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# Human nature again st Mother Nature

Lately, Mother Nature seems to be trying to get our attention. Its signals are increasingly loud, strident and hard to miss. Some have been lethal. 2015 is poised to become the hottest year on record. Last October, Hurricane Patricia, the strongest ever recorded by meteorologists, produced record winds that reached 200 miles per hour. Average temperatures in the Arctic have been increasing twice as fast as temperatures in the rest of the planet. This contributes to the thawing of the ice-covered polar surface. Every 10 years, this ice cover shrinks by 9%. Scientists expect that polar thawing will raise sea levels to such a point that the populations of many highly urbanized coastal areas will be forced to move to higher ground. According to the U.N., the number of current storms, floods and heat waves is five times greater than it was in 1970. Although this increase must be partially attributed to the fact that we now have better data than half a century ago, all studies point to a heightened frequency of extreme weather phenomena: abnormally high or low temperatures, torrential rains, mud slides, prolonged droughts and fiercer forest fires. The number of displaced persons due to climate change is now greater than ever before and higher than the number of persons displaced due to armed conflict.

## WHY HAS PROGRESS BEEN SO DIFFICULT?

After decades of intense debates, an overwhelming majority of scientists agree that these changes in the earth's climate are caused by the increase in the emissions of certain gases (especially carbon dioxide or CO<sub>2</sub>) produced by human activities. There is still some residual skepticism. Some of it results from honest and healthy disagreements among experts, but unfortunately there are also plenty of biased “scientific studies” financed by corporations and other parties that benefit from the current patterns of energy production and consumption and fight any reforms bound to affect their interests. Despite the increasingly clear signals that the earth's climate is changing, humanity has hitherto been unable to effectively alter its current disastrous path towards a warmer planet. This lack of effective action is due not

just to the manipulation of corporations and countries that push their worn fossil-fuel oriented agendas at the expense of the common good. It is also due to human nature. Humans have a hard time changing habits and routines. Research on weight-loss diets shows that the great majority of those who start dieting abandon the effort before accomplishing their goals. Or gain back the weight they lost as slowly but surely they return to the old eating habits. Tobacco smokers know how difficult it is to break the nicotine addiction. We also know that a health scare is the surest way to change behavior and drop unhealthy life styles. Surviving a heart attack, for example, does wonders to make people stop smoking, eat more healthy foods and exercise more often.

## BEFORE PERMANENT DAMAGE OCCURS

Is it possible, therefore, to assume that we will need a large-scale climate accident in order to change the ways we treat our planet? So far, it looks that way. Despite the growing stridency of climate events and the wealth of scientific data backing the worrisome trends, the messaging from Mother Nature has not yet been sufficient to induce the changes in human activity needed to curb CO<sub>2</sub> emissions. Therefore, unless path-breaking decisions are taken soon, it is not unreasonable to assume that the world is likely to suffer an unprecedented and painful weather-related event that may finally induce humanity to go on the low-carbon diet we have been avoiding. The carbon addiction rampant in today's world may well be more difficult to break than an individual's addiction to tobacco, sugar or alcohol. The way we light, heat and cool our homes and offices, our means of transportation, the way our cities are built or the products we consume—from plastics to hamburgers—require a high consumption of carbon that, once fed into the atmosphere as CO<sub>2</sub>, contributes to global warming and climate chaos. And this will need to change. The first and most obvious reason why shedding the world's carbon addiction has proven so difficult is that this has to be a collective and multi-national effort sustained in perpetuity. If sticking to a diet is difficult for a person, it is

far more so for countries, especially if they are expected to act in concert with others who are also supposed to follow the diet. Some countries will cheat. Others will demand that the diet of the rich and fat be more stringent than that of the poor and slim. Others will ask that the more onerous low-carbon diet be forced on the countries that have been polluting the planet and its atmosphere since the industrial revolutions and allow developing nations like China and India, to go on a much lighter diet given that they began industrializing (and polluting) much later.

