The world in 2025: A challenge to reason

Thierry Gaudin for European Commission, 2010

Gilgamesh

The time of the finite world begins

(Paul Valéry)

1-Introduction: Approaching the limits

The situation that human species is experiencing during the first quarter of 21st century is a disruption with the trend driving the second half of 20th century. Therefore people presently less than 60 years old have, particularly in developed country, little if no experience of comparable situations and will be tempted to imagine the future using inadequate conceptual tools issued from their own past experience.

The approach of the limits relates first to the so-called "revenge of Malthus[1]". At the end of 18th century, after having completed a long visit to different continents, Thomas Robert Malthus came back formulating his demographic law: In every civilization, the population grows up to the saturation of resources, and then inevitably stabilizes or declines.

A similar statement was made nearly 40 years ago, in the early 70's, by the Club of Rome in his famous report "Limits to growth". It is important to notice, regarding our 2025 horizon, even if the evolution of technology has been able to push the limits, leaving place for a surplus of growth, that most Meadow's[2] models predicted a collapse of our civilization during the first quarter of 21st century. Similar conclusions, taking into account technological evolution, were made in 1990, in the "2100, récit du prochain siècle" study, operated by a team of the French ministry for research on request of the minister Hubert Curien.

Nowadays, many more signs of saturation appeared and one can estimate it would be difficult, if not impossible, to push again the limits. Technology undoubtedly makes miracles, but it would be unwise to carry forward our children's safety on miracles. Therefore, the foresight landscape splits in two basic scenarios:

The first scenario is a tragedy, giving to the word "tragedy" the meaning it had in the antique Greek theatre: a tragedy describes an evolution in which the actors, caught

[1] See the paper of Luc Soete.

[2] Dennis Meadows and his team built their model of the world after the Club of Rome demand. He published in 2002 and update "Limits to Growth: The 30-Year Update". "we must tell people how to manage an orderly reduction of their activities back down below the limits of the earth's resources" says Meadows. His conclusions are close to the ones of the scientific community, as expressed, for instance, through IPCC (http://ipcc.ch).

in their prejudices, are unable to escape their tragic destiny. In Shakespeare performances, many die at the end, and their death bears a meaning, expressing the contradiction between their deep identity and their destiny.

In the case of the present world, the trend can be described as follows: globalization of the market economy, excessive consumption and throw away mentality, after having invaded the so called developed world, spreads over the developing countries, faced to global warming and energy scarcity. It appears to lead to a global collapse. Some experts even foresee an extinction of human species and many others species as a result of mankind behaviour. They call this sixth extinction the "anthropocene[3]", as due to humans (anthropos), differing from the preceding extinctions, at least the one of the dinosaurs (-65M years) and the biggest one at the end of the Permian period (-250 M years), that were probably caused by the impacts of meteorites.

The second scenario is self-control of mankind. But how can we expect 6.5 Billion humans to reduce their consumption and restore the equilibrium with natural resources? **Certainly not with a laisser-faire policy!** Therefore, a major task of foresight is now to estimate the nature and the magnitude of the constraints and incentives that might be generated by the consciousness of the limits, and also the ways these constraints and incentives may be decided and operated.

According to the presently available data, the order of magnitude of this necessary self-control appears important. The ecological footprint analysis initiated by WWF[4] points that, after having consumed non renewable resources, assuming a standard of life comparable to the Europeans by year 2000, the planet would be able to carry 2.5 Billion humans, compared to the present level of world population: 6.5 Billion, 8 to 9 being expected in 2050. One must add to this rough evaluation the need to control rapidly the greenhouse effect, the droughts and floods pushing climate refugees out of their land and the rise of the level of the oceans.

[3] See Uno Svedin contribution.
[4] World Wildlife Fund

It can reasonably stated that, before the end of 21st century, the reduction of the world population should have started, the consumption of natural resources per capita should have been cut approximately by half, at least in the so called developed countries, and the greenhouse gases emissions totally compensated by absorption. These would be the conditions to leave a living planet to our grand children.

Such statements have to be taken, not as a catastrophic prophecy, but as a stimulating challenge. After all, during war periods, populations have been able to adapt to stronger constraints. Obviously, the challenge starts now. The period between 2010 and 2025 appears as the crucial moment, the one of the choice between tragedy and revival.

2-The new tensions:

2.1 The environment at stake; climate and biodiversity

Though ignored by decision makers during 20th century, climate change is now considered as one of the key disruption factor of 21st century. As a result, it is likely that the policy guidelines, formerly given by politicians and business leaders, will now be highly influenced if not determined by the scientific community.

Economy has been considered as the normal starting point of foresight during the last quarter of 20th century. Now, the physical data appear to be taken first into account. Approaching physical limits, economic growth is under constraints and its measurements, even corrected by a price index, do not provide a sound description of reality.

Foresight, therefore, must take as preliminary data the estimations of the scientists on climate change and, in a second stage, try to imagine the reaction of the social and economic forces at stake.

2.1.1 Foreseeable changes

If the increase in medium temperature predicted would reach between 3 and 6° Celsius during 21st century with current yearly fluctuations that may, as usual, exceed 10°/year, the difference may not be directly sensitive to the average human being in 2025. But the estimation of the climate evolution by the scientists should be more precise and detailed that it is nowadays, as a result of the ongoing building of global models and more precise measurements.

One of the major difficulties of these estimations is due to the fact that greenhouse effect is a “non linear” phenomenon, in other words bearing in itself a cause of its acceleration. More precisely, the permafrost melting due to an increase in temperature would re-launch methane and carbon dioxide into the atmosphere, which will increase the greenhouse effect. But, according to the present state of knowledge, the order of magnitude of this acceleration is unknown, as is also the order of magnitude of the

capture of the carbon dioxide by an accelerated growth of the vegetation, which will conversely decrease the greenhouse effect.

Anyhow, at least 2 classes of events may, before 2025, call for new decisions:

1-The first is the melting of ice. The models and the observations converge in predicting an increase of temperature higher in the north and south poles than in the equator regions. The melting of the ice sheet covering the North Pole is already visible. The ice reflects the solar radiations, though the sea or the ground beneath absorbs it. Therefore, ice melting is also a “non linear” phenomenon. As far as only the North Pole ice sheet is concerned, it has no important consequences for humans (if not for white bears), because its ice is already floating on the sea. But if the Greenland ice sheet, which is lying on earth, melts completely, it would increase the level of the oceans by 7 meters all over the planet. And another 7 meters would be expected if the west Antarctic Ice sheet melts or is destabilised and transformed into floating icebergs.

The 2007 report of the IPCC predicts an increase of the oceanic level around half a meter during the 21st century but the recent declaration of its president, Mr Rajendra Pachauri warned that this estimation would probably be revised and increased in the next reports.

Even with a minimum 50cm, some countries would have problems because of the increased risk of damages in case of great storms (like Katrina, New Orleans, 2005 or Nargis, Burma, 2008). But if the ocean level rises several meters, then most seashore level towns are concerned: Bombay, Calcutta, Ho-Chi-Minh Ville, Bangkok, Djakarta, Dacca, Shanghai, Canton, Tokyo, Osaka, Alexandria, Venice, Amsterdam and Rotterdam, Abidjan, Lagos, New Orleans, Miami, New York…Bangladesh, Holland, and of course coral reefs islands in the Indian and Pacific Ocean.

The World Bank, in 2007, estimates that if the level of the oceans rises 3 meters, 135 Million people would be displaced, and 300 million for 5 meters. Such a situation would generate an intense rebuilding activity, either on higher land or on “ocean cities” floating platforms, the order magnitude of which exceeds widely the post wars rebuilding activities of 20th century.

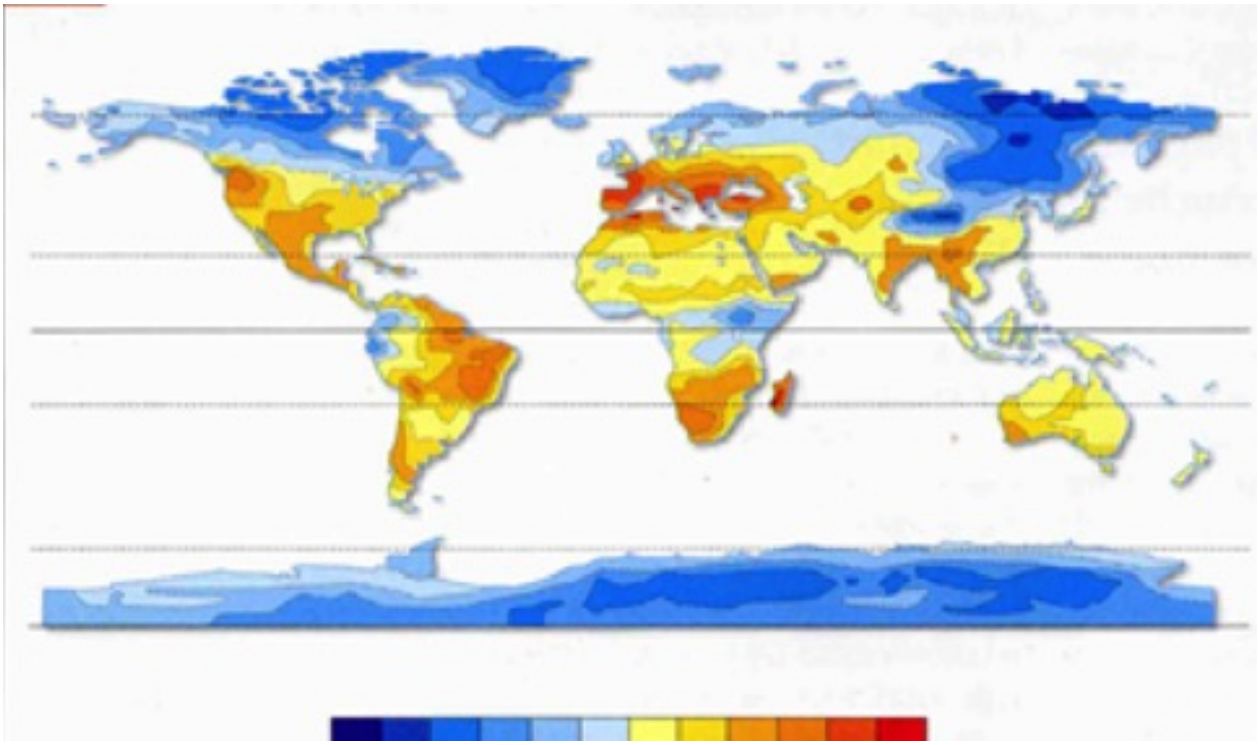
Another important aspect of the melting of ice is in the glaciers and the mountain snows. More precisely, the expectations regarding Himalaya glaciers bear the most important consequences. Himalaya is at the source of all the great rivers of the East, the ones of China, India and the Indochinese peninsula. Though nearly 99% of water in these countries does not come from the glaciers but from local rainfalls, particularly monsoons, any important perturbation in the hydrograph marsh of the great rivers, due to the weakening of the winter-summer regulatory storage of the snows and glaciers, would transform the conditions of life. And the regions concerned bear approximately half of world population. Huge public works, like the famous (and controversial) three gorges dam, may be needed to manage regulations.

2-the second class of events is the increase of droughts and floods estimated by the climate models. The present estimation is an increase of the intensity of rains (floods) and also, paradoxically, a decrease of the water available in the soils. In other terms, the rainfalls would be more irregular, diminishing the agrarian capacity of the soils.

The different regions of the world should experience quite different situations:

Regarding droughts, the vulnerable regions should be around the Mediterranean and Middle East, central America and South Africa (but not middle Africa), Australia and the south of China.

Regarding floods, the vulnerable regions should be the north of Europe, Canada, Central Africa, The north of South America and the west part of China.



Variation of the number of dry days sequences per year (IPCC A1B scenario)

2.1.2 Water management

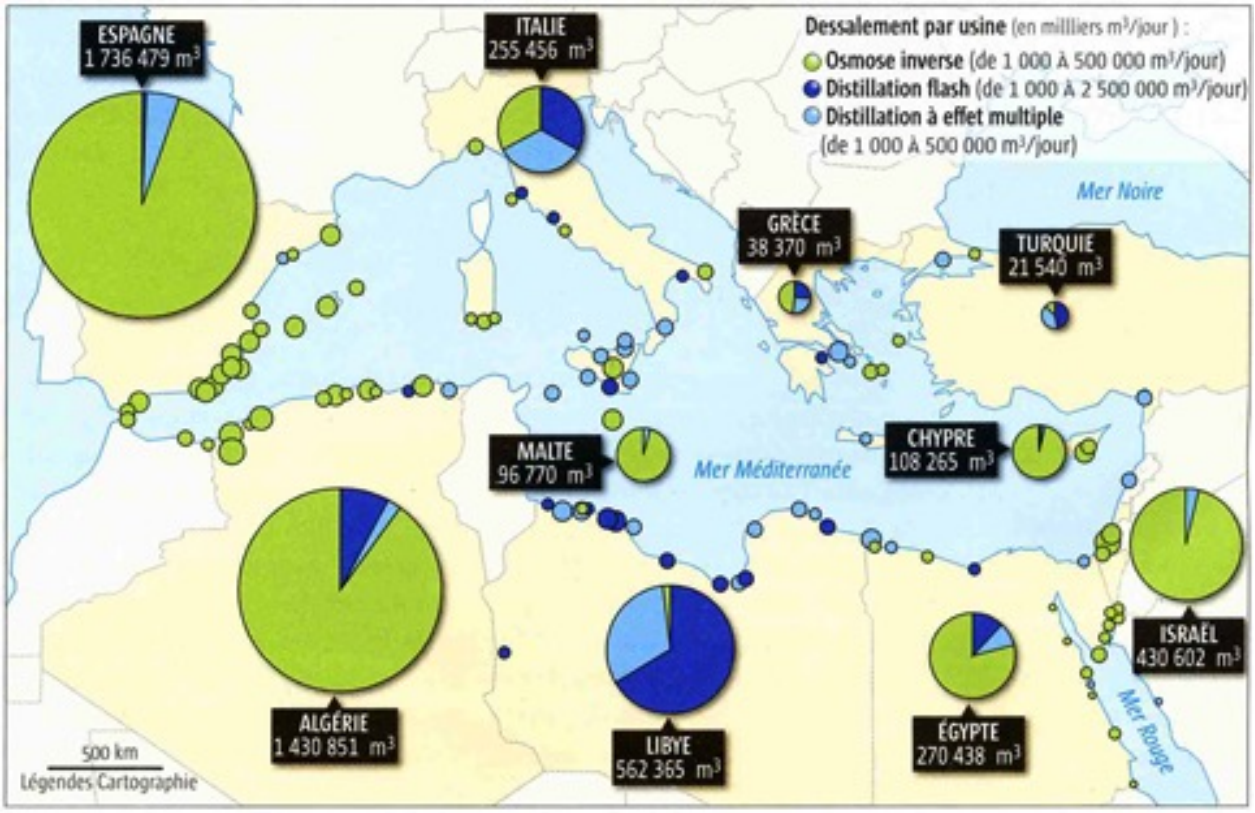
The UN Johannesburg summit in 2002 concluded that, by 2025, nearly half of the world population should experience water shortages[5]. 90% of water consumption is used by agriculture.

Sewage is also at stake: 2.5 billion out of the 6.5 billion humans do not have access to sewage facilities.

The critical importance of the water supply for 21st century is also due to the fast growth of coastal human settlements. To satisfy their needs, desalination plants, first located in the Middle East (presently producing half of world desalinated water), are spreading around the Mediterranean and also in Asia, in Australia and in California. This first generation of desalination is using energy from combustion and therefore participates to carbon dioxide emissions. An order of magnitude is given by the future Spanish facilities,

[5] See also IPCC "Climate change and water", http://www.ipcc.ch/ipccreports/tp-climate-change-water.htm

producing 2.7 M m3 per day responsible for 5,5 M tons of daily CO2 emissions, 0,6% of the total of Spanish emissions.



Desalination around the Mediterranean sea

The water over consumption and mismanagement leads to severe questions all over the planet. The Aral sea, had lost more than 75% of its surface between 1960 and 2000 and is now slowly recovering, helped by Kazakhstan and Uzbekistan public works. Lake Chad in Africa has lost more than 90% of its surface. Some rivers are so much diverted for irrigation that their water does not reach the sea any more. It is sometimes the case of the river Colorado in United States.

To overcome water scarcity, many countries are planning immense water derivations. In North America, the project named GRAND would capture water in Canadian Hudson bay and James bay, drive it to the great lakes by a 800 Km canal and, from there, by a second 2000 Km canal, to the south of United States. China is completing an irrigation water transfer from the Yangtse to the North plains. Brazil is planning to drive the water

of the San Francisco River to the Nordeste through a 500 Km canal and India is planning a global interconnection of its water system, concerning 46 rivers connected by 30 canals.

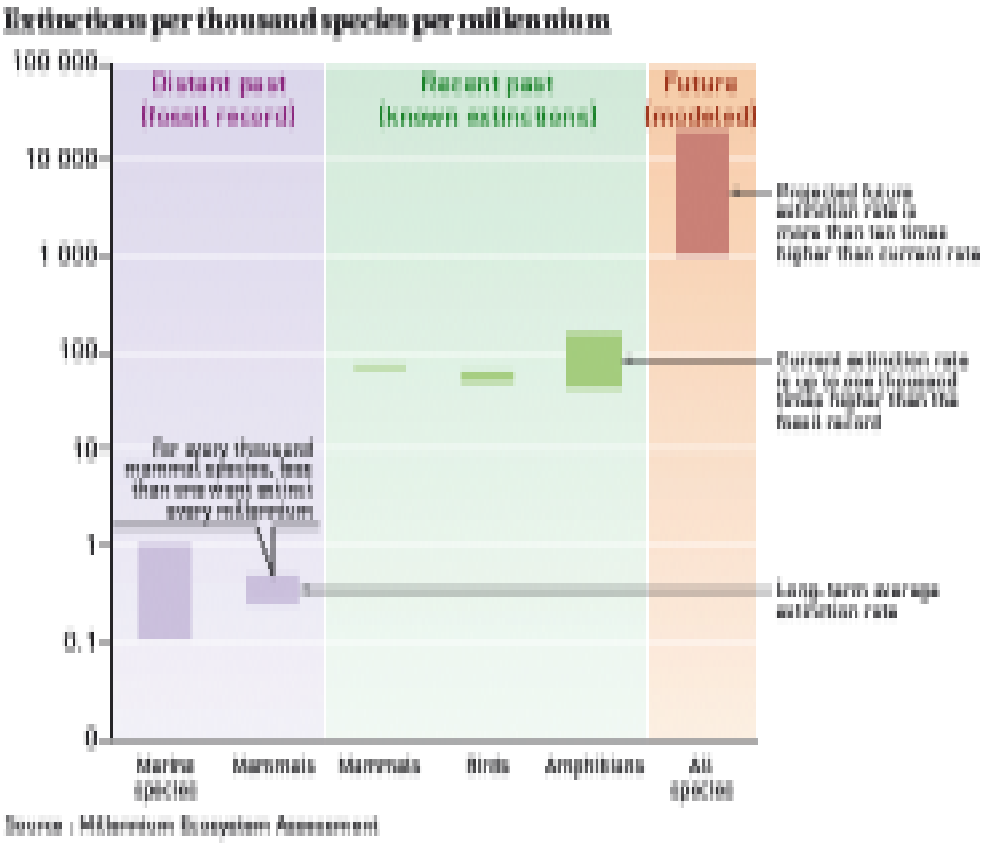
The Indian project: 46 rivers connected by 30 canals representing a total distance of 10000 Km. It should be able to move the water across the country, according to the needs. 30 dams will be associated.

These examples show that until 2025, huge investments aiming at water supply are likely to be decided or realized. Probably the period might stay in history as the starting point of global water management.

2.1.3 Biodiversity: species and mankind in danger

“So far, about 1.75 million species have been identified, mostly small creatures such as insects. Estimates of the present global macroscopic species diversity vary from 2 million to 100 million species, with a best estimate of somewhere near 13-14 million, the vast majority of multi-cellular ones being arthropods.

Most biologists agree however that the period since the emergence of humanity is part of a new mass extinction, caused primarily by the impact of humans on the environment. It has been argued that the present rate of extinction is sufficient to eliminate most species on the planet Earth within 100 years[6]



Species have been disappearing at 50-100 times the natural rate, and this rate is predicted to rise dramatically. Based on current trends, up to 34,000 plant and 5,200 animal species - including one in eight of the world's bird species – may face extinction. For thousands of years humans have been developing a vast array of domesticated plants and animals important for food. But this treasure house is shrinking as modern commercial agriculture focuses on relatively few crop varieties.

About 30% of breeds of the main farm animal species are currently at high risk of extinction. While the loss of some individual species catches our attention (whales,

[6] Edward O. Wilson (2002). The Future of Life. New York: Alfred A. Knopf.

bears and our cousins primates for instance), it is the fragmentation, degradation, and outright loss of forests, wetlands, coral reefs, and other ecosystems that poses the gravest threat to biological diversity.

Forests are the home of much of the known terrestrial biodiversity, but about 45 per cent of the Earth's original forests are gone, cleared mostly during the past century. Despite some revival, the world's total forests are still shrinking rapidly, particularly in the tropics.

Up to 10 per cent of coral reefs - among the richest ecosystems - have been destroyed, and one third of the remainder face collapse over the next 10 to 20 years. Coastal mangroves, a vital nursery habitat for countless species, are also vulnerable, with half already gone.[7]."

The main pressures on biodiversity result from land use changes (usually associated with increasing populations); unsustainable use and exploitation of natural resources (especially fisheries, agriculture, and forestry); global climate change; and industrial pollution. At the same time, biotechnology is introducing new organisms and their effect on existing organisms and habitats also needs to be considered.

In some instances, these pressures can actually be positive for biodiversity. Agricultural activity sometimes improves the habitat and even helps increase the variety of species; the Mediterranean basin is considered a biodiversity "hot spot" in part because of its human-induced agricultural biodiversity.

The available evidence suggests that, in most regions of the world, the effects of economic activity are negative for biodiversity[8]. And neglecting biodiversity may cause catastrophic events: let us remind the Irish potato blight of 1846, which was a major factor in the deaths of a million people and migration of another million, was the result of planting only two potato varieties, both of which were vulnerable.

"Goods and Services" provided by ecosystems include:

* Provision of food, fuel and fibre

[7] The convention on biological diversity, UNEP.
[8] Oecd observer, Policy brief, 2005.

* Provision of shelter and building materials

* Purification of air and water

* Detoxification and decomposition of wastes

* Stabilization and moderation of the Earth's climate

* Moderation of floods, droughts, temperature extremes and the forces of wind

* Generation and renewal of soil fertility, including nutrient cycling

* Pollination of plants, including many crops

* Control of pests and diseases

* Maintenance of genetic resources as key inputs to crop varieties and livestock breeds, medicines, and other products

* Cultural and aesthetic benefits

* Ability to adapt to change

The economic "free" services rendered by ecosystems have been estimated between 2900 and 38000 billion $ compared to a world GDP of 54000 billion $.

But the question appears more serious than a simple accounting measurement. It lies in the great ignorance of ecosystems evolution, concerning not only the number of species identified, but, above all the risk of collapse of ecosystems due to their lack of diversity. The souvenir of "Biosphere II" experience in Arizona, settled during the 80's, leads to scepticism regarding the viability and stability of small diversity ecosystems, including only some thousands of different species (2800 in Biosphere II).

Albert Einstein used to say that if the bees would disappear, mankind would soon disappear too. Indeed, pollinators are necessary to the survival of vegetables involved in the production of approximately one third of human food. Multinational firms promoting genetic manipulation advocate that their activity contributes to restore biodiversity. Anyhow, there is clearly an important gap between generating some new species and the building of sustainable ecosystems. Their proposals, motivated by their intellectual property rights, though mentioned by OECD[9], are to be considered with scepticism.

[9] May 2005 Policy brief: Preserving biodiversity and promoting biosafety.

The impotence of present planetary organization, based on nation states, is particularly critical, and may be qualified as anarchic, regarding for instance oceanic ecosystems[10]. During the last decades, enormous fishing boats, equipped with all sorts of electronic detection systems, have been operating. The outstanding efficiency of these equipments has destroyed a number of species, cod being the best known example. In spite of the moratorium decided in 1992, the cod is still absent from the Canadian seashore. Many other species are threatened, not only big ones like whales, but also a part of the biodiversity located in coral reefs that suffer from global warming. The two great sources of biodiversity are tropical rainforest and coral reefs. Both are threatened by human activities, and the present state of the planetary organization is unable to contain their destruction.

To conclude, biodiversity raises a global security problem. It needs a systemic approach, shows a complexity difficult to handle, and is presently out of the scope of existing economic approaches[11]. It leads also to a different attitude towards nature, the one of the gardener. The cultural shift from an exploiter attitude to a planetary gardening attitude, respectful of the even mysterious law of nature, has started and is likely to expand worldwide during 21st century. It is a sign of the emergence of a new consciousness: the one of the limits of the planet.

2.2 Internet: the global connection

Internet is a major factor of transformation of the way of life, the way of doing business and the awareness of planetary preservation problems. Thus we need an estimation of the Internet penetration and its consequences to build the landscape of 2025.

