

Energy management, mobility, carbon footprint, holistic approach and social justice

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I. Foreword

Our presence here is a clear sign that we do agree on the fact that we are going to face the most challenging and endangering situation ever encountered by the human race, and, more generally, all living species will have to address conditions (and possibly suffer consequences) that have not occurred in geological time. For the sake of clarity, and to briefly summarise, not only must we drastically reduce our greenhouse gas emissions (GHG), but we also have to consider likewise decreasing our consumptions of numerous natural resources: biotic, such as fishes and natural ecosystems (forests, wetland, etc.), or abiotic, like minerals and lands.

As a first key point, let us point out a simple fact: we must decrease all our environmental impacts, beginning first and obviously with our GHG emissions.

This being said, it is also worth recalling that this dependency on fossil energy was not completely unjustified and inefficient. In two centuries, welfare and health have singularly increased in all countries, even if inequalities still exist; nowadays, the quality of life has achieved very high levels in many countries. Such a result should be kept, and extended to all humankind, so as to permit to every human being access to the same services and standards available in the richest countries. In other words, the aforementioned recognised, incontrovertible and necessary decrease shall not jeopardize the legitimate aspiration of billions of people for a better life, as recalled by the sustainable development goals (SDGs), and for tens of countries for a higher human development index (HDI).

In this paradoxical race, it is clear that we are facing two contradictory injunctions. Indeed, the observed benefits rely on an economy that was, and is still, extremely dependent on fossil fuels, but we must restrict and quickly reduce their use. However, keeping a strong economy is important for two reasons. First, the economy will be the pillar on which our life standards will be maintained and secured: a weak economy would seriously curtail our abilities to build a sustainable future. Second, our recent past has shown that economic issues can easily lead to tumultuous social climates: this fosters the development of populism, almost invariably against any (environmentally friendly) actions. Practically, this creates the impetus for the development of new basis of and for economy, still eliciting a pleasurable life but in a healthier environment. Consequently, we must engage a mid-term transition to change our economic paradigm without endangering it, to keep levers for action, but undeniably towards a more decarbonised structure.

Last but not least, one final critical point will be to warn against too much confidence in technology-only solutions, and paying too much attention to technological siren songs. As a physicist and expert in the energy field, I will put forward in this advocacy some proposals in this direction. Nonetheless, the task being so huge, it is illusory to think that technological solutions will be sufficient alone. There are many reasons for such a statement. First, the ever increasing demand cannot reasonably be fulfilled if we continue apace with the current trends (and here again, not solely for fossil fuels). Second, taking the example of energy only, many studies and official reports from several governments (France, EU, etc.) have shown that renewable generation as it is currently promoted (i.e., mainly relying on photovoltaics and wind) will not be sustained easily in the future due to lack of some minerals. Third, the rebound effect or some other cognitive bias (e.g., unrealistic optimism), usually leads to smaller reduction or change than initially anticipated from a physical point of view. Fourth, it will be very difficult to create the impetus for a sustainable world, and to efficiently engage people in the struggle for decarbonation (and equivalent measures), by proposing only some technologies. Local features such as the weather, the population density, the organisation of the energy networks must be considered; as well as the use and habits, traditions and cultures, social organisations, etc.
Briefly, the last message is therefore to emphasise the need to combine natural sciences and social sciences in our search for this new world organisation (briefly represented by the triptych consumption – economy – sustainable development). There will not be a single solution, and these solutions will not succeed if they are not developed and fostered by a holistic approach.

II. Proposals

First and foremost, the main issue we are facing is due to our energy demand. When looking physically at its corresponding nature, it is interesting to note that it can basically be divided into electricity, heating and cooling. Given this observation, the first proposal is to better promote multi-energy networks and poly-generation systems, to avoid an unjustified concentration on electricity. For instance, relying only on photovoltaics is not a good idea when heat is required (even if a heat-pump can help to achieve better efficiencies) and solar thermal should be considered (when and if feasible), or biomass burners. Practically, this could be done by modifying regulations and through incentive funding for such systems and networks combining various energy forms, and by favouring technical solutions that better suit the real needs.
Secondly, it has been mentioned the level of consumption is too high and, though renewable generation must be increased, it is also important to make better use of energy. Technical solutions that allow us to decrease the demand, such as energy efficiency and demand-side-management (among others), should therefore be further deployed. Here again, this deployment should be supported financially.
Thirdly, it is important to keep in mind that the underlying goal of the former proposals is to achieve a strong decrease in our GHG emissions. Consequently, this means that a thorough analysis of these latter must be undertaken. Concretely, any public investment should be subject to carbon neutrality, or at least physical proof that GHG emissions are limited to minimal values. As an example, the absence of any carbon footprint balance should be forbidden. In the future, such measures should also be linked to performance-based contracts to ensure that GHG reductions are attained. For instance, thermal building renovation should be more controlled to guarantee an optimal use of the committed money.

