item positioned above the two others)

For us, economy and finance should be no more than a component of society, a component which shapes, and at the same time is shaped by, society. More importantly, economy and finance must be no more than means at the service of people, societies, and their environment and not ends in themselves. Therefore, for us sustainability is focused on socio-ecological sustainability.

Sustainability has, according to the context and/or approach, a wide range of meaning. One way of understanding this wide range is to think of sustainability as being on an axis which is a continuum between two connected poles: the ecological perspective vs. the well-being-perspective as illustrate below.

<p style="text-align: center;">ECOLOGICAL sustainability perspective</p>		<p style="text-align: center;">WELL-BEING sustainability perspective</p>
<p style="text-align: center;">At the forefront is the ecological limits for human growth and development.</p>		<p style="text-align: center;">At the forefront is well-being and quality of life.</p>
<p>For some people, these limits can and should be scientifically objectified and there is only one way to define sustainability, which is thus an absolute notion, characterised by a set of science-based and objective indicators and measurements.</p>		<p>From this perspective, sustainability is situation- and aspirations-dependent and results from societal choices, context, circumstances, and trajectories.</p> <p>Consequently, a great many different opinions are included in this pole.</p> <p>Sustainability is a hazy and relative notion, which has a normative function (a social conception of what is good in the here and now).</p>
<p>The main goal of this perspective is ecologically sustainable development, including the webs formed by all the entities and systems on earth, everywhere and for each dimension, for the present and the future reaching beyond human beings.</p>		<p>The main goal of this perspective is psycho-social sustainable development, which includes human lives and aspirations, and health and environment in the diverse populations and societies, each with their special context, circumstances, and trajectories.</p>
<p>We think that this approach is a simplistic approach that does not take into account the complexity of the earth's system (see Part Two: The Emergency of Climate Change) as well as the deep interconnections and interdependencies between our environment, our societies, and all of human life and activity.</p>		
<p>THE ECOCENTRIC POLE</p>		<p>THE ANTHROPOCENTRIC POLE</p>
<p>SUSTAINABILITY</p>		

Our view is that one should not try to position sustainability (and thus, a sustainable energy transition) along this continuum. We prefer to conceive of these poles as forming a whole, which then underlies a much more inclusive conception of **sustainability**.

Action promoting a sustainable renovated energy system should take into account three factors that characterise sustainability (these factors are cited in most of the different (and divergent) definitions of sustainability):

- ▶ sustainability is a **complex, holistic, global, and polymorphic notion** that cannot be easily tackled, and it thus requires a great number of different viewpoints;¹²
- ▶ sustainability is a **complex social and inter-generational issue** at the core of a web diverse parties, each with their own beliefs, values, aspirations, and interests, and their own constraints, resources, and trajectories;
- ▶ sustainability **can only be achieved through strong, worldwide legitimised institutions** that, at present, do not exist or do not have the full and/or sufficient authority, power, and means to enforce action.

From this rather theoretical reflexion we conclude that:

Sustainability, when dealing with global and pressing socio-ecological issues that concern everyone, everywhere, now and for the future, **should be understood as a socio-ecological sustainability question, where ecological systems and human systems** (that is, 'natural' and 'constructed' systems) **are intrinsically inseparable**.

Furthermore, **there are no 'absolute' or 'normative' ways of determining what kinds of action promote sustainability**. For each individual case, according to the protagonists, the means, the constraints, the context, circumstances, and trajectory in which these actions are inscribed, the same questions must be raised:

'What are, according to our best knowledge, means, and abilities, the best (or least destructive) choices that we can make in order to have the most beneficial and solidary effect possible on people, societies, and ecosystems?'

