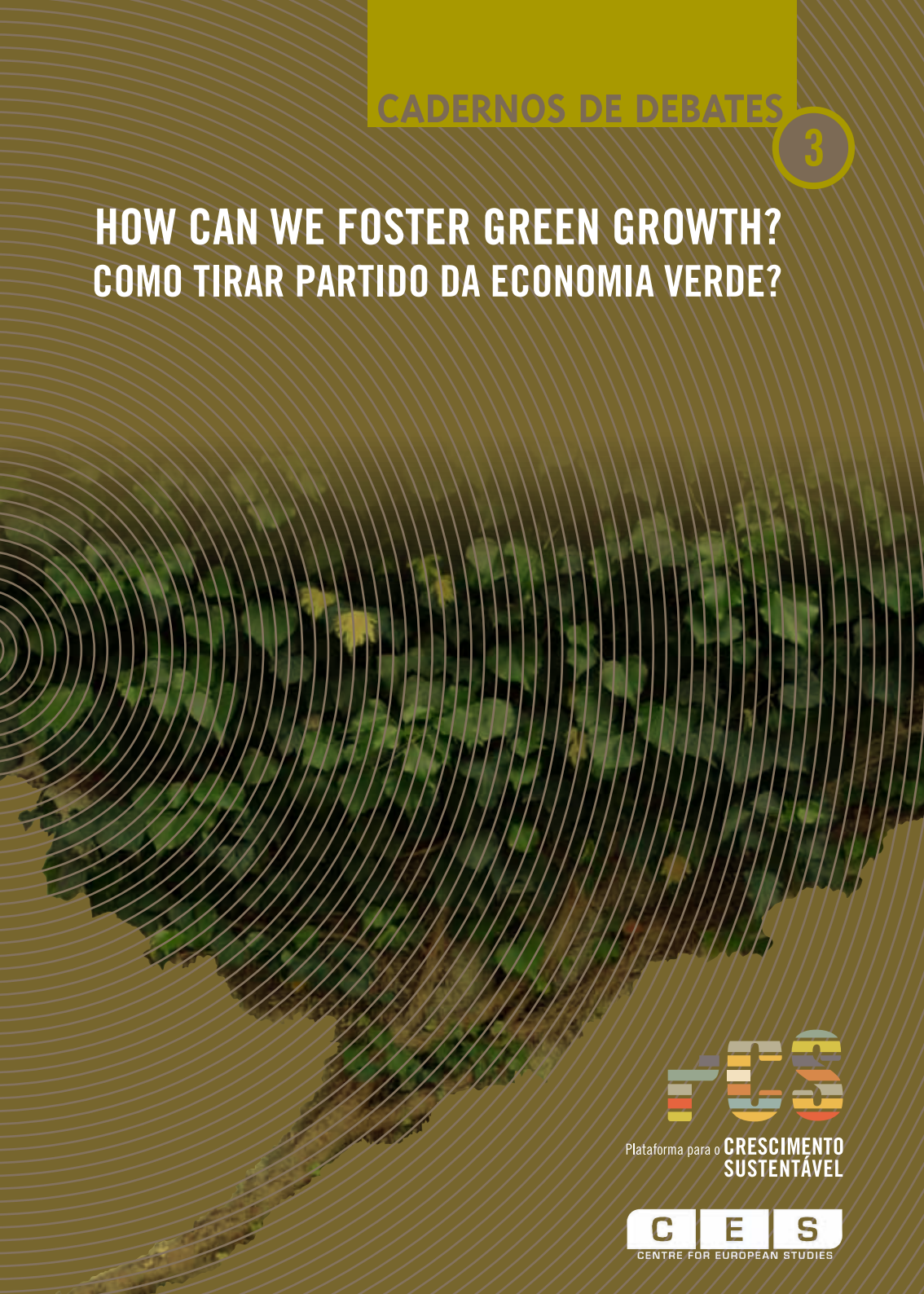
CADERNOS DE DEBATES 3

HOW CAN WE FOSTER GREEN GROWTH?
COMO TIRAR PARTIDO DA ECONOMIA VERDE?



Plataforma para o CRESCIMENTO SUSTENTÁVEL

CES
CENTRE FOR EUROPEAN STUDIES

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How can we foster green growth?
Como tirar partido da economia verde?

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JORGE MOREIRA DA SILVA

Introduction | Introdução

The Platfom for a Sustainable Growth — Plataforma para o Crescimento Sustentável (PCS) — is a non-profit independent organization that aims at identifying policy and measures to foster a sustainable growth.

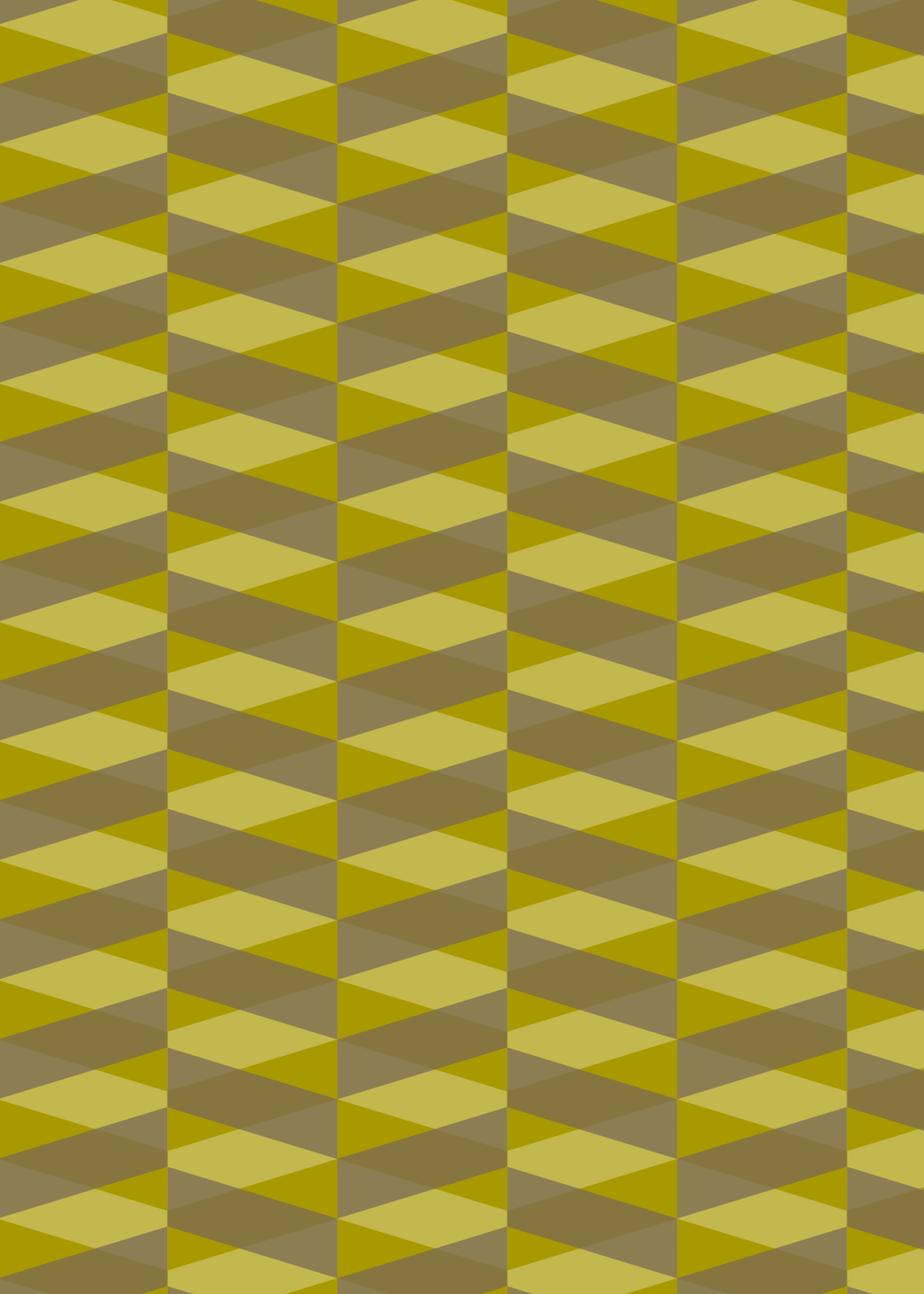
PCS was officially launched in October 2011 and its work has been focused on the debate on European new challenges and on the *Report for a Sustainable Growth*, identifying policies and measures to foster a sustainable growth in Portugal going beyond the Memorandum of Understanding signed between Portugal and IMF/EC/ECB.

PCS has almost 400 members — recognized leaders and experts from private sector, academia, government and NGOs — working as volunteers, within 27 working groups. At the Advisory Board chaired by Francisco Pinto Balsemão we are honored with the presence of leaders of several think-tanks and Foundations: BRUEGEL and CEPS, from Belgium; RESPUBLIC and REFORM, from UK; Konrad Adenauer Foundation, from Germany; ASTRID from Italy; TALLBERG Foundation, from Sweden; Club of Rome, Suisse; Luso-American Foundation and Millennium Foundation, from Portugal.

In addition to our work on the *Sustainable Growth Report*, we have also organized several workshops and conferences.

On the 18th Abril 2012, we organized a conference, attended by 200 people, addressing the question "*How can we foster green growth?*". Speakers included António Costa e Silva (CEO of Partex), Joy Kim (Advisor at United Nations Environmental Programme), Peter Vis (Chief of Cabinet of the EU Commissioner on Climate Action) and Carlos Pimenta (Coordinator of Sustainability at PCS).

