
# WHITE PAPER
# ON FINANCING ECOLOGICAL TRANSITION

***Mobilising private finance for Ecological Transition***

**Directorate General of the Treasury**

**Office of the Commissioner General for Sustainable Development**

**Under the supervision of Dominique Dron, *ingénieure général des Mines***

**And with the contribution of Thierry Francq, Advisor to the Director General of the Treasury**

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**This English version of the White Paper on Financing Ecological Transition seeks to render the positions held within the original French White Paper. However, the Ministry of Ecology, Sustainable Development and Energy and the Directorate General of the Treasury are not liable to the views presented in the English translation.**

**Rapporteurs**

**Office of the Commissioner General for Sustainable Development**

**Robin Edme**
Senior Advisor Responsible Finance to the Head of the Department for the Economy, Assessment and Integration of Sustainable Development.

**Directorate General of the Treasury**

**Emmanuel Massé**
Deputy Assistant Secretary of Sectoral Policies Public Policy

**Joffrey Célestin-Urbain**
Head of the Agriculture Environment Bureau

## I. Context

The President of the Republic singled out the ecological and energy transitions as a priority for future development during the environmental conference. The ecological and energy transitions are vital issues for our societies which must work toward less natural resource intensive consumption models. Ecological Transition could prove an important factor of innovation and a source of economic competitiveness.

The preparation of the White Paper on Financing Ecological Transition was entrusted to a team including experts from the Ministry of the Economy and Finance's Directorate General of the Treasury and from the Office of the Commissioner General for Sustainable Development, under the supervision of Mrs Dominique Dron, Engineer General for Mines, and Mr Thierry Francq's support. This White Paper draws on national and international reports (including reports by the OECD, the IEA, the Economic Council for Sustainable Development, The Office of the Commissioner General for Strategy and Foresight, the Eurogroup Institute, by Louis Gallois, Roger Guesnerie, Gérard de la Martinière, by Karine Berger and Dominique Lefebvre, and by Pierre Duquesne), and on hearings and a consultation with a broad panel of experts in 2012, as well as on the conclusions of an initial conference organised on 12 July 2012 at the Ministry of the Economy and Finances.

## II. Introduction

Ecological Transition means making our economic development compatible with the finite character of our natural resources and the necessity to maintain natural regulations essential to life.. These include, but are not limited to, acceptable climatic conditions and a functional ecosystem. Ecological Transition covers all transformative economic processes designed to maintain natural resources and ecosystemic regulations below thresholds critical to our societies' viability. Beyond the decoupling of economic growth with the quantitative and qualitative exploitation of natural capital (i.e., habitats, physical, chemical and biological resources and regulation), Ecological Transition implies adapting the rhythm at which natural capital is levied to our ability to preserve, maintain and renew it.

Ecological Transition embraces the transformation of production, consumption and investment norms to enable sustainable economic development. In this sense, sustainable economic development means on the one hand low carbon and on the other hand capable of maintaining and renewing natural capital. Ecological Transition covers a wide range of macro-economic and sectoral issues. The foremost amongst this set of issues are climate stability, the preservation of ecosystems and the sustainable use of resources (raw materials, water, soil and waste). Finally, Ecological Transition inscribes itself within sustainable development as defined by international treaties[1/2]. Ecological Transition must also take into account social and societal issues linked to this necessary transformation.

Ecological Transition requires substantial investments over the next forty years. The longer these investments are deferred, the costlier they will be. Action is therefore urgent. Enabling Ecological Transition will require harnessing numerous ventures, many of which are long-term and are, at the same time, often risk-prone projects. Indeed, these projects often unfold over fifteen to thirty years -sometimes longer. The risks attendant upon these projects relate, for example, to the period of return on investment and on whether the chosen technological strategy taken up will prove profitable. Substantial initial investments will be needed for some. Therefore, financing Ecological Transition is as much a matter of long-term financing as it is a question of ensuring the preservation of natural resources and ecosystemic regulations.

Governments have neither the vocation nor the capacity to finance Ecological Transition on their own. Therefore, shifting investment, consumption and savings choices of leading economic actors (i.e. households and firms) towards investments that are beneficial to Ecological Transition through appropriate price signals is the first and foremost issue at stake. The economic and financial crisis has driven small-savers and investors to rein in their exposure to risky and long-term investments. Albeit necessary, reinforced prudential rules could accentuate this trend[3] in asset allocation[4]. Such a situation is likely to restrain the mobilisation of capital funding required for Ecological Transition since projects necessary to Ecological Transition can be risky, medium to

[1] UNDP, *Green Economy in Action: Articles and Excerpts that Illustrate Green Economy and Sustainable Development Efforts*, 2012; UNEP, *Towards a Green Economy: Pathways to Sustainable Development and Poverty*, 2011; OECD, *Green Growth Strategy*, 2011; as well as the title of Part III of the Rio+20 declaration, *Green economy in the context of sustainable development and poverty eradication*.

[2] United Nations World Commission on Environment and Development Report, presided over by Mrs Gro Harlem Brundtland, *Our Common Future*, April 1987.

[3] Eurogroup Institute, *Financing resilient societies and robust territories*, May 2012.

[4] IRRC Institute-Mercer, *Investment horizons – Do managers do what they say?*, 2010.

long-term investments. Furthermore, a significant proportion of existing equipments is nearing the end of its life cycle and will need to be renewed. They will need adapting to future circumstances which include those of Ecological Transition.

This does not mean long-term investments would necessarily be favourable to Ecological Transition. Providing management criteria – in particular non-financial criteria – and the analytical skillset required for a complete, more comprehensive and renewed appreciation of risk is necessary to the implementation of Ecological Transition. Nevertheless, Ecological Transition cannot be successful without a framework that encourages private investors' appetite for long-term projects[5].

Identifying economic mechanisms capable of inducing change in private (households, firms and financiers) and public stakeholders' investment and behaviour towards this adaptation of production, consumption and investment methods stands at the heart of this White Paper. These economic mechanisms must reflect the diversity of the multiple stakeholders' needs and the different modes of economic organisation.

Ecological Transition implies a major renovation of our way of thinking and our lifestyles; that is to say an industrial and intellectual revolution[6]. The involvement and commitment of all of society's stakeholders are required[7]. It may impulse a desire to reinforce *Affectio societatis*; a determining factor of social and economic resilience both at national and local level, which may prove of pivotal importance.

[5] European Commission, *Green paper on the long-term financing of the European economy*, COM(2013) 150 final, 25 March 2013.
[6] Kay J., *The Kay Review of UK Equity Markets and Long-Term Decision Making*, February 2012.
[7] Roadmap for environmental transition, Environmental Conference, September 2012.

*Proposals' summary*

**First principle - Improve the predictability and the signals sent to stakeholders through the regulatory framework and by economic tools**

1. Set scheduled targets for Ecological Transition if possible up to 2050.
2. Sending ecological price signals that reflect long-term issues.
3. Encourage adaptability of the economic fabric, and in particular that of SMEs and intermediate sized firms, to Ecological Transition.

**Second principle – Round out existing tools with other targeted instruments to mobilise and leverage public and private funding for Ecological Transition**

4. Create the legal conditions in the building sector for an improved public-private sharing of risks, to facilitate the funding of Ecological Transition.
5. Encourage Ecological Transition via better mobilisation of public financial resources, in particular for SMEs and intermediate sized firms.
6. Encourage the use of alternative as well as dedicated financial instruments, to finance long-term Ecological Transition, whilst meeting the diversity of needs.
7. Launch an ambitious approach in support of Ecological Transition at European level.

**Third principle – Strengthen the awareness among public and private backers, investors and bond issuers of non-financial challenges (ESG criteria) of Ecological Transition**

8. Reinforce the conditional nature of public financial support (funding, guarantees, subsidies, public-private partnerships, purchases) in relation to their contribution to Ecological Transition, bearing in mind the environmental cost and discount factor when deciding on public investments and financial supports.
9. Encourage the integration and traceability of non-financial issues relating to Ecological Transition for private and public institutional investors.
10. Support the development of socially responsible investment (SRI) and ESG criteria amongst citizens and opinion leaders.
11. Enhance awareness of ESG issues in relation to issuers' competitive development strategy.

**Fourth principle – Re-centre the behavioural set of stakeholder practices around the objectives of Ecological Transition and funding**

12. Enrich, supplement and develop information systems so as to clarify and track the contribution of public and private decisions to Ecological Transition.
13. Accelerate financial stakeholders' appropriation of the challenges of, as well as tools contributing to, funding of Ecological Transition.
14. Stimulate higher education and operational academic research, whilst encouraging a broad-spectrum approach, on including the challenges posed by Ecological Transition in companies' and financial stakeholders' investment choices.

## III. Ecological transition: ensuring the future

### *III.1 Current economic development exploits natural resources at a rate incompatible with their capacity to replenish and the well-being of future generations*

*III.1.1 Nature, an economic resource of equal essential importance to growth as labour and capital.*

"Natural resources" encompasses raw materials, living species -in all their diversity-, water, soil and energy on the one hand, and carbon, nitrogen and water cycles, the climate and ecosystemic functions, on the other. This simple enumeration emphasizes the wide scope of their economic contribution, comparable to that of capital and labour. Ensuring the availability and balanced reproduction of these resources, at a local, national, European and global level, is a challenge the world must successfully face up to. By 2050, the needs of 9.3 billion people (according to the United Nations "Population" Division's median-scenario) will have to be met. To do so, specific and targeted actions to enhance the efficient use but also to substitute and preserve natural resources are essential. Action in this sense is of even greater importance as climate change begins to have a physical impact and since the rates at which natural resources and self-regulatory cycles are exploited is often intensive and sometimes beyond a sustainable rate. As a result they are often in an impoverished state.

The concept of capital must be extended beyond productive and human capital to include natural capital. For a long time, the sustainability of these resources was neglected because natural resources were considered by many as either inexhaustible or even capable of perpetual self-renewal,; the awareness of the importance of natural capital to economic development is relatively recent[8].

Because the social and economic cost of these resources' and natural cycles' gradual destruction is not accounted for, their sustainability is not spontaneously ensured.

*III. 1.2 If no action is taken, the undermining of natural regulation and resources will seriously jeopardise living conditions and could also affect economic growth, with variable impacts and time scales from country to country.*

Numerous international reports have clearly shown that climate change, induced by an increase in greenhouse gas (GHG) emissions mainly linked to the use of fossil energy, could rapidly cross a threshold at and beyond which ecosystems, water and biological resources, upon which human societies heavily depend, are significantly endangered. Extreme climatic events, the acidification of oceans and rising sea levels can be said to be an increasing part of an already observable reality. In certain countries, their economic consequences are currently perceivable. These are, for example, damages to buildings, losses in agricultural yields, fires, floods, storms, soil salinization, the drying up of land and increased physical risks related to the accelerated melting of glaciers. Avoiding the most serious consequences of climatic disruption[9] implies that global GHG emissions reach their peak in 2020 at the latest. Depending on the scenarios and whether non-market consequences are taken into account, the Stern report estimated that global warming would lead to a final and irreversible loss of between 5 and 20% of per capita consumption as compared with a baseline –known as "balanced growth"- scenario over the course of the next two centuries.

The impact of the loss of living species and the growing scarcity of terrestrial and maritime natural habitats in prime condition is not limited to local activities which directly depend upon them but can also impair the biosphere's ability to carry out certain tasks such as pollination, the provision of fresh water, soil maintenance, recycling of atmospheric carbon... The Millennium Ecosystem Assessment (MEA) [10] has shown that approximately 60% of ecosystem services are in the process of "deterioration or non-rational exploitation". These include fresh water, intensive fishing, air and water purification, climate regulation at regional and local levels, parasites and risks of natural disasters. The MEA has pointed out that it is extremely unlikely that the intensity of the majority of the pressures directly responsible for these changes will reduce in the course of the first half of the 21st century, were global GNP to increase by a factor of 3 to 6 by 2050. Conducted at a global

[8] See for example, the *Launch of the British Natural Capital Initiative* of April 2009, and the *Global Natural Capital Initiative* in June 2012 during Rio+20 which launched the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Programme, coordinated by the World Bank, or the Stiglitz-Sen-Fitoussi Commission's Report (2009) recommending the extension of revenue indicators to non-market activities.