Looking at the situation in 2007 and its evolution since year 2000, we come to the following trends:

[10] See for instance : Atlas géopolitique des espaces maritimes, éditions Technip.
[11] The most relevant scientific approaches are based on biology. See for instance **Jared Diamond's** "Guns, Germs, and Steel: The Fates of Human Societies", and also "Collapse"

2.2.1 Technology evolution

The classical view of technological progress is now outdated. But it is useful to have it in mind as a starting point. Let us, for instance, look at Ray Hammond's views on 2030:

"Some aspects of daily life in 2030 will seem very similar to today. We will still live in houses and apartments as we do today (although even older properties will have been upgraded to maximum energy efficiency), children will still go to school (the interpersonal dynamic between teachers and children and between children and their peers is a vital part of learning that cannot be replaced wholly by virtual communications) and we will, it is to be hoped, still have all of the political, legal and social institutions which make the developed economies civilised; parliaments, the law, police, free media, hospitals, universities and so on."[12]

"By 2030 all cars travelling on major roads will be under the control of satellite and roadside control systems and many cars will be driving themselves. Apart from the need to reduce the present appalling death toll from road accidents[13] – and the need to squeeze many more cars onto crowded roads – automated vehicle and traffic systems will make it safer to travel through the extreme weather systems that we are likely to be suffering constantly in twenty-five years' time. All road vehicles (except licensed vintage and classic vehicles) will produce very low or zero carbon emissions. Most large cities will operate congestion charging systems and, in countries with severe traffic congestion, road pricing will be widespread."[14]

These views are still inspired by the old idea of progress: an improvement in lifestyle following the path of the American way of life. Unfortunately, times may be harder, and these predictions slightly outdated.

Anyhow, regarding the Internet and communication technology, the evolution looks widely predictable: the merging of the portable phone and the portable computer, the increase in memories capacity and in processing speed and, more important, the building of the wide band infrastructure allowing transmission of live conversation and

[12] Ray Hammond The world in 2030

[13] Almost 1.2 million people are killed each year and 20-50 million are injured or disabled, although most people are unaware that road traffic injuries are a leading cause of death and disability.

[14] idem

video streaming through wireless and/or optic fibre communication. The portable phone and the laptop computer merging and/or leaving place to a set of interactive instruments even located in different places. One may add also the use of movements that started with the WII game platform.

Ray Hammond, following his dream, goes to fiction: "By 2030 we will be constantly connected to what, today, we can only think of as a 'super-web' and that connection will, for those of us who chose to make the transition, be a bio-digital interface. At the very least our senses will be connected to the super-web by microphones and mini-projectors and, perhaps, some of us will have direct neural connections between our own brains and the 'global brain' – which is what the super-web will have become. Our communications and entertainment will be wholly 'immersory', multi-media, multi-sensory, 3D, holographic and fully tactile, telekinetic and olfactory.

It will be almost impossible to tell the difference between a real world experience and a virtual experience and many of us will be engaged with the real world and several virtual worlds (and other versions of ourselves) at one and the same time.

On our way towards our virtual lives of the future we will be able to understand, and to speak and write, in all languages, as super-intelligent computers on our body and in the networks translate speech and the written word in real time.[15]

"Our leisure activities in 2030 will be similar to today's but our time spent in virtual leisure (watching movies, playing games, chatting with each other, exchanging videos, etc.) will be a lot more intense.

Because so much of our time will be spent on the superweb it is likely that the present trend towards increased sporting activity and increased public support for sports will be even stronger by 2030"[16]

[15] Ford Motor Co. began using 'machine translation' software in 1998 and has so far translated 5 million automobile assembly instructions into Spanish, German, Portuguese and Mexican Spanish. Assembly manuals are updated in English every day, and their translations — some 5,000 pages a day — are beamed overnight to plants around the world.

Anyway, the real limitation of the speed of change is not due to technology, but to the delay human beings need to become familiar with it. Between the first contact with the web and a current clever manipulation of its various opportunities, it takes approximately one generation.

2.2.2 Speed of change

Therefore, the full transformation of civilization due to the web will be advanced but not complete in 2025.

The changes in behaviour associated with Internet diffusion starts on

- A first stage around 8% when it leaves the expert community to become an information diffusion tool for a wider public.
- over 30%, it becomes a usual business tool
- When 70% is passed, anyone is supposed to be reached through Internet either directly or through family, friends or an organization. In many countries, the connections are not operated through personal computers but at Internet cafés.

For a given country, looking at the evolution between 2000 and 2007,

- it takes approximately 7 years to go from a penetration of less than 1% to 8% (phase 1: the experts),
- then another 7 years from 8 to 30% (Phase 2: the professional business people)
- and another 7 years from 30 to 75% (Phase 3: the generalization to all public)

75% is presently (2007) the percentage of Internet connected in the equipped countries like USA, some countries being even more equipped: Iceland 85%, Norway and Netherlands 88%.

[16] Ray Hammond The world in 2030

2.2.3 Present stage of equipment

In 2007, most countries in the world have started to build their Internet infrastructure:

European ones like UK, Germany, Spain, Portugal, Italy, France, Scandinavia, are all over 50 % and many over 60%. Turkey is at 23% and Ukraine at 12%.

In Asia, some countries are highly equipped: Korea 71%, Japan 69%, Hong Kong 70% Taiwan 67%, while others are much lower: Vietnam 21%, Indonesia 9% Pakistan 7%, and others have not entered yet: Afghanistan 2% Cambodia 0.3%.

In Middle East, Saudi Arabia is at 17% Lebanon at 24% and Iran at 27%, the Emirates at 38%, Israel at 57%. Only Iraq stays under equipped at 0.1%.

In Latin America, Argentina is at 40%, Chile at 43% and Mexico at 22%.

Only Africa has still a low penetration of approximately 5%, in spite of some exceptions, like Morocco 18% and Tunisia 17%[17].

One may quote that the countries that suffered recently from war, military occupation or other troubles have not yet entered the Internet community.

Internet world map (Dimes project, Chris Harrison, 2007)

A fast look to the above map shows that, even though Internet is present worldwide on all continents, it still concerns expert or business minorities. The major part of the

[17] source internetworldstats.com

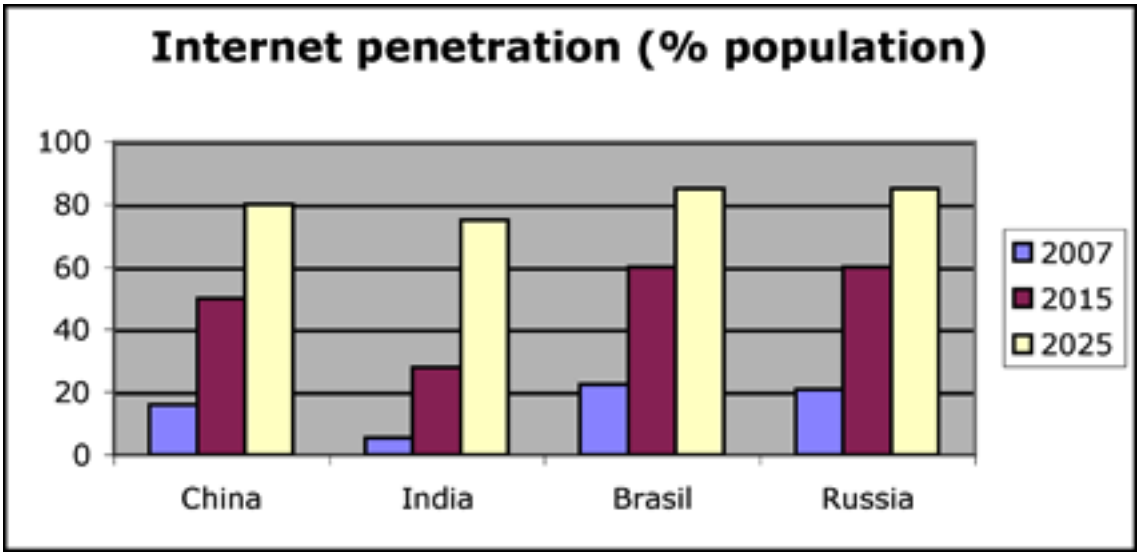
population is not yet connected. But they will be before 2025. Therefore, the **evolution of behaviours it allows is still widely to come**. It will start during the next decade and last for at least one generation.

2.2.4 The case of the BRICs

When looking more precisely at BRIC (Brazil, Russia, India, China), which counts nearly half of the world population, we have the following evolution:

	Population 2007	Internauts 2007	Growth 2000-2007	Penetration 2007	2015 estim	2025
China	1321851888	210000000	833,30%	15,89%	50%	
India	1129866154	60000000	1100,00%	5,31%	28%	
Brazil	190010647	42600000	752,00%	22,42%	60%	
Russia	141377752	29400000	848,40%	20,80%	60%	
BRIC Total	2783106441	342000000	860,42%	12,29%	50%	

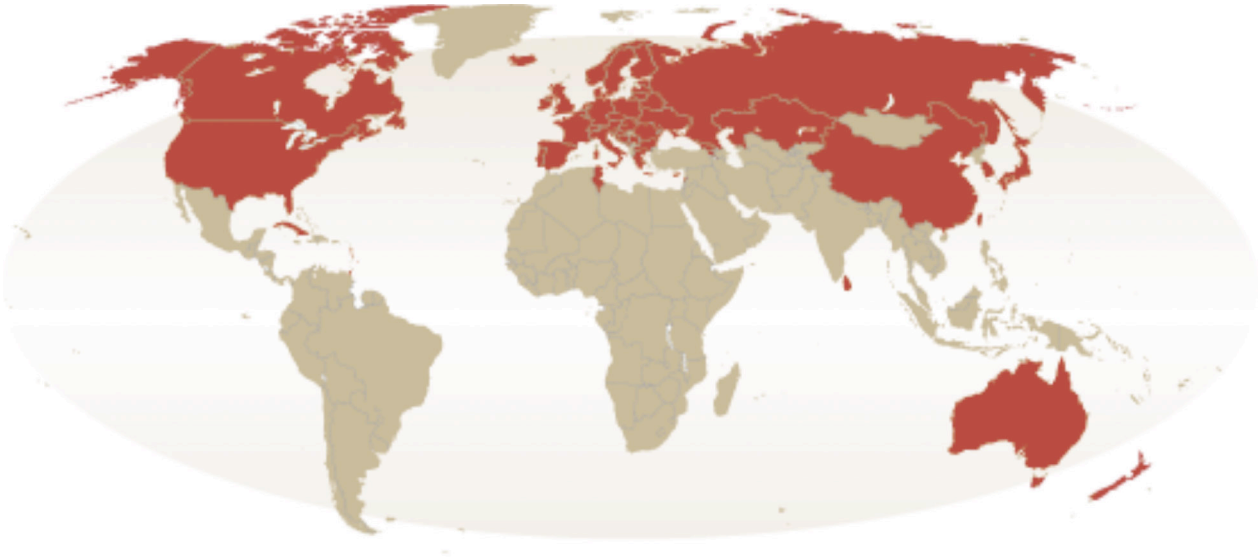
Therefore, we can assume that in 2025 these BRIC countries will be as familiar with Internet as the most developed and equipped countries are now. The diversity of services and also of languages used on the Internet will be, at that time, much wider.



The above estimations rely on the shape of the S curve followed by developed countries since 2000. The speed of equipment may be faster during the following decades, due to the mini laptops appeared in the market in 2008 connected to the 3G cellular phone network (replaced by 4G after 2010). Anyhow, the rate of illiteracy will certainly be an obstacle to the participation of many communities to Internet exchanges.

2.3 The demographic/natural resources tension

2.3.1 The demographic slow down



Brown: countries under self renewal (2.1 children per woman)

Grey: countries above self renewal (source World Bank)

"Connected with the spread of modern contraceptives and the increased educational levels is the fact that young western adults can experiment more extensively with union formation before settling down and start a family. As a result patterns of union formation (and dissolution) have changed substantially: unmarried cohabitation has increased, marriage takes place later and divorce occurs more often. Childbearing has become a result of deliberate reflections (i.e. unwanted pregnancies are getting scarce) and occur much later in people's lives;

The best way to understand fertility behaviour is via *birth cohort* (birth year) analysis, not via *period* (calendar year) analysis. If women postpone childbearing (Phase 1) i.e. they have their first child later in their life than women born in previous cohorts, one will observe a rise in the age at first birth and, as a consequence, a drop in the number of children born per calendar year (period Total Fertility Rate – TFR). This 'tempo effect'

may sometimes lead to 'dramatically low' TFR levels, like currently in several Central and Eastern European countries. Because the first postponing couples start to catch up having children but those from subsequent birth cohorts are now postponing. Phase 2 is characterized by a more or less stable low period TFR. When the increase in the age at first birth starts to diminish (Phase 3) or stalls completely (Phase 4) people are catching up having children that were postponed before, and the period TFR increases substantially again. However it will not reach the initial higher (cohort) level, since a later start normally leads to a lower ultimate number of children (quantum decline). Making a forecast with keeping lowest low TFR constant in a period of a rising age at first birth may lead to a very inaccurate picture of the future.

There is increasing evidence that it may be easier to influence the timing of children than the ultimate number of children. If policy measures appeal to people they may be stimulated to have a child rather soon, but not necessarily have more children in their lifetime. If all of a sudden children are only born earlier, one will observe a baby boom, together with stagnation in the increase of the mother's age at first birth, followed rather rapidly by a baby bust (see Sweden 1990-1995).

It will be an enormous challenge to get population sizes more sustainable, and, more important, their life style? If that would be similar to what is normal now in the USA or in Europe then there is a major food and energy challenge. We do not know what is neither the maximum nor the optimal world population size, and have probably only ideas about the optimal worldwide life style. Both the optimal population size and life style depend on food and energy supply, on peaceful international cooperation, as well as on where these persons prefer to live (cities or countryside)"[18].

"According to ILO's projection, total population is to **increase from 6.6 in 2007 to more than 8 billion people in 2025**. The most important increase will come from Africa (North Africa, SADC and Rest of Africa should have around 404,000 extra persons), India (around 267,000 extra person), Asia (without China and India around 264,000 extra persons) and China (+144,000 extra persons). China increase appears limited considering its current total population. China will start to lose active population over the period: it should reach its maximum in 2015 at around 830,000 persons and decrease to

[18] from Gijs. Beets contribution

809,000 by 2025. As a consequence, China will be in a comparable situation with the countries from the previous Soviet bloc and developed countries with an aging population.

This is apparent as well in the shares of the future world population. China's share is to shrink by 2 percentage points, the European Union by 1.4 points, while Africa's share should increase by 3 points."[19]

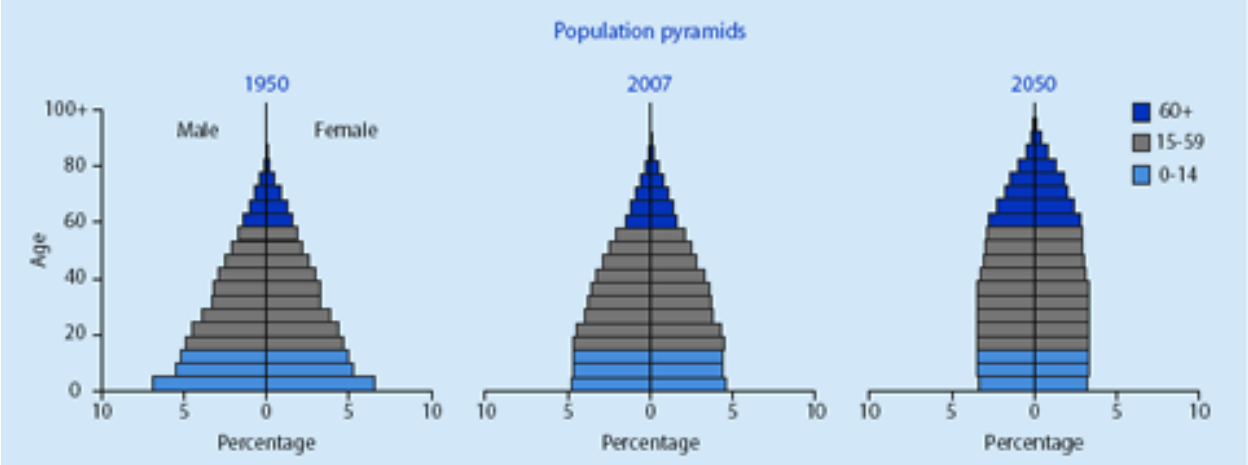
2.3.2 Ageing populations and young ones

"The current process of population ageing that started already more than 100 years ago is "unprecedented, pervasive, profound, and enduring" (UN, 2007). World wide the percentage of persons of 60 years or over was 8 in 1950, 11 in 2007 and it is expected to rise to 22 by 2050. Almost no country escapes from this trend. Europe is frontrunner but also the first to see some relief by mid-century. Variation within Europe is large; specifically Eastern Europe was hit by the world wars, which is still visible (also because of its recurrent effects in the next generations).

As ageing basically results from falling numbers of children, the process normally shows that first the youngest age groups get smaller, but with time running the following age groups are 'affected'. Gradually the labour market population will start ageing as well, first due to lower entrance streams, many years later due to larger exit streams. Then a boom in retirement follows (which is expected at short notice when birth cohort 1946 turns 65 years), later on followed by a boom in the number of very old people. Consequence of this process is of course that the dependency ratios are changing fundamentally as well, in the sense that the number of dependent people per independent person will rise substantially. Currently the 'window of opportunities' or 'demographic bonus' is in many countries relatively large: the number of 0-19 years together with the number of 65+ years compared to the number of 20-64 years (the potential labour market population) is around the lowest point, i.e. those who are economically active have only to care for a small number of dependents (who were mainly youngsters in the past, but now increasingly older).

[19] CEPII Mirage exercise

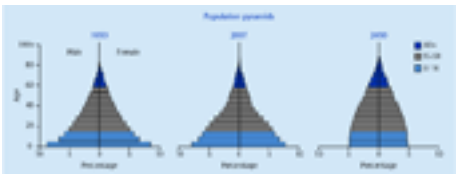
The attitude of the politicians and the press regarding ageing is ambiguous. They may agree that the planet is over crowded, but the ageing in their country is still perceived as a problem. Ageing is not a disaster but a challenge[20]. Ageing will challenge intergenerational solidarity due to changes in family patterns (more unmarried cohabitation, later marriage, more divorce, more re-partnering, smaller family sizes, and later childbearing). This will trigger social protection systems in finding social cohesion to support people to interact as much as possible within and between generations, both in countries with cultural traditions of stronger or weaker family ties. Measures in support of child and elderly care as well as measures that make work-family balances more compatible can strengthen intergenerational solidarity"[21].



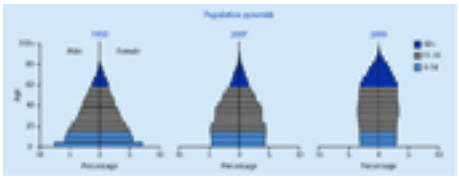
Population ageing 1950-2050 (source United Nations, 2007)

The projection above shows at the same time the growing share of elderly people and the end of growth of world population around the middle of 21st century, as a result of the decline of global fertility rates. It covers very different situations: African countries still have a high fertility and an important base of young generations, as shown by the following graphs:

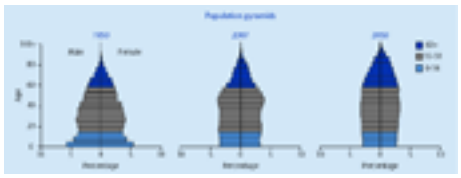
[20] Gijs Beets observation.
[21] from Gijs Beets contribution



Africa



Asia



North America

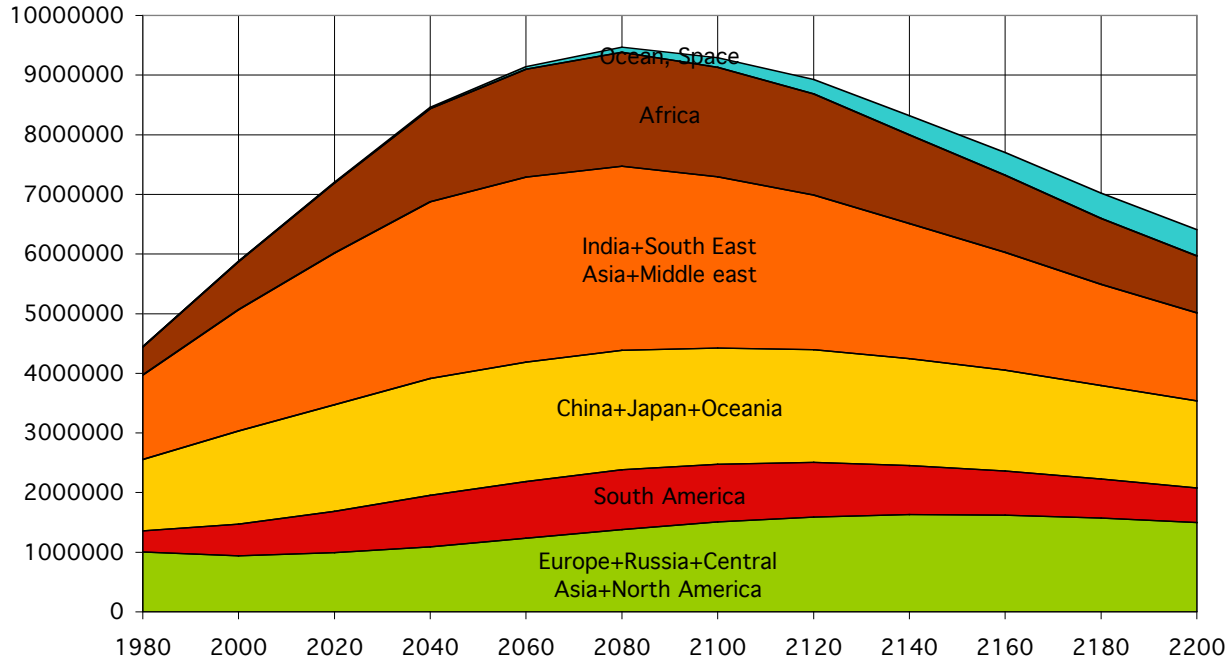
The demographic regulation of Europe and North America is already at work. The one of Asia and South America is taking place between now and 2025. And the one of Africa will not be operating before 2040, according to the projections made by professional demographers[22]. Anyhow, some countries, Russia for instance, who suffered an important demographic slow down during the past decades; tend to foresee the possibility of a future "baby boom" before 2025[23].

Demographic forecasts are traditionally the most secure predictions for the long term. In our present situation, it is however necessary to point some important uncertainties regarding 21st century's evolution:

1-Stabilization or maximum followed by a slow down? Since the end of the 80's, the common knowledge of the demographer's community describes the present evolution as a "demographic transition". It means more precisely the transition between an evolution with high fertility and high mortality to an evolution with low fertility and low mortality, leading to a stabilization of the world population around 10 Billion, with an average fertility of 2.1 children per woman.

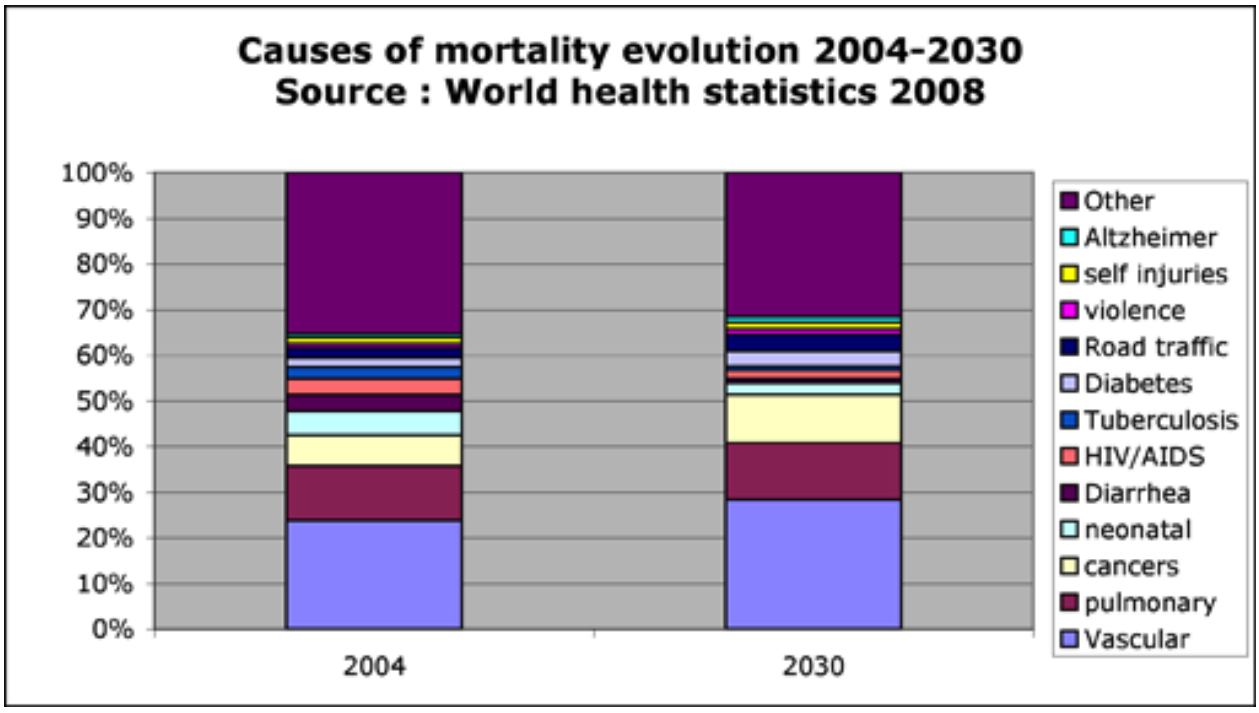
[22] The source of the above graphs is United Nations, transmitted by Gijs Beets.
[23] Quotation from Irina Kuklina.