INTERVENÇÕES | SPEECHES



ANTÓNIO COSTA E SILVA
Partex

1. INTRODUCTION

This article covers the analysis of the energy markets, emerging trends, oil price evolution and oil shocks, identifying the current major energy game changers. Furthermore, the issues of energy security in the XXI century will be introduced and discussed within the framework of supply behavior, stability of prices and economic competitiveness. Special emphasis will be given to the interaction between energy security, climate change and environment sustainability. Europe energy security challenges will be addressed and discussed with a multidimensional analysis covering the current status, public policies, European energy market, European energy networks, emerging technologies and energy efficiency. Recommendations for future steps to be undertaken to reinforce European energy security will be made.

2. STRUCTURAL AND STRATEGIC CHANGES IN THE ENERGY MARKETS

The oil shock of 2007/2008 showed that we are entering in a new era of change in the energy market. The main structural trends can be summarized as follows:

- The globalization of oil demand taking into account that from 2000 to 2007 85% of growth in oil demand came from developing countries; in the past North America, Europe and Japan were the key drivers of the oil demand;
- A structural shift in the oil demand pattern rendering the relationship between oil price and demand more complex; as most of the developing countries have policies of subsidization for fuels, increases of oil price in certain ranges do not lead necessarily to decreases in the oil demand, which lost elasticity.

- Oil price volatility reached new highs and from 1998 (when oil prices were below 10 US$/bbl) till July 2008 (when they reached 147 US$/bbl), the tenfold increase was followed by an even remarkable and astonishing decline with prices reaching 32 US$/bbl at the end of 2008; the price of oil in 2008 changed 5% or more from the previous day close on 39 days setting a new record in volatility with major implications for business and investment planning activities.
- The financialization of oil which is today not only a strategic commodity but also a financial asset; oil has taken a second identity and this created a new era of oil pricing dynamics with the involvement in the oil market not only of the traditional traders and oil producing companies but also of Investment Banks, Hedge Funds, Financial Funds and other Investment Entities.
- Erosion of OPEC SPARE Capacity, which reached a low level in 2008 of less than one million barrels of oil per day (1 MB/D); in spite of a smooth recovery in 2009 and 2010 the spare capacity is still low and means a more fragile and vulnerable market without mechanisms of price stabilization.

In the aftermath of the 2007/2008 oil shock, the economic slowdown and the financial crisis led to a huge destruction of the world oil demand that collapsed 2.2 MB/D in the second semester of 2008. Oil demand decreased 0.6% in 2008, the first decline since 1993 and the largest since 1982. 2009 witnessed a new drop in oil demand of 1.7%. OPEC acted at the end of 2008 to restrain production in order to avoid a huge drop in oil prices and the cartel succeeded to cut 4.2 MB/D in oil production. The drop in prices was contained, they did not go lower than 70 US$/bbl in the period but this is a very serious signal because even with the worst recession in the last decades the oil price not only was contained but increased significantly afterwards. This means that the level of depart for a future rally in price is already high and this may create additional tensions in the

world economy. In any case the supply restrictions decided by OPEC increased the volatility and exerted pressure on the future ability to deliver.

Another consequence of the oil shock was the acceleration of OPEC production of condensates and NGL's (+ 340,000 B/D and 420,000 B/D respectively in 2009) because these products are not covered by the quotas policy. But the key strategic consequence was the response of the developed countries with the US shift to production of unconventional gas, specially Shale Gas. Some of the independent companies of US, taking advantage of the incentives provided by the Energy Act, unlocked huge reserves of shale gas and discovered a technological process of production of these reserves combining two existing technologies: the horizontal wells and the hydraulic fracturing technique. Shale gas is an hydrocarbon system that is retained in the source rock, did not migrate from the generation source and the reserves in US and worldwide are huge. This may create the most important strategic shift in the world energy markets for decades. The US Gas Production increased 7.5% in 2008, the strongest growth since 1984, and increased again 3.5% in 2009 transforming the US in the top world producer ahead of Russia. The implications are very significative because shale gas reserves may range from 60% to 250% when compared with the conventional gas reserves. The International Energy Agency released a study in April 2011 that shows the magnitude of these reserves: in US the unconventional gas reserves can be 3 times more than the conventional, 6 times in Canada, 20 times in Argentina and 12 times in China. [1] On top of that, the technology discovered in US for producing shale gas is spreading to other areas of the world and also to applications in producing shale oil.

Gas will play a more important role in the world energy matrix: in 2010 gas share was 23.8%, the highest on record.[2] Meanwhile oil share declined in the last eleven consecutive years. The growing gas demand (grew by 7.4% in 2010), the growing gas trade (grew by 10.1% in 2010), the changes in the gas transportation systems with the emergence of LNG (Liquefied Natural Gas) which adds

[1]- The Economist, 6th August 2011

[2] - BP Statistical Review of World Energy, 2011, London

flexibility and versatility in the transportation by sea, the slower growth of Nuclear Power after the nuclear disaster of Fukushima in Japan on 11th March 2011, the increase of Unconventional Gas Production and the competitive gas prices, are key drivers that may build a Golden Age for Gas.

3. GEOPOLITICAL AND STRUCTURAL CHANGES

On top of these consequences it is important to stress the geopolitical and structural changes that need to be addressed:

- The National Oil Companies (NOC's) of the producing countries control today 80% of the world oil reserves; the International Oil Companies (IOC's) control directly 7% and indirectly 13% (through the Production Sharing Agreements).[3]
- The IOC's have more and more difficulties to access new oil and gas reserves
- Usually periods of high oil prices foster the growth of the Nationalism on Resources as illustrated in the case of Russia, Venezuela, Algeria or Ecuador which normally leads to limitations on the supply and less efficiency in production.(3)
- Increase of Financial Power of Oil Producing Countries translated by the fact that OPEC countries revenues duplicated between 2006 and 2008 reaching 960 billion US$ in 2008; in fact in January 2008 when oil prices reached 110 US$/bbl, Saudi Arabia made 1 billion US$ of revenues in one single day.
- The most important geopolitical consequence of the high oil prices is the huge transference of dollars from the consuming countries to the producing countries. A study by the "Petroleum Economist" shows that in the period 2007-2009, the six top oil consumers (US, Japan, India, South Korea, Germany and Italy) paid 1.8 trillion US$ for their oil imports and the 6 top producers (Saudi Arabia, Russia, Iran, UAE, Nigeria and Venezuela)

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[3] - António Costa Silva, "Does the End of Oil Means the End of Oil Culture?" Seminar on "Energy and Environment", Casa Mateus, September 2006

received 1.7 trillion US$.[4] This transference of financial wealth does not have precedents in history, is changing the world financial order and creates additional constraints to the world economy. A study by the Bank of International Settlements (BIS) shows that 70% of these revenues are not translated into productive investment and are not applied in economic development projects. The implications for the world economy are critical.

4. ENERGY GAME CHANGERS, CLIMATIC THREAT AND ECONOMIC IMPACT

The key energy game changers in the first decades of XXI century can be summarized as follows:

- **Shale Gas:** if the estimated reserves are confirmed they may range from 60% to 250% of the conventional ones and this may dramatically change US and Europe landscape with implications for gas developments and supply in Europe. However some obstacles related to the environment implications and costs need to be addressed.
- **Bp's Macondo Oil Spill**: the Blow-Out that occurred in the Gulf of Mexico in the offshore Macondo well in April 2010, led to serious implications on safety and environmental issues related to offshore operations. The accident was a wake-up call for the whole industry and the consequences are more tight regulations, impact on costs, implications on long-term supply for offshore production and new requirements for Risk Management and Deep-offshore Safety.
- **IRaq's Upstream Potential:** Iraq is with Venezuela the founder of OPEC but the country today is not encompassed by the quota's policy of the cartel. Given its huge reserves potential, Iraq announced a plan to increase oil production 6 times from current 2.4 MB/D to more than 12 MB/D in the next 6 years; this is a very ambitious plan implying enormous challenges but the potential is there and the technical and political implications may be huge starting with the impact on OPEC policies and cohesion.

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[4] - Petroleum Economist, December 2010

- **Shifting Of Power From Atlantic To Pacific Basin**: the role of leading emerging countries like CHINA and INDIA in the world energy matrix and in the growth of energy demand is shifting power to the Indian and Pacific basins. This may trigger major implications on world balance of power; there are already significant changes in trade, finance and investment patterns and this raises issues about the response in terms of European Companies, Corporate Policies and European Geopolitical Strategy.

5. THE ARAB SPRING

In the last years and specially in 2011, some developments amplified the dimension of the Game Changers that may affect the energy market and create additional geopolitical challenges.

The first of these events is what became known as the "Arab Spring". The situation in North Africa and Middle East with the Arab Regional upheavals eroded a good part of the strategic balance in the oil and gas markets and may have major consequences for the stability of the Region and for European oil and energy security. In its essence, the Arab upheavals are a positive event with the emergence of democratic movements, not inspired by religious extremists but by young educated people, claiming more freedom, civil rights and better conditions of life. These movements emerged in countries like Egypt where the population is quite young and 70% of the people lives with less than 2 dollars per day. These are open-ended events and, as it happened with the European democratic revolutions in the XIX century, some may succeed and others will lead to new autocratic regimes or to failed states. The case of Libya is critical because if a failed state emerges in the Mediterranean Basin, the impact for the energy security in the whole area and for Europe may be dangerous. In terms of the oil and gas market, the rupture of production in one important producing country leads to significative increases in oil prices. When the revolt emerged in Libya against Colonel Khadafy regime, the oil prices increased 15 US$ per barrel.