[9] Recent statements by N. Stern suggest that the impacts of climate change have been severely underestimated (http://ourworld.unu.edu/en/nicholas-stern-i-got-it-wrong-on-climate-change-%E2%80%93-its-far-far-worse/).

[10] **M**illenium **E**cosystem **A**ssessment, *Ecosystems and Human Well-Being. Synthesis*, Washington DC, Ed. Island Press, 2005.

scale, the Economics of Ecosystems and Biodiversity (TEEB)[11] study highlighted that 11% of wilderness areas, and 60% of coral reefs could potentially disappear by 2050. Wilderness areas are put at risk by their conversion into agricultural land, the development of infrastructure and by the impact of climate change. Coral reefs could be endangered as a result of intensive fishing, pollution, disease, and "bleaching" of corals linked to global warming. According to this study, the annual cost of biodiversity destruction and ecosystem degradation amounts to between $2,500 and $3,500 billion globally. When added up to 2050, the total loss of corresponding living standard ($14,000 billion) reaches the equivalent of 7% of global GDP in 2050, according to assumptions deemed conservative[12].

Without significant progress to resource productivity, between 2010 and 2030, the global water demand will increase by 40% and the need for cultivated land will increase by between 10 and 15%[13]. According to the International Energy Agency (IEA), if on-going policies remain unchanged, the global primary energy consumption will increase by 47% between 2010 and 2035[14].

Moreover, in numerous cases air, water and soil pollution can exceed the ecosystem's natural absorption and recycling capacities and/or the human body's level of tolerance. For several years now, the World Health Organisation (WHO) has acknowledged the health impact of environmental risks[15].

Finally, food production is subject to significant amounts of waste. It is estimated that between 30% and 50%, that is to say between 1.2 and 2 billion tonnes, of global food production is never consumed[16]. Significant water, land, energy resources and fertilisers required in the food production process are equally wasted.

*III. 1.3 Technical progress will not suffice to ensure renewal of natural capital given the scale and irreversibility of shocks on the climate and on biodiversity.*

Energy saving programmes launched following the oil crises in the 1970s undeniably helped reduce energy intensity, particularly in the leading developed countries. But these programmes have proved insufficient to counteract the global increase in GHG emissions. Between 1970 and 2004, emissions grew by 70%[17], in part as a result of the rapid economic growth of the major developing economies.

Over the course of the 20th century, the annual extraction rate of building materials was multiplied 34 times, that of minerals 27 times and that of fossil fuels by a factor of 12. This increase was to a large extent dictated by world GDP growth. The latter was however faster (GDP grew by a factor of 23) than the global increase in the quantities of extracted materials (increased 8 times)[18]. This suggests a form of decoupling between wealth creation and resource extraction. However, the extent of this decoupling appears insufficient to achieve a sustainable rate in the use of raw materials, particularly if environmental impacts are taken into account.

Global fresh water consumption is growing whereas per capita water reserves are decreasing[19] despite an increase in its efficient use in industry, for certain agriculture practices and for domestic purposes[20]. Globally, the ratio of water consumption on agricultural and industrial production improved, respectively, by 0.8% and 0.5% annually[21].

Between 1960 and 2000, global agriculture yields –all types of crops combined- increased by 1.7% per annum (at a slower average rate in recent years[22]). According to the FAO, to meet the global nutritional needs of the

[11] European Commission, *The Economics of Ecosystems and Biodiversity*: *An Interim Report*, 2008, - commonly referred to as the TEEB Report.

[12] *The Cost of Policy Inaction (COPI): The case of not meeting the 2010 biodiversity target*, ENV.G.1/ETU/2007/0044, 2008.

[13] McKinsey Global Institute-McKinsey Sustainability and Resource Productivity Practice, *Resource revolution: meeting the world's energy, materials, food and water needs*, November, 2011.

[14] IEA, *World Energy Outlook 2012*, 2012.

[15] WHO, *Preventing disease through healthy environments - towards an estimate of the environmental burden of disease*, 2006.

[16] Institution of Mechanical Engineers, *Global Food: Waste Not, Want Not*, January 2013.

[17] IPCC, *4th Assessment Report*, 2007.

[18] PNUE, *Decoupling: natural resource use and environmental impacts from economic growth*, 2011. OECD figures corroborate this estimation.

[19] UN, *Water in a changing world*, UNWW Development Report 3, 2009.

[20] OECD, *Environmental Outlook 2012: A global survival strategy*, 2013.

[21] Alexandratos N. & Bruinsma J, *World agriculture towards 2030-2050: the 2012 revision*, Agricultural Development Economic Division, FAO, Working paper no. 12-03-2012.

[22] According to a study by Lobell et al., a global sliding average of the rate of increase of agricultural yields taken over 10 years shows a slowdown from 3.5% in 1971 to 1.3% in 2007, whereas the rate of population increase has decreased from 2% to 1.3%. As far as Asia is concerned, an FAO study in 2010 (Nguu Van Nguyen, *Sustainable Intensification of Rice Production for Food Securing in the Near Future-*

fast-growing world population, assuming current consumption trends hold, agricultural production must double in the period between 2000 and 2050. 90% of this increase would be met by increasing yields and cultivation intensity and 10% would be met by extending the surface of cultivated land. Such a scenario supposes increased pressure on natural resources and on the quality of the environment (soil, use of ground water for irrigation).

*III.1.4 Relying on the depletion of fossil fuels as a factor of a stabilisation or on the biological capital's regenerative capacity to provide automatic solutions to ecological issues is ill-advised.*

First, as far as we currently know, no natural process can redeem global warming or biological degradation *post hoc* within any meaningful human timescale.

Second, although the depletion of fossil resources may have appeared as a factor which would inevitably lead to reduced carbon emission thereby acting as an automatic stabiliser and preventing global warming, the oil and gas peak is regularly delayed as new non-conventional fossil fuel resources are discovered (i.e. shale gas and oil, heavy oils, tar sands, etc.). Moreover, the production and consumption of fossil energy continues to receive considerable financial support from the public sector. According to the IEA, the amount of public sector support was $523 billion in 2011. Based upon a wider notion of public sector financial support for the production and consumption of fossil fuel, the IMF's estimate is of $1,900 billion in 2011. The Organisation for Economic Co-operation and Development (OECD) estimated this support to be between $45 and $75 billion annually in its member States in recent years and reaching $410 billion in developing countries in 2010. It is now a widely accepted fact that the oil and gas production peak will postdate the appearance of the first damages unquestionably caused by climate change. More importantly, critical thresholds beyond which catastrophic, irreversible and highly damaging events are more likely to occur, will be reached before the fossil fuel depletion acts as a stabilising effect. It seems likely that the security provided by current climatic conditions will be jeopardised before tangible signs of fossil fuels'-gas, coal, oil- depletion have the required impact or even become clearly apparent.

Limiting global warming below the critical threshold (corresponding to a maximum 2° Celsius temperature increase between the present and 2100) means conforming to a carbon budget which caps the consumption of fossil fuels to one third of known current total reserves [23].

Ultimately, societies cannot rely on this automatic stabilising effect and on technical progress -which is likely to prove insufficient-, to spontaneously solve the aforementioned environmental issues.

*A Summary Report,* 2010), conducted in 227 rice paddies in China, Vietnam, Thailand, India, Indonesia and the Philippines between 1994 and 1999, shows that the rise in minimum daily temperatures had already reduced yields by 10% to 20% during the last quarter of the 20th century.

[23] Carbon Tracker Institute & Grantham Institute, *Unburnable Carbon 2013: wasted capital and stranded assets*, 2012.

### *III.2 Ecological Transition: above all a nation and a Europe-wide range of economic policy decisions*

*III.2.1 Many human activities are conditional on biological regulations and the diversity of living species and the environment; it is a subject which must be addressed at local, national, European and international levels*[24].

Whether in terms of biodiversity or ecosystems' protection, France bears a major responsibility both in its metropolitan and overseas territories. France holds the second largest maritime territory in the world. France has the largest population of amphibious species, birds and mammals in Europe. According to data from the International Union for the Conservation of Nature (IUCN), France is home to over 8% of the total number of threatened animal and plant species in the world. Taking these national specificities into account, it is clear that threats degrading biodiversity could be particularly damaging to France.

The livelihoods of a significant number of people are directly dependent upon sustainable resources (e.g. fishermen, farmers, fish farmers, forest workers and managers…). These economic activities are dependent on the preservation of ecosystems and biodiversity. Preserving the environment which provides the services necessary to the subsistence of these economic activities is therefore in those actors vested interest. However, the economic models upon which these activities are based often omit either to remunerate the preservation of these ecosystem services or to include the cost of their degradation. Other professional activities are indirectly dependent on the existence of a rich and diverse biodiversity, quality landscapes (e.g. sporting and outdoor leisure activities, and the tourist industry…) and on the quality of natural sites (i.e. activities dependent on the coastline or the sea bed, extraction of materials and water resources management activities). In the European Union (EU), 7% of the entire active labour force is strongly dependent upon ecosystem quality[25]. In developing countries, up to 35% of the total active labour force depends upon ecosystem quality[26].

Ecosystems can also reduce economic and human vulnerability to catastrophic events. Mangrove swamps and coral reefs, for example, beyond their role as the ocean's "nursery", reduce the effects of tidal waves and storms on the land that surrounds them. As for wetlands, they reduce the impact of flooding.

The actions required for the preservation of biodiversity, ecosystem services and the natural environment run from the local scale, (i.e. soil renewal, pollination and environmental management…) to the global (i.e. protecting fish resources, fighting against protected species' trafficking, ensuring the survival of migratory species and developing carbon sequestration technology…), and includes the European level (i.e. reducing local pollutants and controlling the environmental impact of products and processes).

*III.2.2 Air, water and soil pollution are local issues with ramifications for French and European growth and for which solutions must be provided at all three of these levels.*

Local pressures on the environment, whether air pollution in urban areas, water pollution in rural areas (nitrogen fertilisers, plant protection products) or even soil quality degradation, all have increasingly well documented health impacts.

The National Health Monitoring Institute's (*InVS*) APHEKOM study, published in September 2012, showed that the differences between the rates of atmospheric pollution measured in nine urban areas in France and the thresholds set by the WHO represent an annual cost of around 5 billion to the French collectivity. 2,900 deaths per year could be avoided by a reduction in the concentration of very fine airborne particules in French towns and cities. This represents approximately 91,000 years of life preserved per year or an improvement in a 30 year old's life expectancy of between 3.6 and 7.5 months, depending on the urban centre.

Recent studies conducted by the Ministry of Ecology, Sustainable Development and Energy (*MEDDE*) show that the external cost of water quality deterioration amounts to several hundred million euros per drainage basin. Moreover, the direct cost of agricultural pollution to water quality is estimated between 1.1 and 1.7 billion euros annually, 1 to 1.5 billion euros of which is borne by households[27].

[24] The Economic Council for Sustainable Development, *Policies to preserve biodiversity, economic and social dimensions*, no. 24, 2013.

[25] FEEM-GHK-IEEP, *The social dimension of biodiversity policy*, Report to the European commission, 2011

[26] Ibid.

[27] General Commission for Sustainable Development, *Costs of the main types of agricultural water pollution*, Studies and documents no. 52, September 2011.

Whether monetary or non-monetary, borne by the taxpayer (for health services and public installations) or by private agents (indirectly via fees for water consumption, for example), these losses divert resources from the production system and have an impact on economic growth.

Defining a "balanced growth path" -as defined in the Stern report on climate change-, would provide a means to assess the unsustainable character of current forms of development by integrating into projections of potential medium to long-term growth the implicit (negative) economic value of these external environmental factors.