## INTERNATIONAL RESPONSIBILITY TO PROTECT THE PLANET

The United Nations' first climate change conference took place in Brazil in 1992 and the next one, COP21, will be held in Paris this December. Since the first gathering many others have taken place, but little progress has been made. The hope is that COP21 will conclude with more tangible and effective progress than previous such gatherings, in curbing more CO<sub>2</sub> emissions than ever before. This, of course, is welcome news. But celebrating the potentially positive achievements of the Paris meeting also shows how complacent and even minimalist our ambitions have become. It turns out that success has been defined down and that the agreements that will hopefully be reached in Paris, while welcome, will not reach the goal of stopping average global warming from rising 2°C above pre-industrial levels. Thus, human inertia will keep challenging Mother Nature without apparent concern for the fact that nature always wins. In the past, humanity has always been able to avoid and adapt to situations where Mother Nature threatened human life. This was greatly helped by the human capacity to imagine the future and act to avoid the most negative consequences. But curbing global warming is the biggest challenge humanity has ever faced, and so far it has shown little adaptability or foresight. To be fair, however, some progress is being made. According to the REN21 report produced by a group of 154 countries, by the end of 2014 the percentage of global consumption of clean, renewable energy such as solar, wind or biofuels had already reached 20% of the total and the prevailing trend is to accelerate the reliance on

renewables. More dramatically, atomic fusion, after a long period of research and false starts, seems to be on the verge of major breakthroughs that would enable commercial plants to be available by 2050, providing practically inexhaustible sources of clean energy. Steven Prager, head of the Princeton Plasma Physics laboratory, calls this development “inevitable,” while scientists at the Marx Planck Institute seem similarly bullish about this possibility.

## BILL GATES' FORWARD-LOOKING SUGGESTIONS

If fear is a powerful motivating human factor, another strong one is provided by material incentives. More governments and even private institutions and individuals are now providing strong financial incentives for humans to develop cleaner sources of energy in the quickest possible manner. In a recent interview, Bill Gates spoke with a sense of urgency about the two essential components required to accelerate this drive. One is the carbon tax, which he calls the “pull” that would create lucrative incentives to develop clean alternatives to fossil fuels. The other is research and development, which he calls the “push” that could generate a quicker, more permanent solution to global warming. However, as already existing global warming is essentially irreversible, adaptation measures will have to be taken, at costs of some \$70 billion per year before a solution is finally found. Without a substantial carbon tax in place, Gates says, there is not enough of an incentive for innovators to invest in alternative, cleaner energy sources. And the recent drop in oil prices is also an inhibiting factor in the development of the more expensive to produce sources of cleaner energy. Bill Gates is calling for what feels like an almost miraculous effort to solve the problem of global warming. But launching this effort is not as impossible as creating a miracle. This almost-miracle will come about not by means of a victory of human nature over Mother Nature, but as a result of our collective realization that the survival of our species depends on how effectively we can heed nature's warnings.



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● Welcome to *Oil*, a publication of news and ideas for the energy community and beyond. It provides authoritative analysis of current trends in the world of energy, with particular attention to economic and geopolitical developments.  
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Exclusive/Laurent Fabius, French Foreign Minister and President of COP21



# Saving the planet

The environment and terrorism are two international emergencies requiring global cooperation, which will be necessary to restore confidence on both fronts

*«COP21 still has the obligation to mark a historic turning point»*

**T**he recent terrorist attack that shook the heart of Paris and the entire international community has disrupted the international political agenda, pushing the fight against ISIS to the top of the world's list of priorities. However, this event has not taken away the energy and hope directed toward another event that will take place in Paris: COP21. Laurent Fabius, in his double role as French Foreign Minister and President of the Climate Conference, confirmed this fact in this interview with *Oil*. Fabius naturally cannot help but reflect on the measures taken to deal with the threat of ISIS, but he emphasizes that an equally important part of restoring equilibrium to the globe will be a "strong" agreement to move the planet towards final liberation from the consequences of greenhouse gas emissions. →

by  
JEAN-MARIE  
COLOMBANI





**LAURENT FABIUS**  
France's Minister of Foreign Affairs and International Development (R), a position he has held since 2012. He was Prime Minister from 1984 to 1986. Previously he was Budget Minister from 1981 to 1983, Minister of Industry and Research from 1983 to 1984, and Minister for the Economy, Finance and Industry from 2000 to 2002. He served two terms as President of the National Assembly, from 1988 to 1992 and from 1997 to 2000.