The "Syndrome of Disruption of Production" is immediately replicated in the markets. During the 1991 Gulf War when Iraq invaded Koweit, the oil prices increased 150% in three months. But the most critical issue is the spread of the revolt to the Arabian Peninsula with upheavals in Yemen, Bahrain and Syria. Saudi Arabia intervened military in Bahrain to protect the suni monarchy in a country where 70% of the population are Shia. The key consequence for the future is that Saudi Arabia, the heart of the world oil system, is circumvented by an Arch of Instability that ranges from Yemen in the South to Bahrain and goes deep to the Saudi Eastern Province (Qatif). In this province are located the greatest Saudi oil fields and the population is dominantly Shia (the 12% Shia population of Saudi Arabia is concentrated in this province). Qatif has experienced periodic upheavals and it is important to stress that the Abqaiq petrochemical complex that processes 7 MB/D, the most important of the world, is located in this province which harbours also the Gahwar field, the largest in the world, and Ras Tanura, the most important oil port of the world (exports 5 MB/D). The regional dispute between Saudi Arabia and Iran affects dramatically the situation in the whole Arabia Peninsula with the Saudis supporting the revolt in Syria, a close ally of Iran, and with the Iranians supporting the revolt in Bahrain and Qatif to foster instability in Saudi Arabia. The geopolitical situation is quite unstable and the consequences are deep in terms of increasing oil prices, threats to the supply, disruptions in production, restrictions in the export quantities and problems in the energy security system. A specific illustration of this geopolitical uncertainty is related to the Hormuz Strait from where 19% of European oil supply flows every day.

6. THE IRANIAN THREAT TO CLOSE THE HORMUZ STRAIT

This is especially critical with the Iranian threat to close the Hormuz Strait where each day passes 30% of the volume of oil traded in the world. The Hormuz Strait is the most important bottleneck of the world oil transport system and its closure means the paralysation of the Japanese and South Korea economies and the semi-paralysis of China, US and Europe.

It will be difficult for Iran to close the Strait on a permanent basis with a significative duration but even very focused actions will be translated into a huge increase of oil prices. In January 2012 when the Iranians made naval exercises in the Strait and threatened to close the traffic, oil prices jumped more than 4% in the same day. It is expected that rational decisions will prevail. The closure of the Strait will be interpreted as an act of war by all Gulf states and the US and Iran will be the most affected by these acts. In fact the Iranian National Budget is strongly dependent of the oil revenues and in 2011 Iran collected more than 100 billion US$ in oil exports. However, the current situation is a concern in terms of European oil security given that 19% of European oil supply comes from the Gulf. Incidentally, the current environment of geopolitical tensions and threats is a driver for high oil prices which affect the developed economies.

7. THE JAPANESE EARTHQUAKE AND TSUNAMI AND THE CONSEQUENCES

Another key event that emerged in 2011 and became a game changer was the earthquake and tsunami that hurted Japan on the 11th March 2011. The power supply was disrupted with a likely permanent loss of a significant portion of Japan's nuclear power generation capacity. Even today 48 out of the 54 Japanese nuclear reactors are still paralyzed. The energy market provided a strong answer to replace the failure of the nuclear power generation and the LNG market was instrumental to this response. The LNG which implies the liquefaction of gas and its transport by sea (the gas liquefied occupies a volume which is 300 times lower), gave birth to a very flexible and versatile market and this proved to be a strong competitive advantage providing Japan, already the top LNG consumer, with additional LNG volumes of 8 to 10 million tonnes. Key LNG producers like Russia, Indonesia, Qatar and Oman have been quick to offer LNG cargos to help Japan to restore and maintain power supplies. In March 2011 the LNG prices moved up in the Pacific rim from 9 US$/MBTU to more than 12 US$/MBTU and this dynamic also lifted benchmark gas prices in Europe.[5] The European spot LNG market has played a crucial swing supply role and displaced more expensive pipeline gas.

[5] - Argus Daily LNG Prices, News and Analysis, 31st March 2011

One effect of the Japanese crisis might be to push European gas market, currently split 50-50 between oil indexed and non-oil indexed pricing, back towards a period of strong oil indexation. But the desindexation of gas from oil prices, that developed strongly in the Atlantic Basin, is a trend that will be reinforced on the medium/long term and the role of European spot markets will be more significant. The role played by LNG to overcome Japan power supply crisis, is the first key event that antecipated the change of the gas market in the medium/long term from a fragmented market to a globalized one. The LNG market will be totally globalized by 2022/2025, the flexibility in LNG transport responds quickly to shifts in demand and LNG will be the driving force for the Globalization of the Gas Market.

8. THE RE-EMERGENCE OF THE ATLANTIC BASIN AND CONSEQUENCES FOR EUROPE

Finally during the last years a string of oil and gas discoveries in the Atlantic Basin may change the strategic balance in the energy market with deep positive implications for Europe.

The string of oil discoveries in Brazil deep-offshore, in the Pre-Salt formation of Santos Basin, created conditions for the emergency of a new oil province of the same magnitude as Kuwait with reserves that may ascend to 70 billion barrels. This adds to the huge discoveries of oil and gas in the French and British Guyana, to the discoveries made on the other side of the Atlantic in the offshore of Ghana with the Jubilee Field and the positive implications for the Niger Delta. Angola may grow its oil and gas reserves with the exploration of the potential of the Pre-Salt following Brazil who has found the way to locate and produce its deep water Pre-Salt fields. By the next decade Brazil could be producing twice as much as Venezuela, traditionally the oil power-house of South America. The Atlantic basin is also home to huge gas shale discoveries from North America to Argentina. On the heavy oil and tar sands we cannot ignore the magnitude of Venezuela Orenoco extra-heavy oil reserves and Canada Athabasca Tar Sands which in total may represent two Saudi Arabias.

In aggregation it is fair to say that for the first time in the last decades a key challenge may emerge in the Atlantic Basin to counter-balance the role of the Middle East. In geopolitical terms, the re-emergence of the Atlantic Basin, where more than 90% of the relevant world offshore discoveries are concentrated, from the Gulf of Mexico to deep offshore Brazil, from Ghana and Niger Deep waters to Angolan fields, gives to the Atlantic Ocean a key role in the future energy supply of the western hemisphere. The change in strategic balance has deep implications for the west and specially for Europe.

9. ENERGY SECURITY AND GLOBAL CHALLENGES IN EUROPE

The concept of Energy Security that still prevails today in Europe is based on the architecture that emerged from the first oil shock in 1973.

Nothing substantially changed and this can be dangerous for the future. In the US the process of redefinition of the energy security framework has started long time ago.

Jan Kalicki and David Goldwyn [6] formulated a definition of energy security for the XXI century as "the ability to access resources which are necessary for the continuos development of the national power" drawing the attention to the capacity to secure the resources and the ability to protect the world economy from the effects of extreme volatility.

Putting the things in context, the 1973 threats ranged from the disruption of supply in producing countries to the repetition of the oil embargo and the price volatility in the market. Those elements led to the formulation of an energy security framework based on the following strategic responses:

- The creation of the Petroleum Strategic Reserves in the developed countries (SPR)
- The creation of the International Energy Agency (IEA) as a Platform to defend the interests of the consuming nations

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[6] - Jan Kalicki and David Goldwyn, "Energy and Security: Toward a New Foreign Policy Strategy", Woodrow Wilson Center Press, Washington, 2005

- The definition of standards for the Automobile Industry to reduce the fuel consumption (in the US this law became known as "CAFE" which stands for "Corporate Average Fuel Efficiency")
- The building of "spare capacity" in key producing countries

The Global Security Challenges in the XXI century are more wide and the threats are multiple. They can be summarized as follows: Terrorism; Internal destabilization in producing countries; Erosion of the "spare capacity"; Increasing dependence on OPEC; Disruption of production and distribution power networks; Emergence of hurricanes like Rita and Katrina; Black-out's; Extreme price volatility; Climatic threat; Demographic factor; Unsustainability of the existing Energy model.

10. THE KATRINA EFFECT ON THE ENERGY SECURITY CONCEPT

One event that changed the perception about the energy security and that fostered the need to rethink the existing model, was related to the consequences of the Katrina and Rita hurricanes that triggered an integrated shock in the energy system of the US.

For the first time in history we had the simultaneous collapse of the Drilling Platforms, the Production and Pipeline systems, the Refineries, the Energy Distribution System. It never happened before. Katrina and Rita brought a new perspective to the security demonstrating how fundamental is the entire chain to feed the electrical grid. [7] We need a new energy framework able to protect the system as a whole. Furthermore the current energy system is under pressure, collapses happen more often, shortages of power supply occur more frequently like the ones in Ruhr Basin in Germany in 2004, in Italy in 2003, in North America (US/Canada) in 2003, in Brazil in 2004 and 2009 (where 18 of the 24 Brazilian states were affected by a black-out).

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[7] - Daniel Yergin, "Ensuring Energy Security", Foreign Affairs, Vol. 85, n 5, April 2006

11. CURRENT THREATS TO EUROPE ENERGY SECURITY

In terms of current threats to Europe Energy Security they can be summarized as follows:

- Emergence of a Failed State in the Mediterranean Basin (e.g. Libya) with all the consequences in terms of disruption in energy production, increase of piracy attacks, disruption in trade and flows, impact on oil prices and insurance costs
- Geopolitical instability in North Africa producing countries with disruptions in oil and gas supply to Europe. This happened already in 2011 when oil and gas supply of Libya was interrupted. Italy depends on Libya for 15% of its gas supply through the Greenstream Pipeline and 20% of oil; and the disruption in Libya created concerns for the future.
- The Key role of Algeria as an important European oil and gas supplier may be affected by instability; Algeria provides 19% of the gas supply to Europe, the network of Algerian pipelines Medgas and Magreb is crucial to supply the Iberian Peninsula. Furthermore the Transmed pipeline and the future Galsi project are critical for Italy and the Southern Mediterranean; a disruption in the Algerian pipeline system will affect significantly European Southern countries and the Mediterranean Basin.
- North Africa provides 12% of the European oil and 19% of European gas; a key strategic response of Europe is to help the North Africa countries to establish democratic regimes, stabilize the institutions and enter in a new era of development. This is a key step to avoid major disruptions in the oil and gas flow and improve European energy security.
- The Middle East represents 19% of the oil supplied to Europe and threats like the closure of the Strait of Hormuz are quite damaging for the continent. The stabilization of the Arabian Peninsula and the containment of the level of disruption in oil and gas production, created by the upheavals in Yemen, Syria and Bahrain, is crucial to avoid a new rally on high oil prices, disruption in supply and threats to the energy security.