### *III.2.3 The increasing scarcity of crucial non-energy natural resources requires recycling and substitution strategies*

Decoupling growth from the exploitation of resources is an economic, environmental and geopolitical imperative which requires structural changes in industrial processes. Less than a third of sixty commonly-used metals are recycled beyond a 50% proportion. Furthermore, thirty-four metals have a recycling rate below 1%[28]. Investments in this sector are all the more essential given that a great number of these metals are primary components for the production of renewable technologies and therefore vital for Energy Transition - neodymium, lithium, indium, germanium, ... but also copper and lead. Investments to improve the recycling of these metals could reduce Europe's dependency upon imported supplies and will lessen the global pressure placed upon these resources. Within a number of sectors, the renewal of equipment may be an opportunity to systematically address the need to save, recycle or substitute the resources required for a well-functioning economy.

Reducing waste through the extension of product lifespan either at conception point, via repair and re-use, and promoting the recovery of materials, upstream (through product design) and downstream (by organising collection, sorting and production tracks for recycled raw materials) are key issues for the European Union. The ecological footprint of certain categories of electric and electronic goods is greatest during production and at the end of their lifespan. Therefore, extending the lifespan of electrical and electronic equipment appears essential in order to reduce their ecological footprint.

Finally, the National Observatory of the Effects of Global Warming (*ONERC*) estimates that if the current industrial, agricultural (irrigation) and food production water demand trends hold, the drinkable water deficit in France could rise to 2 billion cubic metres per year by 2050[29]. Even with moderate climate change, water grid leakage is hardly compatible with strain on local water supply and the need for restraint. Currently, grid loss is evaluated, on average, as being almost a quarter of the amount of water captured and transported annually[30].

### *III.2.4 France and the EU cannot resolve the problem of climate change alone but they have no other choice but to act*

*European commitment: a necessary condition for effective international action for the climate*

The mitigation of climate change calls for strong international cooperation which is the only means capable of limiting global warming to 2°C by 2100. The European Union is amongst the areas most exposed to climate change. Between 2002 and 2011, the increase in average temperature was greater on the European continent (+1.3°C as compared with the preindustrial era) than the world average (+0.76° C between 2001-2005, as compared with the period from 1850 to 1889). Without a European and French political and technical commitment, the possibility of controlling the global evolution of climate change is unlikely. According to the OECD delaying, beyond 2020, the necessary actions to remain on track for a global average temperature increase of no more than 2°C[31], will increase the global cost of GHG emissions reduction by 50% by 2050. In terms of GDP, the cost of GHG emissions abatement could increase from roughly 5.5% of global projected GDP to 8.25% in 2050 as a consequence of the required speed and depth of change between 2020 and 2050[32]. The European Union is already spearheading international action with regard to the fight against climate warming, as shown by the 2020 energy-climate package and participation by the EU and its Member States in the second commitment period of the Kyoto protocol (2013-2020), signed in Doha in December 2012. In order to encourage the introduction of instruments for the effective and universal regulation of GHG emissions -which the EU strongly promotes-, but also to increase visibility for economic and financial stakeholders, the EU must provide,

[28] The United Nations Environment Programme (UNEP) International Resources Group.

[29] *Evaluation of climate change and adaptation in France*, Second phase report, 2009.

[30] *Water and sanitation public services Observatory*, Report February 2012.

[31] No additional measures before 2020 beyond the Copenhagen and Cancun, commitments regional and fragmented carbon markets.

[32] *Environmental Outlook 2050: The consequences of inaction – 'key findings'*, OECD, 2012

as soon as possible, GHG reduction targets beyond 2020 (such as -40% in 2030 and -60% in 2040). These targets must be consistent with a fourfold (75%) emissions reduction objective by 2050 and member States' existing emissions reduction targets.

*Adaptation to climate warming, an increasingly pressing economic necessity*

Given the current pace of climate change and even if rapid actions are taken to halt global warming, it will be necessary to anticipate the adaptation measures to moderate its probable impacts. The minimum cost of climate warming in Europe without prior adaptation is estimated to be in the region of $100 billion in 2020 and $250 billion in 2050[33].

Thus, to appropriately adapt to climate change today, investments to build or renew infrastructure and industrial facilities with a long lifespan must take these parameters into consideration when drawing up their socio-economic impact assessment. Behavioural changes will also prove necessary (e.g. water conservation, better insulated dwellings, preserved soils[34]...) in order to minimise the impact and the vulnerability of private and public stakeholders.

#### *III.2.5. Ecological Transition objectives must be taken into account during scheduled renewals of physical capital*

Infrastructure (i.e. energy, water and sanitation networks, energy production plants, transport, buildings) will play a crucial role in Ecological Transition because it constitutes the framework for future economic development for decades to come. Water supply or sanitation networks have a lifespan of several decades. Buildings' lifecycles often extend from 50 to 70 years. Transport infrastructure often lasts a century. The exploitation cycle of deciduous forest may exceed 80 years.

According to the IEA[35], existing infrastructure locks in 80% of the world's carbon budget[36] up to 2035. If current GHG emissions trends follow a business-as-usual scenario, this budget will have run out by 2017. In developed countries, many of these facilities, built in the 1950s to 1980s are currently or should soon be renewed or rehabilitated. Given the inertia of investment decisions, future GHG emission trajectories up to 2050 and beyond and the resilience of infrastructure to the effects of climate change will therefore largely depend on choices made today. The same is true for rapidly developing countries, which are currently rapidly accelerating their capital accumulation -including infrastructural capital. The chosen allocation of investment capital toward infrastructure will determine the energy and carbon intensity of their economies for future decades.

## IV. The economic equation of Ecological Transition: (extra) costs in the short term, benefits in the medium and longer term

### *IV.1 The multiplicity of investments calls for the mobilisation of diverse paths and stakeholders for their funding*

Building a society better attuned to preserving natural resources involves the creation, development, conversion or renewal of at least five key areas: research and development, innovative SMEs/intermediate-sized companies, (more) sustainable production processes (e.g. industrial, agricultural, forestry...), infrastructure which encourage a more efficient use of resources (e.g. heat renovation, energy production and distribution, treatment and distribution of drinking water...), infrastructure designed to reduce direct and indirect damage (e.g. effluent treatment...), to, for example, human health (e.g. transport...) or to critical resources such as water, pollinators or natural carbon storage (e.g. "blue and green infrastructure"). Ecological Transition's scope is therefore vast. It covers the whole economic cycle, from procurement to consumption, including research and development and production. Its territorial scale is global, continental national and local. This diversity of situations corresponds to a variety of economic balances and to multiple financial and socio-economic horizons and rates of return, which are necessarily reflected in the diversity of types of funding instruments and stakeholders, from households to the numerous institutional financiers and investors.

[33] Report by the European environment agency no. 12/2012.

[34] *Agriculture, agro-forestry and energy transition*, Agroforesterie, 2013

[35] *World Energy Outlook*, 2011 edition.

[36] This carbon budget at 2035 is estimated on the basis of having an 80% chance of achieving an average global 2°celsius temperature increase by 2100.

*IV.1.1 Equipment designed to save resources.*

*Water*

National expenditure on the extraction and distribution of drinking water represented 13.1 billion euros in 2010[37], with €2.3 billion for capital expenditure. In the same year, total expenditure on wastewater management reached €12.7 billion, with €5.2 billion representing investment[38]. According to the OECD[39], the need over the next two decades for investment in water and sanitation will be significantly in excess of the investment required for other types of infrastructure, for instance, roads or the production/transmission/distribution of electricity: in Europe, it is reckoned to be between $642 and $991 billion by 2030, that is 28% of total capital expenditure planned within this timeframe.

*Energy production and networks*

Changes in electricity demand and production mix will demand additional investment, both in production (e.g. for renewable energy or additional gas power stations), as in the networks (e.g. adaptation to intermittent renewable sources, smart grids) and in the downstream management of demand (e.g. smart meters, demand-reduction mechanisms). The level of such additional investment will depend on the share nuclear power in electricity production, on the extension of existing nuclear power stations' operational lifetime beyond 40 years, and on the renewable mix adopted to produce the remaining non-nuclear electricity required.

In the French Electricity Union's (*UFE*) Energy 2050 report, two different electricity mix scenarios were evaluated (with nuclear share being respectively 50% and 20% and the renewables share being 34% and 40% by 2030), which called for additional investment over the period 2010-2030 respectively of €60 and €110 billion (approximately 80% for production, and 20% for the grid). Compared with 2010, these scenarios reveal a downgraded carbon balance due to the replacement of part of the nuclear electricity production -low in GHG emissions- by gas-fired power stations production.

For its part, the Commission of Atomic Energy (*CEA*) outlined a scenario that involved exiting nuclear electricity production by 2025, but avoiding a deterioration of the carbon balance as compared with 2010, unlike the Energy 2050 report. Under the *CEA* scenario, additional cumulative investment over the period 2010-2025 rose to between €350 and €600 billion (with approximately 70% for production and 30% for the grid).

Moreover, additional investment will also have to be set aside for gas and heat networks as well as for renewable electricity and heat production to accommodate for the increased use of biogas, plants and organic waste.

The table below summarises the figures corresponding to the four scenarios examined during the National Debate on Energy Transition (*DNTE*)[40].

| **Scenarios** | **DEC** | **DIV** | **EFF** | **SOB** | ***Current*** ***(2010 unless indicated otherwise)*** |
|---|---|---|---|---|---|
| **Title** | "Decarbonisation by electricity" | "Average demand and diversification" | "Energy efficiency and diversification" | "Energy moderation and exit from nuclear" | |
| **% nuclear electricity 2050** | 70 | 50 | 25 | 0 | *84* |
| **Final energy consumption 2050 (Mteo)** | 260 | 189 | 108 | 84 | *265* |
| **Electricity generation 5050 (TWh)** | 886 | 596 | 399 | 431 | *541* |
| **Investment in** | 24.1 (2020) | 24.3 (2020) | 22.8 (2020) | 30.1 (2020) | *14.5 (2012)* |

[37] Commission for Environmental Economics and Accounting, *The economy and the environment in 2010*, Report published in 2012.

[38] CCEE.

[39] OECD, *Benefits of investing in water and sanitation: an OECD perspective*, 2011.

[40] These estimates must be considered with the usual caveats applying to this type of exercise and considered as orders of magnitude, depending on the assumptions underlying the model/models used.

| | | | | | |
|---|---|---|---|---|---|
| **production and energy networks[41] [in €Billion/year]** | 26.5 (2050) | 25.4 (2050) | 23.1 (2050) | 30.3 (2050) | |
| **$CO_2$ Energy 2050 (Gt)** | 102 | 115 | 61 | 25 | *381* |
| **Achieving factor 4 (all gas) in 2050** | unlikely | unlikely | Possible | Possible | - |

Source: DNTE, 2013.

*Building: Housing and tertiary*

According to the Environment and Energy Management Agency (*ADEME*) Agency OPEN 2012 survey, 134,000 private dwellings have undergone energy renovation according to the best quality standards (so-called "three star" renovation). The average per household cost of energy improvement works, based on a sample of 10,000 households[42], currently amounts to €4,517. This amount is approximately four times less than the estimated cost for a complete household thermic renovation set to achieve the energy reduction targets outlined in the Environment Grenelle (-38% in existing housing by 2020).

To meet the target of 500,000 renovations per year by 2017 (including 380,000 in private accommodation) set by the President of the Republic, with an average estimated cost for complete thermal renovation of a dwelling place of €20,000, the annual sum needed for investment in private housing (excluding Council housing) would be in the order of €7.6 billion.

[41] Electrical production and grids, heat networks, gas networks, biomass.

[42] ADEME, '*Communiqué de Presse: Baromètre ADEME/TNS SOFRES "10 000 MENAGES*", 19.9.2013.

*Transport*

In the transport sector, Ecological Transition may in principle modify forward investment estimates for infrastructure, vehicle production and the production of energy used by road vehicles.