Local decisions to move towards a more sustainable system call for a global vision

A proposal can be locally sustainable. However, its effects when viewed globally can have the opposite effect. An example is the net reduction of greenhouse gas emission by the West : an important aspect of this net reduction is simply the simple export of their emissions to other states with less stringent regulations and/or cheaper labour (for instance China and the other emerging national economies.)¹³ Furthermore, the moving of industrial production to such states had and still often has unintended and/or unpredictable social and/or ecological effects (whether positive or negative).

Consequently, each decision in implementing an energy transition should be analysed at both the local (or, rather, the situated level) and the global level. The global level is the paramount criterion, and every choice should be made by asking (and answering) the following question :

'Is my specific action, here and now, to the best of my knowledge, capacity, and efforts, useful for the common and collective goal of promoting a sustainable (and beneficial) energy transition?'

¹² In other words, it is not possible to define in an absolute manner what is and what is not sustainable. For each issue, according to the place, time, and circumstances, the answer can change and should be continuously adjusted according to the evolution observed, our level of understanding, and other considerations.

¹³ See, for instance, the latest report from the Intergovernmental Panel on Climate Change (IPCC).

Energy transition and socio-ecological change are inseparably linked, and, if their interrelationship is judiciously conceived, they can nurture and reinforce each other.

Socio-ecological measures to promote transition towards sustainability are more than theoretical concepts. Very practical measures can be proposed that would be useful for energy transition while having beneficial social and ecological effects. An example, among many others, would be the promotion of a more circular economy¹⁴ in which goods (material or otherwise, such as data or services which always require material and energy) are considered in the context of a global life-cycle where their design, production, uses, maintenance, renewal, and replacement, as well as their recycling and the use of recycled materials in their construction, are conceived and planned as a whole and inserted into a functioning socio-economic and ecological matrix. All these steps must be considered together and seen as a whole in a given context and aim at sustainability.

The 'life' of each good should be conceived globally from its design to the re-insertion of its components within other goods. The aim is to reduce the consumption of energy¹⁵ and material at all steps of its life-cycle. (This conception requires material should be sparingly used; the aim is to use as much recycled material as possible and to produce a truly recyclable good).

Such a move to a more inclusive way of conceiving of the 'life' of goods could prove efficient in terms of energy and ecology as well as being socially beneficial (different productive activities would be more closely connected through shared interests that would go beyond merely financial ones), positive for humanity (people would move away from a consumer attitude to a new outlook in which everyone contributes to the life of a product, in which 'green gestures' take on a much more tangible reality, and where sharing and/or renting counteracts the throwaway attitude).

We should emphasise that a true circular economy is still only a project. Although there are efforts today to promote it, in many cases it amounts to a kind of mock circular economy resulting from unjustified windfall profits while genuine attempts are impeded by the complexity of changing the whole socio-economic system.¹⁶

Conversely, social measures can also facilitate energy transition.

An example, among many others, would be a reduction of the work week to 32 or 30 hours on a European scale. This would increase the available time for activities other than jobs and allow the expansion of social nexuses, such as cultural and educational activity. This could also contribute to another form of 'development' and 'progress', one which would not result almost exclusively from the production and consumption of goods and the servicing of their financial avatars. In a nutshell, reduction of the legal work week could, if part of a whole socio-ecological transition, help reduce humanity's ecological footprint as well as promote personal and social development.¹⁷ This is still more in the realm of wishful thinking than reality. That is why we also would like to use as an illustration an actual social modification that leads to the reduction of energy consumption: the development of carpooling. Carpooling initially resulted from spontaneous commuter initiatives, which were subsequently promoted both by private entities (such as BlaBlaCar) and public ones (for example, many French regions and départements that promote free internet linkup systems, and patrolled meeting and parking sites in close proximity to communication nodes – highways, public transportation stations, etc.). Carpooling emerged as a solution to the increased price of individual mobility and increased time used in transportation; it has proved to be a new source of human interaction as well as providing an economy of energy¹⁸ (and matter), as well as contributing to pollution reduction.