**Minister, you said in Pretoria that the two major threats to the planet are terrorism and global warming. Let's start with the first: what chance of success does the French initiative have in aiming to create a large coalition?**

We must wage a relentless battle against ISIS. Discussions are currently underway with Presidents Obama and Putin, German Chancellor Merkel, British Prime Minister Cameron, Italian Prime Minister Renzi and the heads of other countries. A vast international union is emerging to eradicate the Islamic State. At the same time, we need to find a political solution to the Syrian conflict, which has consequences not only for the region but for the entire world. The plan recently adopted in Vienna, envisioning a political transition in Syria, is a first glimmer of hope.

**How can the resolution adopted and voted unanimously by the United Nations Security Council be interpreted?**

The measure voted on at the United Nations Headquarters was as hoped for by French President Hollande in his speech before the French parliamentarians gathered at a congress in Versailles a few days after the November 13 attacks. The speed and unanimity of the consensus expressed by the Security Council represents a strong gesture: the international community has demonstrated its determination to defeat terrorism and intensify the fight against ISIS and the groups linked to Al-Qaida. All states must now take concrete action in this fight, in terms of military action, seeking political solutions or countering the financing of terrorism, which is a key point. Solidarity and sympathy must be translated into proactive collaboration.

**As for Syria, are French and American positions converging to that of Vladimir Putin, or is it rather that the Russian President is a step ahead of Paris and Washington?**

When, at the beginning of September, President Putin proposed a large international coalition against terrorism, France welcomed the idea, but only as long as the Russian bombings were focused on ISIS. I myself had submitted this message to the Security Council during the General Assembly of the United Nations. At first we noticed that the Russian bombings in Syria were mainly aimed at moderates who oppose Bashar al-Assad. Following the attacks in the Sinai and Paris, it seems that Russia's attitude has changed, and that the bombings are now focused on ISIS. To build a large coalition against ISIS, we must act in unison.

**The French government decided not to cancel COP21, which has faded slightly into the**

**background. Are you confident of a successful outcome of the conference?**

The reasonable consternation caused by the Paris attacks must not allow us to lose sight of COP21, given that the stakes for the planet are very high. The Conference opens on November 30 with a summit that will bring together approximately 140 heads of state and government from around the world in order to drive the fight against climate change at the highest level. There is widespread and committed political will to reach an ambitious agreement. The commitment, not only of the states, but also of local communities, companies, investors and the entire civil society, has never been so deep. There is still work to be done in Paris to reconcile the 196 parties, but success is crucial.

**Will this Conference really be able to change our models of growth?**

The agreement that we want to reach in Paris is not a simple declaration of good intentions: it needs to contain legally binding provisions that will have real consequences for our models of development and lifestyles. Of course, COP21 in Paris cannot suddenly solve all problems, but it still has the obligation to mark a historic turning point. The Conference must create the conditions for a gradual transition from a carbon-based world economy to a carbon-free economy.

**What do you expect from the relationship with Italy in dealing with the two threats we have discussed?**

With Italy, we share the same analysis of threats looming over Europe. Italy gives its support to the actions of the international anti-ISIS coalition in Iraq, in which France is also involved. Rome also plays an essential role in creating a national unity government in Libya. As for the fight against global warming, Italy is a key partner: when it served the role of presidency of the Council of the European Union in 2014, it helped to define some of the ambitious goals of the Union in terms of international negotiations ahead of COP21. Italy remains actively committed to enabling a rapid implementation of the commitments made. Confronted by the great challenges of the 21st century, France and Italy are therefore two active and supportive allies.



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**THE AUTHOR**  
Jean-Marie Colombani, a journalist and essayist, was director of the French daily Le Monde from 1994 to 2007. He founded JMC Média and was the creator and chairman of the information website [www.slate.fr](http://www.slate.fr). He has written for the magazines Challenges and L'Express and taken part in the program "La rumeur du monde," broadcast on France Culture. He has also written editorials for a number of foreign newspapers.