- Europe holds only 16.2 billion barrels of oil corresponding to 1.3% of world reserves; this is a structural fragility of the continent; the European oil production is 5 MB/D but the consumption is three times more
- EU refining capacity is stagnated for many years and has not been upgraded to cope with the more heavy oil that flows today to the market
- European oil and gas companies are facing growing difficulties to have access to new reserves; European oil production is in decline specially in the North Sea
- Some EU countries, specially in Eastern and Central Europe, depend strongly on the Russia gas and this has created complex situations in the past when the interruption of Russia energy supply in 2006, 2007 and 2009 left European populations without gas at the peak of winter.
- A key EU fragility is the inexistence of a true open energy market in Europe

12. PROPOSED EU STRATEGIC RESPONSES

In broad terms the EU needs to develop strategic responses to manage and minimize its fragilities and increase the energy security of the continent. The history of energy shows clearly that a time of crisis is followed by a break point during which the government policies, the social, environmental and technological forces begin to rebalance and reshape the world energy complex.[8] These strategic responses can be as follows:

- Shift the Energy Model: the current energy model is a source of external dependence and fragility; a consistent bid on domestic resources ranging from renewables, biofuels, hydro-electricity, nuclear, biomass and microgeneration needs to be addressed
- Reduction on OPEC Dependence: a new look to the Atlantic Basin in order to minimize the supply from the Middle East and promote the development of the resources in the Atlantic Basin is crucial to change the geopolitical and strategic balance in the future.

[8] - Peter Tertzakian, "A Thousand Barrels a Second", McGraw-Hill, 2006

- Diversifying Supply Sources: which means to focus on the reinforcement of the Mediterranean, Atlantic and Central Asia axis.
- Building the EU single integrated Energy Market: an open and competitive market is today a key element of Energy Security and there is neither integrated policy nor a single market. The reinforcement of EU energy monopolies unbalances the market, restrains competition and foster the resistance to liberalization. The economic and financial crisis may trigger the return of national protectionisms preventing Europe of building an Integrated Energy Market. EU is a formidable economic power but lacks political convergence and will. The liberalization of EU Energy Market, the unbundling of Energy Facilities and Utilities leading to cut profit margins in gas distribution and reducing Gazprom appetite for European energy assets, the increase in the inter-connections between electric grids and pipeline networks, all these policies lead necessarily to less Russia ability to play one European country against the other and to the improvement of European Energy Security.
- New EU Policy on Strategic oil Reserves and Strategic Gas Reserves to prepare the continent for disruptions in supply and threats to energy security.
- Integration of China and India in the International Energy Agency to reinforce the consumers platform in order to reach better influence in the energy market.
- Ensure the security of supply cooperating with Russia who shall become a key strategic partner of Europe but avoiding an over-reliance on Russia and diversifying the sources of supply.
- Reinforce the cooperation with Norway in order to support the country who is a key EU energy provider (19% of the oil and 13% of the gas), in the "hidden" war made by Russia in the Arctic region; a broad agreement EU/Norway/Russia is important.
- Tackle the "Russian Issue" treating Russia as an European strategic partner, building a win-win approach based on the existing interdepend-

ence leading Russia to renounce to the "threats policy" and to the use of bilateral agreements to play some EU countries against others.

- Change the architecture of Energy Security with the increase in size of oil and gas strategic reserves, coordinate EU countries policies, review the mechanisms of utilization, coordinate policies to defend consuming countries interests vis a vis the volatility and overcome disruptions in supply.
- Review EU storage policies: the current situation renders the EU vulnerable to shut-off's and it is important to expand EU storage capacity, increase cross-border links and understand that storage and transportation capacity provides a buffer to supply and demand shocks.
- Update EU electricity grids: EU electricity infrastructure is ageing, recent black-outs and power failures are an illustration of this; there are enormous opportunities to promote new investments and provide jobs with the modernization of EU electricity grids (smart grids).
- Reconfiguration of EU refineries to face the booming demand for diesel; diesel cars are 30% more efficient and the existing refining systems need to be updated; opportunity to promote investment and cooperation.
- Push for the Energy Conservation Policies in order to consolidate changes in consumers behaviour induced by the economic and financial crisis; the support of renewables and clean technologies should not be disregarded avoiding the mistake that followed the second oil shock.
- Energy as a potential engine for growth: avoid "business as usual" policy because unregulated free markets and private capital will not solve the needs for decarbonization of the economy and the minimization of the climatic threat; energy may act as an economic driver with public policies, investment and fiscal incentives to promote a low carbon society and more efficient use of energy and innovative technologies. Taking into account the greatest challenges of the XXI century the bid on the economy of energy is a good strategic choice.[9]

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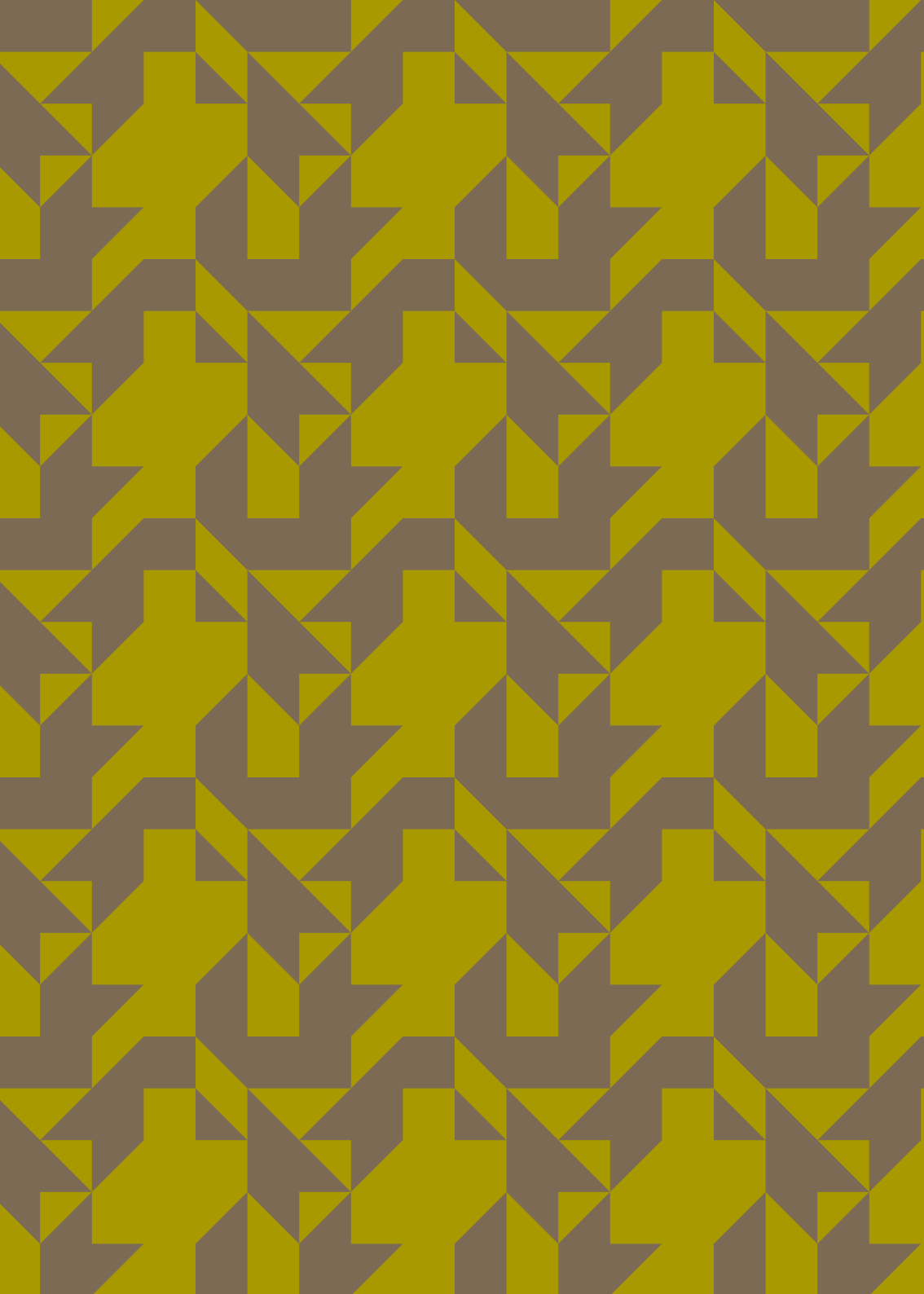
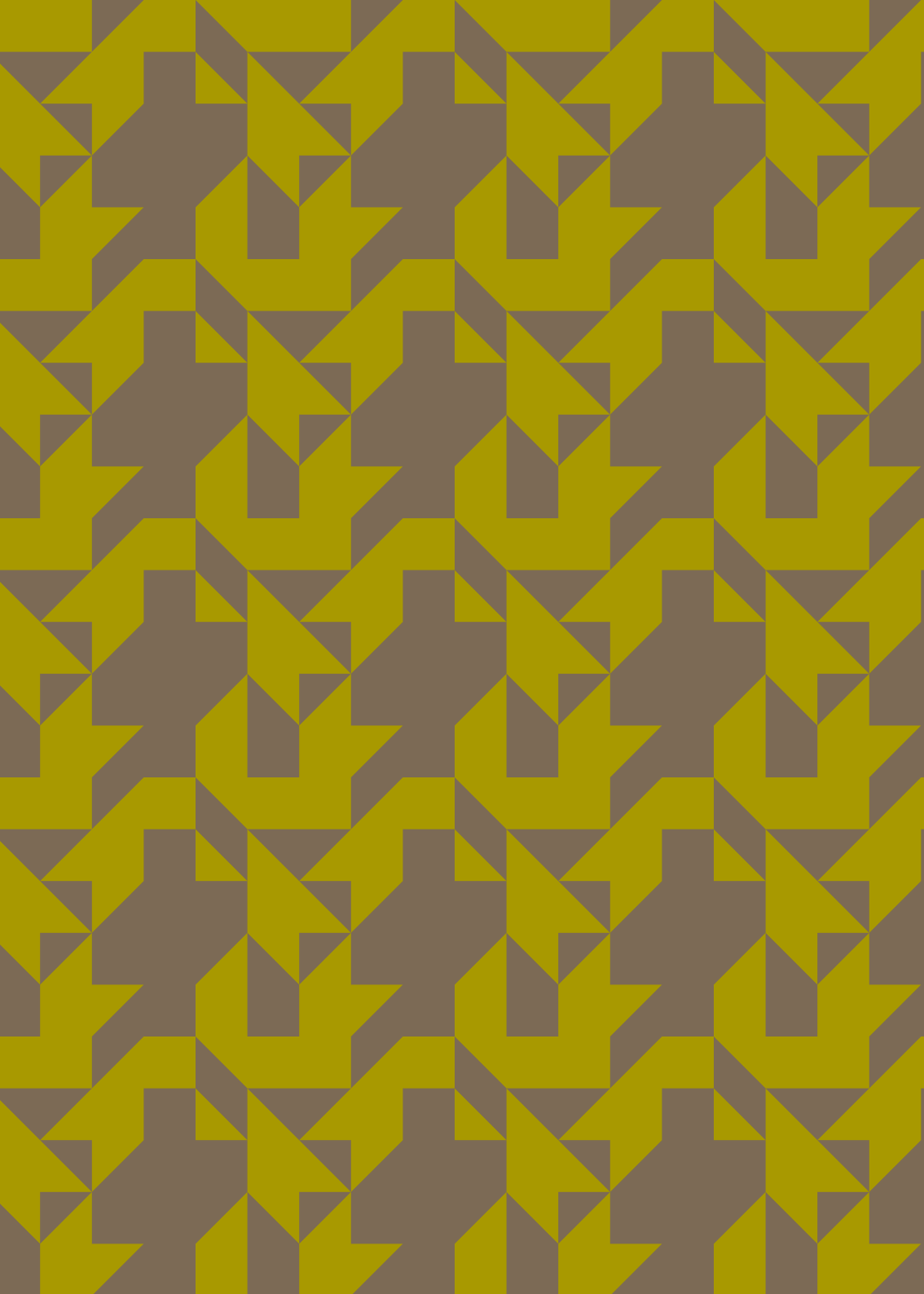
[9] - António Costa Silva, "Europe and Russia: How the Energy Partnership can Work?", "Bureau of European Policy Advisers – Monthly Briefing", UE, Brussels, December 2008



