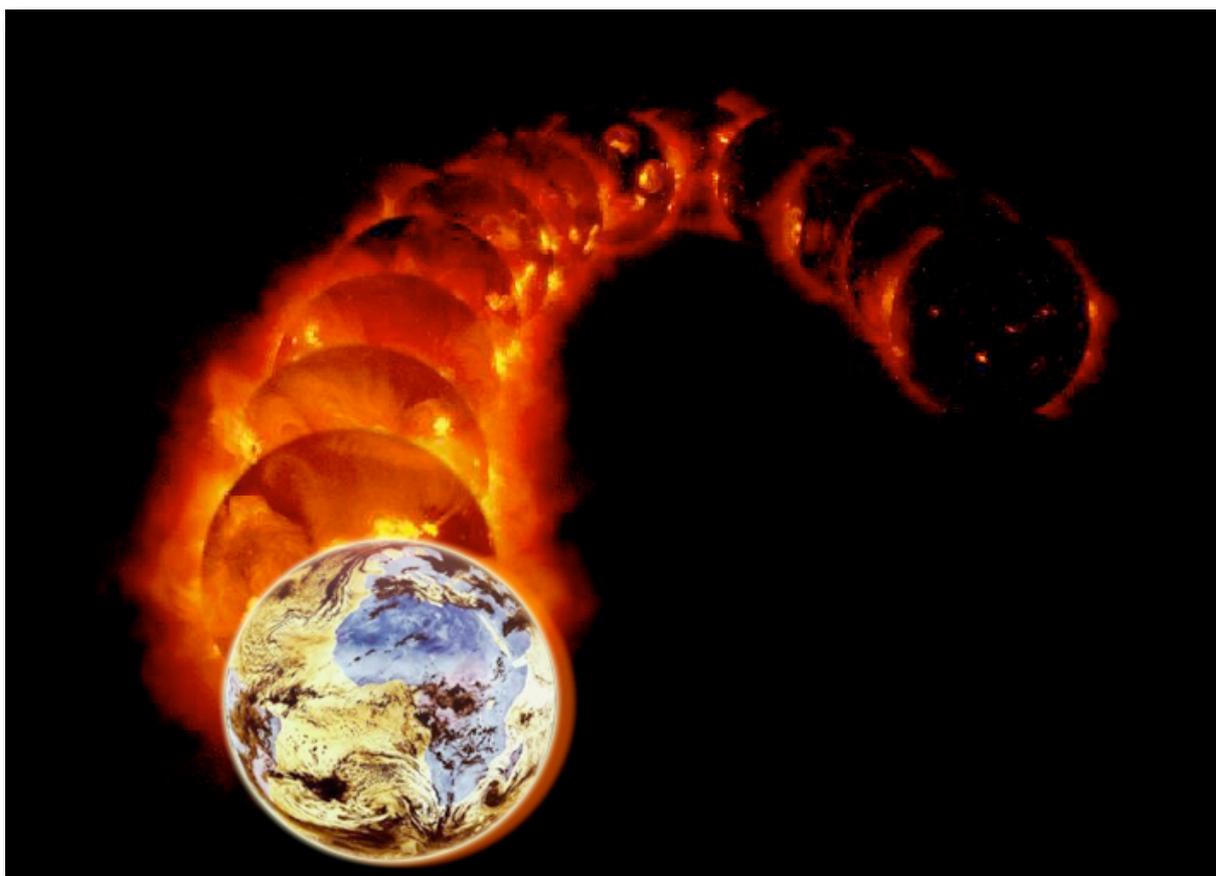
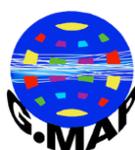


THE CONTENTIOUS FACTORS OF ENERGY TRANSITION



**Objective Measurement of the Information
And 3 Years Projection through the Analysis
Of the Measurement of the Signal**

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CONTENTS

- 3. Foreword
- 4. Objectives, Methodology and Parameters
- 5. Frames of References
- 9. Observations: Contentious Factors of Energy Transition
- 9. Relations of Interaction Centred on Energy and Transition, Frame of Reference 1.
- 10. Heat Map of the Relations of Proximity, 2030 projection, Frame of Reference 2.
- 11. Relations of Interaction Centred on Energy and Transition, Frame of Reference 3.
- 12. Heat Map of the Relations of Proximity, 2030 Projection, Frame of Reference 3.
- 13. Comments

FOREWORD

More than six billion human beings today and some questions: how can we answer the **inflation of the world energy demand** in a world where resources are limited? How can we keep developing energy-consuming economies and our current ways of life without destroying our ecosystem and our planet? Are traditional energies really going to be running out and what are the **possible alternatives**? What is the place of States, economies and civil societies in the debate on the energy transition?