## ENERGY REVOLUTION/The historic declaration



# We commit ourselves

Ten energy companies gathered in OGCI, the Oil & Gas Climate Initiative, launched their personal "call to action" against climate change. The words of President Gérard Moutet

**W**e know that energy is a complex global issue, and there is no single solution that will resolve the fight against climate change while also supplying sufficient affordable energy to support the development of the world's growing population. The climate science is clear: the world must reduce net greenhouse gas (GHG) emissions substantially in order to have a chance of limiting the rise in global temperature to two degrees centigrade compared to pre-in-

by **GÉRARD MOUTET**



**THE AUTHOR.** He is Vice President Climate-Energy for the Total group, in charge of the GHG and Energy efficiency related subjects. He has 30 years of experience in the Oil and Gas industry, mainly in Exploration and Production, including geosciences, development, new business and general management. He has been working in France, Argentine, Norway, United Arab Emirate, and Egypt. Since 2006 he specialized in climate and energy related subjects. He is also strongly involved in the Oil & Gas Climate Initiative work and development, and has been elected chairman of the OGCI Executive Committee.



dustrial levels. Innovation, technology, collaboration, flexibility, behavioral change and adequate policies will be the key factors of success. The Oil and Gas Climate Initiative (OGCI) has been built to serve as a recognized and constructive voice of the Oil and Gas sector in this effort. OGCI aims to catalyze practical action on climate change through collaboration and the sharing of best practices. OGCI companies are committed to responding to this global challenge, and to be part of its solution. They are also committed to reporting regularly and consistently on progress. OGCI seeks synergies with existing initiatives and organizations, such as the International Petroleum Industry Environmental Conservation Association (IPIECA), the Global Gas Flaring Reduction Partnership (GGFR), and the Climate and Clean Air Coalition (CCAC), in order to build on, rather than duplicate, the work of others.

#### A COMBINED EFFORT TO INCREASE EFFECTIVENESS

What makes the OGCI initiative especially powerful is that it is an agile and business-focused organization led by the chief executives of its member companies, who together form the Steering Committee of the initiative. Member companies come from different geographical regions, and encompass both IOCs and NOCs. The current members are as follows: BG Group, BP, Eni, Pemex, Reliance, Repsol, Saudi Aramco, Shell, Statoil and Total. Combined, they produce

almost 27 million barrels of oil equivalent a day, or almost one fifth of global oil and gas production. Importantly, OGCI has a flexible and voluntary structure that allows individual member companies to collaborate on joint projects where they have shared interest. It also means companies are not obliged to participate in specific areas where their views on appropriate approaches differ greatly. For those reasons, OGCI is unique; it's a much-needed, action-oriented initiative that allows the Oil and Gas sector to be an active participant in the collective fight against climate change. OGCI is a quite recent initiative. It was established following discussions held during the January 2014 World Economic Forum annual meeting, initially between Eni, Saudi Aramco and Total, and was officially launched at the September 2014 UN Climate Summit.

#### AN IMPORTANT FIRST RESULT

OGCI marked a major milestone on October 16th when the CEOs of its member companies had an open discussion with key high-level external stakeholders and climate experts to explain the work of OGCI, engage in a dialog, and receive feedback. In a joint declaration released on the same day, the CEOs expressed their collective support for an effective climate change agreement to be reached at COP21 in Paris. They confirmed that the OGCI member companies recognize the general ambition to keep the rise in average global air temperatures below 2°C, while acknowledging that the ex-

# “ JOINT COLLABORATIVE DECLARATION

**A**s the international community heads into COP21, we, the member companies of the Oil and Gas Climate initiative (OGCI), who together provide nearly 10% of the world's energy, express our collective support for an effective global climate change agreement. We recognize the general ambition to limit global average temperature rise to 2°C, and that the existing trend of the world's net greenhouse gas (GHG) emissions is not consistent with this ambition. OGCI member companies have taken significant actions to reduce our GHG footprint. Over the past ten years, the collective GHG emissions from our operations have decreased by 20%. We have also made significant investments in natural gas, carbon capture and storage (CCS) and renewables, as well as low-GHG research and development (R&D), and innovation. These actions and contributions are the subject of our combined report that is issued today. Going forward, we will continue in our efforts to help lower the current global emissions trajectory. However, neither our contributions nor those of any one industrial sector alone will be enough to address the challenge of climate change; it can only be met by each part of society making an appropriate contribution. Governments face a dual challenge. The world needs more energy as populations and economies grow. Yet this energy has to be provided in a sustainable and affordable manner. For us as energy suppliers, and for energy consumers, the challenge is that meeting growing energy demand with lower emissions is likely to be more complex, at least in the short term. However, investment in gas, renewables and lower GHG technologies like CCS today will contribute greatly to reducing the cost and impact of climate change for future generations. It is our hope that COP21 will help to overcome these challenges and put us on a progressive pathway for addressing climate change. Governments set the conditions within which we produce and use