JOY KIM

United Nations Environment Programme

Programa das Nações Unidas para o Ambiente



HOW TWO PER CENT OF GLOBAL GDP CAN TRIGGER GREENER, SMARTER GROWTH WHILE FIGHTING POVERTY

Investing two per cent of global GDP into ten key sectors can kick-start a transition towards a low carbon, resource efficient Green Economy a new report launched today says.

The sum, currently amounting to an average of around $1.3 trillion a year and backed by forward-looking national and international policies, would grow the global economy at around the same rate if not higher than those forecast, under current economic models.

But without rising risks, shocks, scarcities and crises increasingly inherent in the existing, resource-depleting, high carbon 'brown' economy, says the study. As such, it comprehensively challenges the myth of a trade off between environmental investments and economic growth and instead points to a current "*gross misallocation of capital*".

The report sees a Green Economy as not only relevant to more developed economies but as a key catalyst for growth and poverty eradication in developing ones too, where in some cases close to 90 per cent of the GDP of the poor is linked to nature or natural capital such as forests and freshwaters.

It cites India, where over 80 per cent of the $8 billion National Rural Employment Guarantee Act, which underwrites at least 100 days of paid work for rural households, is invested in water conservation, irrigation and land development.

This has generated three billion working days-worth of employment benefiting close to 60 million households.

Two per cent of the combined GDP of Cambodia, Indonesia, the Philippines and Vietnam is currently lost as a result of water-borne diseases due to inadequate sanitation.

Policies that re-direct over a tenth of a per cent of global GDP per year can assist in not only addressing the sanitation challenge but conserve freshwater by reducing water demand by a fifth by 2050 compared to projected trends.

The report has modeled the outcomes of policies that redirect around $1.3 trillion a year into green investments and across ten key sectors — roughly equivalent to two per cent of global GDP. To place this amount in perspective, it is less than one-tenth of the total annual investment in physical capital.

Currently, the world spends between one and two per cent of global GDP on a range of subsidies that often perpetuate unsustainable resources use in areas such as fossil fuels, agriculture, including pesticide subsidies, water and fisheries.

Many of these are contributing to environmental damage and inefficiencies in the global economy, and phasing them down or phasing them out would generate multiple benefits while freeing up resources to finance a Green Economy transition.

INCOMES AND EMPLOYMENT

In addition to higher growth, an overall transition to a Green Economy would realize per capita incomes higher than under current economic models, while reducing the ecological footprint by nearly 50 per cent in 2050, as compared to business as usual.

The Green Economy report acknowledges that in the short-term, job losses in some sectors — fisheries for example — are inevitable if they are to transition towards sustainability.

Investment, in some cases funded from cuts in harmful subsidies, will be required to reskill and re-train some sections of the global workforce to ensure a

fair and socially acceptable transition. The report makes the case that over time the number of "new and decent jobs created" in sectors – ranging from renewable energies to more sustainable agriculture – will however offset those lost from the former "brown economy".

For example, investing about one and a quarter per cent of global GDP each year in energy efficiency and renewable energies could cut global primary energy demand by nine per cent in 2020 and close to 40 per cent by 2050, it says.

- Employment levels in the energy sector would be one-fifth higher than under a business as usual scenario as renewable energies take close to 30 per cent of the share of primary global energy demand by mid century.
- Savings on capital and fuel costs in power generation would under a Green Economy scenario, be on average $760 billion a year between 2010 and 2050.

The report, *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, also highlights enormous opportunities for decoupling waste generation from GDP growth, including in recovery and recycling.

- The Republic of Korea has, through a policy of Extended Producer Responsibility, enforced regulations on products such as batteries and tyres to packaging like glass and paper, triggering a 14 per cent increase in recycling rates and an economic benefit of $1.6 billion.
- Brazil's recycling already generates returns of $2 billion a year, while avoiding 10 million tones of greenhouse gas emissions; a fully recycling economy there would be worth 0.3 per cent of GDP.

The report, compiled by the UN Environment Programme (UNEP), in collaboration with economists and experts worldwide, takes meeting and sustaining the UN's Millennium Development Goals – ranging from halving the proportion of people in hunger to halving the proportion without access to safe drinking water – as one aim.

Bringing down emissions of greenhouse gases to the much safer levels of 450 parts per million by 2050 is another overarching target.

The findings were presented today to environment ministers from over 100 countries at the opening of the UNEP Governing Council/Global Ministerial Environment Forum.

The report, part of a bigger macro-economic study published online, is aimed at accelerating sustainable development and forms part of UNEP's contribution to the preparation of the Rio+20 conference scheduled in Brazil next year.

The full report is available online from today and countries are encouraged to submit further Green Economy examples. Over the coming months UNEP's Green Economy team plans to present the report in capitals around the world.

Here they also want to learn firsthand how best to assist countries and communities commence a transition to a Green Economy within their national circumstances.

Achim Steiner, UN Under-Secretary General and UNEP Executive Director, said: "*The world is again on the Road to Rio, but in a world very different to the one of the Rio Earth Summit of 1992.*"

"*Rio 2012 comes against a backdrop of rapidly diminishing natural resources and accelerating environmental change – from the loss of coral reefs and forests to the rising scarcity of productive land; from the urgent need to feed and fuel economies and the likely impacts of unchecked climate change,*" he added.

"*The Green Economy as documented and illustrated in UNEP's report offers a focused and pragmatic assessment of how countries, communities and corporations have begun to make a transition towards a more sustainable pattern of consumption and production. It is rooted in the sustainability principles agreed at Rio in 1992, while recognizing that the fundamental signals driving our economies must evolve in terms of public policy and market responses,*" he said.

"*We must move beyond the polarities of the past, such as development versus environment, state versus market, and North versus South*," said Mr. Steiner.

"*With 2.5 billion people living on less than $2 a day and with more than two billion people being added to the global population by 2050, it is clear that we must continue to develop and grow our economies. But this development cannot come at the expense of the very life support systems on land, in the oceans or in our atmosphere that sustain our economies, and thus, the lives of each and everyone of us,*" he added.

"*The Green Economy provides a vital part of the answer of how to keep humanity's ecological footprint within planetary boundaries. It aims to link the environmental imperatives for changing course to economic and social outcomes – in particular economic development, jobs and equity,*" said Mr. Steiner.

Pavan Sukhdev, on secondment from Deutsche Bank and head of UNEP's Green Economy Initiative, said: "*Governments have a central role in changing laws and policies, and in investing public money in public wealth to make the transition possible. By doing so, they can also unleash the trillions of dollars of private capital in favour of a Green Economy.*"

"*Misallocation of capital is at the centre of the world's current dilemmas and there are fast actions that can be taken starting literally today – from phasing down and phasing out the over $600 billion in global fossil fuel subsidizes to re-directing the more than $20 billion subsidies perversely rewarding those involved in unsustainable fisheries,*" he said.

"*A Green Economy is not about stifling growth and prosperity, it is about reconnecting with what is real wealth; re-investing in rather than just mining natural capital; and, favouring the many over the few. It is also about a global economy that recognizes the intergenerational responsibility of nations to hand over a healthy, functioning and productive planet to the young people of today and those yet to be born,*" added Mr. Sukhdev.