On the one hand, the Copenhagen summit showed us the **failure of true multilateral dialogue** on energy questions and on their future development. Indeed, in the field of international relations, the question of power statute still seems to have an impact concerning who could, and who couldn't, participate to the debate and to the construction of a new energy system. In fact, even if the issue of financing is central in an energy transition project, the most important is to adopt a multilateral approach, including all the players which could be concerned by this transition. Including those players is necessary to install a global project taking into account differences, because having a global approach doesn't mean universalizing solutions and standardizing problems and local specificities. On the other hand, the Copenhagen summit illustrated too how some superpowers, as China and the United States, could use the question of energy transition to defend their own power interests and economical ones without taking into account the need of a global approach of energy and environmental issues and the necessity of a common strategy to respond, locally or regionally, to **challenges of the new energy transition**.

Internal and international debates on the energy transition and various models set out by different countries, enterprises or organizations¹ ask a challenging question. What will contentious factors be - social, environmental and geopolitical ones - resulting from choices of one or another energy strategy? Globe Expert will allow us to **hunt out these contentious factors** and weak signals able to inflect, or to characterize, strategies of energy transition.

This study presents the results of the comparison between three frames of references, one general and two more particular, focused on the field of contentious factors in the global viewpoint of energy transition.

¹ To have more information concerning some examples of these models: for Japan, see the "2050 Japan Low- Carbon Society" scenario team of National Institute for Environmental Studies; for International Energy Agency, see World Energy Outlook 2009 and 2010 on <http://www.iea.org/>, etc.

OBJECTIVES, METHODOLOGY AND PARAMETERS

OBJECTIVES

The objective of this study is to illustrate, in the field of energy transition, *relations of proximity* between different issues (economic, geopolitics, environmental, etc.) and particularly to define *contentious factors* and *weak signals* that we have to take into account in all strategies of development.

METHODOLOGY

1. Preparing a **semantic frame of references** structured by axes, segments and associated keywords.
2. Starting from this frame of references, a first search is executed on the whole database (3 million documents) in order to retrieve the most relevant documents matching with each reference. Thus, a **documentary repository** is carried out. It includes about 500 documents by segments.
3. Provided with this “base of learning”, the system executes new queries and searches for the most relevant and complex documents with respect to the references. In this way a **mini database** (20.000 documents) is carried out.
4. Keywords expressing the **core question** of the study are associated with the frame of references and the mini database before the full process starts.
5. The process takes into account **concepts** and not only words. It is not binary - yes or no, white or black - but **fuzzy**: i.e. rendering a wide scope of colours. It is **comparative**.

PARAMETERS

1. We chose to use several frames of references in order to have a **global view** of contentious factors - with broad definition of geopolitics - and a **particular vision**, focused on energy transition and contentious factors - with a different view of geopolitics - at a time. The third frame of reference represents a synthesis of referential 1 and 2, and is more focused on the energy issues.
2. We chose to limit the **projection to 20 years**, so by 2030, because most of energy transition models present strategies and actions which will have consequences in 2020 or 2030.
3. Regarding the “behavioural simulations” (genetic algorithms) we opted for the “Prey and Predator Model” based on the Lotka-Volterra equation.
4. We did not balance the weight of the different predators, just as we did not modify the selection of the preys and predators that the system had carried out.

FRAMES OF REFERENCES

FRAME OF REFERENCE 1

FIVE AXES

- Geopolitics; Economy; Climate, Environment; Sciences & Technology; Society.

THIRTY-ONE SEGMENTS

- **Geopolitics:** Domestic politics; Territories; Migration; International Law; International Relations; Defence, security.
- **Economy:** Domestic economy; World economy; Globalization; International trade; Finance.
- **Climate, Environment:** Water; Agriculture, Food; Raw Materials; Oil; Energy; Renewable energy; Global Warming; Biodiversity.
- **Sciences & Technology:** Information and Communication Technologies; Research fields and technologies; Knowledge.
- **Society:** Human Rights; Religion; Beliefs; Education; Demography; Welfare; Health; Social stability; Information, Communication, Rumour.