On the first point, emissions generated by the construction of new infrastructure must be taken into account. One should bear in mind that according to an assessment by the Environmental Authority, implementing the National Transport Infrastructure Scheme (*SNIT*) would lead by 2020 to an emissions increase and in the long term, to a plateauing out and stabilisation. The National Debate on the Energy Transition, (*DNTE*) examined two "transport" scenarios: the first deals with the accelerated electrification of the transport sector over the period 2015-2050, the second presumed a very significant increase in biomass in producing liquid and gas fuels (see above the transport scenario from the EFF, DIV and SOB trajectories). The DNTE estimated that cumulative investment[43] in energy production, improvements to the electricity grid and the installation of recharging terminals was estimated at the time of the *DNTE* over the period 2013-2050 at approximately €80 billion for the first and €50 billion for the second. In the first scenario, 80% of investment was linked to the grid and distribution (recharging terminals, grid improvements, etc.) while, in the second scenario, 70% related to the construction of second-generation biofuel production facilities.

*Agriculture and forestry*

In agriculture, European and national subsidies have been introduced to create a lever effect and to prime the investment required to meet Ecological Transition targets. Between 2007 and 2013, various support mechanisms were introduced to support investment in livestock buildings modernisation, the acquisition of energy saving cultivation equipment to cut back on the use of chemical plant protection products, to support good agricultural practices and encourage the development of renewable energies (methanisation, biofuels)[44]. Over the period, total investment – public and private – averaged €1.7 billion per year, 55% provided by public support.

European and national subsidies support investments to improve forest productivity and finance measures to protect forests[45]. Annual investment in response to Ecological Transition in the forestry sector is estimated at €173 million per year, 49% of which comes from State support.

In the particular case of forestry, certain forest management practices – the adoption of management by plots with mixed stands of varying ages – whilst an over-investment nevertheless offer a degree of insurance over the longer term (e.g. less damage in the event of storms) while providing an increased number of ecosystem services (e.g. water filtration, carbon storage in the ground, preservation of the natural habitat).

The report entitled "The agro-ecological project: Towards doubly effective agriculture to reconcile competitiveness and environmental protection" presented to the Minister of Agriculture on 11 June 2013, based on 6 case studies, shows that the link between environmental performance and economic performance is not unequivocal. Certain more environmentally friendly systems or practices can increase yields (e.g. multi-crop-based independent rearing of dairy cattle, agroforestry), while others may see a decline in per unit yields at the same time as keeping up the gross margin -frequently- through savings on inputs (e.g. major crops with low input levels), or a decline in the financial profitability of farms when the value of production is not increased by short distribution channels or by quality labels (e.g. the production of pigs on straw-based litter).

*Industry*

Ecological Transition could be a lever of development for certain sectors in which France seems well positioned and enjoys comparative advantages. These sectors include, but are not limited to, hydraulics, offshore wind, solar thermal technology, smart grid industries, waste processing and even water management.

Furthermore, existing industries will be encouraged to introduce more energy-efficient production techniques. According to the National Statistical and Economic Studies Institute (*INSEE*)'s "enquiry on investments in the

[43] Part of the extra cost to decarbonise vehicles does not depend on investment. These figures have been calculated excluding the extra cost of vehicles. These investments are not in addition to the investments presented in the "Production and energy networks" part *above* with the exception of investment in recharging terminals in the case of the "transport electrification" scenario in DEC's trajectory (estimated as being €55 billion).

[44] These mechanisms were introduced in the context of the rural development programme, financed by the second pillar of the CAP (EAFRD): Plan to modernise livestock buildings (PMBE), plant-environment plan (PVE), agricultural and environmental measures (MAE), including support for organic farming. At national level ADEME's "Chaleur" fund supports methanisation projects in the context of the Farm energy performance plan (PPE), and the development of biofuels is supported by the Government via partial exemption from TICPE, the domestic tax on consumption of energy products.

[45] In the rural development programme, nine measures are designed to improve forest exploitation (measures 122 A and B, 123 B, 125A, 221, 222 and 226 A, B and C).

industrial sector", approximately 8% of investments by the manufacturing industry (including food and agriculture) were designed to yield energy savings in 2011, as against an average of 6% at the start of the 2000s.

*Waste and the circular economy*

In the area of waste, the need for funding to achieve the new targets set following the Grenelle Agreement and in the terms of the 2009-2012 Waste Disposal Plan amount to some 7 billion euros between 2009-2015; a major part of which goes to the upkeep and modernization of the waste management facilities network. An impact study of the Planning Law implementing the Environment Grenelle Agreement concluded that as far as waste was concerned, environmental benefits amounted to at least between €5 and €8 billion. Further, if the waste disposal sector was to divide the non-hazardous waste currently sent to waste disposal sites by a factor of 10 and recycle it industrially, the investment needs over the period 2020 – 2030 would, the MEDDE estimated, amount to €8 billion.

### *IV.1.2. Infrastructure and equipment to improve territorial resilience.*

*Adaptation to climate change*

Faced with extreme events (i.e. floods, droughts), both more frequent and of greater intensity, faced too with increasingly scarce resources that need to be maintained, an inadequate infrastructure is likely to imperil the territories depending on it. At an international level, the annual cost of adapting to "moderate" climate change (+2°C) could be in the order of $70 to $100 billion per year by 2050[46]. Although consolidated data of the costs associated with meeting climate change in the European Union do not currently exist, the last Strategy Document published in April 2013 by the European Commission set out orders of magnitude thematically: for example, flood protection on a European scale would demand an extra €1.7 billion per year in the 2020s and €3.4 billion around 2050.

*Biodiversity*

The TEEB study[47] estimates that globally, current expenditure for maintaining biodiversity amounts to €10-12 billion per year. Despite uncertainties and the difficulties inherent in such an assessment and calculation, in particular local variability and difficulties in identifying all the services supplied by biodiversity, the social and economic balance sheet of what for the most part are non-market services supplied by ecosystems is considered positive. According to the TEEB study (citing Balmford 2002), an investment of $45 billion in preserving the ecosystems (approximately a sixth of the annual sum required globally to protect all ecosystems) would lead to savings of $5,000 billion, which corresponds to the value of the services these protected areas supply .

In France, the Accounting Commission for Environmental Economics in its 2012 report estimated expenditure on biodiversity and landscape at €1.9 billion (+5% compared with 2010). Of this, investments -mainly the purchase by public authorities of sites of ecological interest and river and streams upkeep- in managing open spaces and the protection of wildlife amounted to over €500 million. For the first time in France, studies have looked into the value of biodiversity services set against their marginal and long-term loss[48]. Drawing on several case studies, the CGDD estimated the economic value of services rendered by wetlands to be between €2,400 and €4,400 per hectare[49]. In this respect, the contribution of natural cycles' regulatory functions to the economy appears to be far from negligible. Other studies view this function in terms of several tens of thousands of euros[50].

### *IV.1.3 Research and development*

The drive towards a non-carbon economy, sparing of resources and respectful of the way Nature regulates itself, presumes consistent research and development policy guidelines. This is all the more pressing given that the knowledge required, often conditional on bringing together different disciplinary fields, is rarely explored along the necessary cross-disciplinary lines; especially the interface between physics and biology (e.g. biomimetism) or, for as yet immature technology (e.g.: photobioreactors which could well replace solar panels, the hydrogen

[46] World Bank, *Economics of Adaptation to Climate Change: Synthesis Report, 2010*. Data in euros was obtained by applying the following conversion rate: €1 = $1.3 US.

[47] *The economics of ecosystems and biodiversity*.

[48] CAS, *The economy of biodiversity and services linked to ecosystems*, 19 May 2009.

[49] MEDDTL-CGDD, *Methods and reference values for the valuation of services supplied by wetlands*, Le Point Sur No. 97 September 2011.

[50] Several references Le point Sur and CGDD-SEEIDD studies and documents.

track). Such advances should also cover academic research in the field of risk modelling, non-financial data integration into financial analysis and market price fixing and asset allocation models....

### *IV.2 Reallocating resources to goods and services with a low environmental footprint.*

#### *IV.2.1 The value of natural capital to the community is not spontaneously reflected in prices.*

An investment project is financially viable when, over its lifetime, the financial inflow it generates is greater than the sum of its capital investment and interest charges. The interest rate expresses the preference for the present and the level of risk the community is willing to accept. This rate depends on the rate of remuneration for savings deemed 'risk-free', and on the risk premium. Projects where the financial return is uncertain (e.g. limited feedback, changing prices, etc.) and accrues only over the long term, face difficulty in spontaneously attracting funding and thus must be more profitable if they are to be attractive. This difficulty illustrates the preferences shown by households and many fund holders for a certain degree of liquidity in their investments, particularly during periods of economic hardship. However, Ecological Transition implies replacing investments that consume or severely undermine natural capital by less natural-capital demanding investments. A project based on Ecological Transition thus presents a positive balance sheet to the community when the potential extra cost or the drawbacks attached to the investment are offset by its profits, by the benefits derived from saving natural resources and by the preservation of natural self-regulatory cycles (e.g. climate, ecosystems…). Some of these resources – water, fossil energy, tradable species, raw materials – are tradable goods and to this degree are market priced. The benefits associated with their non-use can thus be weighed up. *A contrario*, certain resources and free natural services (e.g. climate, biodiversity, natural environments…) in the absence of signals from Public authorities (i.e. regulatory standards, prices), are ignored. Furthermore, investments unfavourable to Ecological Transition still, in some instances, benefit from subsidies (for instance, fossil energies, certain practices which pollute or undermine ecosystem services). These subsidies distort relative prices. Market mechanisms do not necessarily lead to a situation that is collectively satisfactory; natural resources risk over-consumption to the detriment of both the environment and the living conditions of future generations and natural mechanisms of self- regulation, exploited but not maintained, fall apart.

#### *IV.2.2 Environmentally friendly measures are often less attractive to the private sector because prices are either of limited sensitivity to community costs and benefits or insufficiently reflect non-financial criteria.*

Several examples, drawing on current economic conditions illustrate the frequently lower profitability of environmentally favourable solutions:

- The cost of generating electricity via photovoltaic panels and offshore wind turbines is considerably higher than the average market price. In the first quarter of 2013, the average tariff granted to photovoltaic installations -once requests for grid connection were received- amounted to €218 /MWh[51] and the average market price for electricity was €56 /MWh over the same period. By 2020, the estimated extra cost of electricity generated by offshore wind turbines will come to €160 /MWh[52]. Hydroelectricity aside, currently, the cheapest source of renewable electricity is onshore wind, with a purchase price of €85 /MWh in 2013.
- In the building sector, according to the UFE (2012), energy efficiency works, as a rule, generally provide private investors with insufficient return as compared to alternative investment options. Only 7% of housing which is technically suited to energy savings would show a return on investment rate greater than 10%.
- Currently, in what remains their start-up phase, electric vehicles cost approximately 1.3 times more than traditionally powered vehicles[53]. According to a report from Centre for Strategical Analysis (*CAS*)[54], the cost of using electric vehicles will remain higher than that of fossil fuel vehicles up to 2020, such extra cost

[51] A Treasury Department calculation based on the purchase tariffs in force in the first quarter of 2013 according to MEDDE and the Energy Regulation Commission's assessment concerning connection requests received in the same period (Deliberation of 18 April 2013 covering communication to the Government of the values of the S8 and V8 coefficients defined in the amended order of 04 March 2011 setting the terms of purchase of electricity produced by installations using radiation energy from the sun, Appendix "Summary of complete applications for connection for installations using radiation energy from the sun").

[52] According to the Energy Regulation Commission, Deliberation of 05 April 2012 giving an opinion on the choice of proposals that the Minister responsible for energy envisages following the invitation to tender covering offshore wind electricity generation installations in Metropolitan France.

[53] CAS, *The car of tomorrow: fuels and electricity*, mission directed by Jean Syrota, 2011

[54] Ibid.

depending to a large extent on the assumptions made as to battery cost, battery autonomy, and the price of electricity and petrol.