NOTES TO EDITORS:

Key Findings and Some Key Sectors

UNEP defines a Green Economy as "*one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities*".

A big part of that transition involves policies and investments that decouple growth from the current intensive consumption of materials and energy use.

While there has been some decoupling over the past 30 years, the gains have been far too modest to put the planet on a sustainable path and conserve finite resources.

Pivotal Policy Role of Governments

Innovative and imaginative public policies will be vital to generate enabling conditions that, in turn, can unleash markets and direct private sector investments into a Green Economic transition.

These include:

- Sound regulatory frameworks, a prioritizing of government spending and procurement in areas that stimulate green economic sectors and limits on spending that deplete natural capital.
- Taxation and smart market mechanisms that shift consumer spending and promote green innovation.
- Public investments in capacity building and training, alongside a strengthening of international governance.

Public policy can also ensure that the benefits of greening one sector can trigger wider sustainability benefits across others.

- Overall, the report suggests that the lion's share of the proposed two per cent of global GDP will need to come from private capital, primed by more modest amounts from the public purse.

From Fisheries to Buildings: Ten Key Sectors Underpin a Green Economy

The ten sectors identified in the report as key to greening the global economy are: agriculture, buildings, energy supply, fisheries, forestry, industry including energy efficiency, tourism, transport, waste management and water.

Of the two per cent of GDP proposed in the report, the sums invested by sector at current levels of GDP would be:

- $108 billion for greening agriculture, including on small-holder farms.
- $134 billion in greening the building sector by improving energy efficiency.
- Over $360 billion in greening energy supply.
- Close to $110 billion for greening fisheries, including reducing the capacity of the world's fleets.
- $15 billion in greening forestry with important knock-on benefits for combating climate change.
- Over $75 billion in greening industry, including manufacturing.
- Close to $135 billion on greening the tourism sector.
- Over $190 billion on greening transport.
- Nearly $110 billion on waste, including recycling.
- A similar amount on the water sector, including addressing sanitation.

SOME SECTORAL HIGHLIGHTS

Agriculture

A Green Economy would invest $100 billion, up to $300 billion a year until 2050, in agriculture in order to feed nine billion people, while promoting better soil fertility management and sustainable water use to improve biological plant management.

- Scenarios indicate an increase in global yields for major crops by 10 per cent over current investment strategies.
- Equal to raising and sustaining nutrition levels to 2,800-3,000 kilocalories available per person by 2030.

- Food waste globally is translating into 2,600 kilocalories per person per day; therefore, a transition to a Green Economy needs to address these challenges, which link to several of the sectors concerned.

Buildings

The building sector is the single largest contributor to global greenhouse gas emissions,with one-third of global end-energy use taking place in offices and homes.

The construction sector is responsible for more than a third of global material resource consumption, including 12 per cent of all freshwater use.

Based on an IPCC scenario, the climate footprint of the building sector is projected to nearly double to 15.6 billion tones of carbon dioxide equivalent by 2030, or 30 per cent of total energy related Co_2.

- A combination of applying existing technologies and growth in renewable energy supply under the Green Economy scenarios could dramatically reduce emissions at a saving equal to $35 per tonne of Co_2.
- With the right government policies, energy savings of around one-third could be achieved worldwide in the building sector by 2050 for an annual investment of $300 billion to one trillion dollars.

Fisheries

Subsidies estimated at around $27 billion a year have generated excess fishing capacity by a factor of two relative to the ability of fish to reproduce.

The report suggests that investing in strengthened fisheries management, including the establishment of Marine Protected Areas and the decommissioning and reduction of fleet capacity, as well as retraining, can rebuild the planet's fish resources.

- Such an investment backed by policy measures will result in an increase in catches from the current 80 million tones to 90 million tones in 2050, although between now and 2020 there would initially be a fall.

"The present value of benefits from greening the fishing sector is estimated to be three to five times the necessary investment," says the report.

- Jobs losses in the short to medium term can be minimized by focusing cuts in capacity on a small number of large-scale fishers over small-scale artisanal fleets.
- Jobs in fisheries are expected to grow again by 2050 as depleted stocks recover.

Forestry

Forests generate goods and services, which support the economic livelihoods of over one billion people, recycle nutrients vital for agriculture and harbour 80 per cent of landbased species.

Deforestation also currently accounts for close to 20 per cent of the world's greenhouse gas emissions.

"Reducing deforestation can therefore be a good investment: the climate regulation benefits of halving global deforestation alone have been estimated to exceed costs by a factor of three," says the study.

The report analyzes the contribution that $15 billion a year — or 0.03 per cent of global GDP — can make to greening this sector, including triggering greater investments in Reducing Emissions from Deforestation and Forest Degradation (REDD).

Such investments can also assist in scaling-up tried and tested market mechanisms, including certified timber and the certification of rainforest products to payment for ecosystems and community-based partnerships.

- Over the period 2011 to 2050, investment of $15 billion annually, or 0.03 per cent of GDP, would raise the value added in the forestry industry by more than 20 per cent, relative to business as usual.
- The report suggests that a transition to a Green Economy could increase forested land — currently close to 4 billion hectares — by over three per cent in 2020, eight per cent by 2030 and over 20 per cent by 2050, relative to business as usual.

Fast tracking such recommendations could make a key contribution to 2011 — designated as the UN's International Year of Forests.

Transport

The environmental and social costs of transport in terms of air pollution, traffic accidents and congestion can currently cost around 10 per cent of a region or country's GDP. Policies for greening transport range from those that shift journeys to public and nonmotorized transport to ones which boost fuel efficiency and cleaner vehicles.

In Europe, the analysis indicates that public transport investments yield regional economic benefits more than twice their cost.

Reducing the sulphur content of transportation fuels in Sub Saharan Africa could save up to nearly $1 billion a year in health and related costs.

- Investing 0.34 per cent of global GDP per year up to 2050 in the transport sector can reduce oil usage by as much as 80 per cent below business as usual— increasing employment by six per cent above business as usual, primarily in expanding public transport.

Waste

By 2050, the world is likely to be generating over 13 billion tonnes of municipal and other wastes: currently only 25 per cent of all waste is recovered or recycled.

- An investment of $108 billion a year in greening the waste sector could lead to near full recycling of electronic wastes, up from the current level of 15 per cent.
- Such an investment could also boost the overall waste recycling threefold by 2050 and cut the amounts going to landfill by over 85 per cent versus a business as usual scenario.

Between 20 per cent and 30 per cent of methane-related greenhouse gas emissions could be reduced by 2030 with associated financial savings.

Waste prevention and management also remains a key challenge for manufacturing, where approaches such as remanufacturing and redesign of products and processes can play a part in reducing waste and resource use.

- If the life of all manufactured products was extended by 10 per cent, for example, the volume of resources extracted could be cut by a similar amount.
- The recycling of heat waste through combined heat and power (CHP) installations presents high potential for more efficient energy use. The pulp and paper industry has CHP installations that allow savings of over 30 per cent of primary energy use.

Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers, and the full draft chapters, including the modeling and scenarios, will be available after 1pm Nairobi time (or 1000 GMT) on 21 February 2011 [at: www.unep.org and www.unep.org/greeneconomy]

The site will also showcase the current compilation of Green Economy case studies from countries and regions around the world.

The 26th session of UNEP's Governing Council/Global Ministerial Environment Forum can be found at: http://www.unep.org/gc/gc26

The UN Conference on Sustainable Development 2012 or Rio+20 website is at: http://www.uncsd2012.org/

The International Year of Forests 2011 is at: www.un.org/en/events/iyof2011/

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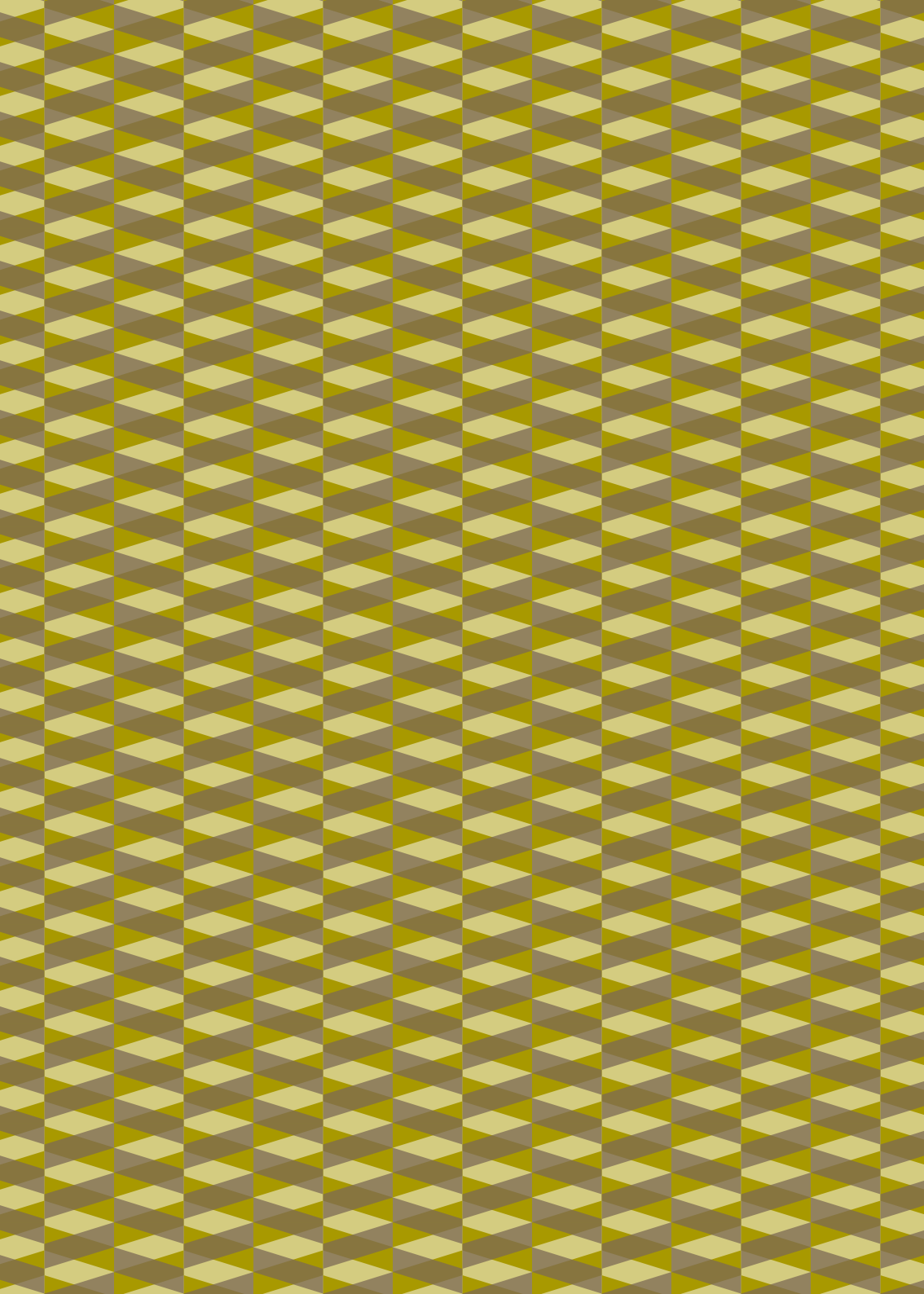