energy and have a critical role to play in creating clear stable policy frameworks that are consistent with a 2°C future. We will support the implementation of these frameworks because they will help our companies to take informed decisions and make effective and sustainable contributions to addressing climate change. Over the coming years, we will collectively strengthen our actions and investments to contribute to

#### EFFICIENCY



- Optimising our operations, both upstream and downstream, with a particular focus on energy efficiency
- Improving the end use efficiency of our fuels and other products to reduce their GHG footprint
- Working with automakers and consumers to improve the efficiency of road vehicles

#### NATURAL GAS



- Contributing to increasing the share of gas in the global energy mix
- Ensuring that the natural gas we provide for power generation results in significantly lower life cycle emissions than other fossil fuels
- Eliminating 'routine' flaring from our operations
- Reducing methane emissions from our operations

reducing the GHG intensity of the global energy mix. Our companies will collaborate in a number of areas with the aim of going beyond the sum of our individual efforts.

OGCI member companies will regularly and consistently report on our progress. Our shared ambition is for a 2°C future. It is a challenge for the whole of society. We are committed to playing our part.

**Helge Lund** (BG Group)  
**Bob Dudley** (BP)  
**Claudio Descalzi** (Eni)  
**Emilio Lozoya Austin** (Petróleos Mexicanos)  
**Mukesh Ambani** (Reliance Industries)  
**Josu Jon Imaz** (Repsol)  
**Ben van Beurden** (Royal Dutch Shell)

**Amin H. Nasser** (Saudi Aramco)  
**Eldar Saetre** (Statoil)  
**Patrick Pouyanné** (Total)

”

#### ENERGY ACCESS



- Providing more people with access to energy in partnership with local and national authorities, as well as other stakeholders

#### LONG-TERM SOLUTIONS



- Investing further in R&D and technology innovation to reduce GHG emissions
- Shaping and participating in public and private partnerships to progress the deployment of CCS
- Contributing to increasing the share of renewables in the global energy mix and exploring new business models

#### PARTNERSHIP AND MULTI-STAKEHOLDER INITIATIVES



- Seeking opportunities to accelerate climate change solutions by working individually or in collaboration with the United Nations, other multilateral organizations, governments and civil society such as: IPIECA, the global oil and gas industry association for environmental and social issues; the Sustainable Energy for All initiative; the Global Methane Initiative; the World Bank, and its Zero Routine Flaring initiative;
- the Climate and Clean Air Coalition, and its Oil and Gas Methane Partnership; the Carbon Sequestration Leadership Forum; the World Business Council for Sustainable Development and the Low-carbon Technology Partnerships initiative, in particular on Carbon Capture and Storage; the Global Compact and Caring for Climate

isting trend of the world's net global greenhouse gas (GHG) emissions is not consistent with this ambition, and that additional efforts are needed. They expressed their support for strong and clear government policy frameworks, as well as their ambition to play their part and their commitment to report regularly and consistently. The same day, OGCI also issued its first report: "More energy, lower emission: Catalyzing practical action on climate change," which can be found on the OGCI website. It outlines progress made by members in addressing climate change by improving operational efficiencies, lowering carbon resources, supporting innovation, and developing new technologies and business models. The report also provides global figures on GHG emissions, methane emissions, flaring, R&D spending, investment in renewables and support to start-ups in a coherent manner, with shared reporting methodologies.