Currently, investing in Ecological Transition is seen by most financiers as insufficiently profitable. In fact, the longer the investment horizon, or the more unsettled its attendant circumstances, the more complex the associated assessment of risk and the lower the probability of meeting the expected return on investment. For projects linked to Ecological Transition, these risks appear high for several reasons: choice between underlying technologies may not be sound[55], regulation may change, markets may not emerge at the expected speed... Given such a level of risk, profitability may prove insufficiently attractive; a scenario that is likely to turn most financial stakeholders away from such investment when compared with other investment products considered safer and yielding greater financial returns..

A large amount of equipment will soon need to be renewed which, compared to current expenditure, will require further investment. Aligning to meet the key issues of Ecological Transition may give rise to extra cost, but inaction may in the medium to long-term lead to even greater expenditure. Without appropriate signals and without assigning monetary value to natural capital, the socio-economic return; that is taking into account the full range of impacts on society of, for instance, local pollution, noise and in the longer term, global warming and the measures that maintain resources and uphold environmental regulation; will remain unrewarded and under wraps.

Inadequate future energy prices estimations may, by the same token, cause households to underestimate the financial rewards of Ecological Transition. If households or businesses bank on low prices for fossil energy they have no reason to change their behaviour or make the investments necessary for the energy aspect of Ecological Transition. The low cost of coal, a consequence of the low-cost exploitation of shale gas in the US[56], led to an increased use of coal for electricity generation in the order of 15% over the last two years[57] in Europe, to the detriment of less polluting energy sources.

Public authorities must, on the one hand, encourage stakeholders to take into consideration the current and future societal impacts of the degradation or loss of environmental resources in their investment choices and, on the other hand, they must stabilise future energy prices expectations. The economic signals directed toward households and the private sector must become coherent with the medium to long-term objectives to cut back on the use of natural resources. To ensure effective support for these projects, public sector signals, must be consistent, proportionate and predictable. Without these conditions, investor appetite may be limited; their support to these projects -especially if on-going- retracted or may impose upon them to pay a high-risk premium.

Price signals must include future price evolutions but must also clearly be amended to reflect non-financial information regarding the impact (positive and negative) of these choices on Ecological Transition objectives. Households that so desire must also have access to non-financial information allowing them to allocate their savings according to criteria other than the purely financial.

### *IV.3 Ecological Transition: a long-term investment, pre-financed like all investments by the present day economy*

Ecological transition is, like any strategy, a wager on future outcomes. It is not without risks. These must be contained and equally borne by all territorial levels and amongst economic stakeholders. It works out over the medium to long-term. Akin to an investment subscribed to by the community, Ecological transition would prevent inevitable higher future costs under the alternative inaction scenario and reduce the community's resource dependency in a world of intensified global competition for raw materials. The alternative scenario leads either to the exhaustion or lack of access to resources or even climatic and ecosystemic deterioration (e.g. the over-exploitation of numerous ocean species, the decay of forests, the sterilisation of soils, etc.). In this scenario, high and sometimes irredeemable costs will be incurred; professions, individuals and societies dependent upon these resources may find themselves faced with no alternative.

Taking on board the challenges of ecological transition may also enable economic operators to provide a better response to the growing consumption demands for more socially and environmentally responsible products and goods. As such, it could become a strategic, technological and commercial issue to these economic actors.

[55] The parallel development of different competing technologies that meet the same need constitutes a risk for an investor to the extent that it is not possible to know which technology will prevail over the other. This uncertainty holds back investment. In the case of the automotive sector, several choices face manufacturers, whether it is a matter of electric, hybrid, biofuel or hydrogen power systems.

[56] Of the 260 $Gm^3$ of extractable shale gas in the United States, 10 will be at less than \$6/MBTU and 160 at most \$10 (according to Rystad Energy, detailed proprietors data), with an overall breakeven point of around \$10. Long-term European contacts are currently at \$13 /MBTU.

[57] Eurostat, *Energy Statistics*.

Nonetheless, the process of Ecological Transition will not be wholly without its price to economic growth, at least in the short-term. A recent study by Schubert et alii[58] suggests that the "factor 4" (75% emissions reduction) target can only be achieved by 2050 with a very high level of carbon tax and/or subsidies for technical innovation. Moreover, the growth path to achieve the 2050 objective would be lower compared to a "business as usual" trend. However, such a trend scenario appears highly unrealistic as it does not account for damages to the ecosystems, and their impact on future growth.

#### *IV.3.1 The adoption of sustainable technologies and practices often leads in the short-term to extra costs, charged to current growth.*

Ecological transition must lead production methods and the supply of goods and services to adapt towards demand endeavouring to be more sparing of natural capital. This change implies that a part of productive capital is downgraded so as to modernise it. If this downgrading occurs without consideration of the scheduled renewal cycles of equipment subject to these changes, physical capital will be destroyed in the short-term. This constitutes a cost to the community. The introduction of new techniques inevitably replaces certain pre-existing skills thereby rendering part of the workforce obsolete. Providing training and vocational retraining is a necessary compensation. In the short term, this constitutes an additional cost.

To households and businesses, ecological transition is, on the one hand, an investment to preserve an acceptable future and, on the other hand, represents a financial cost. As with any economic transformation, effective Ecological Transition relies on setting a pace of change which enables economics agents' adaption whilst avoiding irreparable environmental damage. Moreover, Ecological Transition implies promoting technologies, methods of organisation and funding mechanisms which are, as a rule, the most cost-effective to reduce the use of natural resources. Thus, public sector intervention should not influence technological choices except in the light of ecological transition objectives concerning the economic use of resources and the preservation of natural regulations.

#### *IV.3.2 Ecological transition requires the investment of part of business capital and household savings that will therefore not be devoted to consumption.*

Investment in the renewal and creation of equipment consistent with ecological transition must be financed either by reallocating capital from other investments or by mobilising extra household savings. Some investments in ecological transition which provide comparatively reduced financial profitability and the reallocation of investment capital from other investment will initially reduce economic growth. However, this effect is largely due to the means by which economic growth is currently measured, that is to say, without accounting for current and future consequences of the deterioration of natural resources. If these investments are funded via household savings, thereby increasing the total volume of investments in the economy, their interest rate (i.e. the price of savings) should increase and slow down economic activity. If the public sector finances these investments, and if no new debt is incurred, fiscal tools will be the sole means of raising the necessary capital which will also reduce consumption and economic activity in the short-term. A reduction in economic growth leads to downsizing, but downsizing can be mitigated by developing "green" sectors with a greater relative work force intensity than that in sectors they would replace.

## V. Which public policy instruments are required to successfully fund Ecological Transition?

### *V.1 Improve predictability and signals sent out by the regulatory and economic context*

From the outset, the success of Ecological Transition requires coherence between the signals public authorities send out to economic stakeholders, once the targets to be reached by 2050 and the corresponding phases in the route map are redefined. Government is responsible for ensuring that households and firms understand the value the community attaches to maintaining and renewing natural capital so that the "hidden" social and economic cost of accelerated consumption and the deterioration of environmental resources is fully taken into account when exercising choice in consumption, production and investment.

Amongst the available instruments, environmental taxation is, according to a widely shared and consensual estimate, insufficiently developed in France. At almost 36 billion euros, in 2010 environmental taxation represented 1.8% of GDP and 4.1% of all compulsory levies, as against 2.4% and 6.2% respectively in Europe.

[58] N. Maggiar, F. Henriet, K. Schubert, *A stylized applied energy economy model for France*, September 2012.

Taxes to preserve natural resources and/or reduce pollution and damage (e.g. the General Tax on Polluting Activities (*TGAP*) remain a minor contribution within ecological taxation representing, 6% of all ecological tax income in France. Despite recent reform, their rates are still very often below the monetary value of the negative externalities they seek to internalise (e.g. *TGAP* air, *TGAP* applied to household waste incineration).

This situation reflects both a failure to implement the "polluter-pays" principle and is an obstacle to developing products and consumer behaviour that are environmentally mindful. It skews economic calculation and risks boxing stakeholders in on a path which, set against requirements for the management and reconditioning of resources and the revision of basic natural regulation, is inappropriate. Delay arising from inappropriate "technological choke points" will increase future expenditure in the event of a sudden and late redirection of the economy to achieve environmental goals. High predictability in public policies- which economic stakeholders wish for- demands a set of consistent signals which therefore entails readjusting the French taxation system.

### *V.1.1 Reinforcing ecological taxation and making ecological subsidies more effective.*

Change in behaviour, which is the purpose of tax and regulatory signals, saves resources and reduces pollutants and waste, sometimes through their recycling (circular economy). Ecological taxation and tradable emissions permits, if accompanied by conditions ensuring fairness among stakeholders[59], help to pass on more accurate incentives to economic participants, reduce the overall costs to the community in meeting a given target and encourage on-going innovation such as "clean" products, services and technologies. The benefit to be had from appropriate and more frequent recourse to these levers of public policy has repetitively been underlined in official reports, some recent[60].

With respect to fossil fuels, the key measure relates to specific taxation to cut back on carbon dioxide emissions on the consumption of fossil energy.

For fuels subject to the interior consumption tax, introducing a carbon component (as proposed in the Financial Planning Law (*PLF*) for 2014), amounts to raising the price of fossil energy in a planned and incremental way though independently of non-taxed price fluctuation in the price of crude oil.

More widely, changes to the tax regime would reflect environmental damage better, through either an extension or modification of the tax base (i.e. Waste Removal Tax (*TEOM*), *TGAP* on extraction equipment...), or by increasing their rates (i.e. fuel taxes, *TGAP* Air, pollution fees...). In the case of pollution linked to agricultural (e.g. nitrogen, methane, $N_2O$ and fluorinated gases), collective costs could be better taken into account by taxation and by exploring alternative policy mechanisms to account for the current difficulties in evaluating amenity, thereby helping to preserve ecosystem services.

### *V.1.2 Give carbon markets their stimulus role back.*

The climate dimension in a policy of Ecological Transition must not be based solely on effective carbon taxation, but also, in a complementary manner, on strengthening the European market quotas for GHG emissions which ,in France, covers a quarter of all GHG emissions. The current price of carbon (around €5 /t in mid-November 2013) in the European Emissions Trading Scheme (EU ETS) is insufficient to act as an incentive for low carbon investment, particularly in energy production. The low price of $CO_2$, combined to the rise of low-cost shale gas in the United States, has unexpected short-term consequences: the opening of new coal-fired power stations to the detriment of more environmentally efficient gas generating units, notably in Germany. In response to this, new European targets for overall GHG reduction could be in line with the operational life expectancy of current equipment and complexes. The President of the Republic proposed at the environmental conference that the European Union should commit to emissions reduction targets of 40% in 2030 and 60% in 2040. A political decision in this direction, together with legislative work on a new climate-energy package, would give the carbon market a new stimulus and could move international negotiations forward by encouraging more ambitious climate policies.

### *V.1.3 End tax and subsidy measures detrimental to the environment*

Ending environmentally damaging taxes and subsidies is necessary to ensure the clarity and consistency of public sector signals sent by taxation, irrespective of the economic sectors involved. According to the OECD[61], global fossil fuel subsidies are four times higher than support for alternative energy (i.e. nuclear, renewables, biofuels…). The sectoral support objectives certain taxes currently pursue must not hinder or thwart the behavioural changes meeting the challenges of Ecological Transition require. The termination of environmentally damaging subsidies and, more generally, fossil fuel subsidies is regularly called for by the G20. It is absolutely necessary to underwrite consistency, effectiveness, credibility and fairness in a policy of Ecological Transition.

Consequently, the main tax advantages from which fossil energies benefit (in reality, most pertain to fuel), save for exceptions justified through the application of other instruments, must be gradually phased out. Finally,

[59] In particular a certain homogeneity of the participants in the market: see work by OECD 2012 on the conditions for the smooth operation of tradable permits.

[60] Landau report in 2007 concerning economic instruments for sustainable development, Rocard report in 2009 concerning the climate-energy contribution, Quinet report in 2008 from the Strategic analysis centre...