World demography, projection 2200, limit 1.8 children per woman



But according to the fact that fertility rates are lowered by female education and urban way of life where both members of the couple work; according also to the fact that a world population of 10 billion reaching a consumption level of natural resources close to the one of the average European in 2000 would not lead to a sustainable world by a factor of 4, it is more realistic to predict a maximum followed by a slow decline lasting one or two centuries. That hypothesis would fit with a stabilization of the birth rate around 1.8 children per woman, instead of the 2.1 stabilization hypothesis.

2- **Mortality evolution**. Inside the demographer community, an important debate is taking place about mortality. Here is a graph made out of the official World Health Organisation figures:



Some demographers, following the medical community, point the progresses in vaccination and treatment of developing countries diseases like neonatal, diarrhoea, tuberculosis, malaria… Other experts point the deterioration of health conditions in so-called developed countries, due to unhealthy food, stress, lack of exercise, leading to obesity, tobacco alcohol and drugs, hard working stress and poor living conditions. The above graph shows the growing importance of vascular diseases and cancer, which are typical of modern urban environment.

The demographers also point the growing proportion of elderly people, which may be felt as a burden by younger and less numerous new generations. These elderly may suffer less care than the previous old people who, having many children, could expect to be assisted and live peacefully over 90. All these factors would lead to estimate not a reduction of mortality as during the previous half century, but on the contrary an increase of mortality rates.

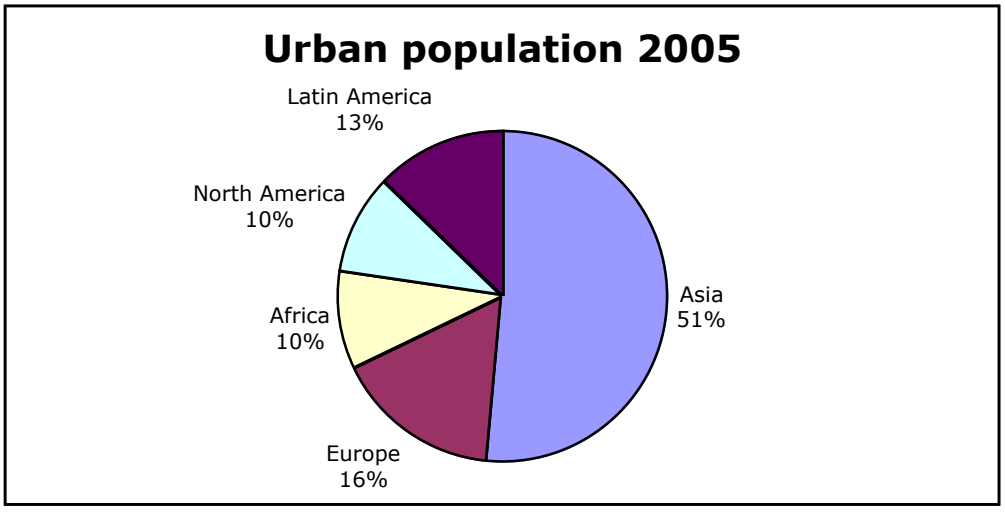
This debate shows clearly that medical research is not the determining factor. It may help to cure difficult illnesses like AIDS. It has no influence on the environment factors that determine most modern pathologies. Looking at mortality globally, as shown by the above graph, the question is raised to the social and economic organization, to social sciences and governance rather than to hard sciences.

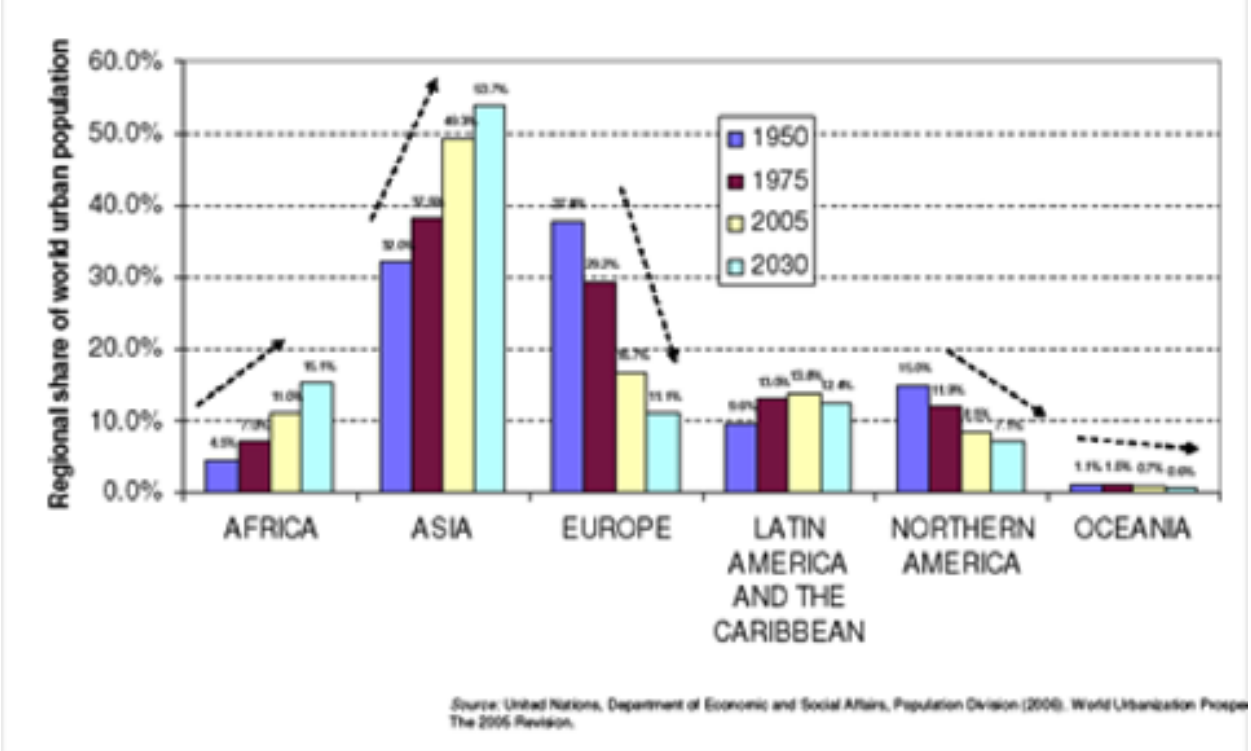
3- The third question mark about demography is the one of migrations:

2.3.3 Migration to cities

The first and massive migration in 21st century is the one to cities. Urban population passed 50% in 2008: 3.3 billion.

Urban population grows twice faster than total population growth (1.78% vs. 0.95% annual rate for 2005-2030): projected resulting 4.9 Billion (about 60% of total population) by 2030 (out of 8.2 billion) 1.8 Billion urban population will be added in 2005-2030 out of which 1.1 Billion will be added in Asia.





Regional distribution of world urban population (source UN)

Cities in Asia:

11 out of 20 world mega-cities (over 10 million),

17 out of 30 cities of 5-10 million,

184 out of 364 cities of 1-5 million,

225 out of 455 cities of 0.5-1 million.

From these data, we can make a simple and clear statement: 21st century is, at least during the first half, a period where the majority of world population lives in cities. And the majority of these city dwellers are in Asia. The first impression given by these facts is that the new "centre of the world" (if there is any) will be Asiatic.

The second impression relates to daily life. Most mega cities are highly energy consuming, they contribute massively to carbon dioxide emissions and they experience enormous traffic congestion, air pollution and unhealthy environment. Some of these negative points will probably lead to popular protests and rebellions. And, as it happened previously in history, at the middle of 19th century in Europe for instance, the public authorities would launch in response huge reshaping programs, including common transportation, green spaces, energy conservation, floating structures for the seashore towns (as quoted previously), and many other initiatives aiming at ecological sustainability.

2.3.4 Migrations increased by climate refugees

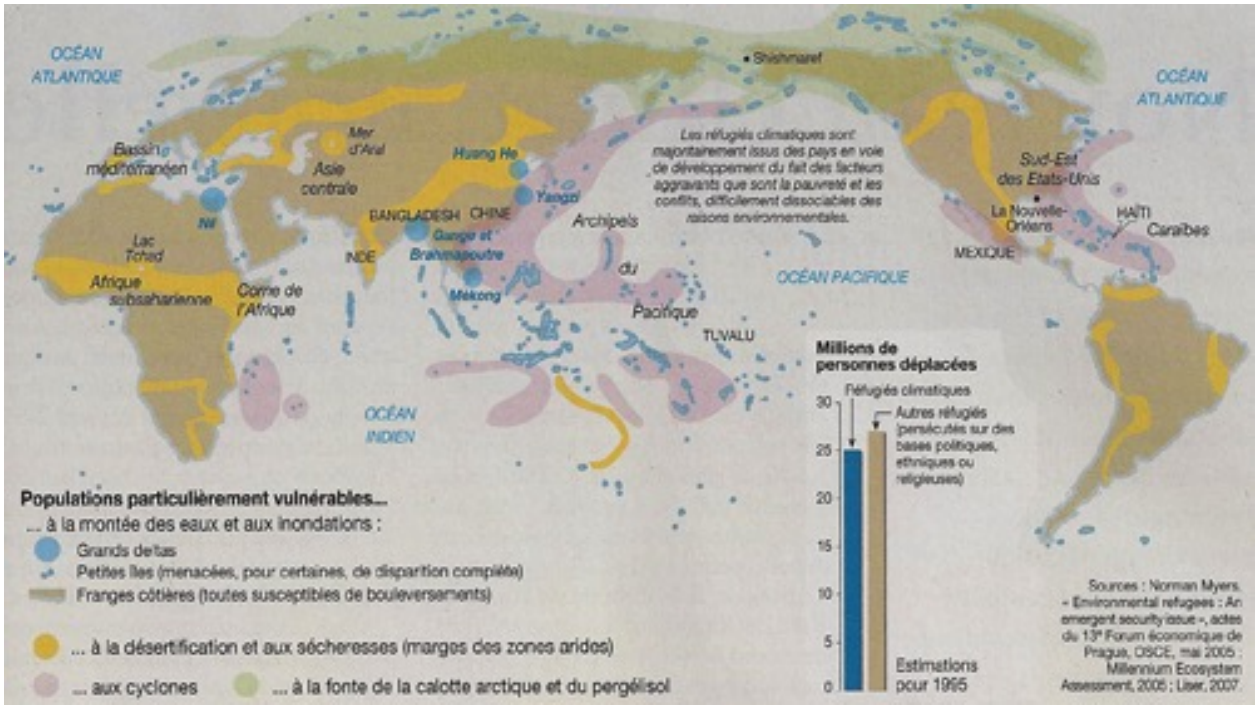
"International migration has become a larger player in demographic trends. International comparable statistics are scarce, also because the definition of what is a migrant varies. Migrants are mainly driven due to economic reasons or to political instability (refugees / asylum seeking), in the future likely more often also to natural disasters of which some may be the result of climate change. Migrants orient towards countries where they have historical or cultural bonds with (including language bonds), or where already larger groups from the same country of origin have settled and have send positive information. UN estimates suggest that about one third of all international migrants in the world live in Europe (i.e. persons born in another country). These 64 million persons make up 9% of the total European population. North America (44 million) and Oceania (5 million) have

lower absolute numbers but higher shares of their population being born in another country than where they live, respectively 13 and 25%"[24].

Observing the present movements, it is possible to anticipate strategic questions that may come on the front of the stage before 2025. Important flows of migrants silently move from overcrowded countries to places less occupied and with a low birth rate. Three places of the world can be mentioned: United States, target of an important flow from Mexico, South America and from different Asiatic countries; Europe, target of an important flow from North and sub Saharan Africa and Turkey; Siberia, target of an important flow from China migration. The key question is raised by the different culture of the migrants and the tensions it may generate with the existing population.

Regarding climate refugees[25], the estimation by Norman Myers, published also by IPCC is 150 million in 2050. It shows an order of magnitude of the climate impact on migration comparable to the one of international migrations for economic and social motivations at the end of 20th century. It should be added to these figures that the estimation of climate effects in terms of hurricanes (like New Orleans Katrina), floods and drought are rough ones. And if, as explained previously, the rise of the ocean level would reach 3 meters, most mega cities being built on the seashore, another 135 million displaced people should be added (OECD).

[24] From Gijs Beets contribution
[25] Estimated 25 Million at the beginning of 2008, by European deputy Hélène Flautre.



The map of vulnerable to climate change populations

The conclusion of these estimations is that **huge public works should be expected (reshaping town, water supply, ocean cities…), which will probably determine the shape of 21st century's economy**.

2.3.5 The future of poverty

Ray Hammond writes: "Within our societies inequality will continue to increase, as it is increasing today. Even though the poorest groups in developed societies have become much better off over the last twenty-five years (and will be very much better off comparatively by 2030) the wealth of the richest in our society has grown far faster. This trend will continue and although the middle-classes will continue to expand and become more affluent, the super-rich will become mega-rich and then hyper-rich. And there will be many more hyper-rich people in the world of 2030."[26]

Displacement of tenth of million people means an increase of poverty, even in case of important solidarity mobilization. The fast urbanization process, often due to the

[26] Ray Hammond The world in 2030 "But this could change – nothing can be ruled out when politics is considered. For this reason long before we get to 2030 we must strengthen our national and federal laws to control who has access to such surveillance information and we must develop much stricter rules about how it can be used"

migration of poor peasants searching for survival opportunities in a big city, is also generating poverty.

The classical economic definition, often quoted in international talks, considers as poor a person earning less than 2$ per day. According to this kind of definition, one third of mankind would be in a situation close to poverty. But we should remind that our ancestors lived in the countryside earning less, and survived producing freely for their own consumption. Many civilizations: Aborigines, Inuits, some Amerindians and Africans still survive that way.

It is necessary to take a distance with the previous definition. It is the one that suits to the merchants, which are not interested by people not using money. Anyhow, if we follow Toffler's analysis on the rising "prosumer" attitude[27], we must take into account the development of investment strategies aimed at escaping the merchant power by developing self-production systems. Seen by the merchants, it looks like impoverishment (economists would call it recession), but seen by the end user, it looks like an improvement in safety and comfort.

The important point, anyhow, is that, **in a big city,** survival is difficult or even impossible with 2$ a day because, there, survival needs a minimal compulsory consumption. A recent analysis in France[28] shows that compulsory expenses (housing, electricity, telecom, but food not included) mobilizes in average more than 40% of the revenue of the households. And this percentage has grown approximately 5% during the last 5 years. In spite of the increase of their revenues, the citizens feel a decline in their standard of living, because their freedom of choice is reduced. In many cases, poverty occurs when the prices increasing and the debts too, compulsory expenses grow over the level of the income of the household. Such situations are exemplified by the "sub-prime" crisis (2007, 2008…) in United States.

[27] In Toffler's vocabulary, prosumer is a contraction of producer and consumer. It describes the attitude of people who choose to produce by themselves for their own needs. The present development of kitchen gardens and do it yourself practices testify this trend.
[28] France 2025 report, CASE, 2008 p58.

It shows at least that poverty has two faces: the one for instance of refugees in a poor country, and the one of decay in wealthier countries for those who has lost access to the minimal survival needs. Therefore, the "wealth of nations" should not be measured through their GNP but, as suggested by Amartya Sen, at least by the non-compulsory expenses for which the average citizen keeps a freedom of choice. In many countries, very rich people and very poor people live close to each other, particularly in big cities. But very rich people may have a great freedom of choice, without having time for it. Cognitive saturation[29] lowers also governance awareness, increasing the gap between rich and poor.

Deep poverty escapes to present statistics[30]. But common sense would accept that when a human being has to sell a part of his body (the kidney for instance), or to get his food out of municipal waste piles (like in some Brazilian towns), or to sleep in the street, or to accept situations offending his dignity to survive, she/he is in poverty. But this is not the case of most village traditional communities, in spite of their low purchase power.

Outsights scenarios

In 2004, the "outsights" consultancy[31] has been commissioned by UK department for international development to elaborate scenarios for the poorest in 2030.

In one of them, named "moral warming", the companies begin to sign up the UN declaration of human rights, the shareholders police the ethical codes of conduct, the consumers turn to fair trade and ethical products and the super rich host philanthropic foundations.

In another scenario, named "on the move" it is assumed that in 2030 the proportion of the world population who live and work outside its mother country has doubled compared to year 2000 (from 1.5 to 3%), due to economic globalization, rural to urban shift and global warming. Deregulation removes the obstacles to migrations. **Informal**

[29] hyperchoice concept stated by Toffler (the future shock)
[30] One of the best definition has been given by Amartya Sen "depriving of elementary capacities". The quotation of Joseph Wresinski, founder of "ATD quart monde" is also essential: "where humans live in misery, human rights are not respected".
[31] http://www.outsights.co.uk

economy is accepted, except in the case it shelters criminal activities. The social and health services are harmonised internationally.

Another approach for Europe has been published in Futuribles[32]. It focuses on states or EU intervention, either through financial and education support of the poorest or even declaring misery outlaw.

Obviously, the weakness of all these scenarios lies in minimizing the role of NGO's.

This difficult question of poverty should be analysed also through **historical references**. A global change concerning at the same time technology and civilization as a whole, like was the Industrial revolution in the 19th century, generates huge social difficulties. During a first period, the technology provides new unexpected services and brings satisfactions to the customer. In a second stage, the new activities displace the employment of the old ones and may generate a social crisis.

It was the case in Europe in 1848, when the competition of industrial manufactures had cut down craftsmen's market. Migration to towns and poverty increased, as described in the novels of Dickens (Oliver Twist) and Victor Hugo (Les Misérables). The 1848 revolution, all over Europe, gave the powers to new teams who operated a new set of policies: great public works (Haussmann's urban planning in France for instance) and compulsory popular education, in order to give to the lower class access to the minimal knowledge necessary to operate in the new technical system. This effort lasted for half a century and was successful.

Clearly, 21st century is also a period of transition between an old technical system, the industrial one, and a new one, quoted as the "cognitive civilization". Therefore, a similar strategy of the ruling class is to be expected: **huge public works and popular education**. Public works, necessary to reshape the cities and face global warming consequences, will provide employment. Renewed education will be necessary to get familiar with the new tools (Internet) and the new goals (planetary gardening).

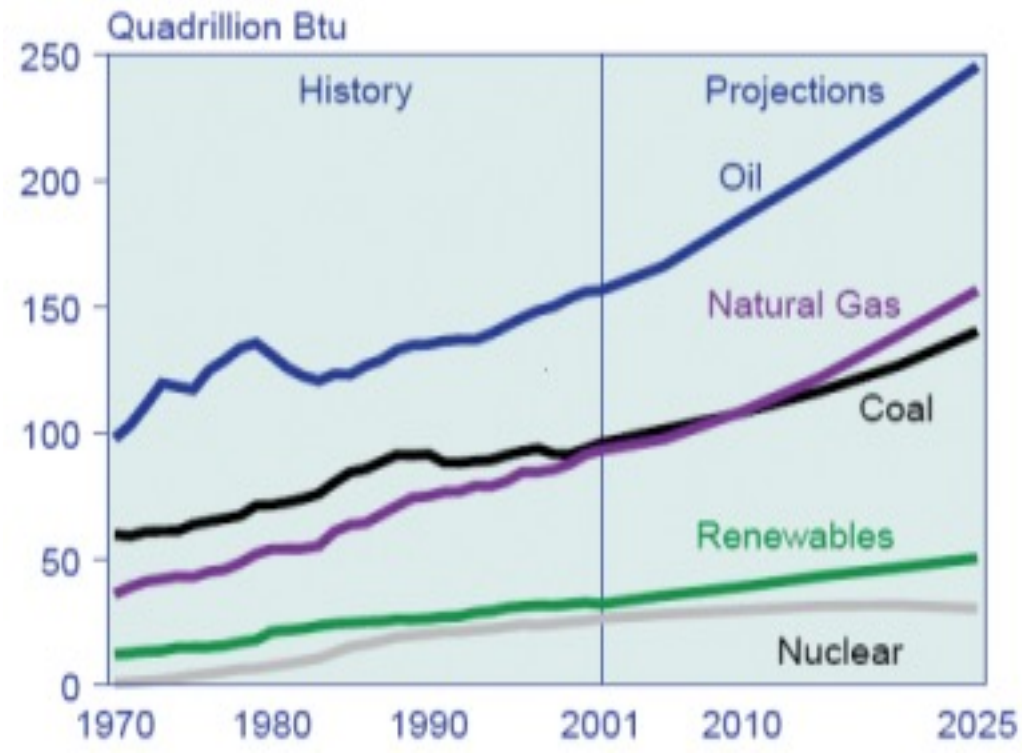
[32] by Xavier Godinot and Saphia Richou, n° 290 oct 2003.

2.4 Sustainable technologies are well known

The debate around energy supply, agriculture policies and environment care has generated an important scenario building activity, in companies as well as in governments and international organizations[33].

2.4.1 Energy and economic growth

Regarding energy, the present trend shows clearly an unsustainable future in which the 2025 consumption would be 60% higher than the 2000 one, this increase relying on carbon dioxide emitting energies, namely coal, oil and natural gas. China, Russia and US would contribute for two thirds of this increase.



World energy consumption trend.
Source International Energy Agency (created by OECD)[34]

Such an evolution has motivated the following strong warning of the IEA:

[33] Ref: Towards a post carbon society, European research on economic incentives and social behaviour, Conference proceedings, Brussels, 24 Oct 2007, European commission, DG Research, dir L.
[34] This graph out the 2007 report, assumes an oil price around 60$/bl. In 2008, this price level has doubled and adaptation reactions of the public (less consuming cars for instance) appeared, even in United States.

"**Urgent action is needed** if greenhouse-gas concentrations are to be stabilised at a level that would prevent dangerous interference with the climate system. The Alternative Policy Scenario shows that measures currently being considered by governments around the world could lead to a stabilisation of global emissions in the mid-2020s and cut their level in 2030 by 19% relative to the Reference Scenario. OECD emissions peak and begin to decline after 2015. Yet global emissions would still be 27% higher than in 2005. Assuming continued emissions reductions after 2030, the Alternative Policy Scenario projections are consistent with stabilisation of long-term CO_2-equivalent concentration in the atmosphere at about 550 parts per million.

According to the best estimates of the Intergovernmental Panel on Climate Change, this concentration would correspond to an increase in average temperature of around 3°C above pre-industrial levels. In order to limit the average increase in global temperatures to a maximum of 2.4°C, the smallest increase in any of the IPCC scenarios, the concentration of greenhouse gases in the atmosphere would need to be stabilised at around 450 ppm.

To achieve this, CO_2 emissions would need to peak by 2015 at the latest and to fall between 50% and 85% below 2000 levels by 2050. We estimate that this would require energy-related CO_2 emissions to be cut to around 23 Gt in 2030 – 19 Gt less than in the Reference Scenario and 11 Gt less than in the Alternative Policy Scenario. In a "450 Stabilisation Case", which describes a notional pathway to achieving this outcome, global emissions peak in 2012 at around 30 Gt.