PETER VIS

Comissão Europeia

Thank you for the invitation.

Now I work in Brussels and my job is really to advocate the green economy in Brussels and in the policy-making spheres with a particular emphasis on climate change.

And of course Europe is undergoing an economic crises the like of which we haven't seen in the history of the European Union. In the situation we are in, in Brussels there are a lot of people who are worried about generating growth and jobs in this difficult economic context, and there is a feeling among some people that the advocates of a green economy are different, that the green economy is somehow a different species of economy from the real economy. They talk about helping the real economy. And I have to break that idea that the Green economy is something else, something out there that NGOs advocate, so it's trying to normalise the concept. It's not something radically different.

What it does essentially is emphasise some rather old-fashioned values such as saving, husbandry, careful management of resources, being economical, reusing, recycling, and those sorts of things. In fact they are a kind of old fashioned values... someone who comes to mind is Mrs Thatcher, she was Prime Minister from 1979, just after the IMF actually had gone into the UK in the 1970s to help the UK, and she was the daughter of some shopkeepers, and she used to repeat very often that the traditional values of shopkeepers were that you saved your money when times were good, you didn't over-borrow, you worked damned hard of course, and I feel that those older values are actually quite compatible with green economy values. We need however new mind sets, new inventiveness because technologies have changed.

We need to think about things that haven't necessarily been thought of before like pricing pollution. I mean in Dublin when I was a kid, water was free. It rains a lot in Ireland, but water was free, and that is just a misallocation of resources, because it wasn't really free.

And gradually I think policy making has to start pricing things properly. And we have to think of new ways of doing things. I'll give you some examples during my talk, but I think one of the key messages is that the Green Economy doesn't need different solutions to what they call the real economy, the normal economy. In actual fact, the same structural reforms that are being advocated now in Europe, such as labour market flexibility, manageable debt levels, those are needed in the case of a green economy too. So they've got to be done as well.

Let me give an example though. I want to portray the green economy as something we've already got a lot of. My own case is I've owned my house for about 18 years. Since 1994 when I bought it I've reduced my gas consumption by 47%. I keep a record of these things; I'm sorry, but...

The guys who I got to put insulation in my roof were just normal builders. One day they were putting insulation in my roof and the next day they were building new walls, new houses. They didn't think of themselves as having green jobs they just thought of themselves as builders.

Another example is when I got the boiler changed, the central heating boiler. It was just the central heating plumber. He also fixes my toilet when it gets blocked, and so on.

And I think we've got to try to conceive of the economy as having a green component and then trying to expand it. And we are doing that in policy making terms in Brussels and the word we use is mainstreaming. Now when I say to you Europe, people think of the Common Agricultural Policy, Cohesion Policy, the EU Budget, it might be Energy Policy or Industry, but in all of these policy areas

we're trying to mainstream climate concerns, or environmental concerns, into those other policies. And that is our method of trying to green the economy. If we can make the Transport Commissioner greener or the Energy Commissioner greener we are getting them to reach the green economy. So that mainstreaming is the method we use.

And there is, I will say, an inbuilt conservatism in policy makers everywhere, in Brussels and in national capitals, because the people who have run the Common Agricultural Policy for the last 50 years, because it is 50 years old now, they haven't been used to thinking about climate, so we have got to change and educate and convince and persuade. And we're trying to do that. For example, in the new EU Budget that will start in 2014 we are imposing, the direct payments that farmers get from Europe, 30% of those direct payments will be conditional. Farmers will only get them if they do things which we want them to do and which are good for climate, such as preserve their grasslands, or diversify their crops or set aside some land for ecological... just leaving it to develop as it would do. Those conditions are then built into the Common Agricultural Policy and the direct payments that farmers get, and then the farmers start doing it. We are trying to do that and to show them that it actually also enhances the long-term viability of farming.

So we're trying to eliminate this inertia. And I'll give you another example of inertia. It's, we're all like that. Human nature has that. In the UK they discovered that the reason people didn't insulate their roof space was very often because their attic was full of old stuff and they didn't want to empty their attic. I can identify with that. My roof space is like that too. So the UK tried to overcome that by offering to clean people's attics for free and then they were prepared, and in fact the buy-in to insulation was much, much better, so it was overcoming inertia.

And another powerful instrument that has been used in the UK to overcome inertia is to tell people how much energy the neighbours use. And funnily enough when the data for a street was posted in all the letter boxes, you know this street has an average electricity and gas consumption of this much per household, people wanted to beat that, there was that competitive instinct in mankind that said '*hey! I can do better than that*', and they wanted to. And so these are sometimes new ways of thinking about very old problems.

OK. I want to just make a parallel between the climate problem that we've got and the euro crisis, because I think that's topical, the euro crisis and the economic crisis are at the forefront of everybody's mind. And I just want to say that I think there are some parallels that we should bear in mind.

The Euro crisis built up over several years, many years perhaps, opportunities for structural reforms were missed when the times were good, before the trouble started, now it's an imperative, we could have done it under less pressure before, but there's an inclination not to do it if you can avoid it. I think also in the Euro crisis we're understanding that we're all in it together, solidarity is a prerequisite, that's very much the case for the climate system as well, we're all in it together. And I think, as has been said by the previous speaker, that we can't just try and get over this crisis and get back to the way we were doing it before the crisis arrived, or we will get into the same troubles again. We can't revert to how it used to be, and that is true also for the climate in that when economic growth comes again we must make sure that our emissions do not rise as quickly as our GDP rises, we must do things differently.

I think one of the good stories that I tell in Brussels is that this green economy is also an economy full of opportunities, we've heard a bit about the opportunities, the green jobs that exist, and I emphasise they exist in every sector, the building sectors, but all of those sectors of the economy that are covered by the Greenhouse Gas Emissions Trading System which we have in Europe, where the

pollution has to be paid for. Every auto producer who wants to sell cars in the European Union has to comply now with CO_2 standards, every bio-fuel producer has to comply with sustainability criteria, so my contention is that the green economy is already there but we want to expand it. And I think we can do that using all the possibilities that we will have in the future using information and technology applications to better manage our energy and transport systems, to use technologies — solar, heat exchangers, geothermal.