Finally, the emphasis has been put on not relying only on technological solutions. In this respect, it is mandatory to consider trans-disciplinary approaches in all the above proposals. Social sciences must be combined with physical sciences to ensure a better application of the induced changes, and to limit the risk of rebound effects, or any negative or vicious spiral counter-effects. Without any loss of generality and non-exhaustively, environmental psychology and sociology, economics and law should be considered, at least. To be more precise, part of the granted funding should be devoted to addressing the challenges with these viewpoints, and/or transverse approaches should be favoured over siloed ones. In fact, and remaining only on a pragmatic point of view, a better adherence could also be achieved by involving culture and arts, and so, some trials could be tested in this way (and quantified, on an energy efficiency basis).

The second main contribution will concern the mobility issue. Indeed, it is clear that in the short to mid term, freight of goods and merchandise will not vanish and so they will play a significant role in GHG emissions. In spite of needed tests and trials of new solutions in this specific field, more intense efforts should be focussed on the mobility of people. Without hampering the substitution of thermal vehicles by electrical ones, it is also noteworthy that the latter cannot simply replace the former. Indeed, the forthcoming scarcity of some resources, and the environmental impacts associated with this sector, do not play in favour of a massive penetration of such technologies. There could be two rather simple solutions to such an issue. Firstly, the main need being for short travel and to promote soft mobility, light cars with limited speed should be asked of manufacturers. In addition, vehicle sharing should be further developed through incentives and dedicated regulations (e.g., reserved parking lots or recharging slots). At the same time, the key role of intermodality must be further scrutinised, since real beneficial reductions can be achieved without any restriction on the travel possibilities. Pertaining to intermodality, the steps to release it more freely are three-fold: i) better physical interconnections, at various locations and for different distances, with reinforced regularity and (more importantly) secure first- and last-scheduled train/bus/etc. ; ii) incentives and ambitious sponsored tariffs such as, for example, similar investments as in renewable energy and/or thermal insulation for partially or totally reimbursed yearly subscription fees; iii) better coordination between all stakeholders with simple tools for customers to find and book their travel and trips (e.g., centralized web platform, dedicated app, SaaS solution, etc.).

Logically, these solutions should once again not be primarily and uniquely based on the technological features. In contrast, it is mandatory here to undergo social sciences analysis, with the help for instance of geographers and experts in spatial planning.

The third and last proposal based on an engineering and physics approach will concern the products and goods with a high carbon footprint. Though our society could sometimes legitimately question the needs for some of them, a simple practical analysis is performed here. As such, the first and efficient signal sent to the customers would be the generalisation of carbon labels, and the obligation to provide an estimation of the whole carbon footprint of any products, goods and even services. Furthermore, the impacts being possibly huge, a stronger emphasis must be put on the repairability index with i) the gradual enforcement of a lower threshold, and ii) the development in parallel of local sectors (supported by jobs and SME, and not associations only). In this regard, low-tech sectors and circular economy must clearly be singularly more investigated, supported and disseminated.

Finally, this contribution will end with two major remarks to shed a light on the general consistency of the whole approach and the solutions proposed above.

Whatever the solutions tested and the choices finally made, it is above all vital to try not to create the conditions for a similar disaster in twenty or fifty years. More precisely, in this race for decarbonation, we also must keep an eye on the other planet boundaries and similar vulnerability points. A specific attention should thus be given to controlling and limiting the environmental impacts, as specified by life cycle assessment for instance, but also to biodiversity (in all its forms). If we are to have some success against climate change, it will not come without high burdens and painstaking efforts: may this effort not be partially wasted by the destruction of other features that are as important as the climate for humanity.

Furthermore, tremendous work has been undertaken (or is to be) by all humankind, and deep and persistent modifications of our way of life are ongoing. In such a context, it is compulsory to ensure that laws are respected. In fact, this is not strictly a call for more severe regulations (even if one could advocate in this direction, yet they will certainly come in time) but to enforce the existing laws and to have fines that really discourage fraud. This is highly important for four reasons: i) targeted reductions cannot be achieved when fraud is present, which undermines our efforts against climate change; ii) cheaters must not earn more than serious players and court sentences must therefore be really dissuasive; iii) equivalent to the most serious felonies, strong sanctions and severe penalties do send the message that such behaviours are not acceptable any more and must be modified; and iv) it is both a question of social justice and of equity between everybody, which strengthens social acceptance and reinforces overall engagement.