We are aware that linking energy-efficient measures to social beneficial ones (and vice versa) is not a straightforward process; one does not necessarily imply the other. Thinking through these measures and their direct and indirect consequences, both from a situated and a global point of view, is necessary in both the short term and the long term. In these measures, very slight alterations in how, where, and when they are applied can cause major discrepancies in their final effects. However, judiciously conceived measures can prove to have major positive consequences; energy transition is not necessarily an endeavour implying only effort and sacrifice; it is also an opportunity to discover and build a path to a worthwhile life.

14 See for instance the European Commission roadmap 'Circular economy strategy' http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2015_env_065_env+_032_circular_economy_en.pdf

15 See the Strategic Energy Technology Plan (SET Plan) Towards and integrated roadmap: research & innovation challenges and needs of the EU energy system https://setis.ec.europa.eu/system/files/Towards%20an%20Integrated%20Roadmap_0.pdf

16 See 'Le pari de l'économie circulaire', Alternatives Economiques 349 (September 2015).

17 For an analysis of the gains and pitfalls of measures promoting work-time reduction, see Giorgos Kallis, Michael Kalush, Hugh O'Flynn, Jack Rossiter, and Nicholas Ashford, "'Friday off': Reducing Working Hours in Europe", Sustainability 2013, No. 5, pp. 1545-1567 (doi:10.3390/su5041545) <http://ashford.mit.edu/sites/default/files/documents/G86.%20Kallis%20et%20al.,%20Sustainability%202013,%205,%201545-1567%20pdf.pdf>

18 See for instance Paul Minett and John Pearce, 'Estimating the Energy Consumption Impact of Casual Carpooling', Energies 4, No. 1 (2011), 1pp. 26-139, <http://www.mdpi.com/1996-1073/4/1/126>.

Promoting an energy system that allows for living decently and for planning the future

As already stated, energy is at the core of human life, activity, and societies, and our dependency on energy sources and energy systems has dramatically increased since the industrial revolution.¹⁹ Consequently, any shortage of energy or dysfunction in the energy system can lead to dramatic consequences. For instance, the accidental shut down of electricity, whether temporary or intermittent, endangers the very life of people in hospitals, and necessarily effects the activity of many people as well as the economy.²⁰

There are many different, and often synergetic, causes of energy shortages or, in less acute cases, changes in energy availability. These causes are multiple, not always predictable, and not necessarily preventable. Thus many **monitoring, backup, and protection systems, as well as laws and regulations have been devised, actively enforced, and constantly improved.** Even when very carefully designed, these systems, laws, and regulations cannot provide for every (unforeseen and/or unpredictable) event, and therefore many of them have only been put in place after an observed (and analysed) dysfunction. History shows that not all the potential disruptions or malfunctioning of the energy system could not be prevented, and each time they were not prevented there was a wide range of harmful human and societal consequences.

Thus, we collectively need to design an alternative energy system that is both secure and robust: **secure** in that it is as resistant as possible to threats (whatever their origin and whether they are accidental or deliberate) and to human errors; **robust** in that it maintains its global functioning and the energy services it provides, whatever the challenges, stress, and malfunctions it may face.²¹ A secure and robust energy system is thus one which can resist any disturbance arising from either natural causes and/or human action.

This energy system must be one that everyone can depend upon, where and when needed and in the form and quantity required. The availability of energy, as well its capacity to fuel a wide range of different uses, must be ensured. **The energy system furthermore constitutes a vital collective service since** energy is essential for preparing and planning for the future, thus playing an important role in both **the individual's and the collective's capacities to project the future, and thus their hopes for betterment.**²² Consequently, any unpredictability and/or uncertainty involving such a crucial issue represents a significant source of stress, anxiety, unhappiness, and dissatisfaction.