KEYWORDS (EXAMPLES)

- **Geopolitics:** Demography; refugee; climate; poverty; freedom; conflict; politics; humanitarian disaster...
- **Economy:** Bankruptcy; economic warfare; domino effect; recession; speculation; regulation; bubble; IMF; reflation; EOCED; system; restabilising; rebalancing; readjustment; World Bank; growth; emerging; developing; localization; relocation...
- **Climate & Environment:** River; weir access; flood; drought; dryness; importation; exportation; technology; desalination; desert; desertification; catchment...
- **Sciences & Technology:** Nanotechnology; biotechnology; stem; cell; medication; biology; nuclear energy; patents; norms; space; aeronautics; physics; chemistry; engineering research; disruption; warfare...

- **Society:** Employment; unemployment; poverty; inequality; homeless; tax; revenue; revolt; rebellion; revolution; strike; riot; demonstration; anger; wrath; benefit; retired; youth; student; worker; farmer; cultivator; wealth; credit; repression; middle class...

FRAME OF REFERENCE 2

FIVE AXES

- Economy; Geopolitics; Politics; Sciences & Technology; Society.

TWENTY-FOUR SEGMENTS

- **Economy:** Domestic economy; World Economy; Finance; Globalization; International Trade.
- **Geopolitics:** Energy; Migration; Oil; Raw Materials; Territories.
- **Politics:** Defence, security; Domestic politics; Human Rights; International Law; International Relations.
- **Sciences & Technology:** Information and Communication Technologies; Knowledge.
- **Society:** Beliefs; Education; Demography; Religion; Health; Welfare; Information, Communication, Rumour.

KEYWORDS (EXAMPLES)

- **Economy:** Austerity; liberalism; state; regulation; conjuncture; structural; sovereignty; defence; energy; welfare; budget; inflation; deflation; debt; limit; deficit; growth; increase; GDP; indebtedness; borrowing; power; arbitrage...
- **Geopolitics:** Land purchasing; boundaries; sound; sea access; continental shelf; deep offshore; mountains; migrations; sounds; dry well...
- **Politics:** Stability; crisis; black list; sanctions; multi-track diplomacy; conflict; coalition; influence; G8; G20; G77; BRIC; BASIC; AU African Union; League Arab; States; ASEAN; Shanghai Organization; European Union EU; MERCOSUR; ALENA...
- **Sciences & Technology:** Research; patents; norms; disruption; economic warfare; Internet; globalization; Google; China; USA...
- **Society:** Birth; migration; aging; death; education; nationality; religion; ethnicity; fertility; infant; expectation; rate; gross; reproduction; immigration; emigration; rural depopulation; residents; number; mortality; unemployment; employment...

FRAME OF REFERENCE 3

FIVE AXES

- Climate & Environment; Economy; Geopolitics; Politics; Sciences & Technology; Society.

TWENTY-NINE SEGMENTS

- **Climate & Environment:** Global climate change ; Water ; Land ; Carbon ; Renewable energy ; Biofuel.
- **Economy:** Domestic Economy; World Economy; Globalization; International Trade; Finance.
- **Geopolitics:** Territories; Strategic Raw Materials; Migration; Oil; Gas; Energy.
- **Politics:** Domestic Politics; International Relations; International Law; Defence, Security; Human Rights.
- **Science & Technology:** Research Fields & Technologies; Knowledge.
- **Society:** Demography; Beliefs; Welfare; Health; Information Communication; Rumour.