#### TOWARDS A REAL ENERGY TRANSITION

After 18 months of work, it is clear to me that OGCI represents an unprecedented collaborative attempt to accelerate and guide our efforts towards a low greenhouse gas future. OGCI companies have different histories, strategies, and focuses—but this is true—but this variety contributes to the richness of the initiative. Our regular meetings and our joint works have enabled us to build greater levels of trust and understanding, and to move forward quickly in our thinking and engagement. The will to progress together and to openly discuss those questions is truly inspiring. It is clear that we share a common desire to engage and contribute to meeting the climate change challenge, and indeed, efforts of OGCI companies to face climate change challenges are not new. Many have been actively seeking to improve energy efficiency, reduce emissions and facilitate low carbon technologies. To give one example, member companies have globally reduced their GHG emissions by 20% since 2005. But OGCI will enable us to go one step further. We will now build on our initial success by amplifying our work, in order to make OGCI a reliable, credible, action-oriented initiative from the Oil & Gas sectors dedicated to solving the climate change and energy transition challenges.



## They said



**Bob Dudley**  
CEO, BP

"As oil and gas companies, we can be part of the solution, providing gas as a sustainable fuel for power and industry, pursuing energy efficiency in our operations and products and supporting government efforts to make lower carbon options more competitive."  
"We came together as CEOs under the banner of the OGCI to do things better and to make them more effective, and I think there are four reasons that we talk about to work together like this. First, to speak with a

common voice about the actions we've already taken on climate change. Second to work together on how we might take additional and accelerated actions in the future. Third, to report consistently on what we do. Fourth, to support government policy and initiatives that enhance the ability of all the stakeholders, governments, companies, consumers, to deliver the solutions that are needed at the Paris talks in December and beyond. Our companies are engaged in a diverse portfolio of activities that address climate change."  
"There is a sense of commitment and urgency from this group. The

report looks at the role of the oil and gas sector in reducing greenhouse gas emissions. For example, it includes reducing methane and flaring, and it includes increased energy and product efficiency and the growing role of natural gas. It also shows how we as companies are preparing for a low greenhouse gas future in our businesses. This means integrating climate change into our corporate strategies, it means investing in renewables, and it means researching and developing low greenhouse gas businesses and technology such as carbon capture and storage."  
"It shows our collective effort for an effective climate change agreement in Paris, it contains our explicit recognition of a shared ambition to limit the global average temperature rise to 2°C,

and it's also a recognition that the existing trend of net greenhouse gas emissions is not today consistent with that goal; we recognise that. It sets out our strong support for government and government frameworks that help our companies take informed decisions and make effective contributions that are also competitive."  
"Today you see companies who are responsible for one tenth of the world's total energy production, 20 percent of the world's oil and gas production, and we are united in supporting a global climate change agreement united on the shared ambition to limit the rise in temperature to 2°C, and we are united in our commitment to be a part of the solution as we provide energy for the future."



**Eldar Saetre**  
CEO, Statoil

"At Statoil, we don't question the scientific consensus on human-induced climate change. We embrace the need to meet the 2 degree scenario."



**Patrick Pouyanné**  
CEO, Total

"There is no silver bullet solution: a combination of gas, renewables, energy efficiency, CCS, and clean energy for populations who don't have access today – all of this will be needed to combat climate change."  
"Maybe it was more important not to look to the glass half empty but half full. I feel what is most important today, from my point of view, is that you have eight CEOs who recognise that the trend to go to be on is the right track, and who are committed, and we are committing our company

by making these statements."  
"I think it's quite an important step and there are policies on which we agree together and technology we can repeat technology three times or one of us has done it, it's probably we are strong and that the technology can deliver us a solution for the future, and this is a ground, this is an area where we can collaborate for the future and that's important. I think in fact the message that on this climate change we can, we prefer to collaborate rather than compete on our businesses".  
"We reduced our GHG emissions by 20 percent in ten years, so the trend is there. We reduced our methane emissions by more than 60 percent in seven years. We have invested more than ten billion dollars in renewables in the last three years."



**Helge Lund**  
CEO, BG Group

"There is no simple solution to climate change or formula to transition to lower carbon energy. The scale of collaboration required is virtually unprecedented, and the OGCI is a valuable platform for committed companies to work together and accelerate progress."