Adjustability and adaptability are two characteristics which, though often forgotten, are crucial. An **adjustable** energy system is one that can adapt to the variations of production and consumption in order to continuously ensure different (and variable) energy services. An adjustable energy system is one that permanently accommodates changing demands and contexts. An **adaptive** energy system is one that allows for overall changes in structure and/or function in the medium and long term in order to meet future needs and deal with future constraints. It prepares and provides for future services.

More than simply providing for the sustained functioning of an energy system, it is important to promote a system that is at once:

- **more secure and robust;**
- **more reliable;**
- **readily adjustable;**
- and **adaptable.**

The challenge we are facing is overwhelming. Many people are confronted with numerous difficulties simply in providing for day-to-day needs (while some others publicly enjoy comfortable, free and, spendthrift lives). At the same time, their lives are made more difficult by the consequences of a number of global issues (air-pollution-related disabilities and diseases, climate change, ecosystem modifications, political tension, and social unrest connected to energy resources).

¹⁹ Some would say that human beings have become energy-addicted since some energy services have become psychologically and/or socially necessary even though they are constructed and not imposed needs.

²⁰ This also explains why energy system unreliability (such as in most of sub-Saharan Africa or in Bangladesh) as well as energy unaffordability for many poor people (whether in developed, emergent or developing countries) are a major impediment to one's aspiration to a 'good life' or even to decent living conditions.

²¹ Maintenance of an energy system does not exclude its being transformed: it necessarily changes (structurally or in terms of its function), but in a controlled manner in order to preserve its usefulness.

²² For us, clearly, progress is not limited to material conditions but above all denotes human and cultural development.

One way to collectively deal with these issues is to invest in deep changes in the energy system. It is thus essential to explain that the changes and effort involved, both individually and collectively, even if mainly aimed at changing the energy system, are, in fact, part of the social transformation people need to have a decent future. This may prove more mobilising than simply stating that 'we need to change the energy system'. In order to change, accept change, and be a protagonist in the process of change, one has to have a clear idea of what one will eventually be suffering from and what could be gained by taking action.

Progressing towards democracy and energy sovereignty

The project of promoting a democratic energy system in Europe must be situated within the overall project of achieving real democratic ownership of politics in Europe. This project requires Europe's economic and financial autonomy.

In this project, fossil fuel plays an important role and is a powerful lever since it currently accounts for approximately a quarter of the EU's total imports.²³ Progressively phasing out energy imports (except in cases of mutually beneficial cooperation) will reduce the need to export in order to balance the EU's budget.

In of itself, **switching to a more autonomous energy system would give the EU greater economic, financial, and political autonomy and, as a result, help it fulfil its potential to become more democratic.**

In addition, **this would undermine the power of the transnational corporations** that exploit energy sources and market energy. For both these reasons (aside from it being a step in the necessary energy transition), a strategy aiming at reducing EU's energy imports is crucial.

The project of democratic ownership of politics in Europe requires the development of an effective democratic and civic life. This goal is facilitated by the fact that renewable energy sources,²⁴ energy efficiency, and energy sobriety are, to a great extent, manageable at a regional, local, and/or individual

scale and are thus conducive to building participation, ownership, and civic control. This point is developed in the next chapter.

Reducing geopolitical tensions, practicing international solidarity, and assuming international responsibility

Geopolitical tensions and conflicts between and inside states are largely the consequences of the unequal distribution of the currently known and/or estimated exploitable petrol and gas reserves.²⁵ A move to put an end to fossil energy could lead to a significant reduction in geopolitical tensions and conflicts.

However, **changing to another energy system must not create and/or increase pressure on scarce resources** (such as indium used in some type of solar panels) **or already fragile and/or highly exploited resources** (such as soil or water used in the production of agrofuel or dam-generated electricity).