[61] Figures for 2007, on the basis of estimates from GSI (2010). Source: Joint report IEA, OPEC, OECD, World Bank 16 June 2010.

public intervention should as far as possible seek to raise the productivity of resources consumed and prevent damage to natural regulations.

### *V.1.4 Take systematically into account environmental externalities in the social and economic assessment of public investment*

Account for environmental externalities in economic decision-making should apply to public sector decision-makers, especially with regards to major investments in energy and transport infrastructure. The General Commission for Planning and Forecasts[62] has completed an update of the main parameters to be included in social and economic assessments of public investments (i.e. time budgeting, discount rate excluding risks, value of agricultural land, etc.).

The Public Finance Planning Law of 31 December 2012 has made social, economic and environmental assessments of public investment projects compulsory. For major projects, a second assessment must be undertaken under the guidance of the General Investment Commission (*CGI*).

### *V.1.5 Improve the quality of environmental information provided to consumers and savers.*

The effectiveness of economic instruments which seek to enable household to make informed decisions depends on consumers and customers having reliable information about the environmental impact of everyday goods and services. Such knowledge is likely to facilitate households' choices between a range of substitutable products that meet the same need, or serve the same use, but have different environmental footprints. Environmental information is neither a substitute for, nor a precondition to, but an addition to, price signals. In turn, such information can lead manufacturers into modifying the range of goods offered and distributors to adjust their marketing strategies. In recent years, progress has been achieved in terms of consumer information; through the environmental labelling of certain goods such as new cars (grams of $CO_2$ per kilometre travelled) and domestic electrical appliances (energy consumption for washing machines and refrigerators) as well as transport services (displaying $CO_2$ consumptions levels). Energy performance certificates (EPC) have also provided home-owners with information on the energy consumption per unit area of their residence.

The Ministry of Ecology and *ADEME* led a study to develop standardised calculation methods to scale up environmental displays on major consumer goods. It involved French, European and global companies. The development and dissemination of environmental information should be based on a Government approved benchmark to provide consumers with a better guarantee of the quality of information and to limit the potential proliferation of self-awarded labels. As far as possible, such a benchmark must be harmonized at European level so as to limit potential distortion of competition across the Community. Initially, for reasons of data availability, environmental information should include only indicators based on robust and tested methods: carbon, energy consumption and water... Such selectivity limits the initial cost to companies of introducing such practices (adapting their internal information systems, revision to the content and presentation of labels and prices…) and would thereby be to their advantage. Evaluation of this experiment could deliver worthwhile lessons which may serve to strengthen the case for the development of ecological impact analyses to inform the choice of portfolio investors and savers'[63].

[62] Transformed into the General Directorate for strategy and forecasting at the Council of Ministers on 24 April 2014.

[63] *Financing Ecological Transition* Seminar, July 12th 2012, Ministries of Ecology and Finance.

### *V.2 Taking the non-financial issues posed by Ecological Transition across the funding chain (savers, investors and bond issuers) into account*

#### *V.2.1 The Government must take steps to guide private financing in a direction more favourable to Ecological Transition and associated investments.*

Appropriate price signals stand as one of the most powerful drivers to bring about desirable change in economic stakeholders' decision-making, financial decision-making included, by helping realign the yield from investment projects with the key issues of Ecological Transition. At the same time, awareness of key issues of a non-financial nature can play an effective and additional part in financing Ecological Transition.

*Develop disclosure for the non-financial dimensions of Ecological Transition including for investment portfolios*

As with information for consumers and firms, information for savers and investors is a major issue. Just as consumer eagerness for ecologically responsible goods and services can be sensitised further by developing clear and transparent information on environmental performance (energy, materials, environment...), so for the choice exercised by stock holders and savers. Greater prominence and transparency as to the contribution of investments to financing Ecological Transition, through, for example, a certification process, based on the work undertaken on environmental display and CSR labels, can play a role in the choice savers make in building their personal portfolio. Current research into consumer information could also lead on to the development of ecological impact analyses for investor portfolios and saver choices, thus figuring alongside other private initiatives[64]. The introduction of labels, information and awareness campaigns is intended to further sensitise economic stakeholders to the various opportunities and especially with regard to the non-financial impacts of their choices, and particularly their personal investment. Extending and developing existing information systems, or even setting up new ones, turns around both explaining and following through the part played in Ecological Transition by options both public and private. Amongst savers the demand for both understanding and closer involvement in the use of funds may already be observed. The development of crowd-funding[65] platforms - which must be made secure and regulated to avoid fraud-, as well as the lest recent socially responsible investment (SRI) and the success of certain community-based operations with an explicit SRI dimension and/or aimed at local investors (for instance recent regional bonds issues such as that of the Ile-de-France or Pays de Loire) all express a growing readiness on the part of savers to be more closely implicated in what they are backing through their investments.

Specific features of a non-financial nature of Ecological Transition must therefore not only be measurable but must also lend themselves to being tracked across the complete operational lifetime of the process of investment and funding. Several avenues should be used in support of this dynamic: (1) alerting fund administrators' to the non-financial issues of Ecological Transition; (2) for institutional investors, improving transparency when voting rights are exercised at Annual General Meetings; (3) the feasibility of adding non-binding resolutions into areas covered by SRI, to be voted on at the Annual General Meeting of shareholders; (4) a better evaluation when reporting on assets over the medium and long term of issues arising from Ecological Transition; and (5) more generally, a new approach to risks and uncertainty; together with backers - lenders, investors and insurers - devise a method to assess the vulnerability to Ecological Transition over their lifespan of projects completed; extend the application of techniques of carbon footprint measurement to other domains in Ecological Transition (water, energy) for which robust indicators are available.

Finally, better weighing up of the challenges of Ecological Transition and activities related to it assumes that current efforts to evaluate the economic value of national ecosystem assets and their services are completed rapidly, taking into account the value of and the need to upkeep this capital resource. Such elements as the living environment, water, soil, GHG effect, materials... must figure as part of the indicators of economic and national wealth to flesh out an assessment currently too exclusively and solely based on tradable goods and on monetary value. New approaches for measuring activity are surfacing in a number of settings, but will only be fully effective if applied at European and international level. The Commission's report on measuring economic performance and social progress, coordinated by Professors Stiglitz, Sen and Fitoussi, published in 2009, which gave this perspective both impetus, as well as international attention, helped underpin the economic foundations to this alternative perspective.

[64] For example: 2°C Investing initiative or Carbon Tracker.

[65] 550 platforms of this type exist throughout the world; new ones are created every day. Between 2011 and 2012, collected resources rose from 1.7 to 3.4 billion USD; forecasts for 2013 estimate collected resources to reached 5 billion USD – Source: Presentation by A. Poissonier, ALFI – *Responsible investing conference*, May 15th 2013. A number of these platforms fund renewable energy projects and projects in the field of the social and solidarity economy.

*Adjust taxation or revise savings products' regulatory framework to make long-term investment more attractive and more in keeping with the objectives of Ecological Transition*

By changing the net yield of different investments, taxation of savings plays a role in where households place their savings. Here, tax incentives should encourage savings managed over the medium to long-term with adequately compensated attendant risk. At the same time, improving the linkage between such tax incentives and the methods for managing the corresponding savings products is essential so that the distribution and management of these assets may be brought into line with the medium-term horizon that marks out the asset behaviour of households. These general principles have particular bearing for funding Ecological Transition which, over and above other signals, also requires that the medium to long-term perspective and risk-taking are effectively dealt with.

Furthermore, opening up long-term investments via SME and medium-sized firms' bond product could be envisaged by adjusting the regulatory framework and through a suitably adapted tax framework.

*Devise accounting standards better suited to the long-term.*

Energy Transition does not pose specific accounting problems, as such, other than the fact that most of the targets currently pursued are not as yet accommodated in purely accounting terms (the European regulation of July 2011 introduced non-financial accounting for some key ecological issues). Yet, Energy Transition does assume that a fraction of savings over the long term will be tied up, and will therefore be able to rely on long-term investors.

As expressed in IFRS standards, "Fair Value" accounting frequently favours a balance sheet approach to financial information[66]. Currently, the use accounting standards make of "Fair Value" does not take sufficient account of the specific characteristics of long-term investors.

Long-term investors are in effect identifiable unlimited or long maturing by external liabilities and/or by the importance of their own funds. In France, the *Caisse des Dépôts* together with assurance brokers (especially those not specializing in life insurance) are a good example of this type of investor.

Accounting standards influence investment strategy especially when unrealised capital gains or losses on assets held over the long-term significantly affect the profit and loss account. Recognition of unrealised capital gains and losses in the profit and loss account is not relevant provided that the fluctuation in the yield expected at expiry (in the case of debt) or the average maturity of the liability (in the case of shares) is less than the annual or quarterly fluctuation of these same assets. Furthermore, the method of valuation can have a bearing on the way these holdings are organised - often with considerable environmental impact. Thus, for instance, "just-in-time" stock management, which has greatly increased the turnover of goods, is not without relevance for the way stocks are represented in accounting.

One way of improving the valuation of long-term liabilities in the accounts and also to avoid such situations would be to include within accounting norms the business model employed by long-term investors and to provide better value for long term liabilities.

*Encourage local and regional funding channels contributing to a better integration of Ecological Transition issues*

Expanding the bond market, especially for regional authorities, can play a part in financing Ecological Transition. Regional authorities are important actors in Ecological Transition: public transport, urban development, upkeep of ecosystem services, water and waste management, renovating public buildings, etc. Funding their investments therefore represents a key dimension within the general setting of Ecological Transition. From this point of view, three initiatives can be highlighted:

- Development of funding on the bond market: large authorities have experience of direct funding via the market. For smaller authorities, on several occasions, syndicated bond issues have been organised.
- The setting up of securitisation vehicles for authority debts: in 2012, several initiatives were taken by banking establishments in mobilising the resources of institutional investors to refinance the debts of regional authorities. On the understanding that the good quality of these loans would be upheld at their origination,

[66] According to this concept, assets and liabilities are frequently re-valued in the balance sheet, expressed by a variation in net assets (and therefore shareholders equity) during the financial year, without this variation necessarily passing through the profit and loss account.

these initiatives must seek to ensure a diversification of funding sources for authorities and to increase market depth.

- Provision for setting up a funding agency: the government's banking bill includes a provision allowing local authorities to set up a funding agency as a commercial company under the status of an anonymous society as legally defined in book II of the commercial code and for which they are the sole stockholder. The purpose of this funding agency is to contribute to the financing of local authorities holding ownership via a subsidiary. The subsidiary's activities are liable to the same common law as that of credit companies.

These different initiatives may serve to raise the visibility, remit and impact of projects financed in this way and cause them to loom larger in the concerns of savers. By diversifying funding sources for these projects, such initiatives may at the same time also reduce the financial cost of this form of funding.

#### *V.2.2 Support the dissemination of SRI and ESG criteria to citizens and opinion leadership.*

The development of SRI[67] has made France one of the leading European markets. Still, SRI's contours remain unclear. Firstly, its part developing a sustainable economy is not systematic and SRI strategies remain extremely diverse. Thus, despite its pre-eminence in France, the 'Best in class' approach is contested, on the grounds that it eliminates no sectors while some are considered incompatible with Ecological Transition.

Unlike social investment, SRI does not in effect have a single definition. Of its varying definitions, some lead to the conclusion that SRI might have taken over a large share of traditional financial management. This is a source of confusion, particularly for private investors. There is a debate over the terms used to describe investments based on non-financial criteria (socially responsible investment, responsible investment, sustainable investment, ethical investment, etc.). Thus, to advance SRI involves a clearer, shared, operational definition of what it entails, its objectives, its practices, including financial management, in particular strengthening labelling processes to guarantee reliable, operational and traceable information in such a way that it can be clearly grasped by citizens.

Evaluation of Ecological, Social and Governance (ESG) performance of funds claiming to be SRI, and de facto correlatively the ESG performance of bond issuers, is therefore necessary. SRI labelling must be clarified bearing in mind existing mechanisms in France and Europe, its effectiveness and use developed further. The assessment to be undertaken following the implementation decrees for the ESG descriptors required under articles 224 and 225 of law no. 2010-788 of 12 July 2010, setting out the National Agreement on the Environment, will be an opportunity to reflect on ESG information and, if necessary, to reform it.