## numbers

20%

fall in OGCI members' greenhouse gas emissions in the past decade

33%

energy demand could rise another 33% by 2030

10%

a complete switch from coal to gas would save 10% of energy related emissions

99%

of new coal capacity will be built in developing economies

55%

fall in OGCI members' methane emissions since 2008

37%

fall in OGCI members' gas flaring over the past decade

12%

only 12% of primary energy is transformed into transport, heat, cooling and light

60%

of produced oil is consumed by transportation

13%

greenhouse gas mitigation need to come from CCS (capture and storage of anhydrite carbon)

140%

higher cost of mitigation without CCS



**Ben van Beurden**  
CEO, Shell

"The global energy system is moving towards a progressively cleaner, less carbon-intensive model, characterized by a greater share of natural gas and renewables – and a key role for carbon capture and storage."



**Amin H. Nasser**  
CEO, Saudi Aramco

"OGCI puts the oil and gas industry at the forefront of solutions to climate change, demonstrating that a technology-driven, industry-enabled approach is the only viable way forward. OGCI will play an important role in making lower GHG emissions a reality."  
"With regard to carbon pricing, while we share a common goal in seeking to reduce carbon emissions, we adopt a different approach to the problem. We are different companies, we have different

strategies to achieve common goals, and our purpose is to reduce carbon emissions and for that for Saudi Aramco to say we do have programmes for example in flaring, we have one percent flaring which is one of the best in the investor year and we continue to bring that down. If you look at the amount of R&E that we are investing in capitalising on technology to reduce carbon emission by working in different centres around the globe, in Korea or in France with IFB or the next centre that we're opening in Detroit also, their chief are seeing results, more mileage efficiency, and at the same time, we are working to work

on evolving more advanced at the same time we have programmes as national companies similar to others in terms of carbon capture and sequestration even though our fields are young, we do not require these at this stage, however this technology is important for us and we had the test pilot evolve this year, it's on production, we have more than 800,000 metric tons of CO<sub>2</sub> being injected and we're achieving good results on that. Gas is an important element and we continue to introduce more gas to our energy mix."



**Claudio Descalzi**  
CEO, Eni

"It is crucial to secure a broadbased commitment to chart a low carbon future that will provide an effective response to the climate challenge without stifling the legitimate development aspirations of emerging nations."



**Emilio Lozoya Austin**  
CEO, Pemex

"No degree of success in our environmental policies will suffice if we fail to tackle the economic challenges before us. So, when dealing with the crucial question of sustainability over time, a comprehensive approach is the name of the game."



**Josu Jon Imaz**  
CEO, Repsol

"We must be ambitious in our emission-reduction targets and flexible in how we deliver them. We uphold a new model in which the war on climate change, growth and competitiveness are all mutually reinforcing."

**The lack of statements by Mukesh Ambani, CEO of Reliance, is due to his absence at the event in Paris.**

## Determined and solid

The **OGCI** (Oil & Gas Climate Initiative) is an organization that was officially launched by the Secretary General of the United Nations, Ban Ki-moon, during the Climate Change Summit of **September 23, 2014 in New York**. The proposal of its establishment had already been founded at the sidelines of a first discussion initiated between Oil & Gas companies during the 2014 edition of the World Economic Forum Annual Meeting. The OGCI was created to define the important **role played by the oil and gas industry** and the efforts that this sector will continue to implement to help resolve the problem of climate change. The forum is also intended to support the long-term efforts aimed at **creating a world with low greenhouse gas emissions**. Over the next year, the OGCI will develop work activities based on issues identified in internal discussions and in discussions with interested parties, and individually implement some of the good practices and lessons learned.