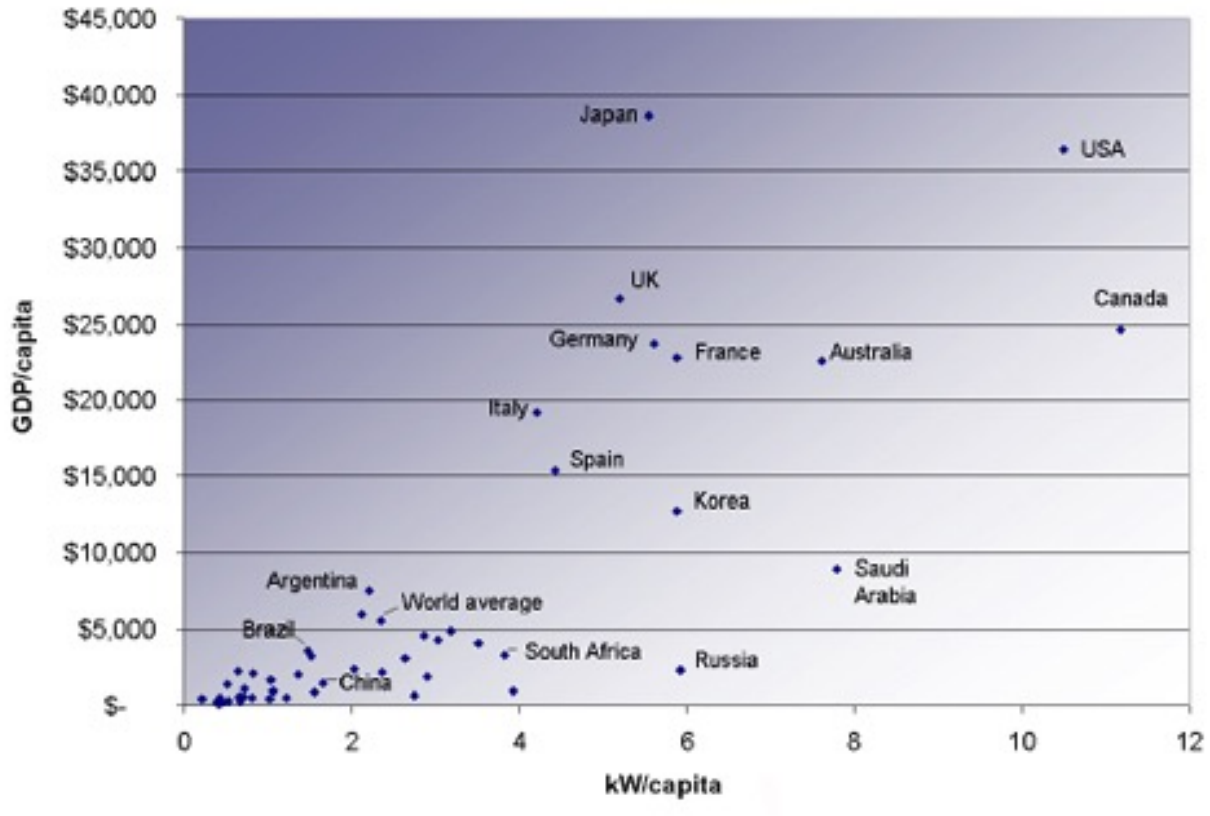
Emissions savings come from improved efficiency in fossil fuel use in industry, buildings and transport, switching to nuclear power and renewables, and the widespread deployment of CO_2 capture and storage (CCS) in power generation and industry. Exceptionally quick and vigorous policy action by all countries, and unprecedented technological advances, entailing substantial costs, would be needed to make this case a reality."

Such a position, following several other warnings of the IEA (in spite of the protests of US government), raises two questions:

1- Is the GDP growth inevitably generating energy consumption?

2- Are sober technologies existing ones or are they still in a research stage?

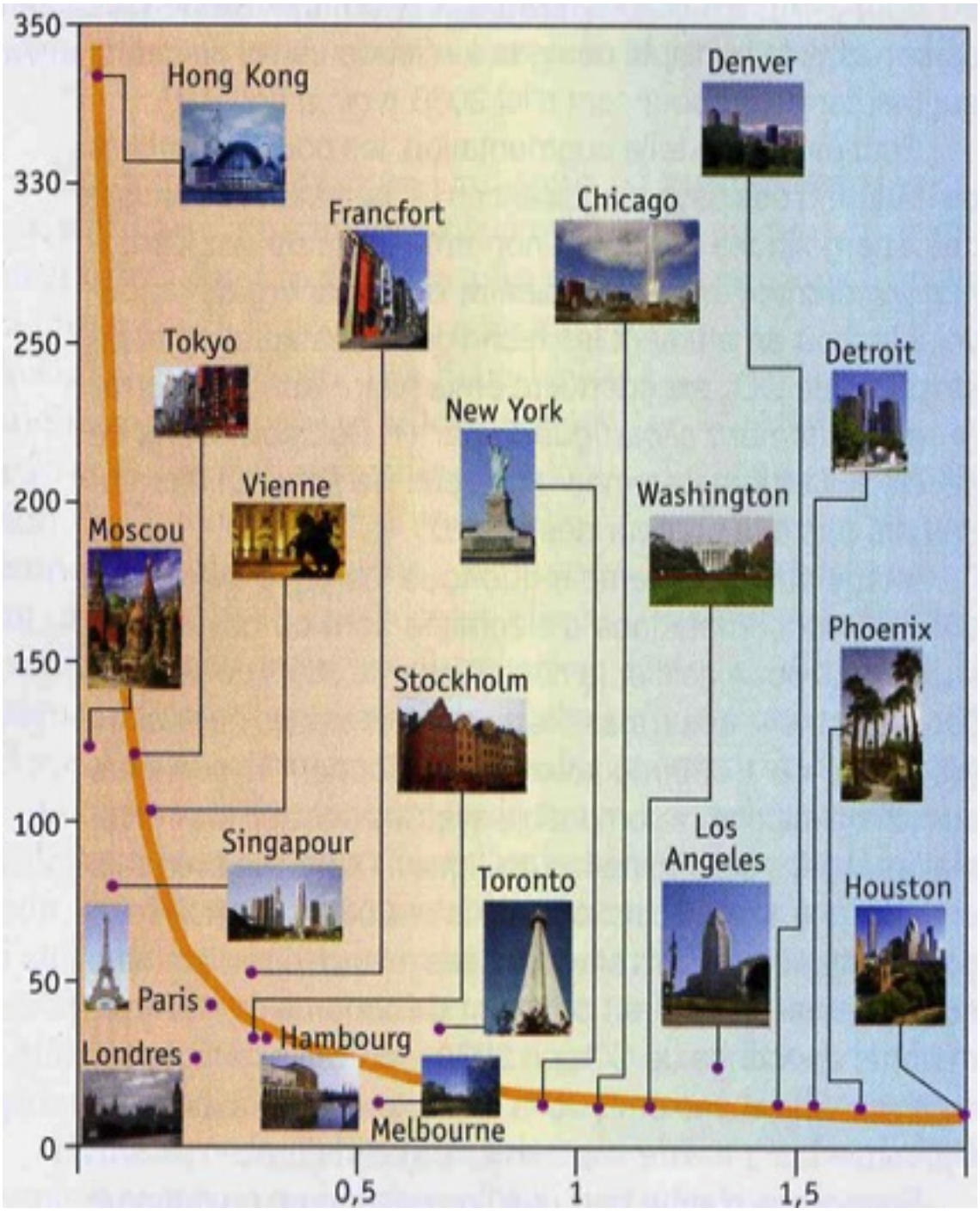
The answer to the first question is clearly no, as demonstrated by the following graph:



Energy consumption compared to GDP per capita (Source IEA)

On the above graph, let us look at the triangle Japan-Russia-Canada. Canada has a GNP per capita 30% lower than Japan and a consumption of energy per capita double than Japan. The cause is not a colder climate: if it were the case, USA, being warmer than Canada, would have a lower consumption per capita. The graph shows it has nearly the same. Other example: Russia, with a low GDP par capita (one tenth of Japan) consumes more energy per capita, why? Anyone who visited Russia knows that, for instance, buildings older than 1990 were poorly isolated. More generally, public free access to energy suppressed any incentive for energy saving.

2.4.2 Structural effects



Vertical axis: density habitants per ha

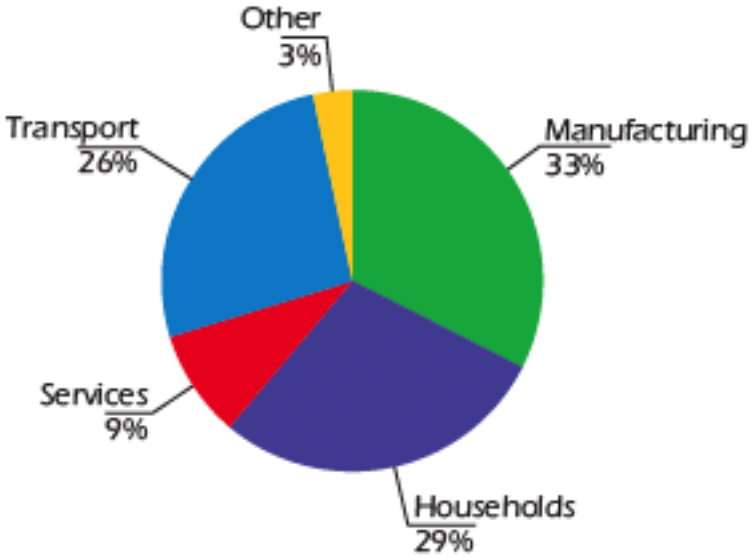
Horizontal axis: consumption per capita for transportation

In USA and Canada, prices of energy were driven, during the late century, by international market prices, with low taxes added. It was not the case in Europe, where

taxes represented the great majority of the price paid by the consumer. US position, being faithful to market ideology, stayed short sighted, because markets are short sighted, but generated long term consequences (as shown by the graph below), that may lead to a collapse of the so-called American way of life (and the US leadership too) during the following decades.

The above graph gives the position of several big cities regarding their density and their consumption of energy per capita for transportation needs. It shows clearly that low density towns that expanded in US during the easy energy half century spend 6 times more energy per capita for transportation than Paris, London or Vienna and some 12 times more than Singapore, Tokyo and Hong Kong. Therefore, the people living in these American cities are trapped in a compulsory consumption out of which there is no fast escape.

2.4.3 Shift in consumption



Total world energy consumption 2005 (source IEA)

As shown by the above graph, energy consumption can be roughly divided into 3 parts: manufacturing, households and transportation. Manufacturing has already taken initiatives to reduce its consumptions. Reducing households and buildings consumptions needs important isolation investments. It takes time and money, but the technologies are

well known. Transportation consumption is growing faster but could be massively reduced.

From a technical point of view, reducing energy consumption and consequently carbon dioxide emissions would be feasible with the existing technologies. The wide gap between the different cities and the different nations shown by the above graphs demonstrate that **it would be feasible only by imitating** the best performances already existing worldwide.

For instance[35], Paris, London and Tokyo have a powerful metro infrastructure transporting 10 million passengers per day in Paris and 5.7 million in Tokyo. In most American cities, except New York, common transportation is weak. Using a car is nearly compulsory. And the consumption of American cars per Km is approximately twice the one of Japanese and European cars, as a result of the past absence of tax incentives.

To go further in the existing technologies, the feasibility of hybrid vehicles was already well known in the 70's when took place the first energy crisis. The one of electric cars was known too. The first car that passed 100 Km/h was electric. And this occurred in 19th century[36]! During 20th century, electricity storage needed heavy batteries. Nowadays, we can expect that either fuel cells or lithium batteries, as used in cellular phones, will overcome partly this inconvenient.

Regarding air transportation, for ground distances less than 1000Km, the high speed train can compete saving important carbon dioxide emissions, even more if the electricity is not generated by fuel, coal or gas combustion, for instance, if it is produced by hydropower, solar, windmills or nuclear.

Jet airplanes are basically derived from military. The great manufacturers financed their research through military procurements and, in a second stage, used their know how to adapt the planes to civilian use. More recently, they made an effort to reduce the kerosene consumption.

[35] as quoted by Rajendra Pachauri, president of IPCC.
[36] 1899, la "jamais contente"

The more radical changes that would cut most of air transportation carbon dioxide emissions are well known but still waiting for a decision.

The first one is known as the “cryoplane”, a jet plane burning hydrogen instead of kerosene, inspired by the hydrogen technologies developed for space propulsion. The combustion of hydrogen produces only water. It means nearly zero emission of carbon dioxide and other greenhouse gases, as far as the hydrogen is produced out of a non-emitting source of energy (again electricity out of hydropower, solar, windmills or nuclear).

The second one is the airship, an old technology that was developed at the beginning of 20th century. The airship floats in the air and therefore consumes no energy for sustentation and very little for propulsion. The airship is also able to carry important volumes or weights (some hundred tons, much more than helicopters, that culminate around 20 tons) and does not need an airport to land its charge. It could not only replace some air and ground transportation, but also bring rescue everywhere in case of natural disease or transform building technologies, being able to carry by air a completely equipped house previously assembled in a factory.

Regarding households and more generally buildings, most energy consumptions are due to heating or cooling. But the isolation technologies are also well known. The buildings are consuming an important share of the energy because they were built in a time where energy was cheap and decision makers improvident. This points again the absence of initiative of public authorities (or their submission to lobby pressure).

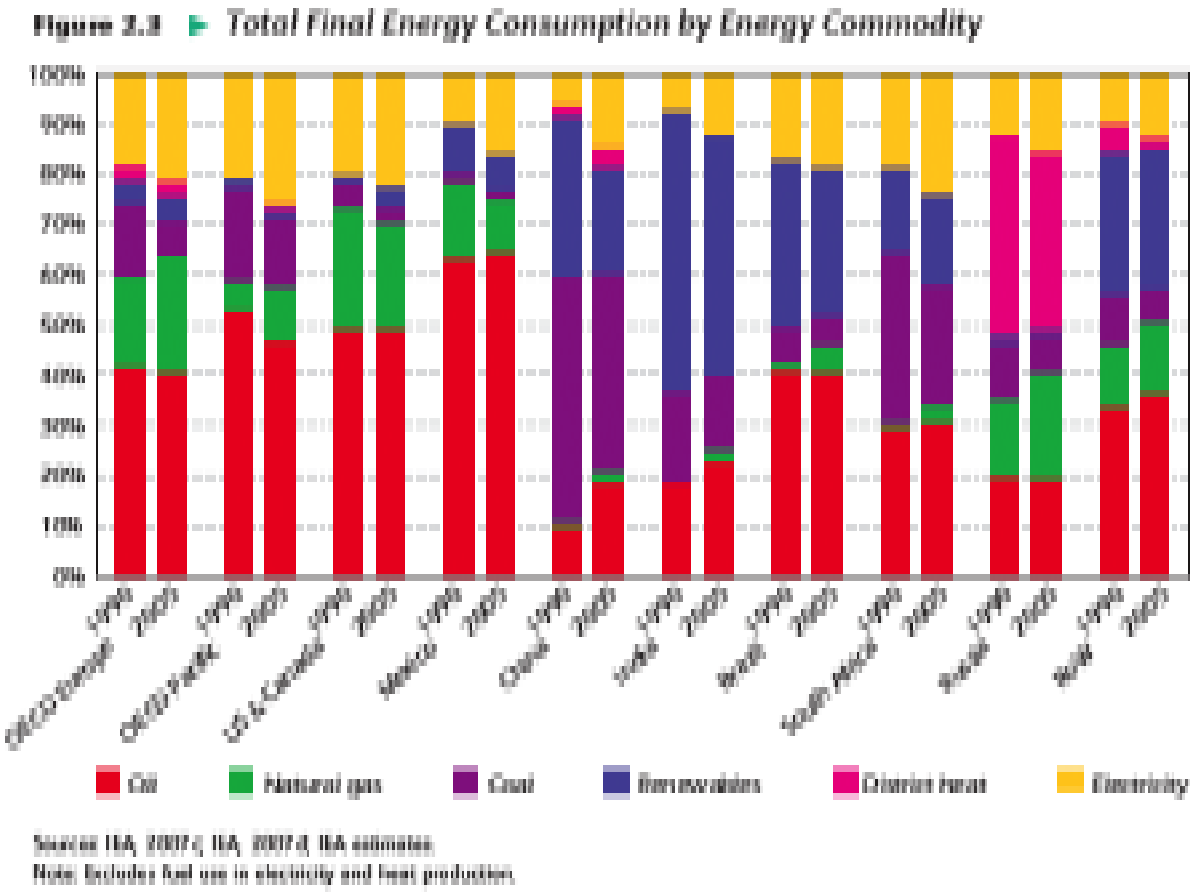
Conversely, the case of the city of Freiburg im Breisgau[37], Germany (215000 inhabitants), shows how a municipal initiative can transform an entire part of the city (Quartier Vauban) in a self sustainable living place, with “passivhaus” (zero energy consumption habitat), green environment, photovoltaic electricity, trams and bicycles, ecological waste treatment and so on. Other examples can be found, the industrial Swedish city of Händelö for instance. An informal network of such ecological cities is

[37] http://www.freiburg.de/

now built in Europe. It exchanges experiences and promotes the sober and sustainable technologies.

2.4.4 Shifts in energy production[38]

It is well known that many ways exist to produce energy without burning fuel coal or gas. But a clear understanding of the situation is not possible considering only production, as if all types of energies were equivalent.



Here is the graph of the final energy consumption by type of energy and by region (in which fuel or coal use for electricity production is counted in fuel or coal and not as electricity). It shows very different patterns depending on local ways of living and equipment. During the last half century, the access to oil and gas has been easy and relatively cheap. This has come to an end. And the greenhouse effect will impose anyway restriction in their consumption and in that of coal too.

[38] For another approach of the energy question see Irina Kuklina's contribution

"Prices: a general equilibrium model represents price evolution in real term and relatively to a world price index used as reference. Inflation and monetary policy effects are not taken in consideration. Change in relative prices indicates the evolution of world producer prices, without any change in the aggregate level of prices.

The sectors that rely on the exploitation of some limited natural resource are to experience the most significant price increase. It is the case for **agricultural** products that use land in the production process. ***The price of primary energy, namely coal, gas and oil, is expected to decrease slightly as defined by the official EIA scenario, and in reaction to new significant capital investment and technologic progress***."[39]

Looking at the possible substitutes, one should distinguish between different uses. These are roughly heat, propulsion and electricity. In order produce heat, more precisely to heat buildings and domestic housing, a first solution is the "passivhaus" capturing as much energy as needed from the sun, another substitute is burning wood, and a second one is electricity, even amplified by heat pumps.

For propulsion, a first substitute is given by hydrogen, which can be produced out of electricity, by electrolysis of water, and a second one is electricity. Therefore, **electricity** should play a key intermediate role in the forthcoming energy system.

Then the question raised is: how electricity will be produced and distributed to the users? At that stage, we have to make another distinction: Electricity mass production distributed through a network on one side, or decentralised production, linked or not to a network on the other side.

For mass production distributed through a network two carbon free technologies are available: nuclear and hydropower[40]. As this centralisation fits with high population density and big towns, there is a high probability for these technologies[41] to be

[39] CEPII Mirage exercise
[40] Let us mention also the "solar power from space" project, capturing solar energy by satellite the transmission to earth being operated by microwave beams.
[41] This is not the place to discuss whether these technologies should be developed or not. The attitudes of the Chinese and Indian authorities are clear enough to say that they will be developed.

developed for city uses during the following decades, particularly in China, India and South America.

Regarding decentralised consumption, the question of energy production and storage appears quite different. A wide range of technologies is available: photovoltaic solar panels, windmills, biogas out of waste fermentation, wave energy at the seashore[42]. The link to a network is feasible but not necessary. It can be expected, following Toffler's "prosumer" attitude that many end users would prefer to complete their autonomy in order to escape the world market fluctuations.

Finally, the answer to the second question is that most technologies avoiding carbon dioxide emission are already available on the shelf. Research may be useful to improve them, but the real question is the one of the governance necessary to put them in function, related more to social sciences than to hard science.

This appeal to turn now to the new set of actors involved in the cognitive civilization

[42] Research facilities are being built in Orkney Islands to test wave energy technologies.

3-Different actors:

3.1 Why different actors?

The landscape of the future has been at first quoted by Toffler[43], followed by many other futurists. The following decades are clearly a disruption in the very nature of civilisation. To describe it simply, it is a transition between the industrial age, which started during the 18th century and is still developing in emerging countries, to the **cognitive civilisation**, in which the basic concern is relying on digital communication and nature care.

If the present transformation is comparable in magnitude to the industrial revolution, it should bear also a complete reshaping of the organization of the society. The behaviours should be different and the institutions too, both public and private. Most experts agree on the magnitude of the disruption. But how can we imagine a world where the actors behave differently than the way we know and where the institutional landscape is reshaped and grounded on other legitimacies?

Some authors already tried first speculations: Manuel Castells, Sherry Turkle, Pierre Lévy for instance, and also Alvin Toffler. To go deeper one needs an important amount of work in social sciences observations and interpretation. Regarding the present report, it will be more productive to take the risk. According to the high probability of change, imagining a different world will be a better preparation than staying in the present one.

Anyway, this exercise needs to get rid of the present concepts. May be, in 2025, a nation-state would not be a nation-state any more, a firm would not be a firm as we know it today and the individual attachments would be different. Let us get free to imagine it. Anyhow, let us also take into account the weak signals. New practices appear first in minor initiatives and diffuse in a second stage.

[43] Alvin Toffler, The future shock, 1970; The third wave, 1980; Revolutionary wealth, 2006.

3.1.1 Nature care

The Nature care question has been described earlier through scientific and technical available data. But the important point, regarding the evolution of civilization, is the perception of this question by the public and the actions that may be operated by the different forces at stake.

Common economic knowledge would assume that "homo economicus", being concerned by profit expectancies, would not be interested in long term planet preservation. But, in daily life, she/he has children, listens to the information channels, completed by Internet surfing. She/he builds his opinion as a citizen too.

Since images of the earth seen from space have been broadcasted, a wider consciousness is at work that reaches even obstinately short-sighted people.

Well known NGO's (Greenpeace, World Wildlife Fund, Environment Defence Fund…) have developed worldwide actions for nature protection. The increase of their influence has been impressively fast during the last decades. It may be due to their management skills, but not only. The recent development of the information system enabled public access to scientific information and made visible, through satellite images for instance, the problems due to uncontrolled exploitation of nature.

The cognitive aspect is the central part of the analysis. The hypothesis that a diffuse consciousness has grown in the mind of the public fits with observation. At the same time, the opportunities offered by distance work and learning allows the individual to be simultaneously a citizen of the world and a locally rooted person, participating less in urban agitation. This attitude is not only visible at family level. It is also present in firms, where economic decisions are made[44].

Pushing this trend further, it leads to foresee a shift in the philosophical attitude towards nature. During the industrial age, human activities were implicitly understood in terms of

[44] For instance in oil companies like BP (who claim to be "Beyond Petroleum") and Shell (see for instance the most interesting "Shell energy scenarios for 2050" published in 2008. The extreme conservative attitude of Exxon, financing experts to refute the greenhouse effect, is an exception, and is even not unanimous in that company, as shown by the 2008 debates at its shareholder's assembly.

production and consumption. Nature was only a source of raw materials and a place to get rid of waste.

If natural life, for the cognitive civilization, is perceived as a key factor for future children survival, the relationship should turn to a symbiosis attitude. Such an evolution means a shift in the mentalities from production to gardening. It assumes that the gardener is more than a producer. she/he is the guardian of life perpetuation, and also a poet modelling life as an artist.

To sum it up, nature care generates local rooting, worldwide warning and renewal of art.

3.1.2 Digital communication[45]

The web 2.0, where the connected persons can become authors, started a few years ago. Therefore today, in 2008, is early to estimate the changes in behaviour generated by this new opportunity, including ordinary information, sound and broadcast. Attention should be paid also to games, serious or not, and to massively multi players on line role playing games (MMORPGs), in which are already involved several million players from all continents. In developed countries, a new digital generation is already on line, born with a keyboard a touchpad and a mouse. Other young people from other parts of the world will follow during the next decade. This generation thinks different and will be on command in 2025. Therefore, we need to understand their way of thinking as precisely as possible.

For instance, the attachment to institutions, which was one of the bases of industrial organisation, through the employer-employee and/or citizen-nation relationships, may not be so essential for this generation. If it is the case, the institutional personification that we take for granted should be left aside and replaced by other concepts. In 2025, will it still be possible to articulate sentences like “Shell has the feeling that...” or “Peru will never accept that…” as if these entities had a personality similar to humans?

[45] See also Geoff Mulgan contribution

3.2 Education and health

3.2.1 Education and self training[46]

Toffler's ranking[47] points education as the slowest and last to adapt to the modern communication system, the firms being the first, then the NGO's, then the governmental institutions. Such a statement may be exaggerated. In developed countries, children can be observed, inspired by their school learning, correcting the attitudes of their parents, saying things like: you should put out the light, consume less meat and more vegetables, isolate your windows and so on.

In developing countries, the access to modern economy often rely on schools, many, as in India, connecting to Internet. Such weak signals show that the education community is moving, in some cases faster than the families and the firms. This may be explained by the position of the teachers. The meaning they would normally give to their profession is to serve the common good in a long-term perspective.

The evolution of **education** appears relatively easy to foresee, but may be difficult to put into practice, because of the magnitude and deepness of the changes it assumes for the existing institutions and the huge number of persons involved. Some foresights already show audacious prospects:

"Imagine a university without buildings or classrooms or even library. Imagine a university ten thousand miles away from its students. Imagine a university without academic departments, without required courses or major or grades. Imagine a college open 24 hours a day, seven days a week, 365 days a year. Imagine a college proposing a bachelor degree in individualized studies or in interdisciplinary studies, with a catalogue of more than 4000 different courses. Imagine a degree valid only for five years after graduation. Imagine a college willing to reimburse its students if they don't find a suitable job within six month of graduation. Imagine a higher education system where institutions are ranked not by the quality of their teachers, but by the intensity of

[46] See also the Russian approach in Irina Kuklina contribution
[47] see below section 3.3.3

electronic wiring and the degree of internet connectivity. Imagine a country whose main export earnings come from the sale of higher education services…"[48]

The first element to consider is that, through Internet, **the most successful courses of the best teachers of the best universities will be made accessible**. MIT courses and many European ones too, are already on line, only in their classical shape. Therefore, one can foresee that the direct competition between teachers of all universities, due to this new accessibility, combined with accounting of customers download, will be a powerful incentive to improve their presentations, using images, videos, even **games**. Such an evolution assumes the financing of virtual universes creations rather than the financing of classrooms. It assumes also that the role of a mediocre teacher of a mediocre university will be reduced to comment and explain the presentation of the high-level scientist. And test its assimilation by the students.