As part of this exercise, the regulatory framework imposed on asset managers in terms of ESG reporting (amended Article 224 of the law relating to the National Agreement on the Environment) needs to be extended to include private and public institutional investors by adapting it to their specific conditions. In fact, asset management companies covered by the current article, manage assets on behalf of third-parties, namely by delegation on behalf of the investor. Standard management mandates could therefore be developed in consultation with the financial stakeholders, specifying the nature of non-financial issues and procedures with a view to taking them into account when delegating management (investment and voting policy)[68].

At the same time, this initiative also involves extending awareness of ESG criteria and of the revised SRI label to the range of collective savings products (salary savings, retirement savings, life-insurance).

This mechanism, however, would not be complete were it not to encourage a greater awareness of ESG issues in the competitive strategies of bond issuers for example: amongst company risk managers by urging a broad, integrated, approach to risks, by bringing the opinion of staff representatives into those sections of the management report dealing with sustainable development and including them in the Annual Report to shareholders, by pertaining to contribute and advance coherently and systematically European and international initiatives in favour of integrated reporting (financial and non-financial) and in the area of complimentary GDP indicators systematically and in a coherent manner.

### *V.3 Public funding selectively employed to enhance the market's role in facing key issues of Ecological Transition*

[67] Socially responsible investment.

[68] cf. standard ICGN management mandate (International Corporate Governance Network).

### *V.3.1 Greater awareness of Ecological Transition in the general policy of French and European key public funders.*

Ecological Transition draws on targeted support, particularly in funding to projects fostering new technologies, products or solutions. Beyond this specific backing, it is also a matter of further integrating Ecological Transition in the general strategy of funding agencies (The Public Investment Bank (*BPI*), *Caisse des dépôts* (*CDC*), French Development Agency (*AFD*)...) and of ensuring consistency across their respective funding domains, setting the key issues of Ecological Transition into their funding policies and evaluating their overall contribution to supporting Ecological Transition. BPI's recent publication of its investment priorities heads in this direction.

The same approach which brings together funding of specific projects with a general acknowledgement of the key dimensions Ecological Transition implies for intervention policies to be taken up more widely at European level, in the EU's financial intervention instruments, especially in regard to the European Investment Bank (EIB) and the structural funds.

### *V.3.2 Regulatory consistency and public intervention with the objective of Ecological Transition.*

Consistency across the various regulations (harmonisation of public intervention policies supporting Ecological Transition, public procurement criteria) with orientations of Ecological Transition is a matter of central concern.

If public procurement is taken as an example, even in France, although the objectives of sustainable development must be taken into account when laying down contract requirements (article 5 of the Code of Public Contracts), no binding list of items to be included (resources, energy, waste, water…) has been defined. Only general objectives of an environmental and social nature are mentioned and expressed in such terms as "environmental characteristics", "sustainable development" or "social progress" and "eco-label" (articles 5, 6 and 14 of the Code of Public Contracts).

The national framework has taken up the provisions of EC directive no. 2004/18 of the European Parliament and Council of 31 March 2004 " on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts".. Its preamble lays down that "awarding bodies may contribute to the protection of the environment and the promotion of sustainable development whilst ensuring the possibility of obtaining the best price quality ratio for their contracts".

As far as selecting between calls to tender for products and services is concerned, it may be classified according to several criteria (article 53) including "performance in terms of protection of the environment, performance in terms of the development of direct supplies of agricultural products, performance in terms of professional insertion of disadvantaged groups, the overall cost of use and costs throughout the life cycle", with weightings left to the assessment of the sponsor but which must be "justified and proportionate", or depend on price alone. It is important that public purchasers take environmental impacts into account in their decisions when the size (beyond a certain threshold that has yet to be defined) and purpose of a contract (significant impact in terms of GHG effect, waste, water consumption, etc.) justify it. These guidelines must be based on rules as clear and simple as possible and on harmonised benchmarks for evaluating the energy and environmental footprint involved and for calculating the monetary value associated with each "unit of natural resources" consumed. Under this heading a further European directive is under negotiation. It lays out a clearer list of criteria relating to Ecological Transition to be added to the price, at this stage, expressed only in monetary form. This work could go hand in hand with distributing a compendium of good practice for use by public purchasers or could be included, in the form of a special chapter, in existing public purchasing guides or new ones that are being drafted (the Guide to innovative public purchasing, for example).

### *V.3.3 A consistent system of policies for energy renovation of buildings.*

Carrying out energy renovation in housing faces three difficulties[69]: first, the low profitability of such work at current energy prices; second, the limited resources of many households; and finally, the lack of information directly useable by private individuals about the potential gains (energy-saving and comfort) such outlays might achieve as against not proceeding with such work. Current instruments (Eco-PTZ[70], Sustainable Development

[69] A diagnosis corroborated by the CEDD's (Economic Council for Sustainable Development) report on the energy renovation of buildings at 2030.

[70] The Eco-Ptz is a funding mechanism for Energy Efficiency improvement in private households. Interest-less bank credits of up to 10 years are awarded to private individuals for sums of up to 30,000 euros, depending on the type of improvement.

Tax Credit (*CIDD*)) have played a priming role in making part of the demand solvent, but they are a weight on public finances (€760 million in 2013) and do not achieve change at the scale required.

The major challenge is to identify public policies where private investment leverage private investment and the impact on energy and carbon savings in the housing sector are greatest. The approach adopted to date totals only 134,000 major renovations (3*** work packages) carried out in France during 2011[71], well below the annual private sector target of 380,000 renovations.

A price increase for energy consumed in the building sector is needed to extend the range of private profitability for energy-saving work. The energy price increase must follow a clear growth trajectory announced in advance, such that households may take their decision to invest now.

The general state of public finances, meeting the needs of less well-off households plus the magnitude of the work required mean that measures adopted must impose the lightest burden possible, beyond price signals, on businesses, households and public authorities. Hence, public monies will have to remain aloof from helping stakeholders who can do without this backing and the most efficient systems given pride of place.

Thus, public funding, currently grouped into four policy mechanisms working to the same end (CIDD, éco-PTZ, CEE and soon the €1,350 premium) ought to be rationalised, and only the most effective retained. Eco-PTZ could move towards becoming an incentive-based interest rate bond system, with incentives linked to energy gains, on the lines of the German KfW model. It could thereafter make room for innovative tools (such as third-party financing) backed by the monetary value of the energy savings made. Many issues must be resolved before third-party funding can become a modus operandi replicable at national scale and under conditions sufficiently attractive to households, funders and companies doing the work. The European ELENA -European Local ENergy Assistance- and COSME –Program for Business and SME Competitiveness- as well as EIB funds, could also be called upon and mobilised more intensively.

The information and certification system for private individuals and companies must be developed, especially through reforming the EPC system and supply side skills. Mechanisms like *FEEbat* (Energy Efficiency in Buildings Formation) exist to train professionals but are not able to meet the skilled worker deficit. In France, such a deficit may contribute to the high cost of renovations. In addition, training local field experts is critical for certification, for the private individual and maintaining the confidence of funding agents.

### *V.3.4 Advancing the funding of infrastructures of Ecological Transition through appropriate risk sharing: a joint study with stakeholders of investment instruments.*

Apart from the various initiatives already examined in connexion with funding local authorities, the prospect of creating common securitized investment funds to facilitate the backing of public-private partnership investment projects (PPP) must be mentioned. Consultation between the Government and the market has been taking place since 2010 to consider setting up bond refinancing vehicles for PPP (securitisation of risk-free *Dailly* debts). Such an initiative, which is the responsibility of financial market stakeholders' to see through, could facilitate the inflow of long-term finance for public investment projects involving Ecological Transition. Other initiatives are designed to open the funding of this type of project to bonds (in contra-distinction to refinancing them through a structure drawing on securitized common investment funds).

Moreover, the availability of a €20 billion budget for loans to authorities from the *Caisse des Dépôts* savings fund, will help to finance very long-term investment projects in certain formative areas of Ecological Transition (thermal renovation of public buildings, waste recovery or collection infrastructure, wastewater treatment, etc.). Enhanced investment capacity also calls for greater responsiveness by French local authorities to funding from the EIB or other public lenders, both for refinancing and for setting out guarantees.

### *V.3.5 Promote a dialogue between private and public fund holders.*

Beyond adapting, even recasting, certain instruments, it is also necessary to march alongside changes in practice and in ways of thinking thereby adapting them to unforeseen circumstances. To be alert and aware of the challenges Ecological Transition brings with it, must be the subject of dialogue between private and public fund holders.

The dialogue's mission will be to speed up the take-over of these key issues and the shaping of instruments and tools adapted to funding Ecological Transition by ensuring that expertise, knowledge and experience are shared.

[71] According to ADEME's (Agency of the Environment and Energy Management) OPEN (Permanent Observatory for the Improvement of Energy Efficiency in the built sector ) 2012 annual report.

This dialogue should lead to specific proposals and concrete action by stakeholders, to bring the Transition to fulfilment. As a gauge of the Government's commitment to exemplarity, a public investors club could be created to take part in this dialogue. This national initiative could also act as a starting block to move on to a broader front at European level.

## VI. Detailed recommendations: Four principles, 14 recommendations and 63 measures

### First principle - Improve predictability and the signals sent to stakeholders by the regulatory framework and by economic instruments

#### 1. Set scheduled targets for Ecological Transition if possible up to 2050

1.1. Define and propose quantifiable targets at national and European levels, whether absolute or unitary, that in the medium and long term (2030, 2040, 2050) are binding in areas covered by Ecological Transition (GHG emissions, air pollution, as well as water, raw materials and waste substitution and recycling, and the maintenance of ecosystems services). On this basis, draw up a list of priorities with respect to business sectors, R&D, and innovation concerning Ecological Transition.

1.2. Round off the energy debate with a comprehensive study of European scope on scenarios for GHG reduction up to 2030 and 2040, in order to evaluate and optimise new climate-energy targets.
This exercise ought to clarify the distribution of energy-climate targets between sectors subject to EU ETS quotas (industry, energy) and sectors not subject to quotas (non-quota companies, transport, building, agriculture, waste), as well as the implications that arise for carbon pricing in sectors not subject to quotas, the consequences for industries facing international competition whilst upholding the purchasing power of the most vulnerable households and being prudent with public finances. This requirement to carry out economic and social research may cover other topics pertaining to Ecological Transition.

1.3. Improve the provision of information, certification and the information systems that deal with environmental impact of goods and services (energy, materials, environment...), by building upon, for example, the work carried out into environmental labelling, CSR labels and financial services.

#### 2. Sending ecological pricing signals that reflect long-term issues

The following recommendations (for those relating to ecological taxation) are not intended to anticipate the conclusions of the Committee for Ecological Taxation.

2.4. Send adequate pricing signals to economic stakeholders by reinforcing economic instruments for the protection of the environment other than investments dealing with climate issues.

At the same time as phasing out subsidies running counter to Ecological Transition, significantly increase environmental taxation within the framework of both The National Pact for Growth, Competitiveness and Jobs and The Roadmaps for Ecological Transition; set out in advance the rate of increase of environmental taxation over the medium to long-term:

2.4.5. Adjust the *TGAP* to meet threats to health and environment that need to be reduced: air pollutants, detergents, storage of household and similar waste, materials extraction, drilling and offshore extraction...

2.4.6. Effective cost pricing of damage done to the quality of the water supply (in particular by nitrates and plant protection products) as well as the volume of water extracted.

2.4.7. A Tax structure to discourage urban sprawl, man-made degradation of the soil and the undermining of ecosystem services, as well as a review of the fees charged for the usage of public land, resources and the sea in particular.

2.4.8. At a more general level, a schedule for phasing out taxation mechanisms that run counter to the objectives of Ecological Transition.