As many recent catastrophes (such as droughts, floods, fires, hurricanes, etc.) and/or longer-lasting critical situations (climate refugees, the spread of diseases and pests, crop failure...) abundantly illustrate, the conservation of **our environment and the stabilisation of our climate is a pressing need.**

Nowadays, humanity is in global peril. If the worst is not certain, a major disruption on the horizon seems more and more plausible. If our current (and accelerating) trajectory continues, it is most probable that whole territories will be devastated by extreme climatic events, leading to collective tragedies and the flight of a growing number of refugees. In such a strained and volatile context, geopolitical questions will take on new aspects and will, most certainly, have drastic urgency.

More and more entities – organisations and governments – are starting to take into account the real risk of runaway climate change which is a looming threat for humanity (as seen in a growing number of studies and in the latest IPCC Assessment Report). But at the same time, some pharaonic and reckless climate-engineering projects are receiving support, even though they risk of becoming further causes of the uncontrolled devastation of our biosphere.

²³ According to Eurostat, in 2010 the EU imported fossil fuel at the level of € 381 billion out of € 1 509 billion for total imports. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-GI-11-001/EN/KS-GI-11-001-EN.PD, p57.

²⁴ Renewable energy sources today include solar, geothermal, ambient, wind, marine, biomass, and waste energy. Unfortunately, although the energy source itself may be renewable (which is still a questionable assumption in the case of biomass and waste), the same can rarely be said of the precise methods of exploiting them and converting them into an energy form adapted to energy use. We therefore prefer the term 'more sustainable and less harmful energy sources for people, societies, and the environment'.

²⁵ Exploitable resources' are resources whose use are at once technically, financially, and politically feasible.

The following sub-chapter, *The Emergency of Climate Change*, shows that a general mobilisation of humanity and global solidarity are required. For this, a **major shift of the basis of geopolitical strategies and practices**, towards solidarity, effective cooperation, and mutual emancipation is ever more urgent.

- ▶ From now on, therefore, **the first and foremost geopolitical principle should be solidarity** (for mutually beneficial and unifying common goals). This would be a necessary and irreversible change. The globalised capitalist economy, through free trade without regulation of goods and capital circulation, has too often proven to be an obstacle to the implementation of this principle.
- ▶ A European energy transition to a democratic energy system would be an example of an effective application of this kind of geopolitical overhaul. These new principles must apply

between the EU states and non-EU states: **the EU energy transition must integrate an active policy of cooperation, solidarity and responsibility between the EU and other territories and states.**

It is crucial that knowledge, techniques, and practices useful for energy transition be readily accessible to every state and every population of the world – and that their appropriation and transference is facilitated. Upstream, research and development, as well as education, must be re-established (see chapter 5). A worldwide fund must be established to help finance the energy transition of middle and low income countries in a way that respects local and national particularities and democratic procedures. In conclusion, Europe has the ethical duty to develop an international policy that actively promotes energy sovereignty and the security of the other territories and states of the whole world.

Mutual cooperative solidarity and energy transition

Currently, territories and states differ very widely in their energy systems, their historical and current contribution to the anthropogenic environmental and climatic changes, as well as in their financial and technical capacity to promote an energy transition. This presents Europeans with **the ethical obligation** to develop an active policy of cooperation, solidarity, and responsibility with other territories and states.

This obligation has two complementary components:

First, the EU and all countries must provide **free access** to all knowledge, techniques, and practices that can contribute to the energy transition. This implies not only an open-source policy but also structures that are instrumental for the **appropriation** and **transposition** of this knowledge according to the context, circumstances, and trajectories of the populations, territories, and states that could benefit from them. (In this kind of empowering relationship, all participants would mutually benefit from this process).

It is important to keep in mind that the appropriation of knowledge, techniques, and practices can only enrich strategies and action, which is essential in trying to shape the future. However, without action they are useless. Only actual activity will really contribute to the energy transition and the actual shaping of the energy system.

Second, the EU must promote the creation of a worldwide fund that can be accessed by those in need both **financially** and **practically** (by providing not only money but also **material and human resources**).

Here, too, it is important to bear in mind that financial resources are a necessary but insufficient lever for an energy transition: without infrastructure and the material and human resources money can buy things but certainly cannot emancipate people.