The second element is the development, not only of distance learning, but also **cooperative learning** as practiced in the free software community. Self-trained persons should play a greater role in the future economy. Many skills may be tested through Internet, and the present system of exams may become obsolete. An employer would prefer to test the present capabilities of a candidate and would disregard to know she/he has been twenty years ago a student in a formerly well-known university. Anyhow, collective life on a campus or even in a classroom generates solidarities that cannot be replaced by distance communication. This fact may moderate the shift towards distance learning. In the competition between schools and universities, the quality of life should play a greater role in the future.

The third element is the hierarchy between theory and practice that might be turned upside down. Theoretical knowledge is transferable through Internet, as well as theoretical exercises. Physical attendance to courses remains necessary for **practical skills**, the ones of gardeners, craftsmen for instance, as well as the ones of surgeons or sport champions. Therefore these practical skills should be promoted to a higher social

[48] Beginning of the article "Tertiary education in the 21st century. Challenges and opportunities" by Jamil Salimi, World Bank, United states, published by OECD 2001.

status, as a consequence of their less easy access and also of their scarcity, due to the present overpopulation of professions relying on discourse.

To conclude, the education system will become international and completely reshaped by the Internet access, not only to information, but also to training processes (games) and validation tests. What is nowadays considered as being a high level knowledge will become currently accessible by anyone, and what are considered as second level skills, like the handicraft skills, becoming rare, will be appreciated because of their scarcity.

3.2.2 Health and self care

Regarding **health**, major evolutions are also to be expected:

The first one is **distance health care**. With adequate measurement instruments and teleprocessing, a sick person can be followed and monitored having a normal life, instead of being stuck in a hospital bed. Even if hospitalization is required, it may be handled in small hospitals, assuming they are connected with distant expertise systems and specialists. One can assume, therefore, that the whole logistics of the health care system will be transformed.

The so-called **"medical tourism"** is already developing and will develop faster as a consequence of the opportunities offered by the Internet. The international competition resulting between health services will appeal for harmonization of the various health care systems and the legislations attached to them. The complexity raised by this question is still higher than the one dealt by WTO. Health care being a very sensitive question, close to human rights, it can be foreseen as an important political topic of the next decades.

As for education, **self-care** should increase. In the case of AIDS, some patients have so well documented themselves through Internet that they have been able to teach their doctors. Self-care increase is also a consequence of the accessibility of information through the Internet. The sick person may acquire directly the knowledge of his/her illness, compare the current medical information to his/her feelings, and even test various treatments. The medical corporation may not be satisfied of it and may point out

the risks of self-medication; no one can abolish the desire of the people to care for oneself.

3.3 Multiple individuals and networks

3.3.1 Avatars: assuming several identities

Sherry Turkle[49] devoted her academic life to understand the evolution of mentalities and behaviours induced by young people's computer practice, Internet and games. She used direct observation, psychoanalysis and philosophy. Her books on the topic, "the second self, computers and the human spirit" (1984) and "Life on the screen, identity at the age of Internet" (1995) still considered in 2006 as a basic reference[50].

The major observation she derives from her studies is the constant struggle by people to make a distinction between humans and machines. Once people refused to imagine machines as a very basic human mind, now they refer to their own mind as machine-like at times. She also noticed that people now began to talk to machines freely without much embarrassment. The boundary between humans and machines has been broken down to one point: humans are alive where machines aren't. With the development of a-life, that weak boundary is becoming weaker.[51]

Other observations have been made on avatars in multiplayer games. The addicted player assumes through avatars several identities simultaneously. Misrepresenting oneself in an avatar may have the benefit of being therapeutic. It may also generate troubles.

The major result of these observations is the easy ability of human mind to recognise communication partners, even non-human, as bearing a personality similar to humans. This fact, issued from cognitive science, leads to a provocative assumption regarding cognitive civilization: according to the past way of thinking, issued from the industrial

[49] Professor at MIT.
[50] Many expert views have been expressed on the topic. The PEW Internet gives a good sample involving 742 correspondents (http://www.pewinternet.org). But Sherry Turkle offers a deeper reading, based on observation.
[51] Turkle also observes that women have a "non-linear" approach to computers. This she calls "soft mastery" and "bricolage" (as opposed to the "hard mastery" of linear, abstract thinking and computer programming).

age, some institutions are legitimate, the nation-state, the firm, the family, others are less legitimate, informal groups for instance.

It is likely that the new legitimacy feeling would rely not on the official recognition but on the intensity of information exchange, fast reaction and presence. This may lead to some misunderstandings. For instance, new generations may ask why they have to pay taxes to the government, in spite of its poor efficiency, and not to an NGO which is really serving the common good. Tensions should be foreseen that should weaken old legitimacies.

Completely different situation may also happen: automats on the Internet are taken as partners for games, psychoanalysts of even prophets. The experiences have already been made successfully, but not widely diffused. Personification of machines therefore may transform the relationship to oneself.

Automat partners are presently at work for information retrieval and training. They should play an important role in teaching. They are already replacing some bureaucratic treatments and interfaces with the public in Internet connected countries.

3.3.2 International networking: the global individual

Internet gives the floor to knowledge mining individuals, whatever being their institutional position. It promotes also the "information gatekeepers", who push the circulation of knowledge even before any reward expectancy.

The role of these gatekeepers has been quoted as essential[52] in the innovation process, particularly in big organisations. Their warning role is not transactional. They provide information as a gift, a free participation to the common movement.

Free input to common understanding is probably the key point of the creation of informal communities. And it is important to remind that any organisation started informally, and maintains itself through informal relations.

[52] The five roles in the innovation process are known as: the inventor, the entrepreneur, the facilitator, the godfather and the information gatekeeper (six countries program on innovation policies).

Being now facilitated by communication technologies, cellular phones and Internet, which ignore the frontiers and goes over the institutional cleavages, a deep restructuring of world organisational landscape should be foreseen when the net generation will be on command, around 2025.

3.3.3 Institutions ranking

Alvin Toffler, in “Revolutionary wealth, 2006” raises an important question: what are the actors best adapted to operate on the new connected instantaneous information system? His ranking is the following:

1- the private enterprise, jumping as usual on new opportunities for business

2- the NGO’s, who have recently progressed in expertise and efficiency

3- the governments and their bureaucracies

4- the education system, the slowest and the most reluctant to change.

It is important to keep in mind Toffler’s judgement, which expresses a sort of common understanding of the United States ruling class. As Toffler is a well-known lecturer, often invited to speak in firms or in business officials meetings, he is probably paying attention to the basic assumptions of his public, considering that too provocative statements would not be acceptable or even understood.

But if we look at this ranking more closely, it may appear different in relation to global change. First, since 1990, no important concept emerged from the business community. The new ideas came from the research community through IPCC, (created under UN mandate), and also from NGO’s, particularly WWF with the ecological footprint concept. It came also from the end users, through the free software community (in which some firms have been involved), and the intellectual property contest for music, videos, and also drugs to save developing world populations from chronic diseases.

3.3.4 GBN Scenarios

In the business community itself, the anticipation of a behavioural mutation is present for a long time. For instance, in 1995, the Global Business Network (GBN) issued a foresight 2010 in association with the Sloan School of management of MIT.

In scenario 1, named “small companies, large networks” says: “the corporation of the late 20th century was just a transitional form. It lasted more than one hundred years, but few corporations of that form remain today”. The dinosaur era (General Motors, Microsoft, Sony...) is over. “Nearly every task is performed by autonomous teams of one to ten people, set up as independent contractors or small firms, linked by networks dissolving when the project is done”

In scenario 2, named “virtual countries”, the opposite assumption appears. “The huge global conglomerate has emerged as the dominant way of organizing work.” “These conglomerates operate in almost every industry and have minimal national allegiance. The alliances meet all our needs on a cradle-to-grave basis, income and job security. They are as powerful and influential as nations and we owe alliance to them”. They wage war on each other, using lawyers instead of armies. These days, if you want to define me, you can ignore my geographic location. I can be stereotyped according to the company I work for.”

Obviously, these scenarios will not resemble to 2010 business organizations. Anyhow, they are meaningful describing the imaginary of the 90’s business thinking. They question two opposite efficiencies: the flexibility aimed at fast adaptation to market opportunities on one side, the search for the loyalty of the employees in counterpart of safety on the other side.

Since 1995, between the market and the employees, the business community has clearly chosen the market. And the opportunity to transfer manufacturing to low wages unprotected workforce on the other side of the planet made this choice easy. This will come to an end before 2025, and the decision power will be transferred to other hands, located in the BRIC’s. Let us look first at the trend of the last decades.

3.4 Business behaviours

3.4.1 Increased conservatism

Mass broadcasting through radio and TV has generated, during the last quarter of 20th century, an evolution of the behaviour in the business community. The opportunity to address at the same time millions of customers for several hours a day has increased the influence of the selling force inside the firms. Conversely, the engineering influence has declined. In developed countries, many manufacturing activities have been delocalized to low wages and low manpower protection locations.

One of the unexpected consequences of this evolution is an increased conservative attitude of the big business, in spite of its declarations of faith in innovation and entrepreneurship. The example of the American automobile industry since the 70's illustrates the case. After the first oil shock in 73, it was clear that the heavy and high consumption vehicles would not survive oil scarcity and high prices gasoline.

But these cars were the ones that the selling force was used to sell. And, as the persuasion system had enormously increased its power over the customer's mind, the market tests and the public opinion analysis confirmed that this type of cars was the one the customer wanted. Persuasion of the public had given the floor to a self-confident conservative attitude, enough to neglect geopolitical evidence.

Following this path, the US government forgot to tax fuels as it was in Europe, where the price paid by the consumer included more than two third of taxation, pushing the car manufacturers to built more sober engines. And when the international price of crude oil was multiplied by nearly 10 during the last decade, when the purchase power of the average American was cut by the "sub-prime" crisis, the US automobile industry saw its customers turn to Japanese and European cars and went nearly bankrupt[53].

This example shows not only the **improvidence**, but also the **arrogance** of big business leaders relying on the firm belief that its selling force will anyway be able to convince the public to buy the products that they want to sell. It may be the case for a time, but harder

[53] Top management would not be affected: in case they are fired, their golden parachute opens and make them wealthy for the rest of their life.

will be the fall. And the ability, for the customer, to get more independent information through Internet has started to weaken the influence of the selling force on his mind.

3.4.2 Lobbycracy

One consequence of the cognitive overload of the public is the increase in spending for advertisement and, more generally, persuasion. Therefore the legitimacy of the well known “offer and demand law” is declining. Because of mental saturation, brands have to spend more and more to take a place in the brain of customers. Economy pretends to be legitimate because being demand driven. It has been in fact through mass Medias more and more offer driven. And it is still for a time offer driven, as long as the customer listens to the TV instead of surfing for information on the Internet. Economy is no more liberal. It has turned progressively to a **lobbycracy**, where, in most countries, the public sector is serving the interests of the dominant firms. Except in few sectors, newcomers have little chances of success when they operate on the territory of vested interests.

Another example leads to a critical view of the privatisation policies of public infrastructures and services at the benefit of oligopoly lobbies. In cases, electricity and telephone, competition was supposed to lead to a better service to the customer. Such a view relies on the assumption that he/she (the customer) makes a rational choice, and the only legitimate one, being the end user. The practical result, due to information overload of this end user, has been that the companies have hired a sales force to persuade him/her, multiplied unreadable tariffs conditions and, in counterpart, made the sacrifice of their research units, useless to persuade the customer. The global result is likely to be a slow down in innovation and an enormous waste of time and skills.

But the deeper question is that economic doctrine has to be completely reshaped to fit the realities of cognitive civilization.

3.4.3 Shell scenarios for hope

The perception of the lobbies influence is turned positively through the 2008 Shell energy scenarios. Shell has a long experience in foresight, and its top management is

convinced that one of the roles of the big oil companies is to help solving planetary damages of the greenhouse effect. The document imagines two scenarios:

The first scenario is called **scramble:** “At the international level, scramble is a world of bilateral deals between energy producers and energy consumers, with national governments competing with each other for favourable terms of supply or for access for their energy companies. There is a strong element of rivalry between consumer governments, but they align with each other when their interests coincide. In this world, national energy companies play key intermediate roles, but themselves become increasingly mired in political machinations. Globalization exacerbates the tensions within and between nations and distracts policymakers from the need to take actions and to build international coalitions to face the energy and climate change challenge”.

The second scenario is called **blueprints**: “blueprints describe the dynamics behind new coalitions of interests. These do not necessarily reflect uniform objectives, but built on a combination of supply concerns, environmental interests, and associated entrepreneurial opportunities. It is a world where broader fears about life style and economic prospects forge new alliances that promote actions in both developed and developing nations. This leads to the emergence of a critical mass of parallel responses to supply, demand and climate stresses, and hence the relative promptness of some of these responses”

Clearly, the publication of these two scenarios takes into account both the lobbying influence of the great companies and the necessity to solve planetary problems. To our understanding, the underlying message could be translated as: let us get out this sterile competition and define a common lobbying strategy able to overcome global warming and energy scarcity. In other terms: why don’t we turn lobbycracy positively? It is sending a sign of hope for the citizen.

3.4.4 Free accesses

The so called “knowledge society” in which Europe was supposed to become the most “competitive” continent, has been looked at in classical economic terms. Namely, knowledge production and transfer were viewed first as sources of profit through copyrights, paid connexions and paid data circulation. But, at the same time, signs of

another logic appeared: the telephone through Internet did not charge the distance; some cities started offering free Wi-Fi access to their citizens; a young American company, Google, offered free access to its data retrieval system and, in a second stage, to the most detailed satellite images of the planet, assuming that it will generate such a huge amount of consultations that small advertisements added would overpay the costs. And it was the case. In the cognitive society, economy turns around a persuasion system.

These cases show that information desired by the customer tends to be given for free, and the payment is generated by the advertisement added. Therefore, from this viewpoint, an updated "Lisbon strategy" would tend to eliminate as much as possible tariffs on communications, intellectual property and all sorts of tolls slowing down the flow of information, in order to make the circulation of culture as fluid as possible, and also implement the principle that, as in US, any information acquired with the taxpayer's money should be delivered in free access to the public on the Internet.

3.4.5 Bubble capitalism

The finance collapses of the 90's in Russia, Indonesia, Mexico, Korea, Argentina, the crashes of LTCM, Enron and Vivendi Universal, the new technology bubble in 2000 and the sub-prime crisis started in 2007, are all consequences of a basic statement: the present information system is unable to control itself and vulnerable to all sorts of manipulations. The crash of the Stock Exchange in 1987 was probably the first example of a worldwide interconnection in real time of financial investments, where a number of operators entrusted computers to buy and sell since human beings had become too slow for such a task.

The economic analysis still refers to concepts of 19th century. But this new **"bubble capitalism"** differs in essence from the capitalism at the time of Marx. And the mass persuasion system transforms the worshipped "invisible hand of the market" into an invasive conquest of the public's neurons.

Another factor seems to increase this bubble tendency: the approach of saturations. Let us make it easy to understand through an example. Here is a plot of land, located in a

city; it is used as a parking place. The activity of the city grows, and the intensity of traffic too. The demand for parking places increases over the capacity of the existing places. The matching of the offer and demand is operated increasing the price rates. The owner of the land, therefore, grows suddenly rich. He produces nothing, and the standard of life is not improved by his activity.

Saturation situations become important when “approaching the limits”, as we stated before. The peak oil phenomenon is an illustration that shows it might reach a magnitude that can destabilize an economy. Going back to our parking place, we can predict that people being aware of this potential increase in revenues without any effort added would propose to buy the plot of land, the value of which becomes speculative.

In contemporary economics saturations multiply such situations, and the tendency to multiply speculative bubbles grows as a result of competition to capture rents. And most real goods underneath are not productions. They are in most cases assimilated to property rights: intellectual property patents and copyrights, tolls on highways, parking, telephone communications or electricity. Many compulsory consumptions of the average citizen are involved. Her/his perception is inevitably a reduction in his/her standard of living.

The free market approach of these situations would be an attempt to reduce the prices by increasing competition. But, going back to our parking plot, it does not work. The high prices are due to scarcity. In that case, it is insuperable. Another way to deal with the problem would be to ask about the nature of the saturation money: is it private or public? If it is private, it might generate bubbles and produce nothing. If it is public, assimilated to a common good, then the money, if conveniently managed, may be recycled in urban planning, common transportation or other means to overcome the saturations.

3.4.6 Local roots

The worldwide Internet and cell phone practice will inevitably transform the banking, insurance, tax and accountancy. Business orders and payments will be, if not simplified,

at least deeply transformed by distance treatment. The money itself may be touched[54], if local trade systems appear reliable enough to their users. It is likely that, at least in the so called developed world, an aware fraction of the populations will try to escape the weight of the bureaucratic burden paid through taxes, fees, tolls and tariffs, by restoring local exchange practices.

In some companies, the preparation of the great change has started. Josephine Green[55], from Philips says "**we are not in front of an age of change, but of a change of age**". We are going beyond the consumption society, and she adds: "According to Peter Drucker, "Every few hundred years in Western history there occurs a sharp transformation. Within a few short decades, society rearranges itself; its worldview (paradigm), its basic values, its social and political structures, its arts, its key institutions. Fifty years later there is a new world." Such a dynamic change of age is not served by incremental innovation but by deeper structural change and radical innovation. An example is how we have to re-think and reinvent some of our basic social industries such as health, care, education, transport, and – beyond the social industries – our lifestyles. These are all things that grew out of and were styled around the industrial era but need to be re-invented for the 21st century. As this paper suggests, the more progressive and ultimately more successful companies will progress from a consumer/market-led approach to a people/social-led approach. To make sense of this we need to identify and understand some of the factors influencing the metamorphosis from a market-led to a socially-led company."

3.5 Scientific and cultural communities influence

Since Second World War, research activities have been boosted by military demand, which still represents in United States approximately half of the national expenses devoted to science. In a second period, starting approximately at the first energy crisis (1973), research budgets started to diversify. More was devoted to energy, health and, with the development of civilian electronics, telephone and computers, to high tech

[54] Bernard Lietaer, the future of money, beyond greed and scarcity.
[55] J. Green is n charge of foresight in Philips. See her important paper "democratizing the future"

industry technologies, including biotechnologies, which dealt also with military issues. The research lobby grew in influence and was strong enough to obtain credits from governments and firms, arguing the needs for competitiveness and innovation.

Since year 2000, the scientific community looks like escaping progressively its dependence on economic forces. Internet offers a direct connection to the public, in which movements of amateur science have developed. The media become interested in scientific imaging.

Science fiction progressively became real when anyone could see images coming from inside a human body or images of the earth seen from a satellite. These contributed highly to the enlargement of public consciousness, the care for environment and the interrogations about the very nature of life.

On the industrial side, the realization of great equipments like the Hubble telescope, the LHC at CERN or ITER give opportunities to progress and improve technologies like supra conductivity, measurement, modelling and transmission techniques

3.5.1 The IPCC and the emergence of a global consciousness

IPCC (Intergovernmental Panel on Climate Change[56]) was created 20 years ago, in 1988, by the WMO (World Meteorological organization) and the UNEP (United Nations Environment Program). In 2007, the Norwegian Nobel prize award has been given to IPCC (jointly with the former US vice president Al Gore). This award, known as the "Peace Nobel Prize" differs from the ordinary Nobel Prize delivered by the Swedish academy of Science under strictly scientific criteria. The Norwegian prize, more political, bears the recognition of an influence on the progress of international peace. Therefore, giving the reward to a scientific organization marks a date in history. Not only the scientific value of the work is rewarded, but also the impact it has on the public awareness regarding climate change nature and consequences.

This may be an historical reorientation: for half a century, research was supposed to be at the service of economic competitiveness and/or defence goals, except, of course,

[56] http://www.ipcc.ch

some minority “fundamental research”, supposed to find its own goal in itself. If the awareness of the public and the politicians is turned to climate change, research will conversely determine which orientations should be given to economic and industrial activities, and even to defence ones, which are supposed to be built to preserve global safety.

Some conservative lobbies reacted, preferring their “business as usual” game to long-term perspectives. Exxon financed several experts to bring controversy to IPCC statements. But even in the oil business, this “Texan” attitude appears isolated. The Europeans Shell, BP, Total and even in US Chevron are taking several initiatives to prepare the post-carbon society. The future enormous incomes due to the peak oil and the following price increase will probably be used to convert these companies to new jobs.

3.5.2 The IIASTD: reshaping research and agro policies

In April 2008, the International Assessment of Agricultural Knowledge, Science and Technology for Development presented its report in Johannesburg[57]. It appears also as a turn point in agricultural management philosophy, a central input to European commission policy[58]. Here is a meaningful extract of its executive summary:

“For many years, agricultural science focused on delivering component technologies to increase farm-level productivity where the market and institutional arrangements put in place by the state were the primary drivers of the adoption of new technologies. The general model has been to continuously innovate, reduce farm gate prices and externalize costs. This model drove the phenomenal achievements of Agricultural Knowledge Science and Technology (AKST) in industrial countries after World War II and the spread of the Green Revolution beginning in the 1960s. But, given the new challenges we confront today, there is increasing recognition within formal S&T organizations that the current AKST model requires revision. Business as usual is no longer an option. This leads to rethinking the role of AKST in achieving development and

[57] A video presentation is available at http://www.youtube.com/watch?v=B-0B4Z-7A4s and many comments are published on Internet.
[58] See also the FFRAF (Foresighting food, rural and agri future), issued by DG Research in 2007.

sustainability goals; one that seeks more intensive engagement across diverse worldviews and possibly contradictory approaches in ways that can inform and suggest strategies for actions enabling to the multiple functions of agriculture."

In other terms, the time of agricultural policies that were only productivity driven is over. After the post World war II period, another set of policies have to be built in order to fit the real needs, in other terms to face climate change and reduce poverty. Recognition of the value of traditional knowledge is necessary for that purpose In the discussion following the presentation the Indian vice president, Ms Rajeswari Raina, completed saying that the objectives stated in the reports would inevitably lead to completely redesign agro-food research policy.

3.6 The rise of NGO's

In front of the business system, the power of NGO's has grown. As quoted by Toffler, they now mobilise high-level scientific expertise, and are able to organise lobbying as well as the companies. One of the basic example of the "environment defence fund", who succeeded not only in eliminating DDT, but also in forcing through the court, Mc Donald's to clean the streets where customers had thrown their Mc waste, shows that they can face heavy vested interests.

The number of NGO's operating at international level is estimated around 40000. Some countries, like India, would have more than one million NGOs. "They were important during 19th century in the anti-slavery movement and the movement for women's suffrage, and reached a peak at the time of the World Disarmament Conference. However, the phrase "non-governmental organization" only came into popular use with the establishment of the United Nations Organization in 1945 with provisions in Article 71 of Chapter 10 of the United Nations Charter for a consultative role for organizations which are neither governments nor member states".

In spite of this article 71, NGO's are not yet subjects of international law, except the Red Cross. Only the Council of Europe in Strasbourg drafted the European Convention on the Recognition of the Legal Personality of International Non-Governmental

Organizations in 1986, which sets a common legal basis for the existence and work of NGOs in Europe. Article 11 of the European Convention on Human Rights protects the right to freedom of association, which is also a fundamental norm for NGOs.

The decline of the Nation states started at the time of the cold war. Small nations appeared easy to manipulate by the block leaders. Since that time, the centralized media broadcast favoured the influence of lobbies, even in big countries.

Internet generates a different situation, in which trans-national networks favour the coalition of common views. The resulting trend should be a growing influence of the NGO's that will appear more reliable than nations to take in charge at least humanitarian and planetary concerns. This logic should promote their recognition as subjects of international law under conditions to be defined probably by United Nations.

3.7 And what about "policies"?

The ability to search for worldwide connexions and state of the world information opens a new landscape to any citizen. Even now, through Google earth, she/he, from a global view of the planet, zooms to her/his own cottage. She/he owns the cottage and, at the same time has a direct perception of belonging the whole earth.

The consciousness of the citizen is enlarged by seeing and even more by acting. The time horizon differs according to the personalities and is also reduced by the constraints of daily life. But a free citizen would think at least one generation ahead to preserve the future of her/his children, though the time horizon of a politician is limited by the next election and the time of big company's managers by budget announcements and the financial raid risks.

As a consequence, most advanced initiatives are taken locally at individual or municipal level, the closest to individual consciousness. In Europe, the example of Freiburg am Brisgau building a new ecological suburb (quartier Vauban) is well known. Other cities joined in a network the same inspiration and learned from this Vauban experience.

Starting from this example, it may be stated that the first policies in the new cognitive civilization follow the commandment: "Think globally, act locally", but what about other

levels of policies? In any society, policies depend on the consciousness of the public. Even dictatorship can continue only if the public tolerates. As public consciousness is evolving rapidly, policy makers will have to listen first.