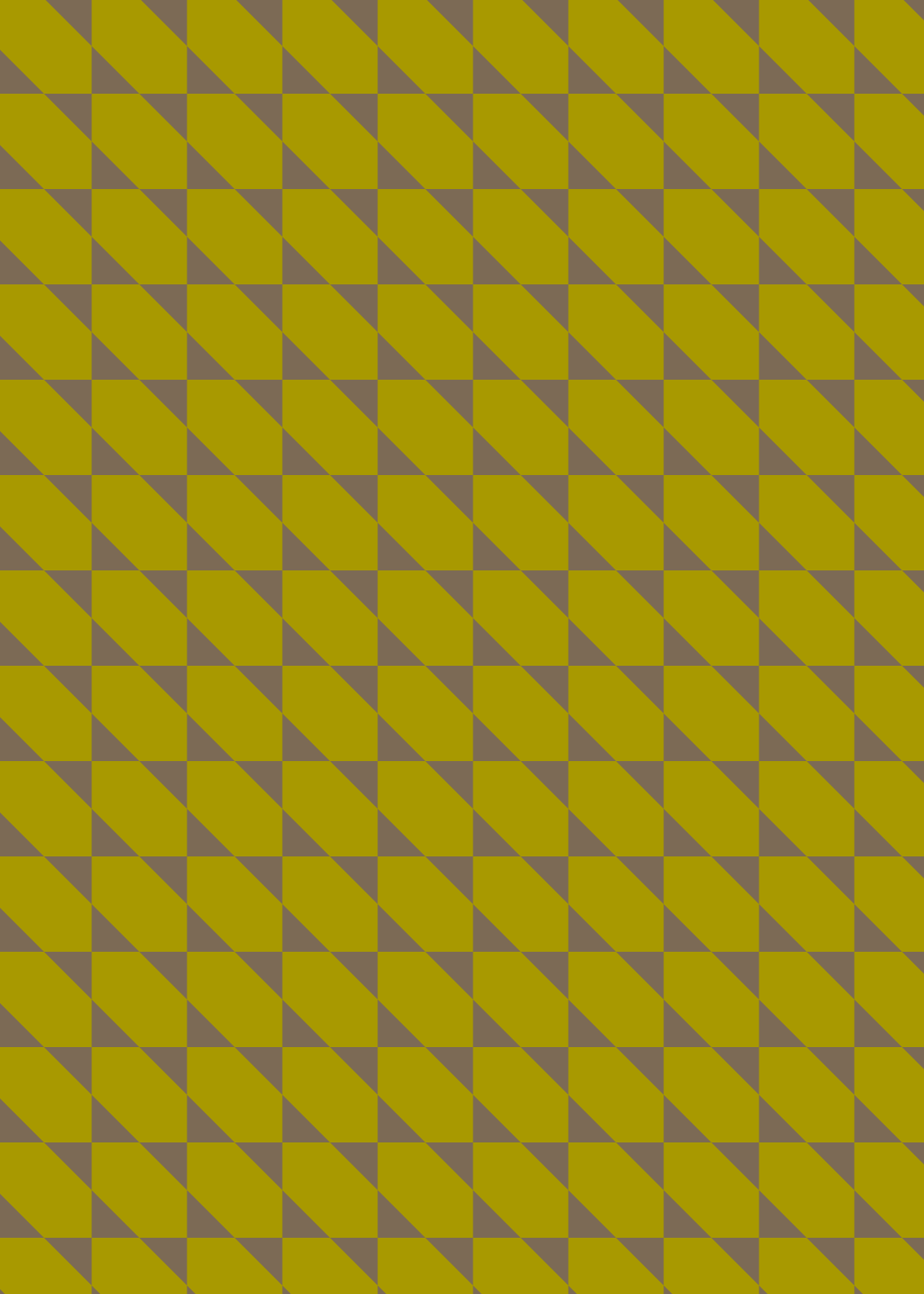
And just to give an example, today in Copenhagen there is a very big, there is an annual Wind Conference that takes place over a number of days, but it's going on today. Just for your information, wind energy has an average annual market growth rate over the last 17 years of 15%, we dream of growth rates like that, there are some sectors which are still thriving and in 2011 it actually grew 21%, and that was in the depths of the recession, so there are some sectors that are growing and they tend to be largely also in the green sectors, if you like. And then remember, we were hearing the numbers of imports that were made in 2011 in Portugal, for the EU as a whole the total trade deficit of the EU is about 150 billion Euros, and the same year, 2011, we paid 315 billion for oil imports, so we pay more than double. Our trade deficit in energy, so in fact energy is the thing that we are really in deficit over. And that money, the oil imports, represent money outputs, outflows, and only a small share of that outflow comes back. Isn't it better to husband our own resources so that we can consume less energy and indeed produce more of it ourselves through indigenous renewable energy?

What can policy makers do? Well, we can do some tax shifting because nowadays all of us have to increase revenues, decrease expenditures, but we have to do this in a smart way. So by tax shifting away from labour towards pollution, that is an opportunity that we must take and as policy makers we try to help it happen. And the Greenhouse Gas Emissions Trading Scheme is one way where we make the polluters pay, and we're making them pay in an increasing number

of sectors. You probably have read in the newspapers the aviation industry is protesting, especially in the third countries, they're protesting very loudly that they are being included into the scheme. But let's face it the people taking the aeroplane from China to Europe, from Latin America or North America to Europe are not those poorest segments of the population, and these are very modest charges, but we think the aviation sector should be paying its way like other major sectors of the economy.

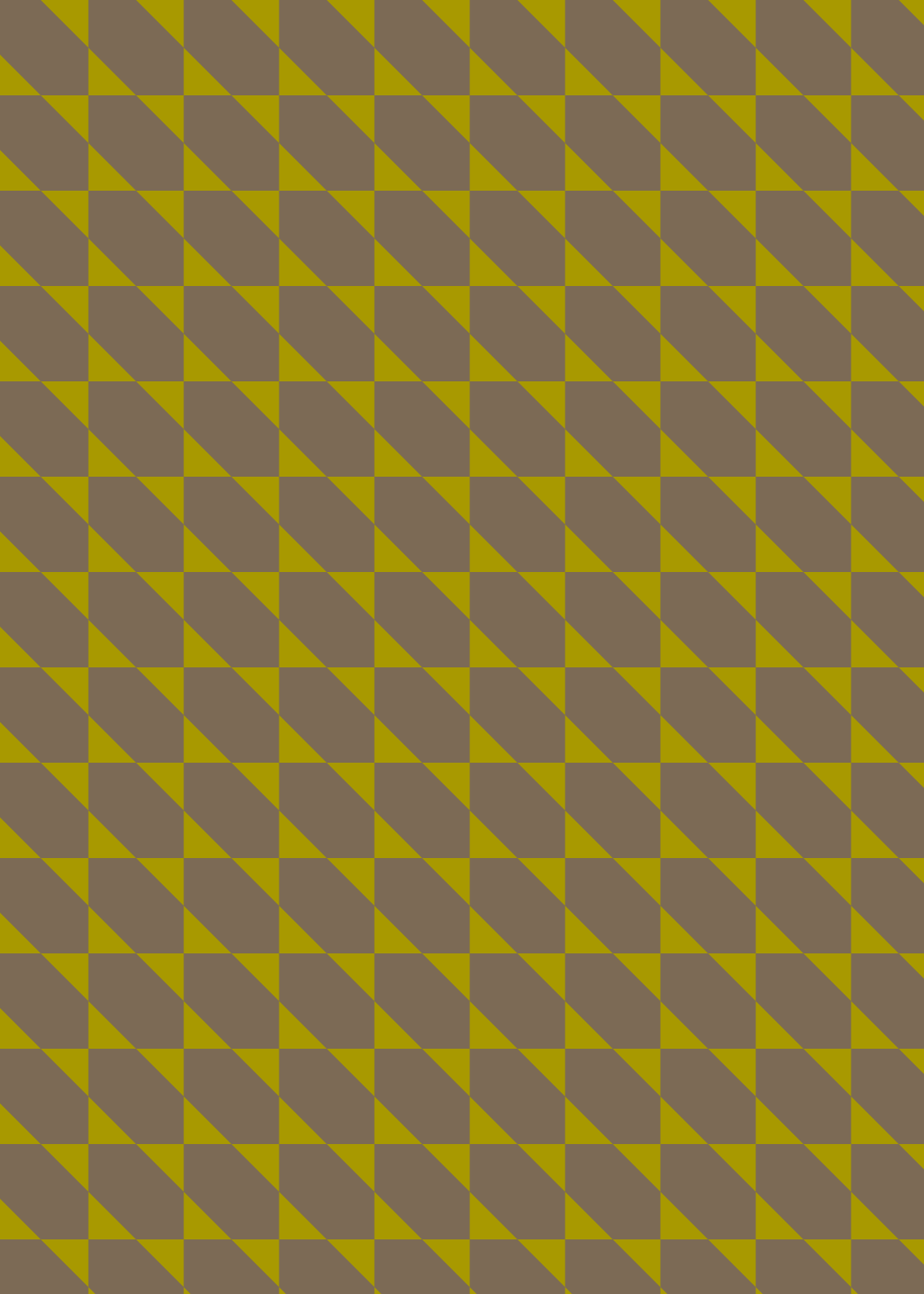
We try to provide more information through labelling, for example at the European level we require labels on the fridges, labels on your cars, the CO_2 performance of cars, so that the consumers can decide better. We try to ensure greater predictability for businesses by setting targets to 2020, and we hope beyond that very soon. We sometimes set mandatory standards. We have done so for cars, we have done so for bio-fuels we have done so for other industries in Brussels, because then people look up and say 'oh, is there something in it for me', and if we can convince them there is we can get them to change their behaviour.

Thank you very much.



CARLOS PIMENTA

Coordenador da área da Sustentabilidade, PCS



One last note of optimism.

There are several cities in Portugal that have joined the Covenant of Mayors and there are some well prepared strategies. I know some of them, from different political backgrounds, that represent the spectrum represented in the Portuguese Parliament. Knowing about them makes me believe that more than the party politics, it is often the determination of the public that prevails.

I would like to give an example of a strategy I know particularly well, and in fact it comes from someone who taught me a lot about energy, Professor Oliveira Fernandes, chairman of the Porto Energy Agency. The city of Porto has a strategy up to the year 2020 that aims to reduce CO_2 emission by half that, as with other Portuguese cities, it will achieve in different ways.

One of the examples of the strategy used is due to changing the water distribution system, once again using the old force of gravity and not just pumping. Another example is related to mobility: public transport, private transport and using the inter-mobility between them. Other examples have to do with urban recovery, insulating roofs and buildings in recovering the old traditional parts of Porto, in much need of recovery, introducing the element of sustainability, etc.

Using a range of measures, all typified, identified and that have their players, measures that are the initiative of city councils, citizens themselves, local departments or companies, that is, many stakeholders, then certainly reducing CO_2 emissions to half will become an enormous saving in terms of running the city, the economy of the city and the economy of the families in the city.

What is usually said is that the problem in Portugal, whether it is water, or energy, or the use of resources, is that the bucket has a hole in it and so there is no point killing ourselves in discussing how to fill the bucket, if the hole remains in it. And indeed, the bucket has a hole in it in many of these sectors.

In dealing with these issues it is important to emphasise that an environmental and green economy policy is a policy for the future, it is a policy that creates jobs. We should also be sure that, and in fact this was already demonstrated by the three speakers and shown on the slides of Professor Richard Müller, from Berkeley, the planet and the atmosphere are in a state of systemic pre-breakdown. This does not mean that the world will come to an end. It means rather that it will continue, although it will be different. We should remember that we have never had so many people living in such sensitive zones that will be so radically affected by systemic changes to climate systems, ocean currents, among other things.

To round off, I should say that the human cost, should we continue with the same model as before, will be overwhelmingly high and that, as Professor Krugman said in one of the articles he wrote in the New York Times, only by applying prevention is it worth investing in a new economy, in a new green economy.

Thank you very much.

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