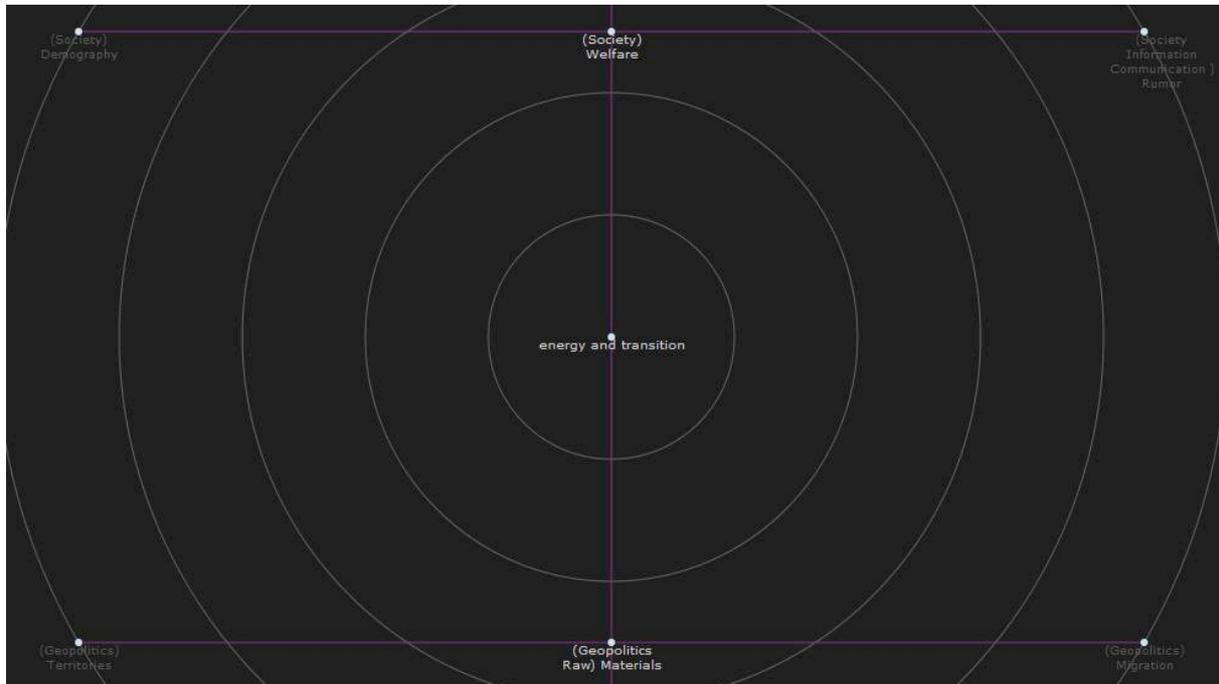
KEYWORDS (EXAMPLES)

- **Climate & Environment:** Carbon tax; dioxide sequestration; carbon market; sink; spot price; emission right; exchangeable licence; proper development facility; quotas exchange...
- **Economy:** Power; superpower; hegemony; world-system; influence; supremacy; soft power; hard power; diplomacy; economy; tax; barrier; Importation; exportation; black list; specialization; BRIC; MERCOSUR; ALENA; EU...
- **Geopolitics:** OPEC; pipeline; tanker; reserve; Borefield; oil field; oil deposit; peak oil; EOR (Enhanced Oil Recovery); mineral fuel; deep offshore; FPI (French Petroleum Institute); Shell; Petrobras; CNOOC (China National Offshore Oil Corporation); BP (British Petroleum)...
- **Politics:** Treaty; contract; normalization; UN United Nations; humanitarian; sovereignty; Geneva convention; Universal Declaration Human Rights; ICC (international criminal court)...
- **Science & Technology:** Research; patents; norms; disruption; economic warfare; ICT (Information and Communication Technologies); Internet; globalization...

- **Society:** Prejudice; superstition; ideology; politics; political; emotion; existential claim; expectation; modernity; refusal; deception; value fear; disease; epidemics; allergy; malnutrition; malaria; AIDS; dengue fever; lung; cardiovascular risk; migration; mortality...