They will probably find that the trust granted to the former institutions is declining. The firms are suspected to give priority to financial results and having little care for their employee's safety. The states are suspected to multiply bureaucratic constraints and to act in favour of vested interests. These institutions will have to rebuild their image acting differently.

Many technical responses to planetary issues are already experimented around the world. Energy or GHG taxations, forestry control, protection of endangered species, fishing quotas, agencies in charge of helping energy saving or water management… Probably the main weakness remains in the warning, measurement and observation system. The fact that the number of different species on earth being estimated around 14000, out of which only 1700 are known and described shows the carelessness of mankind.

Anyhow, the consciousness of the public regarding nature care is becoming more and more attentive. The policy builders will have to follow. The time when qualified officials felt they could know better than the public what is good for him is over. The public is on an immense web, linked to all sorts of knowledge.

3.7.1 The challenge to reason

Anyhow the time scales regarding the physical transformation of environment and human settlements are also widely different.

Presently the order of magnitude of the delay to:

Conceive and manufacture a new car	5 years
Build a high-speed train new line	10 years
Build a new city	20 years
Replace a cement plant or a nuclear plant	30 years
Shift to a hydrogen economy	50 years

Replace an over exploited forest by a new one 100 years

But[59] the world might not have so much time before the energy crisis that may occur before 2025. It will not be a shortage of carbon. A “peak oil” is predicted, but there is enough coal supply to match consumption needs for more than a century. The restriction to GHG emissions for climate control will be the major argument[60] to change the present energy system.

In some cases, old cities for instance, the transformations (isolation) to be made would be so costly and difficult to operate that it is almost impossible to define a time scale. The question anyhow will certainly be examined for all the skyscrapers built after the 60’s poorly isolated and even bearing asbestos (that was the case of the New York World Trade Centre)

The challenge to reason is therefore to adapt institutional organisation to physical realities. “Our political organization was designed for another world[61]”. For instance, to solve local problems, like sewage or waste treatment there are local taxes. But to solve planetary problems like GHG emissions there should be planetary taxes[62] and worldwide agencies to use these tax money to help economic actors in reducing their emissions.

In other cases, like preventing oceanic ecosystem destruction by excessive fishing or pollution, financing is needed, but will not be sufficient. An international police force is also necessary. The same question will be raised for tropical rainforests, in that case operating over the sovereignty of great countries like Brazil, Indonesia and the central African countries.

Going back to physical reality, regarding taxation or intervention, the basic tool needed is a world detailed and precise observation system using satellites and other military observation equipment to detect the damage and even the risk and operate early

[59] As observed by Jacques Theys
[60] This argument gets weaker if, as stated in Irina Kuklina’s paper, CO2 concentration is only partly due to human activities and global warming is also related to solar cycles.
[61] Joao Caraça intervention
[62] The sophisticated market mechanism that has been settled is financing intermediaries, but the assessment of the realities is lacking and the incentive stays weak.

intervention. This world force would also be able to rescue rapidly the population victim of hurricanes or other natural diseases.

Having these physical realities in mind, the present state of the world organization based on the nation state heritage may appear archaic to the younger generations born connected. A negotiation to build something else may start when they will be on power.

Leaving our mind dream[63] about it, we see NATO transformed into a world preservation and safety force, including the participation of Russia, China, India, Brazil and Middle East countries, placed under the authority of UN. We see also UN transformed[64], with a college of NGO's and a third one for the business community. We see a WEO (World Environment Organization parallel to the WTO) to witch this new force and warning system is the operational arm.

[63] As shown by the well known Martin Luther King "I had a dream", reason appears through dreams. Mathematicians are well aware of that.
[64] Probably very small nations grouped and placed under international control to impose world regulations, regarding particularly finance.

4-Other games are played:

4.1 National and cultural identities

The person-to-person relationship through the web deeply transforms the landscape of solidarities. Roughly speaking, new solidarities are not relying on political, social or economic assumptions, but only on daily life exchanges, that appear to be based on three basic sharing:

The sharing of a profession

The sharing of a passion (for instance horticulture or surfing)

The sharing of a language and of a culture

We can already see some consequences of this third point: the revival of local languages and the claim for more independence for **local cultures**. The case of Belgium in 2007 is particularly well known, but Spain has had also claims for autonomy in Catalunya, Galicia and Euskadi, Great Britain in Scotland and Wales, France in Corsica and Brittany, Italy in her northern league, and Czechoslovakia has been peacefully shared into 2 different nations.

The fact that Belgium has been able to function normally without government for half a year shows that the old structures, though still respected, are less necessary. If we imagine 2025, a **mosaic** of local cultures may be more likely than a federation of nation states. Europe may turn to a linguistic and cultural melting pot. Internet accelerates the revival and diffusion of local cultures and traditions. It is likely that the nation state type of organization, built in the 17th century to help ending the religious conflicts in Europe[65], and imposed later to colonized continents, will be progressively replaced by multiple affiliations, the shape of which is to be defined.

Internet crosses the barriers. It offers communication opportunities to people bearing the same culture but living far from each other, to retrieve their ancestral roots and rebuilt solidarities.

[65] Westphalia treaty, Oct 24 1648.

Anyhow, local claims of minorities for independence, like the ones of the Kurds, the Ouigours, the Berbers, the Aborigines, the Inuits, most African and Amerindians ethnic communities, will be reinforced by the opportunities to illustrate and develop their culture and solidarity through Internet.

It will be more and more difficult to control and/or eliminate their claims for independence, as it has been done during 19th and 20th century, because of the numerous opportunities given by the web to escape any type of control.

To sum it up, digital communication should stimulate worldwide cultural solidarities and claims for independence.

4.1.1 Identities: China[66], Russia[67], India, Brazil, US, Europe

Europe has a high level of equipment in personal computers and connexions, and therefore will experiment the transition before the other continents. Anyhow, the question will progressively be raised worldwide. Most countries include a wide diversity of different cultures. Some African countries have more than a hundred different languages, South, middle and north Americans have hundreds of Amerindian cultures still alive and Russia (128 “national” ethnic groups), China (54 ethnic groups), India (23 official languages, some 4000 dialects) include also huge cultural diversity, as well as middle east and central Asia.

Anyhow, some countries/regions are under the domination of one ethnical culture, progressively built during centuries, even millenniums:

China by the Han imperial one, inspired both by Confucian duties and Taoist doubt.

Russia also by a central Russian imperial view, rooted in the orthodox religious inspiration.

United States have lived for 2 centuries under the WASP culture inherited from Great Britain, very different from the Chinese and Russian ones. Now, with the growing weight

[66] See Mu Rong Ping contribution on technology foresight in China
[67] See Irina Kuklina contribution

of the immigrants and their sons, US are becoming multiethnic: deep changes have to be expected during the following decades.

The two main **multicultural and multiethnic** blocks are India and Europe, both supporting diversity and in quest for democratic and spiritual values. It is likely that, during 21st century, these two similar continents will try to promote the same universal values at world scale.

In spite of some Islamic attempts to restore a common destiny through religion and language, a wide part of the world stays a mosaic with no separation of powers, ruled by local barons. The prediction made by Samuel Huntington, namely the "clash of civilizations" Islam facing the western world may be still present in the mind of some excited cold warriors, but does not fit the understanding, nor of the majority of Europeans and Indians, nor of the majority of Muslims[68].

The present trend, due to the growing density of the communication network, is a slow decline of the nation state, which stands as a recent concept in mankind history, issued from the Westphalia treaty in 1648. The new generations, born with a laptop, will give their full potential in 2025. And they will act through new structures.

Through these new media, a revival of ethnic identities is to be expected. These bear not only claims for independence, but also music (Celtic, African, Indian..) which is the language of soul, traditions and philosophies of nature and human relations.

For instance, the Chinese vision of society is different from the "democracy" invented by the Greeks, though it includes Confucian duties for the dominants, judicial processes and limits to excess of power[69]. The millenary civilization of this part of the world has its own views and its own techniques to solve problems. It would be unwise and unrealistic to try to transfer there the western "democratic" model, which is only at work since industrial revolution, and may even be maladjusted to the new cognitive civilization.

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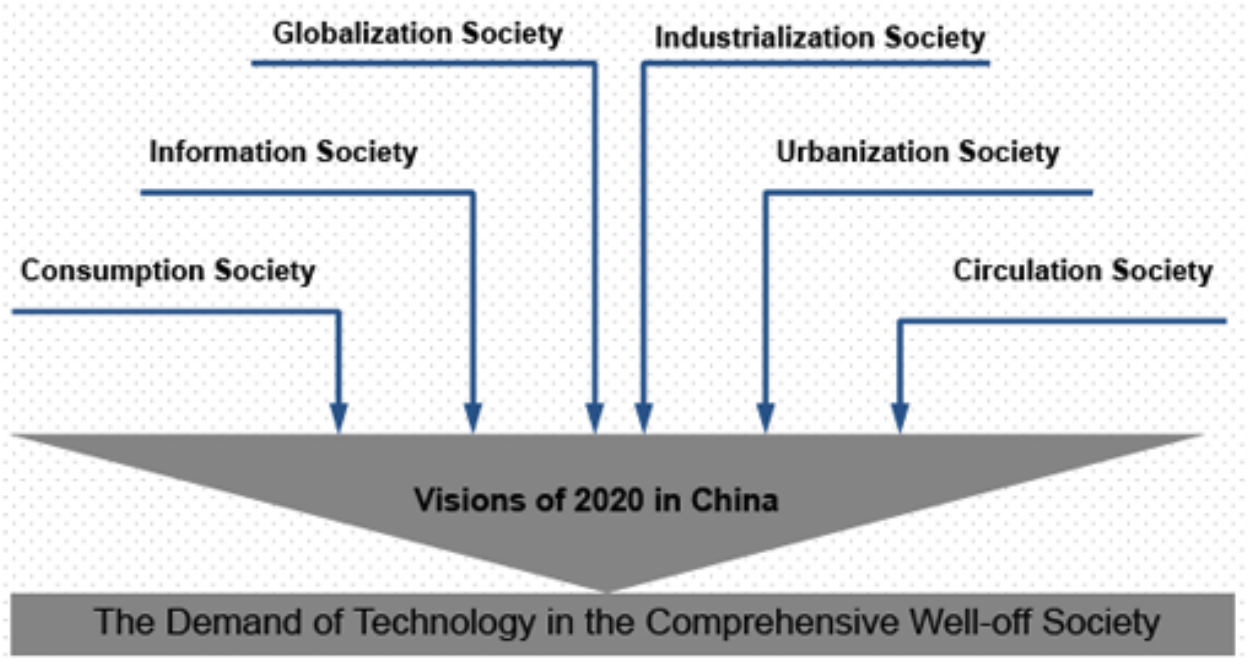
[68] Huntington position has been recently refuted by an in depth inquiry of Emmanuel Todd and Youssef Courbage, who conclude that the Islamic countries are moving towards a separation of religious and civilian powers "Le rendez-vous des civilisations, Seuil, 2007".

[69] See "La chine et la démocratie", Mireille Delmas Marty et Pierre Etienne Will, "La pensée chinoise", Anne Cheng and the 2007 Euro-chinese meetings organised by European Commission and Fondation Charles Léopold Meyer.

Here is a contemporary foresight from the Chinese academy of Sciences:



Technology foresight scenario building in Chinese Science Academy from Mu Rong Ping

The Integrated index of importance of this Chinese technology foresight exercise, published in 2006 is calculated according to three indicators such as “contribution to economy increase”, “improve the quality of life” and “contribute to the security system”. According to the integrated index of importance, the **most important 10 topics** for China are following:

1-The solar cell will be developed successfully, which transfer efficiency reaches as high as 50%

2-The new technology about biological energy will be developed successfully, which can continuous produce ethanol with straw, biological diesel, hydrocarbon compound and so on

3-The metal material obtains the large-scale use, which has nature of high intensity and light weight.

4-The most security and cheapest control technologies of large-scale electrical network obtains the widespread use

5-The technologies about biology processing and mining for crude oil develop successfully;

6-The anti-viral medicine with highly efficiency applies to clinical medicine widely

7-The technologies about biochemistry, immunity, and gene etc. applies to food quarantine widely

8-The important character gene which decide the yield, quality and resistance of crops obtains comprehensive annotation and get practical use with biological technology

9-The 10nm processing technology obtains widespread use in the scale production, and integration rate of the integrated circuit achieves the 1000G transistor

10-The defence and monitoring system of harmful biology will be established for public security.

The above graph and list show that, regarding foresight, the methods used and the problem raised are the same in China than in other countries. Cooperation and mutual understanding[70] appear highly feasible concerning the future.

The Indian organization has imitated the western democratic system, but the Indian vision of society, with the castes, the religious and philosophical references and the relationship to nature is different, and may be closer to the nature care necessity than the present western exploitation attitude. Teachings of wisdom may be imported from India.

Therefore, anyone trying to imagine the feasible future world organization should give up the idea of one dominant model, and look deeper into the soul of the different civilizations.

4.1.2 Evolution of religions

In 1993, Samuel Huntington, Science policy professor at Harvard and former secretary of the NSC[71] published "the clash of civilizations". According to his analysis, the former conflicts were between nations and then blocs during the cold war. The conflicts in 21st century will be based on ethnical and religious cleavages. More precisely, the two blocs of the cold war differed in ideology. The Fukuyama thesis describing "the end of history", a worldwide civilization based on trade and democracy[72] is, according to Huntington, not realistic. There will be new differentiations and these should be "cultural". He stresses particularly the tension between United States and the Islamic world, and also between United States and China. As shown by the map below, religion is the main factor of this cultural divide.

[70] As shown by the experience of the China European forum, organized by the Charles Leopold Meyer foundation in late 2006. See also "La Chine et la démocratie" by Mireille Delmas-Marty and Pierre Etienne Will.
[71] National security council, direct advise to the President on military and intelligence affairs.
[72] The thesis of Fukuyama, "the end of history"

The world seen by Huntington (source Wikimedia copy left)

Looking from 1993 to 2008, Huntington's prediction appears not completely false, but clearly exaggerated. And, as it has inspired military and secret service thinking in US, who supported Islamic movements through ISI[73] when they were fighting against Russia, it is difficult to share real conflict from manipulated conflict.

Referring to the origins, opposing Islam to commercial values would be a complete misinterpretation. The first wife of the Prophet possessed caravans and was issued from an Arabic great trader family. Anyhow, there is an important common attitude to Jesus and Muhammad: Jesus chased the merchants out of the Temple and Muhammad chased the merchants out of the sacred city Mecca. Both tolerated trade, but not abuse in confidence, exploitation of superstitions and credulity. On that point at least, their teachings as Gilgamesh one, have to be revisited by modern world.

Religion foresight must also take into account that all religious positions try to explain the meaning of life and the reasons for survival. Monotheist religions have been accompanied by aggressive behaviour. They were born in Middle East, at a time when city-states were fighting each other under the symbol of their respective gods.

[73] ISI is the secret service of Pakistan.

Afterwards, even tiny cleavage on doctrinal points, like the ones separating Roman Catholics; Protestants and Orthodox were sufficient to motivate religious wars.

The situation in 21st century looks different. Above national, ethnic or tribal survival appears the question of global survival in relation with ecosystem equilibrium and climate change. No one can escape this question and everyone has something to do with it. The shift from local to global safety has already been understood by some religious authorities. It is likely that one generation will be necessary to place symbiosis with nature in the centre of religious concerns[74].

Conversely, Internet will give new opportunities to embezzlers, sects, and many other types of abuse, against which the individuals will have to rely on their own alertness. As said formerly, new types of mental illnesses should appear generated by the identification to avatars in virtual universes. Personality may split into different characters weakening or even blurring the distinction between reality and virtual universes[75]. This part of the landscape is, of course, more difficult to predict.

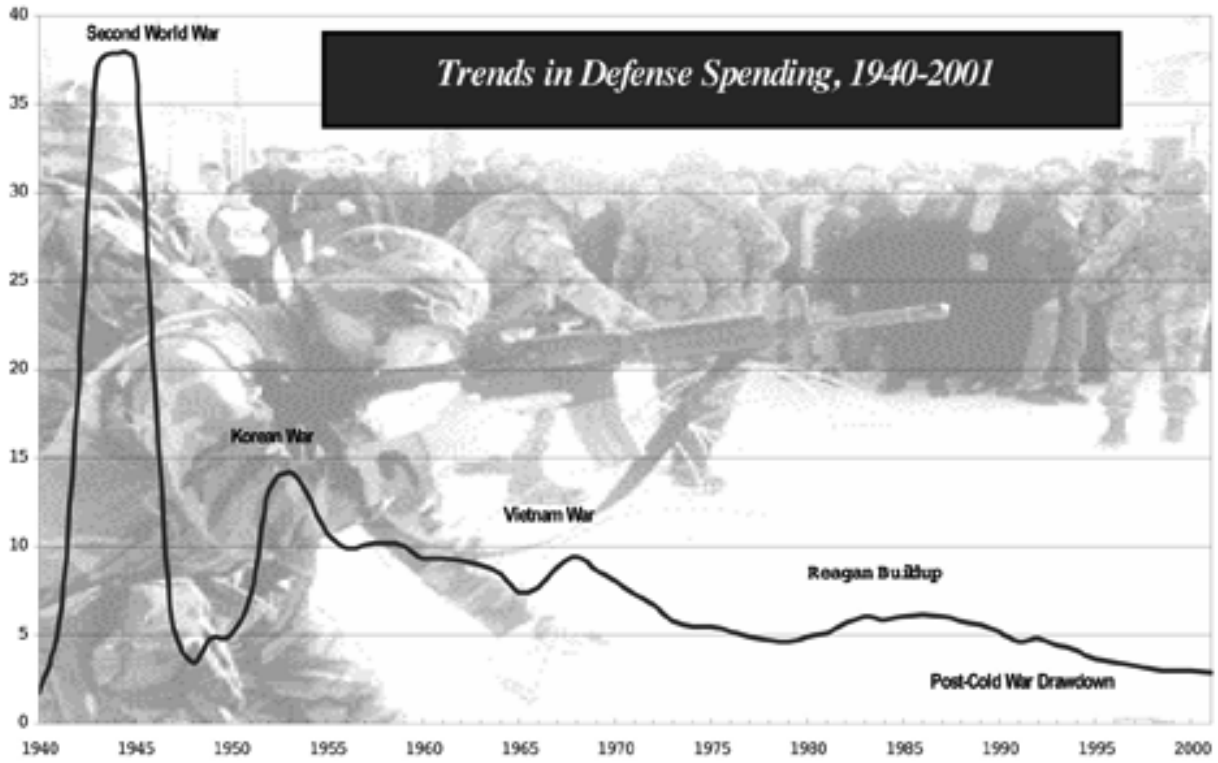
4.2 Conflicts as rule generators

4.2.1 High probability for new wars or new types of wars

"Anyhow, there are increased risks for open conflicts among nations - or among groups of people - around capacities as arable land, access to fresh water, and settings for production and livelihood not disrupted too much by climate change or changes of other kinds as presence of industrially distributed toxic chemical deposits. The tensions may especially increase around food and energy availability"[76].

In 2025, the generation of the cold warriors will be retired or dead. Samuel Huntington would be 98 and George H. W. Bush 101, Henry Kissinger 102. The lobbies behind will still be there but with a new generation better informed which may not have the same simplistic views.

[74] As it was predicted by James Lovelock in "The ages of Gaïa".
[75] Defence Intelligence Agency on Emerging Cognitive Neuroscience and Related Technologies (2008)
[76] from Nicole Gnesotto contribution



America's defence spending since WW2

(source "rebuilding America's defence" from the "New American century" group, 2000)

The document "Rebuilding America's defence"[77], was issued in year 2000 by a group known as "the new American century", belonging to the so called "neo-con's" movement. It gives in the above graph the evolution of the magnitude of the US military spending since WW2. The document says that the role of US is to control the world and, for that purpose its military equipment should be duly upgraded. Follow a list that has been progressively honoured by the conservative administration.

For our scenario building, it is useful to rethink the meaning of the conflicts since the Second World War. Of course, many interpretations are possible, and the complexity of the situation should not be oversimplified[78]. Anyhow, let us remind a very simple interpretation, that is not the only possible reading of history, but has the advantage to

[77] The graph above comes from this report, to which Paul Wolfowitz contributed.
[78] As says Nicole Gnesotto

be based on one simple hypothesis: the actors involved follow their own interests without consideration to other constraints.

“In 1945, US and Soviet Union ended the war with an enormous over-capacity in weapon manufacturing. As these capacities were ruled by the heroes, and had produced on economy a powerful Keynesian revival, it seemed unacceptable to stop their activity. The heroes could not be reduced to unemployment.

The “cold war” has been initiated by the post war lectures given by Churchill in US. He pointed the “iron curtain” separating Eastern and Western Europe and argued that a new enemy of freedom had to be fought. Seen by the weapon manufacturer lobby, the cold war was an invention that could mobilize, on both sides, the taxpayer’s money. The nuclear threat was more than necessary to frighten the public and obtain the votes of the politicians. It had another advantage: nobody really wanted to use nuclear weapons, because it was too dangerous[79].

As a consequence, a lot of money could be spent, and that was the real goal of the game, without even using the weapons. It may have saved a lot of human lives in the developed world. Anyhow, the tension had to be maintained in order to demonstrate the “credibility of the finger”. Korea, Viet Nam, which suffered important losses, and Cuba served this purpose. Even lost by US armies, these wars were sufficient to prove US determination in case of a broader conflict.

During the 60’s and 70’s, the technology of the so-called “satellite countries” governance through secret services management was implemented on a large scale, first by Soviet Union in Eastern Europe, then by United States in South America (Chile, Argentina..) and even in Greece.

The game ended after Reagan’s “Star war”, when Andropov, followed by Gorbachev, started to dismantle the soviet system, probably because they found it too costly and weighed down by gerontocracy. But, on the American side, the symmetrical move was out of scope. Eisenhower, when leaving the presidency, had warned the risks of the

[79] Unfortunately, it may not be the case anymore for the “mini nukes” developed by US. These are by far much more worrying than the “massive destruction weapons” that Americans pretended to look for in Irak.

growing influence of the weapon lobby. He was right, but his warning had been useless: at the beginning of the 90's, under father Bush, former CIA director, US were governed by lobbies.

Anyhow, as shown by the above graph, the Clinton administration succeeded in lowering to some 40 billion $ the annual defence procurements, compared to 150 under Reagan administration. But the lobbies came back in 2000. The total US military budget in 2007 is at a level of 439 billion $ half of the total world military spending, plus an extra budgetary supplement of 170 billion to cover the expenses in Iraq and Afghanistan.

Through the financing of elections, lobbies can influence any government decision. At the beginning of the 90's, their basic concern was, as ever, to continue their activities in production and research, and, for that, they had to find another enemy. Huntington theory could help: Islamic terrorism to which twin towers collapse was immediately charged. The destiny had provided the "Pearl Harbour" event that was, according to this "rebuilding America's defence" report, necessary to obtain the vote of the necessary procurements by the Senate.

But it may be not sufficient to feed the enormous needs of the high tech lobby of weapon manufacturers.[80]"

Until 2025, conflict foresight has to take into account the global movement of privatization of the military concerns. Not only weapon manufacturing went private, and started to disseminate its supplies in different countries, but also troops, managed by companies like Halliburton or Blackwater. And weapon international trade tends to work as ordinary business, stimulating its market through the different available persuasion channels. The European and the Russian products were not out of the game, particularly for small size weapons (AK 47 is the best known[81]). The Russian ones have been distributed by well-known intermediates, like Viktor Bout[82] who brought the unused supplies of the Russian side cold war to African dictators.

[80] This part of the report has been put between "" because it cannot be endorsed by all the members of the expert group. Anyhow, as quoted before, it represents a particular simplified view of the situation.
[81] Under the name of the general who invented it Kalachnikov.
[82] Whose story has inspired a film, the "Lord of war"

What may be the landscape from now until 2025, staying on the track of the continuation of the lobbycratic trend?

In December 2000, the US National Intelligence Council could publish his "global trends 2015"[83]. It stated that "US global economic, technological, military and diplomatic influence will be unparalleled among nations as well as regional and international organizations in 2015." This statement is now to be revised. Most experts predict a "**multipolar world**" in which the domination of US will belong to the past and suffer the reminding of its many abuses. Not only Russia, but also China, India, Europe Japan and some countries in Middle East will recover their military sovereignty.

The resulting complex situation may inspire some countries to push NATO, presently under American control, under the authority of United Nations. Anyhow, understanding the situation needs first to analyse the possible behaviour of the lobbies.

To measure the power of the US weapon lobby, one should remind that the procurements at his benefit represent more than 360 billion $ per year, an amount comparable to half the US external trade deficit [84](~750).

When the weapons are manufactured, tested and operational, the remaining question is "will they be used, and if yes how, where and when?" In spite of the massive diffusion of war games in the public, there remains little enthusiasm for using weapons in the real battlefield. The US army recruits painfully and, even in places where it is not facing organised and equipped forces, like Iraq, it looks rather unsuccessful.

Anyhow, it would not fit the lobby's interests to leave these armaments unused. In 2008, the weapon export of United States increased by 45%. A conflicting multipolar world is now under preparation. Sophisticated scenarios and gesticulations may be necessary to invent, with the help of some Hollywood movie directors. The old well-known Russian partner may also be involved in the game. First signs appear during summer 2008. To sum it up, before 2025 we might be surprised.