Humanity urgently needs a solidary socio-ecologically sustainable energy transition to an energy system that is at once **more responsible and more just**. In order to reach this vital collective goal, Europe's international solidarity implies an active and voluntary policy of effective cooperation and mutual emancipation. The EU has the duty to contribute, to the best of its ability and means, to the empowerment of populations, territories, and states to organise their own individual energy transition, following their own trajectory. Everyone everywhere in the world should have **the capabilities, the means, and the power to act** for the accomplishment of this collective energy transition.

Conclusion: From the issues we are facing to the way in which we deal with them

As we launch a transition to a new energy system, the energy system as a whole will change. This will require much more than just a change in technology and will entail changes in the socio-technical-ecological paradigms that it helps shape and on which it depends.

The energy system and the socio-technical-ecological system are co-evolutionary processes. Their current associated paradigms are inseparably linked,

being mutually constitutive and undergoing interactive changes.²⁶ Any change in one of these two systems will inevitably change individuals, societies, cultures, and their relationship to nature.²⁷ Therefore, our shared values and goals and what we consider to be a desirable collective future will progressively change.²⁸

As a consequence of changes to the energy and socio-ecological systems, the parameters of our collective challenge will be modified, the stakes of the energy issue will change, and the framework of the question will be modified.

In conclusion, as the transitions unfold, our very goals of a responsible, just and solidary socio-ecologically sustainable energy transition will change.

We must be aware of this and prepared to be as adaptive and flexible as possible (and also seek out opportunities for change) as well as meet our obligation to constantly provide for future (and unpredictable) changes by developing new knowledge, means, and skills.

26 For instance, climate changes and fossil energy exploitation are interconnected. This has been known since the end of the 18th century, but the clear and scientifically-grounded causal connection between them began to be seriously considered only a few decades ago; 'If the information Fourier had at his disposal did not, of course, allow him to quantify its different manifestations, the Enlightenment ended with the emergence of the concept of the 'greenhouse gas effect'. The work of the physicist-prefect was the prelude to Pouillet's work and that of the Irishman John Tyndall in 1860 on climate changes in the ice ages, and above all to the work of the Swedish scientist Svante Arrhenius, who in 1896 was the first to locate the problem in the carbon cycle and definitively related the greenhouse effect to the industrial use of fossil fuels. As it was for the Québécois physician Gautier one and a half centuries before, for Arrhenius the warming generated by fossil fuel combustion became the indicator of future security, with the explosion of humanity's economic activity guaranteeing it that it could ward off a hypothetical new ice age.' René Favier, 'Penser le changement climatique au siècle des Lumières', Denis Lamarre (ed.), *Climat et risques. Changement d'approches*, Lavoisier; Paris, 2008, pp. 9-23.

27 For instance, the major take-off and global spread of fuel consumption, notably in the sale of gasoline along with the boom in private car use and the roads and petrol stations associated with it, favoured individual mobility. It led to urban growth, greater commuting time and distances, the decline of (and disinvestment in) public transportation as well as dramatic changes in landscapes (urbanisation and the development of roads), the emergence of many kinds of pollution (including new noise and air pollution), and globally to an increase in fossil fuel consumption (not only through recourse to individual transportation but also through many other related consequences such as road maintenance, individualisation of housing, the increase in inhabited space per individual, etc.).

28 Continuing the previous example, the take-off of individual cars contributed to the development of the 'sense of freedom', which particularly is expressed in individual mobility without constraints (financial, material, or social). The return to lower-impact means of transportation (walking, bicycling, and using public transportation, etc.) is suffering from competition from electric private cars, which promises 'green transportation' but which will not reduce our total energy consumption. Private electric cars do not solve the many problems caused by individual kinds of transportations (such as town extension) while creating new problems of their own (such as the mass production of batteries and their recharging at the same time).