CONTENTIOUS FACTORS OF ENERGY TRANSITION

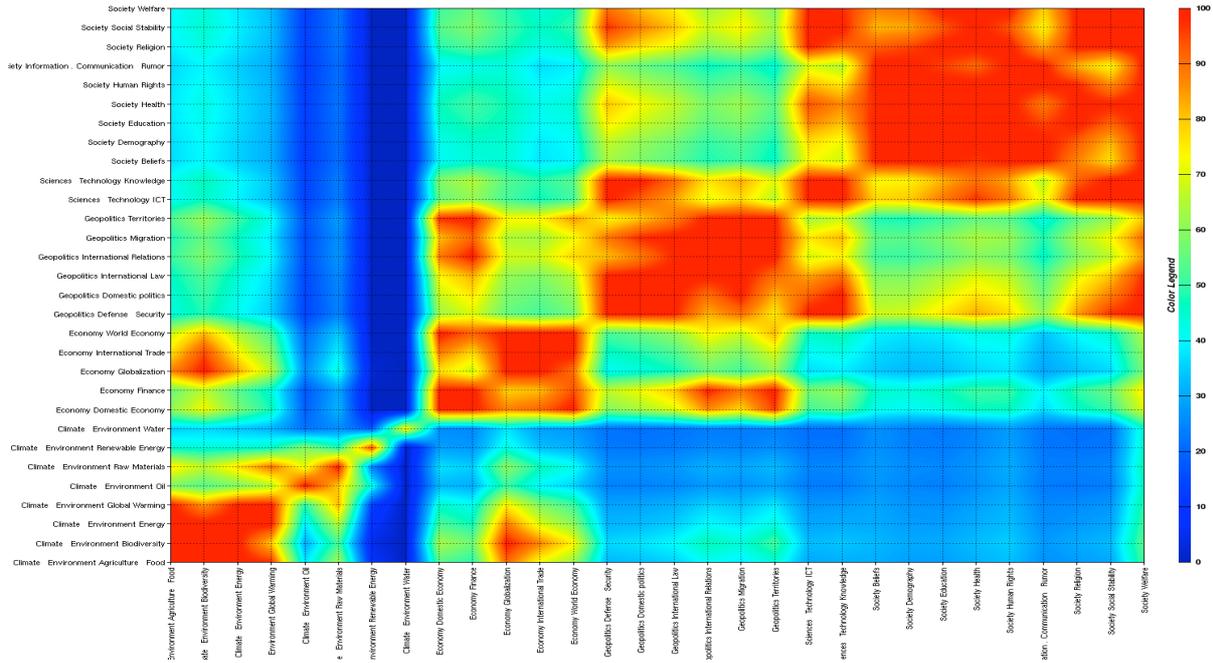
OBSERVATIONS



Map 1: relations of interaction centred on energy and transition, frame of reference 1.

Which choices in the field of energy transition will be taken into account: **societal factors** or only geopolitical ones? Is the debate on the energy transition focused on the means avoiding the **energy shortage** or much more centred on the ways to improve the **global way of life**? So, has the societal factor to be considered as a weak signal, that is to say a major element to be taken into account or, should the opposite occur, as a factor of destabilisation? Here, Globe Expert shows us the possibility for the energy transition issue to be divided into two central fields: the question of raw materials, of their use and their rarefaction, and the recognition of societal factors as welfare. Will the next energy transition have a social component or will it be only economic and geopolitical? That is all the question.

PROXIMITY RELATIONSHIP MAP



Map 2: heat map of the relations of proximity, 2030 projection, all things being equal, frame of reference 2.

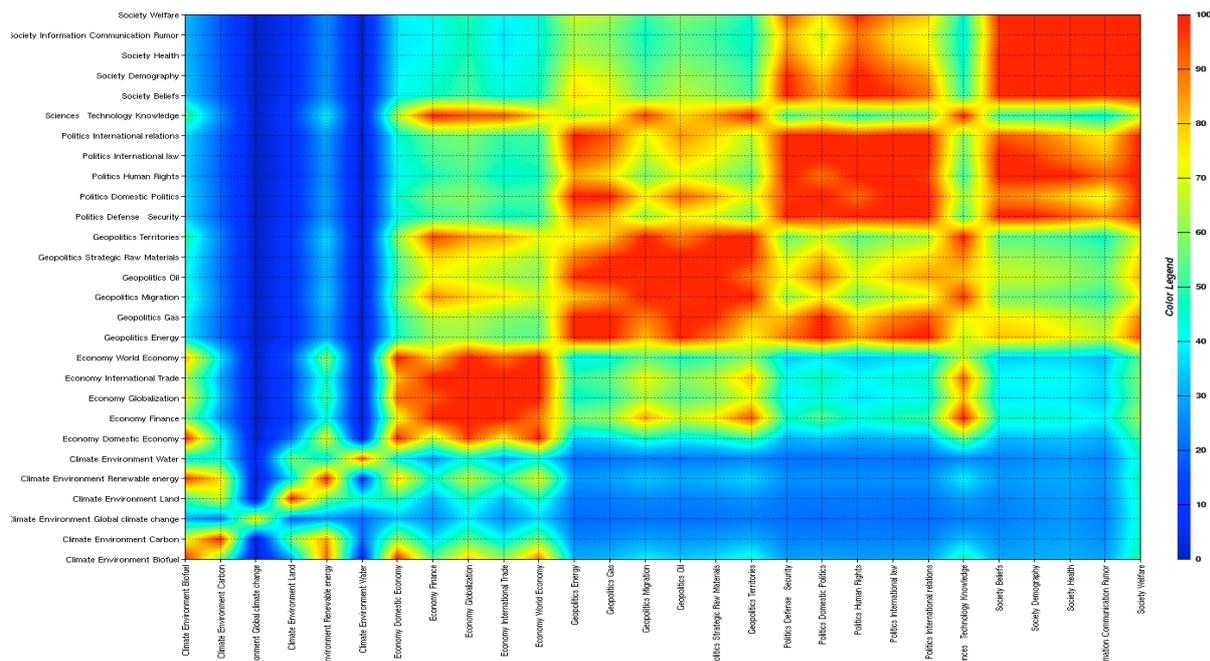
This result taken from the second frame of reference shows that two sectors are really isolated compared to the others: water and renewable energy. That isolation can be seen as a clue to say that **water and renewable energy** will be **two major contentious factors** by the 2030s. Indeed on the one hand, we see that water is, and will become, a central issue in relations and negotiations between States. On the other hand, the will to develop renewable energies is, and will be, confronted to the reality of resources notably illustrated by the core problem of rare earth and their localisation.