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[83] Global trends 2015, published by the national intelligence council of United States, an organ of the CIA, after consultation of non government experts, mostly academic.

[84] A fact that some disrespectful European citizens translated as: if US military effort is paid by the rest of the world, their troops should be under international legitimate control.

The heaviest consequence of lobby's influence is that **any scenario which would forget to feed the lobbies with sufficient procurements is to be considered as unrealistic**. It can only be imagined to **shift their productions** from weapons to something else, under one condition: maintain the margins at the level they are. But they will probably resist and try to continue selling the equipments that they are used to manufacture.

But what else could be ordered with the taxpayer's money, using the high tech qualification of these companies? If the use of public money shifts from local or tribal safety to global planetary safety, the answer is clear. High tech resources can obviously be used at the service of common global good, and there is enough work in that field to give occupation to the workforce concerned. More **science** is needed, using new or reinforced measurements of the planet evolution. A world **space** program, aimed at planet ecosystem warning and analysis would be a first example. Ground intervention is also necessary, on land as well as at sea: an international force, **protecting** the oceans and the biodiversity from business predation is another example.

4.2.2 The way rules emerge from conflicts

In 1938, the Dutch philosopher and historian Johann Huizinga published his masterpiece, "Homo ludens". His central idea is that humans are always playing games. They play roles in their family, in their job, with their friends… Later, the same idea has been developed by the psychoanalyst Eric Berne, founder of the "transactional analysis" in his book "Games people play" (1973).

This game playing interpretation gives the opportunity to imagine outcomes to conflicting lobbycracy, but raises another question: how are the rules established? Huizinga answers through an example: in middle ages, the practice of tournaments, bordered by precise rules of conduct, served as substitutes for battles. The clash of the champions was accepted as definition of the issue, and this appeared to Huizinga as a progress in civilization, because it saved human lives.

Apart from this particular "fight of the champion" rule, the noticeable point is that rules emerge from practice. In that case, the battle is turned into a symbolic battle, the

champions representing their clan. Many other examples of such ways to peace may be found. The Olympic Games are symbolic battles. Following the intention of their founder, they highly contribute to create a peaceful climate between nations.

Economic competition may also be viewed as a derivative for human aggressiveness. In trade also, conflicts inevitably appear. And the reliability of transactions, and consequently the intensity of the commercial activity, is depending on the reliability and efficiency of the conflict settlement process.

Viewed through Huizinga's game approach, **the market is one of the games invented to match heterogeneous interests**. But the other basic game should not be forgotten: **arbitration and courts**. This one cannot be avoided, because it is the place where investigations are presented and where the respect of the rules, including the rules of the market, is verified.

Therefore, the most interesting case, regarding foresight, is the settlement of **judicial** processes. Here is for instance, a sentence out the Hammurabi code, which was written in a market environment, the one of the future Silk Road, in order to help solving merchant contests:

"If any one lose an article, and find it in the possession of another: if the person in whose possession the thing is found say "A merchant sold it to me, I paid for it before witnesses," and if the owner of the thing say, "I will bring witnesses who know my property," then shall the purchaser bring the merchant who sold it to him, and the witnesses before whom he bought it, and the owner shall bring witnesses who can identify his property. The judge shall examine their testimony—both of the witnesses before whom the price was paid, and of the witnesses who identify the lost article on oath. The merchant is then proved to be a thief and shall be put to death. The owner of the lost article receives his property, and he who bought it receives the money he paid from the estate of the merchant."

When Kuwait was invaded by Iraq, in 1991, some experts claimed the case should be brought to the International court of justice, which is designed to arbitrate litigations between nations. But, at that time, the world was not mature enough; it still lived under the primitive idea of the "law of the strongest" and nor the International court, nor the United Nations were consulted.

4.2.3 What kind of rules could be foreseen?

Most experts[85] agree on the idea that 2025 will be a "multi-polar world", in contrast with the 1990-2005 periods where the United States appeared dominant, some say hegemonic, on military, economics and politics fields.

At least China and India should first balance American power and maybe some sovereign funds from Middle East.

Europe, Japan, Russia and Brazil should be present too, with their independent voices.

A multi-polar world may be highly conflicting[86]. The present circumstances: increase of weapon exports, dissemination of weapon manufacturing, and privatization of operators, are pushing that way. Even terrible events like the genocides[87] of 20th century may occur. But, if we follow Huizinga's logic, in a second stage rules of the game are settled, there is no more the "law of the strongest" because even the strongest[88] has written his law in the shape of rules. The settlement of conflicts needs the progressive and pragmatic building of something looking like a state of law.

The general framework of the rules of arbitration is well known. Judges have to be independent (not nominated by any executive power), investigations have to be operated as scientifically as possible, testimonies have to be balanced and objective, the rights of defence respected etc…

And the executive force has to be at the service of the legal decisions.

4.3 Mafias, organised crime and terrorism

To complete the historical game building vision of Huizinga, one must quote the permanent tendency pushing the opposite way. In any place where rule enforcement weakens appears transgression behaviours, like entropy in physics, outlaw that, in case of conflict, move to refer to the law of the strongest.

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[85] At least in the working group who prepared the present work.
[86] As quoted by Nicole Gnesotto.
[87] An analysis of the inclination of human species to perpetrate genocides has been presented by Jared Diamond in his book The third Chimpanzee.
[88] As Hammurabi did, see 6.4.2

Mafias are built out of this logic. They substitute absent legal power. During the last 50 years, nations got weaker, except some superpowers that did not escape the temptation to manipulate national governments through their secret services, often for business purposes. Some companies became stronger than nations and after a while, even the greatest countries fell under the influence of lobbies. We named that evolution the transition from democracy to lobbycracy.

At the same time, the illegal activities proliferated: drug traffic, human traffic, corruption, blackmail and so on. Mafia incomes went up to several hundred billion $, and it took different shapes: Camorra in Naples, Cartel in Colombia, Triads in China, Yakuza in Japan, Organizatsiya in Russia, Milieu in France and the Italian name Mafia in United States.

Michel Levine, a former agent of the DEA (US Drug Enforcement Administration), writes: "In 1971, when president Nixon declared the war to drugs, there were less than half a million drug addicted in United States. At that time, the anti-drug budget did not go over a hundred million $. Thirty years and a thousand billion $ later, the number of addicted is over 5 million and the war against drugs costs 20 billion $ per year"[89]

Terrorism uses similar methods like blackmail or drug traffic. The difference lies in its political or religious claim, which challenges the official powers. Therefore, it is treated as an enemy by governments and made visible by the media. Anyhow, some analysts, familiar with game theory, add to this naive political interpretation another aspect. Providing a visible enemy renders a service to the vested powers. Like in Orwell's novel 1984, it generates in the imaginary of the public a remake of the eternal story of the struggle between the Good and the Evil out of which vast budget allocations can be claimed and decided.

[89] Quoted by Eva Joly.

4.3.1 Mafiosi behaviour in business

Legal companies started to use mafia intermediates to solve some touchy local problems. The obscure part of business increased while "the law of the strongest" slowly and silently grew in the business community.

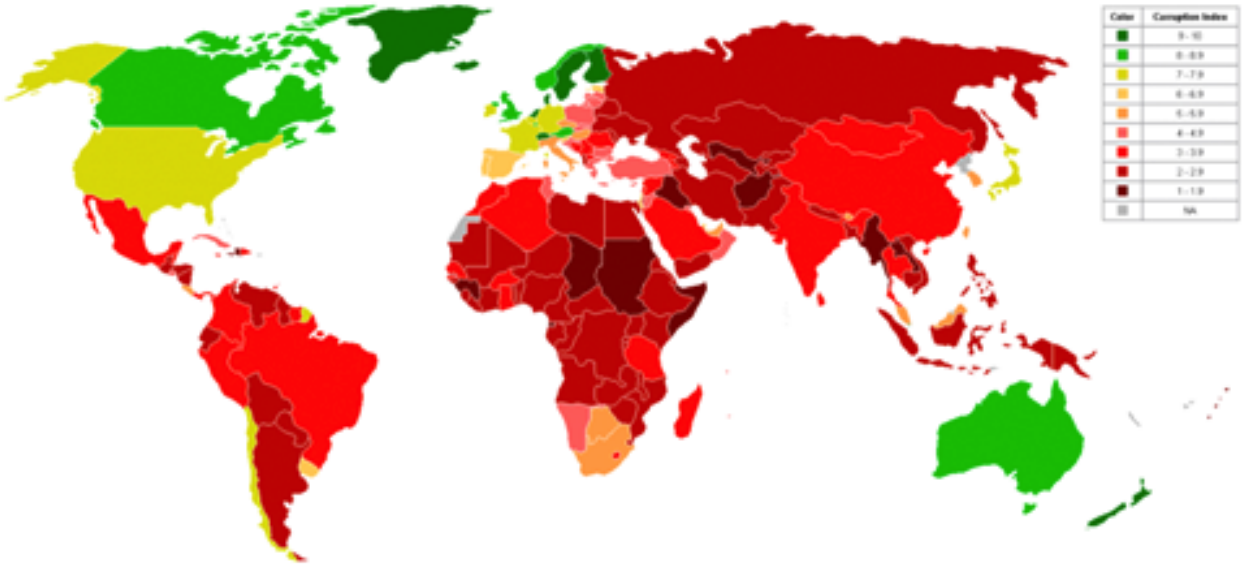
The process building rules out of practice is universal. It works even in mafias. This question is an important one regarding the period under our scope, from 2008 to 2025, because of this recent development of "mafia capitalism". The IMF estimates the income of criminal activities between 700 and 1000 billion $ per year worldwide (World GDP is 54000 billion$). The amount introduced in the stock markets by these criminal organisations has been estimated around one billion $ per day.

Seen from a distance, the present world looks like a state of anarchy[90]contrasting with the magnitude of the global problems it has to solve. But the consciousness of that situation cannot be avoided, and is carried everywhere by Internet. A scenario where the mighty ones, like in the "cupola"[91], meet to find rules and solutions may occur, but will not be sufficient to convince the public.

4.3.2 Weakness and corruption in the nation states

Since 1993, a new NGO, called "transparency international", created to "bring people together in a powerful worldwide coalition to end the devastating impact of corruption on men, women and children around the world. Transparency International's mission is to create change towards a world free of corruption". This organization, based in Berlin, publishes each year a "corruption perception index"

[90] See for instance Jean Ziegler, Les Seigneurs du crime : les nouvelles mafias contre la démocratie, Seuil, 1998.
[91] Or at the trilateral, or in Davos…



Corruption perception index 2007 from Transparency International

Regarding the so-called “transparency” concept, this ranking reflects **visible** corruption, which is probably by far not the most important in volume. For instance, the influence of tax shelters does not appear, though these are involved in most high-level corruptions.

Reminding the cases that have been published because they went to courts of justice, some activities like weapon trading, crude oil exploitation or great real estate operations seem to consider international corruption as an ordinary part of their job. This part uses tax shelters and stays undetectable. But it moves billions of $.

A rough analysis has been published by Eva Joly, a judge[92] specialized in corruption affairs. Corruption is as old as civilization, but it increased recently. She thinks that the first oil shock in the 70’s has been the starting point of new financial circuits, due to the necessity for western countries to recycle the petrodollars. The order of magnitude of the sums concerned was enormous and confidential behaviour was made easier by the concentration of responsibilities in a very small number of hands.

The number of persons involved in this “high level” corruption stays low (she estimates around 2 per million), but the amounts have grown. In each case under examination, the

[92] She is Norwegian, presently serving the Norway government, but her experience comes widely from France, where she had to lead the investigations concerning the oil company ELF during the 90’s.

accounting unit is the billion $[93] If you include the commissions in weapon delivery, which would reach in average around 20% of the contracts (compared to 6% for oil), the total amount of black money circulating would reach several percent of world GDP. But the accumulation of it through well known banks operating in tax shelters may reach the order of magnitude of the GDP of a great country. Even macro-economics should not neglect this fact, generating new types of fluctuations.

The word **transparency** at a first and naive glance may appear as an indisputable characteristic of the emerging cognitive civilization. But it should stay under careful examination. Worldwide communication is also used for non-transparent practices by non-transparent organizations. And this is made easier through the Internet.

Regarding this "**state of outlaw**", most governments define their policies with blind theoretical views, forgetting the practical necessity to implement their laws and regulations.

To illustrate this point do remind that the **dark side** of the Internet should not be forgotten. It includes many criminal activities, violations of human rights that are still staying out of control because of the weakness of most nations.

Even the simplest use of the Internet, the mail, is corrupted. It has been estimated that amongst the trillions of mails circulating on the net, around 85% are spam. The spam is a forbidden activity, but no nation state is **technically able to enforce** this interdiction. Only private development of anti spam software has been able to contain it. But the spam technology is also progressing. It looks like and endless technological war to exploit human credulity.

To conclude, the difficulty of the new type of governance needed in the cognitive society appears **highly underestimated**. It raises problems concerning police (Interpol) but also military questions, like for instance in Colombia, in the "golden triangle" or in some African countries.

[93]" 4 to 10 billion for Mobutu (Congo), 4 for Abacha (Nigeria), 5 for Ferdinand Marcos (Philippines), 40 for Suharto (Indonesia), 5 to 10 for Saddam Hussein (Iraq), according to Eva Joly's book.

Corruption is not a new phenomenon. But it has been boosted during the last decades to unprecedented levels. Its enormous increase is due to the concentration of flows of money in a small number of hands and also to the facilities given by information technologies to transfer secretly assets anywhere at any time[94].

What is new is the order of magnitude of the non-visible financial flows, now big enough to destabilize medium size economies[95]. The assets handled by illegal means are also big enough to buy sophisticated weapons that may create some strategic surprises.

The perception of this "state of outlaw" is probably a major factor motivating the present distrust of the public[96], that will force politicians to implement radical changes.

[94] Regulations have been implemented to observe and control financial flow but at world level many places escape.

[95] The speculation that took place before the settlement of the € and also the ones before on the £ do show how powerful are these flows, which are still growing fast.

[96] "The perception that governments are not responsive to the popular will appears to be contributing to the low levels of confidence in government found around the world," comments Steven Kull, director of WorldPublicOpinion.org. Kull adds: "Most see their governments as primarily serving big interests rather than the people as a whole.". The poll of 17,525 respondents was conducted between January 10 and March 20, 2008 http://worldpublicopinion.org/pipa/articles/governance_bt/482.php?lb=btgov&pnt=482&nid=&id=
The three votes refusing the European constitutional treaty, in France, Holland and Ireland, according to public opinion analysis, express more the general and international distrust in the ruling class than a distrust towards Europe. It seems that the ruling class, focused on its internal intrigues, has not paid enough attention to this evolution. In spite of a global pro-european feeling in the public, this ruling class has not been able to propose the simple, short and generous constitutional statements the citizens are waiting for.

6-The challenges

In this last part of our report, we focus on the challenges that we feel the world will have to take up during the next 17 years. According to the data we presented in the first part, a “business as usual” scenario would appear both unrealistic and dangerous, leaving consciousness asleep when future disruptions are ahead and must be anticipated.

As quoted by Ann Florini: “The world of the early twenty-first century is obviously quite different from the one of the twenty's century… An option, much favoured in some circles, would have us rely on the "invisible hand" of the market. The invisible hand is needed a powerful force-but only under certain conditions. Not everything that is desirable has a market, that is, people able and willing to pay. Even when a group of people share a desire for a good or service, such as a well-educated populace or protection from attack, individual members of the group may not find it rational to pay for that good or service, no matter how much they each want it…

Early in the century, conventional thinking saw the purpose of global governance as "to facilitate free trade, freedom of capital movements and unrestricted access by multinational firms to markets around the globe". Such thinking confused means with ends. It forgot that those steps are merely instruments toward what should be the purposes of governance: solving dilemmas of collective action in just and legitimate ways… **This intense focus on economic efficiency ignores the reality that efficiency is not a goal**. It is a means of enabling societies to use resources productively in the pursuit of goals. And some of those goals-long-term social justice and environmental sustainability- may conflict with shorter maximization of economic efficiency. It is now necessary **to deal with problems of collective goods…** The need for major reform of the systems of global governance is clear.”[97]

The first challenge is taken up by the disequilibrium between mankind and nature and all the planetary problems it creates. A shift from an exploitation attitude to a **planetary gardening** attitude appears as the most obvious response to this challenge. As most

[97] Ann Florini, The Coming Democracy: new rules for running a new world.

official representations of society are focused on **economics**, reshaping the intellectual and measurement instruments used in that discipline appears as a second challenge. Then comes the security question, up to now analysed through classical nation state strategy concepts that may enlarge up to a **global security** concept. Finally, it would be impossible to respond to these major challenges in absence of an international **state of law**, as the one Europe is trying to build for its internal needs.

6.1 Planetary gardening[98]

6.1.1 Gardening as a production, as a cure and as a pleasure

The usual presentation of the planet care is highly pessimistic. It says that if mankind does not moderate its consumption of natural resources and its emissions of greenhouse gases, many species on earth will disappear and probably mankind will disappear too. Planet care therefore is shown as imperative. It is a duty. Implicitly, the pleasure is supposed to lie in consumption, and the duty would be to lower our excessive consumption of energy and other natural resources.

Shown that way, the people who have not reached western level of consumption will inevitably disagree and interpret such discourse as a new trick invented to maintain inequalities, cut their development and perpetuate the dominance of the developed economies. Inside the developed world, the same distrust will emerge between rich and poor classes.

Even the ones who are living in comfort would feel this duty reluctantly. All these psychological factors are converging to pursue, and even amplify for developing economies like China and India, the present state of consumption that can only be refrained by unpopular prices increase or taxation.

Fortunately, a positive image of a new civilization is emerging. In a first stage, the Bruntland report used the expression “sustainable development”, which appears as being acceptable both by defenders of development and defenders of nature. But the positive definition does not present any more economic development as a goal (other

[98] See Uno Svedin contribution

remarks will be made later on that question). It states planetary gardening as the core mission of humans.

A gardener is a guard of nature. She/he is not running away, leaving the weed invading the garden. she/he accepts the responsibility of modelling nature. she/he is on duty to care for nature, but also, this is the important point, she/he takes pleasure and accomplishment as an artist, because, ultimately, gardening is an art.

6.1.2 New huge infrastructures

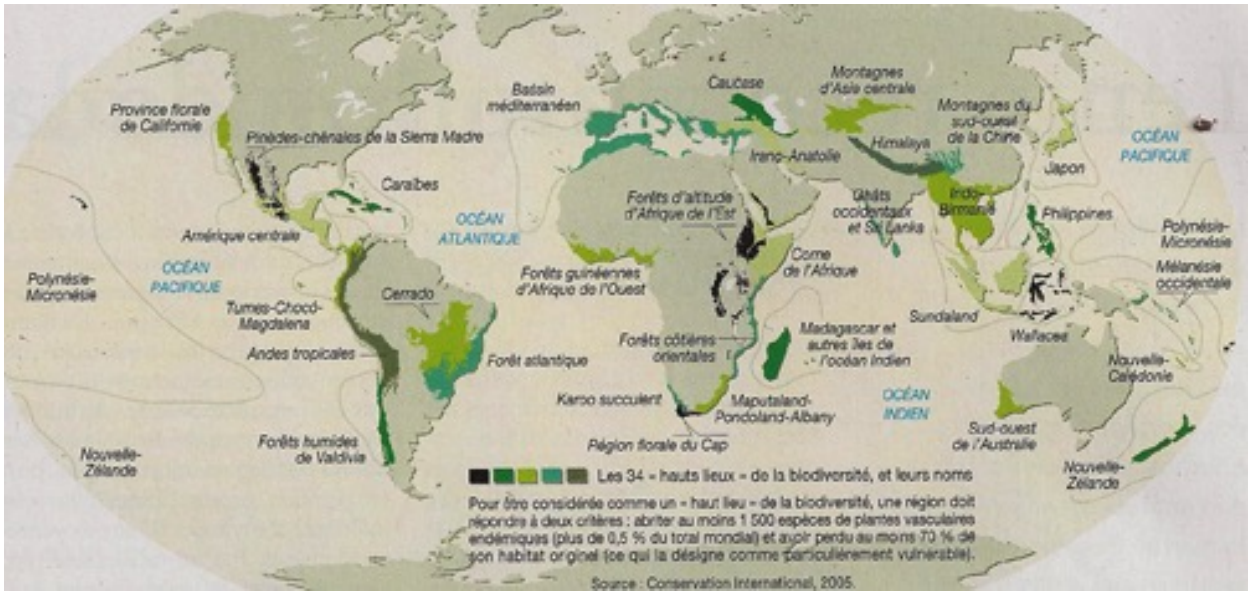
This philosophical point being settled, the magnitude of the foreseeable work has to be kept in mind. If the analysis presented in the first part of this report is correct, the task ahead is as big and may be bigger than it was in the second part of 19th century:

It includes reshaping of the cities, isolation, common transportation, floating structures to cope with the rise of the level of the oceans, enormous water supply public works, greening the roofs and/or covering them with solar cells.

It includes also reshaping of agriculture and fisheries. The industrialization phase is over. It has brought productivity, but also destruction and unfair competition to local activities. Planetary garden should probably return to smaller units, without refusing the inputs of science. The so-called “biological agriculture” is now growing and may represent, at least in Europe, the majority of the surface.

6.1.3 The amount of accessible information needed

The planetary garden approach is definitely knowledge intensive. Industrialization has reduced the number of cultivated species, keeping only the most productive ones. Sustainable natural equilibrium needs diversity. The number of different species necessary to build a sustainable ecosystem is not known. Up to now, the question did not worry. But the present reduction of biodiversity, and also the project to built space colonies appeal for more precise and detailed knowledge about the approximately 14 million species of the earth ecosystem, out of which only 1.7 million are presently referenced.



The “high places” of biodiversity. Source: conservation international 2005

6.2 Re-accounting and reshaping economics[99]

As most technological answers to the situation described are well known, as shown earlier in the first part of this report, we are sent back to governance questions, namely social sciences and particularly economics. Many criticisms have been expressed against the standard economic way of thinking but up to now, the rules of the game stay as they are and the GDP is still considered as describing the “wealth of nations”.

[99] See also Luc Fontanié and Samir Amin contributions

The standard way of thinking is often characterised by a focus on trade, although trade does not reflect always wealth but using an econometric model it can be said that "Concerning trade: the difference in growth rates will lead to significant changes in world trade distribution. China, already considered as the workshop of the world, should take an even greater share in international trade, from 7.7% to 15.1% of world exports. Comparatively to Europe, USA should lose less export shares. This is mainly linked to the fact that they have relatively more relations with fast growing regions. For the European Union, intra-EU trade represents more than five eighth of all EU exports. The weak economic dynamism of the EU should not stimulate intra-EU trade, and EU trade share will probably fall, even if they trade a lot more with other partners.

The pattern of world imports (not represented here) is very similar, except that the USA imports slightly more goods than China in 2025."[100]

6.2.1 Wealth illusions

Anyone knows that a road accident, an epidemic, a hurricane are increasing the GDP through the mobilization they provoke. A war also increases the GDP. More generally, all sorts of vulnerabilities appeal for a GDP increase, including cognitive vulnerabilities, which are increasingly exploited in our civilization. In a sound evaluation of the wealth of nations, should these catastrophic expenses be accounted positively as they are now or negatively?

Another aspect of modern life should influence accounting: saturation. Every biological evolution follows an S curve. The first part of this curve looks exponential: it is a “growth” curve, an expansion without boundaries. There are always boundaries, but they are far enough and have no influence on the speed of development. In the second part, at the approach of the boundaries, the expansion is slowed down and other logics operate.

A typical image of this situation is given by traffic jams. Imagine a great city, like were the Chinese ones in the 80’s, with few automobiles. Circulation is fluid. In a second stage, the number of cars grows, but the city stays more or less as it was. The same

[100] CEPII Mirage exercise

transportation service would cost more time, more fuel and generate more stress. Obviously, the quality of life would decrease though the GNP would increase. The only escape would rely on public decision rebuilding the infrastructure: a metro for instance.

In modern life, as mentioned before[101], compulsory expenses (including compulsory transportation to go to work) represent an important part of household[102] budgets (some 40% in developed countries). If, as stated by Amartya Sen, wellbeing relies on the freedom of choice of the economic actors, these compulsory expenses should be deduced of the GDP.

Finally, the services the prosumer[103] renders to himself or his environment, which are not included in the GDP accounting may represent an order of magnitude comparable to the GDP. The free services rendered by nature also according to the accountings mentioned above[104].

All these factors are not small approximations. Taking them into account would probably change completely the estimations of real wealth and the ranking of nations. Before 2025, the GDP growth question may leave the place to another more fundamental question: **how should be accounted a realistic wealth indicator?**

A first attempt has been made by United Nations with its “Human development index”. In 2007 according to this new measurement, the ten top countries are: 1-Iceland; 2-Norway; 3-Australia; 4-Canada; 5-Ireland; 6-Sweden; 7-Switzerland; 8-Japan; 9-Nederland; 10-France. United States is ranked12, United Kingdom 17 and Germany 22.