2.9. Send appropriate price signals to economic stakeholders by reinforcing economic instruments for climate protection.

2.9.9. Introduce a national carbon component within the existing energy taxes (see PLF 2014) with the prospect of a harmonised tax at European level

2.9.10. Consider specific taxation for short-lived gases such as methane and nitrous oxide.

2.9.11. Encourage the European ETS permit market to play a more efficient role in the medium and long-term: define targets to 2030, even 2040; lay down quota allocation rules for this period;

devise a border carbon adjustment mechanism on the lines developed by pilot experiments for those sectors most prone to carbon leakage.

2.12. Accompany such fiscal re-modelling focused on the resource economy and maintaining natural services by measures to support the most disadvantaged households and the businesses most exposed to international competition, without increasing either tax or administrative complexity.

**3. Encourage adaptability of the economic fabric and in particular that of SMEs and intermediate sized firms, to Ecological Transition.**

3.13. Encourage institutional investors to invest more heavily in SMEs and intermediate sized firms engaged in Ecological Transition as mentioned in 1.1 in a framework as yet to be delineated.

3.14. Support the development of long-term investments in SMEs' and intermediate sized firms' bond products by working out the regulatory changes required and by an appropriate tax framework.

3.15. Follow up those legal options that would allow SMEs and medium-sized firms, including subsidiaries of large conglomerates, to protect their social value, their patents and their innovative capacity by strengthening the rights of controlled companies, without adding to the burden of existing legal rules.

3.16. Analyse the contribution of the different legal incorporation forms open to businesses, in particular in the financial industry, to the diversity of the needs of the Ecological Transition.

3.17. Analyse the way in which societal objectives, and those concerning Ecological Transition in particular, as well as the various economic models of the firms concerned, are taken into account in the different legal status of firms, especially with regard to the finance sector, and with consideration to investment procedures and to long-term investment rates demanded.

## Second principle – Round out existing tools with other targeted instruments to mobilise and leverage public and private funding for Ecological Transition

**4. Create the legal conditions, in the building sector, for an improved public-private sharing of risks, to facilitate the funding of Ecological Transition**

4.18. With respect to energy and environmental efficiency, improve the information and certification system in the building trade for both residential and tertiary sectors.

4.19. Train local field experts. They are essential for certification and for generating confidence amongst private individuals and financial backers; simplify support for the former when they consider thermal renovation for their housing (one-stop local advice centres).

4.20. Align public support for energy–saving renovation work in the light of energy gains measured by energy performance diagnoses both before starting and after completing the energy efficiency improvements..

**5. Encourage Ecological Transition via better mobilisation of public financial resources, in particular for SMEs and intermediate sized firms**

5.21. Take Ecological Transition more fully into account in the overall strategy of public finance agencies. (BPI, CDC, AFD, PROPARCO…).

5.20.21. Uphold the financial support granted when either new technologies, new products or solutions emerge.

5.20.22. More generally, in addition to finance specifically assigned to fostering new technologies, public financial establishments should be encouraged, through a formal investment policy, to take fully into account the Ecological Transition challenges and do so across the whole of their funding policy; plan regular assessments to evaluate their contribution to supporting Ecological Transition and its funding.

5.23. Make better use of the various European funding mechanisms (e.g. the EIB ELENA and COSME programs, project bonds, structural funds) to finance and guarantee Ecological Transition projects in France.

5.24. Target support mechanisms, to strengthen their effectiveness, for households bearing the heaviest financial burden.

5.25. Control development costs of the new energy sectors by targeting support to those sectors that, over the whole investment cycle, are most cost effective for the community and by making the incentives offered more efficient (consider replacing purchasing tariffs by premiums added to proceeds from the sale of electricity).

### 6. Encourage the use of alternative as well as dedicated financial instruments to finance long-term Ecological Transition, whilst meeting the diversity of needs

6.26. Promote the development of new funding methods such as bond issues to fund collective interest projects involving Ecological Transition (public, private or regional projects), following the example of experiments already carried out in France and in Europe.

6.27. Support by calls for submission, the development and marketing of investment products and financial instruments specifically dedicated or contributing to funding Ecological Transition proposed by market-based stakeholders.

6.28. Improve the regulatory conditions that govern the terms of use as for regulated saving products; consider extending these terms to the field of Ecological Transition.

6.29. Draw up a legal framework to foster the development of participative finance (crowd funding) and of the corresponding market-places.

6.30. Create for institutional issuers and investors, private as well as public, in their welfare activities and their social services, a mechanism to promote territorially-based Ecological Transition projects similar to that currently operating for pension funds in terms of social action (institutional social funds).

### 7. Launch an ambitious approach in support of Ecological Transition at European level

7.31. Review European regulations, public support policies, aid and assistance, regarding their coherence to and impact on ecological transition and promote awareness of Ecological Transition issues in awarding public contracts, especially with respect to GHGs and the consumption of energy and water.

7.32. Promote a strategy that favours Ecological Transition for the EU's intervention instruments (EIB funding and structural funds), which brings together the financing of specific projects with a broader focus on boosting the general level of awareness about the challenges Ecological Transition poses within their respective remits.

7.33. Promote regulatory and fiscal harmonisation in Europe for domains pertaining to Ecological transition, which while limiting distortion of competition within Europe's single market, guarantees European firms and enterprises a level playing field in their competition with foreign firms, businesses and interests. In this respect, the creation of players engaged in Ecological Transition of international weight may be desirable as long as competition is preserved in the European market.

## Third principle – Strengthen the awareness among public and private backers, investors and bond issuers of non-financial challenges (ESG criteria) of Ecological Transition

### 8. Reinforce the conditional nature of public financial support (funding, guarantees, subsidies, public-private partnerships, purchases) in relation to their contribution to Ecological Transition, bearing in mind the environmental cost and discount factor when deciding on public investments and financial supports

8.34. Pay systematic attention to environmental damage when calculating the economic cost of major development and infrastructure projects by including reference prices –reflecting their true environmental cost- assigned to each externality.

8.35. Set a dateline for phasing out public support running contrary to the objectives of Ecological Transition.

8.36. Weigh up the introduction of a "climatic resilience clause" that operates over the lifespan of equipment and materiel included in public works contracts.

8.37. In France, complete the incorporation into public contracts of relevant criteria relating to the issues at stake in Ecological Transition in particular GHGs and energy and water consumption, and disseminate best practice examples to public purchasers.

### 9. Encourage the integration and traceability of non-financial issues relating to Ecological Transition for private and public institutional investors

9.38. Complete, whenever it should be necessary, ESG information contained in the ESG descriptors laid down in articles 224 and 225 of law no. 2010-788 of 12 July 2010 which sets out France's national commitment on the Environment and draw up an assessment of their application.

9.39. Extend the framework set out for asset managers regarding ESG reporting (Art. 224 of Grenelle II) so that it apply to private and public institutional investors by adapting it to their specificities, and develop jointly with financial actors, within the framework of a platform as outlined under point 13.1, one or more standard asset-management mandates to lay down the nature of, and procedures for, taking non-financial issues into account when outsourcing asset management.

9.40. Strengthen, in the case of institutional investors, transparency when exercising voting rights at Annual General Meetings.

9.41. Align insurance premiums and terms of public compensation payments for damage to property according to the implementation of preventive measures against natural risks (including the premium against natural disasters).

**10. Support the development of Socially Responsible Investment (SRI) and ESG criteria amongst citizens and opinion leaders**

10.42. Bearing in mind current instalments in France and in Europe, improve SRI labelling to enhance both its use and effectiveness (a study of SRI labels or their equivalents world-wide as well as the quantitative methods for evaluating the impact of investment products on the economy and the environment; the setting up of a multilateral working group to examine the concept of SRI labelling for the public), whilst working to define a common basis for SRI labelling criteria.

10.43. Raise the level of awareness amongst savers of the ESG impacts of their savings choices.

10.44. Promote ESG integration and eventually SRI labelling in collective savings schemes (Corporate employee savings schemes, corporate pension schemes, life-insurance).

**11. Enhance awareness of ESG issues in relation to issuers' competitive development strategy**

11.45. Among company risk managers, press for a broad and comprehensive approach to risk by integrating, in collaboration with professionals, the risks associated with Ecological Transition into the AMF repository so that it figures in the Risks section of corporate Management Reports.

11.46. Incorporate into the annual report the views of staff representatives on those sections of the management report dealing with sustainable development.

11.47. Explore the feasibility of introducing non-binding resolutions into the items covered by CSR, subject to the shareholders' vote at the Annual General Meeting.

11.48. At European level keep raising the issue of the necessary adaptation of IFRS accounting norms to long-term funding needs, amongst which Ecological Transition, including for SMEs and very small firms.

11.49. Set up a working group to give input to European and international initiatives on this issue (dual use of non-financial reporting within firms and directed to society, valuation of intangible capital; development of methods to measure the impact on firms of key long-term risks).

## Fourth principle – Re-centre the behavioural set of stakeholder practices around the objectives of Ecological Transition and funding

**12. Enrich, supplement and develop information systems so as to clarify and track the contribution of private and public decisions to Ecological Transition**

12.50. Extend indicators of economic activity and national wealth so as to compare sub-national regions on a basis other than market production alone to develop a more inclusive GDP.

12.51. Implement a valuation of the assets of national ecosystems and their services, bearing in mind the value and upkeep of this capital, and sustain its use at European and international level.

12.52. Strengthen information about the environmental 'added value' of goods and services, in particular for the regions should need be (see principle 1).

12.53. Extend measurement of the carbon footprint of investments to the challenges posed by Ecological Transition: water, resources footprint...

12.54. Improve reporting of the investment obligation in energy saving projects of the non-centralised compartment of Savings Book A (Livret A) and the Sustainable Development Savings Book (LDD).

**13. Accelerate financial stakeholders' appropriation of the challenges of, as well as tools contributing to, funding Ecological Transition.**

14.55. Establish an institutionalised dialogue with private and public financial actors; its remit being to press forward with the joint appropriation of the issues and instruments involved in funding Ecological Transition.

14.55.55. Uphold, in the setting of this dialogue, the confrontation of opinions, the establishment of an observatory to follow up the funding of Ecological Transition, and push for voluntary commitments to advance Ecological Transition.

14.55.56. Through such a take-over at national level, fuel a wider movement at the European level.

14.57. With due consideration to the Government's leadership role in setting the example, create a public investors' club within the framework of the Club for public establishments and public companies, with the same mission and interacting with the aforementioned platform.

14.58. Train fund trustees (in particular those in joint [Employers/Employees] institutions) and financial intermediaries to technological and environmental risk assessment and measurement methodologies, and, more broadly, to taking into account Ecological Transition issues in their investment and voting policies; to meet this objective, a call for tender ought to be made together with institutional investors to Paris Europlace, based on work in hand into the professions of Ecological Transition

**14. Stimulate higher education and operational academic research, whilst encouraging a broad-spectrum approach, on including the challenges posed by Ecological Transition in companies' and financial stakeholders' investment choices**

14.59. For Investors: Create a national prize for economic research into Ecological Transition (quantitative methods of evaluating the contribution of investment vehicles to Ecological Transition and to long-term funding of the economy; relationships between non-financial risks and systemic economic risks; carrying environmental labelling over to financial products).

14.60. Issuers: Launch an appeal to academics for submissions based on operational research completed with a focus on two topics: the valuation of a firm's non-tangible capital; development of vulnerability tests in relation to challenges Ecological Transition represents for firms.

14.61. Raise awareness of the challenges Ecological Transition entails in higher education establishments' and *grandes écoles'* economic and management curricula.

14.62. Together with lenders and insurers, develop a technique to diagnose investment vulnerability to the issues of Ecological Transition over the entire lifespan of the investment.

14.63. Promote better assessment of the challenges from Ecological Transition and of the cost impact for investors of runaway change upon value and management of their assets, played out against vulnerabilities over the medium and long-term, (historical data cannot be used to take into account the imponderables associated with such new issues as climate disruption, access to different resources, etc.) and, more generally, to devise an updated approach to risk and uncertainty.

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