Map 3: relations of interaction centred on energy and transition, simulation, frame of reference 3.

This map shows that the issue of energy transition is, and/or will be, directly linked with land and carbon, and questions of States reactions, and politics, concerning the greenhouse dioxide emissions and the agriculture (grabbing, production, etc.). The fact that “society-welfare” is directly linked to energy transition shows that this central point is either a ***gathering place*** between climatic problems, or a ***breaking point*** between them because of what could be a lack of consideration for societal aspects.

PROXIMITY RELATIONSHIP MAP



Map 4: heat map of the relations of proximity, 2030 projection, all things being equal, frame of reference 3.

The result of the third frame of reference confirms that the approach in terms of energy transition remains, by the 2030s, **divided up in each thematic block**, while a real global approach will be the best solution, in terms of method, not in terms of result, to apprehend this question. We can consider Water and Global Climate Change, which are the most isolated fields, as ***potential contentious factors*** because of their global isolation with other problems, but also because **they stimulate convergence** between the other fields.

COMMENTS

The definition of a global and common strategy between nations, concerning the energy transition and the consequences of these choices on populations, economies and States, is neither for tomorrow nor for the day after. The Copenhagen summit is the symbol of difficulties, almost of the impossibility, for great nations and emerging countries to determine a common attitude to confront challenges of the global climate change and of the energy transition. But, even if the approach of energy and climatic issues has to be common and global, actions and strategies have to be adapted to each actor and each situation, locally and regionally. The energy transition is a **world challenge** but we cannot require the same response from an emerging country and from a great power. The objective has to be the same but the **responses have to be adapted**.

Nowadays, official discourses concerning the energy transition seem to be completely focused on societal and economic fields while geopolitical ones appear to be isolated from the others. On the one hand, political decision-makers seem to fail to associate, in civil society, geopolitical questions with societal ones, because of the disinterest of the population for these questions. But, in the other hand, the important thing is to know if it exists a true will to associate both of them, risking to lose popular support in focusing debates on geopolitical and economic issues.

Therefore, society represents a **singular threshold** beyond which consequences are not yet determined but they can be foreseen. Indeed, choices in terms of energy transition are not all technical but they have to take into account the role of population in the success of the new energy transition. Actually, ecological and environmental questions are more and more integrated in the political discourses but also in the everyday life of populations: to build an ecological house; to buy a no-polluting car; etc. It will be less and less possible for political decision-makers to avoid the societal component in a global project of energy transition, because nowadays, a great part of populations' way of life is linked to environmental issue, not *de facto*, but by actions and decisions of political elites. But what will be the cost of an energy transition? For who?

Some experts consider that the question of the energy transition cost is the central point of the debates on this subject. Here, we consider that this subject is already treated by a large scale of experts in the field of energy, global climate change etc. and that it is already integrated in all projections concerning different energy transition models. But **what cost are we talking about?** Is it a financial cost for industries, enterprises and States? Is it a political one for States and international organizations? Is it an environmental one for the planet, ecosystem and environment? Or is it a social one for Nations and populations? The question of cost is determinant in a debate on a global approach, because all players are confronted to different situations, and all specificities require adapted reactions. The next study, centred on energy transition and emerging countries, will allow us to develop and illustrate all these particularities, always in the global perspective of studying energy challenges of tomorrow and contentious factors of energy transition.