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[101] in the “future of poverty” part

[102] CEPII Mirage exercise: "Global consumption: between 2007 and 2025, global consumption (in volume) should increase by 84%. But it will not be evenly distributed between sectors. In rich countries, food consumption does not augment any more with income, but only with population. Consequently, all new income should be spent in manufacture goods and, above all, in services. It is not yet the case in poor countries. Their consumption of food should rise with income, even if not as fast as for manufacture and services. Regarding the ratio of sectoral world consumption and aggregated world consumption, for each sector a value above unity designates a consumption increase larger than the average consumption growth.
As expected, the **consumption of food products** increases more slowly than for other goods. It is also observed for fishing and forestry products that are represented in the model with limited stocks. Indeed, we assume in the present exercise fixed use of renewable resources, forestry and fishing. This implies that, **with wealth and population growing, demand will grow but supply will remain inelastic**."

[103] according to Toffler’s expression, the “prosumer” is at the same time a producer and a consumer in do-it-yourself occupations.

[104] In the “biodiversity” part 2.1.3

Other attempts have been made. One is the GNH (Gross National Happiness), based on Buddhist values and promoted, since 1972, by the king of Bhutan. The four pillars of GNH are the promotion of equitable and sustainable socio-economic development, preservation and promotion of cultural values, conservation of the natural environment, and establishment of good governance.

6.2.2 Collapse of the Washington consensus

The World Bank and the International Monetary Fund anyhow, during the 90's continued to define their policies in a classical liberal way of thinking. Their doctrine, now considered by the World Bank itself as obsolete, is known as the Washington consensus. As expressed by Williamson in 1989, it was made of ten broad recommendations addressed to the Nation States:

1-Fiscal policy discipline;

2-Redirection of public spending from subsidies ("especially indiscriminate subsidies") toward broad-based provision of key pro-growth, pro-poor services like primary education, primary health care and infrastructure investment;

3-Tax reform – broadening the tax base and adopting moderate marginal tax rates;

4-Interest rates that are market determined and positive (but moderate) in real terms;

5-Competitive exchange rates;

6-Trade liberalization – liberalization of imports, with particular emphasis on elimination of quantitative restrictions (licensing, etc.); any trade protection to be provided by low and relatively uniform tariffs;

7-Liberalization of inward foreign direct investment;

8-Privatization of state enterprises;

9-Deregulation – abolition of regulations that impede market entry or restrict competition, except for those justified on safety, environmental and consumer protection grounds, and prudent oversight of financial institutions;

10- Legal security for property rights.

During 15 years, and in spite of the protests of some highly qualified economists[105], these recommendations have inspired most policies often imposed to "less developed" countries by the IMF and the WB. Of course, if you read them from the point of view of United States interests, it appears as recommendations that, through these organizations, US impose to other countries

[105] Joseph Stiglitz, Nobel Prize and former Vice President of the World Bank, Paul Krugman, professor at Princeton University, Susan George, author of Hijacking America, 2008.

without imposing them to themselves, and the meaning appears clearly: open you economy to our multinationals and our capital, with low taxes and no regulation that would hamper their settlement. It looks like a scene in a western film: Throw your rifle through the window; I keep mine on hand and push the door.

The only point that could have been really effective imitating the so-called liberal countries, namely an **anti-trust** legislation and enforcement, was absent of this "consensus". It would have closed the way to the capture of some profitable markets by US companies. Why anti-trust? Because, looking at economic history, it can be estimated that anti-trust has played a key role in American prosperity. If it had not been voted at the end of 19th century, United States would probably have followed the scenario imagined by Marx: an excessive concentration of economic power generating revolutionary conditions.

Anyhow, the effect of the resulting policy on South American countries has not been totally negative. The penetration of US firms induced a learning process, gave ideas to new entrepreneurs and, when US domination weakened at the beginning of 21st century, a new generation was able to take the floor. And public opinion, in these countries, became more hostile to North American "gringos".

In its 2008 World development report, the World Bank, denying the Washington consensus, focused on agriculture as a poverty reduction factor, pointed the necessity of increasing the assets of poor households[106] and referred the **Millennium development goals** sustainability imperative. Such an ideological shift has to be quoted. It means that some 10000 professionals from nearly every country in the world, appointed by the Bank, will go all over the planet during the next decade advocating for new programs and orientating the loans according to both environmental and humanitarian goals, instead of helping the penetration of US capital. And this will inevitably generate a shift in national policies.

The capital is still there, but it takes another shape. Cognitive capitalism, exploiting the cognitive weaknesses of the public, will take progressively the place of the original production capitalist system. Symptoms associated to virtual universes may look, for instance, like schizophrenia, and will inevitably be exploited by economic forces to increase the dependency of both the consumer and the producer. But the consumer, helped by Internet access can thwart the guiles of the merchants better than in the past, an also reach the necessary information to operate his prosumer's projects.

6.2.3 Financial governance, towards a new monetary order

The sub-prime crisis that started mid 2007 and will last some years reveals clearly a failure in the governance of the financial system. This failure lies in insufficient control of money creation through bank loans, relying on assets which value was under

[106] Probably inspired by Nobel Prize Mohammed Yunus and his Grameen Bank.

speculative growth. The event mobilized the heaviest world central banks to act jointly and the consequences were contained enough to postpone the risk of a crash. The important point concerning the future is the fact the central banks acted jointly.

World GDP 2007 is estimated approximately 54500 Billion $, in which EU counts for 16600 and US for 13800. Here is the recent evolution of the debt of the American households in Billion $:

Evolution of US households debt (Billion $) Source: Federal reserve

It has reached, in 2007 the level of one year total US GDP[107]. And it is going over, as the present GDP growth has decreased to 2.5% a year. If you add to this figure the debt of the firms (bank and insurance excluded), namely 31200 Billion $ and the debt of the state 9200 Billion $, the total makes 54200, approximately the amount of the World GDP (54500)! One year of world value added would be necessary to reimburse US debts.

[107] The same occurred in Great Britain

Such a disequilibrium is made possible because the $ is still considered as the international monetary standard. Oil and most international trade is paid in $, and the countries like China and Japan who have a positive balance of payments have accumulated hundreds of Billion $ and do not want its collapse, in spite the attractiveness of the €. Anyhow, the situation may be instable, because the first one to convert his assets to € will gain over the last one.

The recent evolution may lead to the conclusion that, having slowly shifted from a democratic system to a lobbycratic one, United States became unable to control their debts, their money and the behaviour of their banking system.

Regarding the banks, an international negotiation, known as Basel2[108] and 3 is going on. It is progressing but faces the difficulty of the access to data related to the diversity of the software and standards used in this highly computerised profession. Cognitive overload is one of the obsessing problems of the cognitive civilization.

Regarding the money standard, any logical human being would be tempted to think that if US became unable to control the $, the $ should be put under international control. Such a simple solution would probably face too strong nationalistic resistance to be feasible. But the example of the € shows how fierce nations can reach an agreement to built a common currency. It could be imitated by other countries, particularly in the East. Negotiations are difficult between China and Japan. They may be easier between China and India. And, reducing the diversity of big currencies would make easier collective management by an informal council of central bank executives.

The important point that could accelerate the process is **the necessity to launch huge public investments**, including city restructuring and common transportation, water supply infrastructure, energy saving and energy production free of greenhouse gases, protection of biodiversity. We are in a time where money is clearly controlled by mankind, up to now under rather poor nationalistic governance. But money injection is necessary to produce a Keynesian effect on the economy and also to build the infrastructures needed to face the problems mentioned in the first part of this report.

[108] See Identity and access management, new challenges for banks, Bull Evidian paper, 2004.

Final remark: this converging process of the great currencies is likely to intensify during the next decade, though its speed cannot be predicted. Symmetrically, the multiplication of small local money (LETS[109]), the diffusion of which should be made easier through Internet, is to be expected, as it would accompany the revival of small units in agriculture, fisheries, craftsmanship, local trade and services.

6.3 The global security concept[110]

6.3.1 The old and the new threats

For the elder generations, inspired by the souvenirs of 2nd world war and cold war, the dangers came first from human attacks. The media still follow this view, giving priority to terrorist actions, which causes few casualties compared, for instance, to road accidents.

For younger generations, safety means a safe employment, a safe food, a safe environment and a safe survival for the next generations, threatened by global warming and species extinction.

To this potential trend has to be added another shift, increased since 2000: privatization of military forces. Not only Halliburton and Blackwater, to which performances in Iraq have given fame if not glory, but various types of mercenaries, from the paramilitary forces in South America to the ordinary security guard of the supermarket. These private companies are hired by states and also by firms, particularly multinationals facing risks of riots or sabotage in the countries they operate. As many nations are too weak to maintain safety, such evolution appear unavoidable to the firms concerned.

6.3.2 Increase of natural diseases rescue tasks

But some of these firms, pursuing their search of profitable opportunities, happen to threaten environment and biodiversity, for instance by destroying tropical rainforests or exhausting fish species. Presently, quite few forces have the mission to protect nature, in spite of its necessity for human survival. It is likely that, before 2025, protection of nature against human and company predations will become a global military concern.

[109] Local Exchange Trade System. See for instance the works of Bernard Lietaer.
[110] See also Nicole Gnesotto and Loukas Tsoukalis contributions

Some of these predators have the capacity to spend billions of €. Nowadays, they only find in front of them disarmed NGO's having as the only weapon a microphone and a camera. Thus, comparable forces will have to be built and managed to defend the common interest of humanity and the protection of the planet. It may be discussed as a new role for United Nations, or a new type of international force. If not, the NGO's will have to build their own military forces.

"Interconnection between threats and risks: one of the effects of globalisation, by the permeability of borders, by immediacy of information which characterises it, by the multiplicity of flows allowed illegally as much as legally, is to scramble the traditional categories of international security: terrorism is fed by economic and social inequalities and by the non resolution of regional conflicts, mafias proliferate on the decomposition of states, refugees flows make difficult the "containment" of the crises in only one territory etc.

6.3.3 The same technology for different missions

Security and defence think themselves in continuum, both in the origin of crises and in the means necessary for their solution, or their prevention. This strategic jamming also affects the traditional distinction between internal safety and external safety, via terrorism, energy disruptions, computer vulnerability, but also pandemic risks or natural disasters, or even migration flows

"Increase of the non military overall threats, whether from natural disasters related to the climate change, or from more rapid dissemination of pandemics, or from the overall repercussions of a financial or stock exchange crisis.[111]"."

The tools necessary to rescue victims of a natural disease, like an earthquake or a volcanic eruption are similar to the ones used for military rescue. Also, private troops are now currently in operation. The **barrier between civilian and military should progressively vanish**, both serving a global security concept. According the danger, which concerns the whole mankind, resulting from the exhaustion of natural resources,

[111] Nicole Gnesotto

renewable or not, and the dramatic decrease of biodiversity, **protection of Nature may become a military concern**.

6.4 One power or the three powers: justice emerging.

6.4.1 Executive, legislative, judicial powers worldwide

According to the analysis made in the middle of 18th century[112], power bears three different functions that should be handled separately:

The **executive** is a top down movement, using its strength to impose its will to the public. Executive is often considered as "the" power, as being the expression of a "natural" law, the law of the strongest.

Anyhow, modern biology and ecology teaches that Nature is not only a "struggle for life" system, but also a place where sophisticated cooperative behaviours are generated. The term symbiosis, originally "living together", illustrated by most ecosystems, including the human driven ones, named gardens, show that something else than pure power is operating.

So what else? The time has come to answer clearly this question. Symbiosis needs mutual understanding, recognition and acknowledgement. It needs also rules of behaviour. According to Montesquieu, there lies the second function of power: elaborating behavioural rules based on understanding of mutual needs. For that reason, many consider that this "**legislative**" function should be devoted to elected assemblies, representative of the citizens will. In practice, things are more complex and depend on the local usages and civilizations.

The main difficulty lies when going to practice. Real situations are complex, unpredictable and do not fit in predetermined conceptual schemes. Therefore, interpretation of reality, when interests are in conflict, needs a peculiar type of work aimed at elaborating a judgement. As it was already the case in ancient Mesopotamia, judgements serve also to the interpretation of future cases, and therefore contribute to

[112] by Montesquieu, "L'esprit des Lois", Geneva, 1758.

the building of the rule of law. Therefore, the **judicia**l function bears an essential role: interpretation of the law and also its contribution to the building of law.

Recent times of globalization are facing great legal difficulties. Since the Westphalia treaty (Oct 24 1648), laws are supposed to be defined inside national areas, and only Nation States are subjects of international law. Fortunately, human behaviours are able to adapt and find ways to overcome this restriction. Progressively new subjects of international law are accepted:

Individuals are now in a position to bring to court Nation States, at least in the 46 countries (including Russia) that signed the treaty creating the Strasbourg European court of human rights.

Firms are also able to bring some Nation States to Luxemburg court for not respecting European rules or to WTO for restricting freedom of trade or investment agreements.

The case of the NGO's appears even more remarkable. Though not being officially recognized as legal actors, they have already had a strong influence in the ongoing building of an international state of law. Let us remind, for instance, amongst many others, the actions of the Red Cross, Amnesty International, Greenpeace and WWF.

Finally, we must quote that the so-called "scientific community", though not having any legal status, appears clearly as the driving force in defining the future economic social and ecological policy, at least through IPCC, responding to a demand of United Nations.

It can therefore be foreseen that, during the following decades, the acknowledgement of the many stakeholders involved in human rights, environment protection and economic activities should inevitably progress, offering a complex landscape in which the Nation States will be only one of the various actors involved. And, as the formulation of the international law may still suffer of the absence of a world legislator, a key role should be devoted to the judicial power, by extension of the existing international courts.

6.4.2 Executive has been predominant. Is judicial the next one?

After a period of autarky of the Neolithic village civilization, between –8000 and –3000, domestication of the camel and the horse around -3000 allowed an increased circulation

of goods. Between –3000 and –500, the end of autarky generated the development of cities as market places, the practice of writing, accounting and also the first courts and legal codes (the Hammurabbi code (-1730) is the best known[113]) to solve conflicts.

But at that time also looting, conquest and many forms of resources appropriation by strength and constraint developed. Executive power was, and is still nowadays in many parts of the world, **the** power. Others proceed by delegation. And the implementation of their decisions needs the ways and means of the executive. Hammurabbi code said it explicitly:

"I, glorious king, have been ordered by the gods to set up justice in order to avoid the weakest to be oppressed by the strongest". In that scheme, which is still operating nowadays, society has 3 levels: the weak, the strong and the "super-strong" who protects the weak ones against the abuses of the strong ones.

Anyhow, in modern times, many places in the world live "outlaw", with no reference to codes and courts. When it happens, in the absence of legal reference, society generates spontaneously a substitute by taking as a reference the opinion of the strongest. It is the case, for instance, of the mafia organisation and in many parts of big business and politics.

More generally, the difference with the old times is that appearance stays in many cases, legal, and the dominance does not depend any more on physical strength, but on tricks and traps. But the relationship is not a free agreement between offer and demand as taught in economic courses. It looks rather like the sentence of the "godfather": "I will present him an offer he can't refuse".

6.4.3 The media power emergence

Medias are often quoted as the fourth power, the new one bearing influence on the three old ones, executive, legislative and judicial. Clearly, they contribute to the evolution of mentalities, particularly when they help building a global planetary consciousness. But it happens also that, under the influence of lobbies, they present to the public an image of

[113] If not the oldest: Urukagina (- 2350), Ur-Nammu (- 2100), Eshnunna (- 1800).

reality generating damaging behaviours. It is the case, for instance, when financed through advertisement, they encourage excessive consumption.

In the world emerging during the following decades, dominance relations will be embedded in the so-called "**cognitive capitalism**". The "rapport de force" has been primarily based on exploitation of physical weakness, then, at the time of Marx, on economic weakness, and is now evolving towards exploitation of **psychical weaknesses**. The mind of the public is the new territory offered to the conquest of economic forces. Anyhow, regarding the common good at planetary level, the regulation of media and Internet is difficult to operate, both for technical and legal reasons, in spite of the effort of some operators.

Therefore, the basic Hammurabbi goal, "to protect the weak against the oppression of the strong" is not yet fulfilled. In modern world, the observation made by the British philosophers[114] should be added: the oppression of the weak may come not only from a person, but also from an institution, for instance a religious organization, a government or a private company.

The building an international "state of law", in which Europe appears as the world most sophisticated and experienced laboratory[115] respecting local traditions is motivated by the desire to approach that goal.

6.4.4 Why judicial influence should increase, in spite of heavy procedures.

Obviously, a unique planetary legal frame would be unacceptable[116]. The laws must respect and take into account the different usages of the different civilizations. Diversity is a part of life, and obviously should not be reduced unless under a common necessity.

Anyhow, facing the major challenges of 21st century, the question of **governance** is often raised. This word, which has not been clearly defined, is used to point the complexity of modern decision making processes and the absence of any authority able to impose solutions. Nowadays, it must be taken into account that the "cognitive

[114] Particularly John Locke in his "letter on tolerance" (1689) and David Hume (1711-1776).
[115] Mireille Delmas Marty, Les forces imaginantes du droit (3 vol), Seuil 2003-2007).
[116] As stated by the German philosopher Emmanuel Kant.

civilization" processes decentralizes information and builds imaginary entities, as does a nervous system. Therefore, Montesquieu statement that the three powers should be separated appears as a first step, illustrating a basic idea that will probably inspire most 21st century reorganizations: Avoid **conflicts of interest**.

For instance, a market where the buyer falls under the influence of the seller is no more a market; a government manipulated by lobbies is no more a legitimate government. A justice depending on the good will of the executive power is no more a justice. All for the same cause: conflict of interest.

Some countries, in Scandinavia for instance, are particularly alert in separating responsibilities in order to avoid conflict of interest. It is not the case in many other countries. At the international level, the influence of some big firms or organized lobbies may dominate the decision making of a number of small and medium size nation states. The expression "banana republic" has been invented to describe such a situation that refers to a much wider scope than banana producing states. Even the biggest nations have defended the interests of some of their dominant lobbies prior to the interest of their own population.

Anyhow, staying faithful to the protection of the weak against the strong, we must take into consideration the slow but continuous progress during the last half-century of human rights for individuals and of anti-trust regulations for economic entrepreneurship.

Stay the weakest: the non-humans and particularly the natural ecosystems.

Awareness that nature and natural resources protection are becoming a global necessity has slowly progressed from the first club of Rome warning in the 70's to the growing concern of the IPCC reports. In a first stage, discussions went around the concept of common heritage. They faced some resistance from developing countries, like Brazil, who refused interference in the management of their internal domains, more precisely Amazonia.

Nowadays, and this should stay during the following decades, the negotiations are dealing with the concept of **common goods**, or "commons". According to climate

change and resources scarcity, nation states have to accept that they have something in common. After the times when declarations of independence were proclaimed, the time has come for declarations of **interdependence**[117]**,** supported at least by a minimal legal frame.

Therefore, as a consequence of the growing interdependent complexity and in spite the waste of time and energy in trials, it is clear that the judicial power is the growing power of 21st century and the most international one. The most spectacular, if not the only one, sign of its growing influence is the ability of the ICC[118] to censure national leaders[119].

It must be quoted also that its internationalization will be made easier by using Internet and other modern information technologies.

Europe, because of its experience being ahead worldwide as a state of law area respecting the different cultures involved, should aspire to become the world leader in building the future international judicial system.

[117] As suggested by Mireille Delmas Marty. See also Tsoukalis "International institutions should acquire instruments to deal effectively with the level of global interdependence reached"
[118] International criminal court.
[119] Case Omar el Béchir, president of Sudan, for the Darfur genocide.

7-Conclusion: governance and consciousness

The word “governance” has been promoted during the last decade as an alternative concept to overcome the difficulties emerging around the words “government” and “power”. It implicitly refers to systemic analysis and tries to put decision-making processes under close examination. It refers also both to legitimacy and efficiency. The state of governance is poorly considered when decisions are slow and formalities heavy. But it also pays attention to legitimacy. Dictatorship, in spite of its fast decisions may not be considered as ideal governance. To make it short, governance relates to the rules of the game, their clarity and acceptability. But it bears also the idea that collective decision-making is feasible. Anyhow governance assessment is not yet established as a discipline in social sciences.

7.1 The transition from industrial to cognitive world[120]

Our investigation leads to a vision of the period between 2010 and 2025 as a time for disruptions. Local, economic, social, technological disruptions that will all result of a major change: the transition between

1-the **industrial civilization**, which started during the 18th century, using the nation state divide established in 17th century, and giving birth to the present so-called “democratic” forms of governance, and

2-the **cognitive civilization,** which started at the end of 20th century. In this new civilization, the dominant activity is no more production. It is nature care and information handling. The communication network crosses the former institutional frontiers and renders progressively obsolete the former divides, including the nation state one.

The word “cognitive” is here preferred to the classical “knowledge based economy” mantra because it bears the assumption that, as quoted first by Alvin Toffler, hyperchoice and cognitive saturation appear as a specific problem in that civilization, facing the industrialization of the persuasion activities.

[120] See João Caraça contribution

This transition, because of its magnitude, will take several generations and probably transform the societies in shapes that are now difficult to foresee. Regarding the next 17 years, what should be expected is a shift in the consciousness, occurring amongst **both conflict and cooperation** processes.

This difficult shift in consciousness, we call it the **challenge to reason.** It is a challenge involving a change in the representation of life. Most political views of the late centuries were inspired by the Darwin-Spencer idea of the "struggle for life". It was interpreted in terms of revolution by the late Marxist ideology and as economic competition by the free market ideology.

Modern biology looks at life differently. If the primitive bacteria that lived 3.5 billion years ago were still struggling for life, we would not be here. Because every one of us is built of 60 thousand billion cells that cooperate. Struggle undoubtedly exists. But complex beings, as we are, emerge when struggle leaves place to cooperation. And, obviously, this cooperation is based on information exchange, from the cellular level to the planetary level. Therefore, the challenge to reason lies in assuming the transition from conflict to cooperation, not only inside mankind, but also with other species.

Regarding this challenge, the rules of competition, the property rights, the relation to natural resources, the legitimacy of institutions will face two visions: the old one, often consolidated in laws, and the new one, claiming for more freedom and rationality[121].

All civilizations have had their defenders of the past and their advocates of the future. In this fast transition period, it is important to be on the side of the future.

7.2 Tragedy as a challenge

As said in the introduction, the Greek tragedy describes the case where the hero, unable to escape a scenario of the past deeply rooted in its identity, follows the trajectory of his tragic destiny, often ended in violent death.

[121] The case of intellectual property rights, agriculture and fisheries regulations, nation state authorities can illustrate this general statement.

The industrial age gave the illusion that mankind could master the world without mastering itself. Pursuing such an attitude would lead to tragedy, because the laws of physics and biology are the insuperable limits to its greed.

7.3 The planet as a new actor

The planet is finite, and there is the limit[122].

And the biosphere needs to be cared. This leads to the "**planetary gardening** attitude".

Looking more precisely in **economic** terms, we find that economic accounting and measurements should be redesigned to take into account the realities that do not pass through the market or get irrelevant evaluation by a market.

We find also that **huge public initiatives**[123] should be prepared: reshaping the cities, protecting natural reserves of biodiversity, water supplying, facing the rise of the level of the oceans, stimulating the use of sober technologies with low greenhouse gas emissions... These should bear also positive Keynesian effects on the economy.

The concept of security, during the industrial age, was essentially a military concern. The limits of the planet may transform it into a **global security concept** where all sorts of rescues to hurricanes, floods and droughts and accidents will merge with classical security goals and be placed under unified command[124], using the same technologies.

Finally, we insist on the building of a world "**state of law**". To cope with planetary limits, more regulations will be needed. They will have to be internationally accepted and enforced. In case of malpractice, international courts will be needed. **Europe** is the most diversified and active laboratory in the field. It is the region most able to promote this future world state of law.

[122] Until the time, if there is any, when mankind will be able to live, grow and multiply in space.
[123] Mostly executed by private contractors
[124] It is already the case in some countries for the navy, assuming both civilian and military security.

11-Annex The working group

THE WORLD IN 2025

List of experts invited

Thierry GAUDIN (Ingénieur général des Mines, President Prospective 2100, France)

Josephine GREEN, (Foresight and design, Philips, Nederlands)

Geoff MULGAN, (Director Young Foundation, former director Forward Unit and Strategy Unit of the prime minister Great Britain)

Jacques THEYS (Centre de Prospective et de Veille Scientifique, MEDAD, FR),

Gijs BEETS (Démograph, Nederlands)

Lionel FONTAGNE (Economist, CEPII, Fance,)

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Joao CARACA (Science foresight, Gulbenkian foundation, Portugal)**,**

Loukas TSOUKALIS (Political science, University of Athens, Greece),

Philippe AGHION (Anthropology, France),

Giovanni GREVI (EU Institute for Security Studies, Italy),

Nicole GNESSOTTO (Defence foresight and and european studies, CNAM, France)

Mu RONGPING (Academy of Sciences, China),

Samir AMIN (Forum of Dakar director, Egypt),

Irina KUKLINA (Foresight program director, Russia)

Luc SOETE (Economist, UNU MERIT, Nederlands)

Richard PORTES (Economist, Great Britain)