Oil companies/A really decisive role

# A climate for energy change

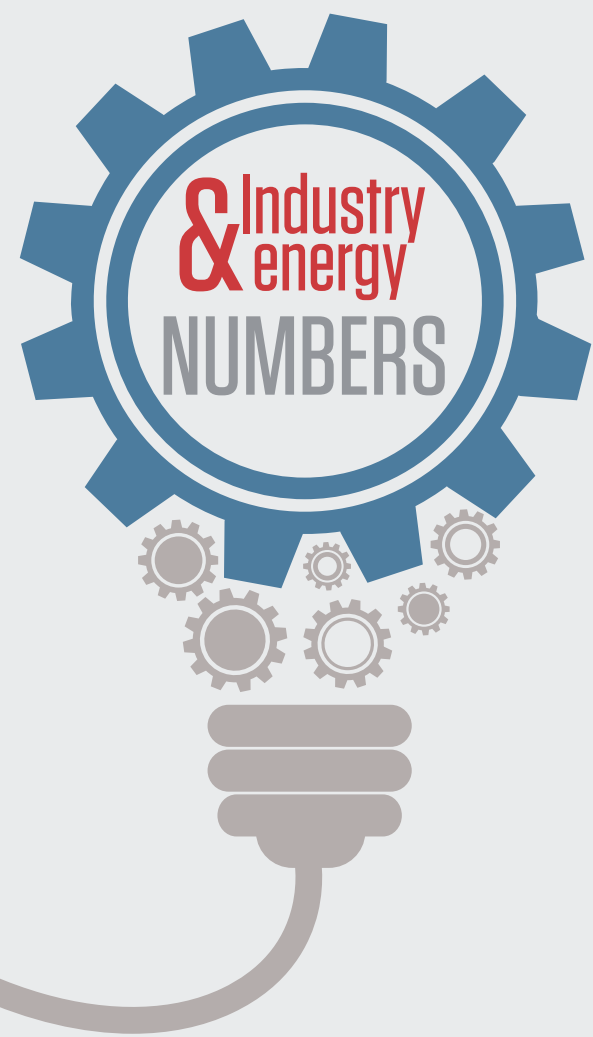
Energy corporations cannot plan their business strategy without considering climate change, increasing the capacity of power generation through renewables sources

A

by FATIH  
BIROL

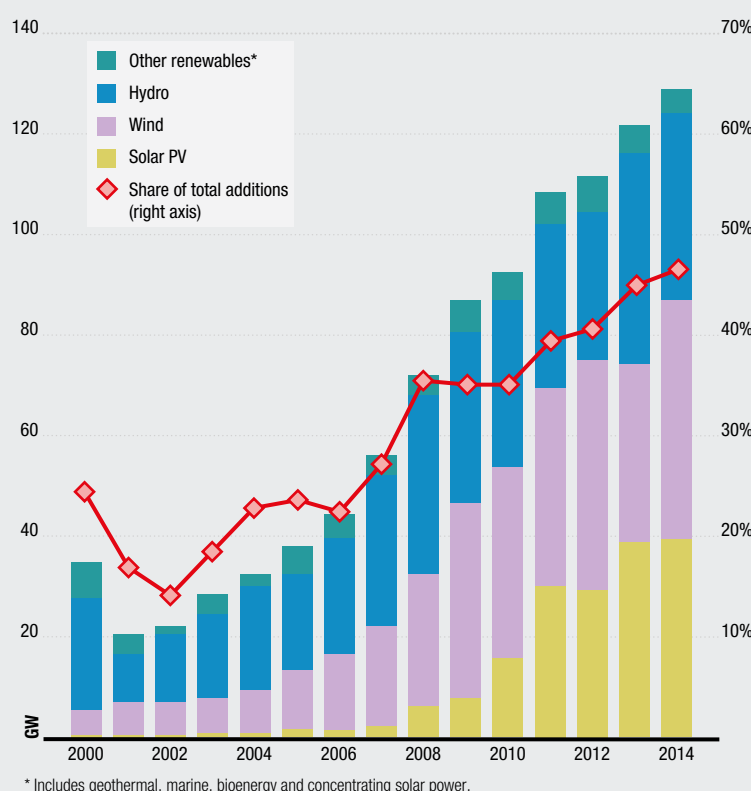
major milestone in efforts to combat climate change is fast approaching – the United Nation's 21st Conference of the Parties (COP21) in Paris. Since the first COP in 1995, global greenhouse-gas emissions have risen by more than 25 percent, and the atmospheric concentration of these gases has marched steadily higher. The world has eaten up ever-larger chunks of its remaining “carbon budget,” while the scientific evidence that this is unsustainable and can bring about catastrophic climate change has become even more definitive. As the largest source of global greenhouse-gas emissions, actions in the energy sector can make or break efforts to achieve the world's agreed climate goal. There are some encouraging signs that an energy sector transition is underway. For example, renewables-based power generation capacity additions reached a new record-high of 130 gigawatts (GW) in 2014, accounting for nearly half of all new capacity additions in that year (Figure 1). This was underpinned by around \$270 billion of investment, which was led by China, and followed →





## 1. "GREEN" ENERGY CAPACITY

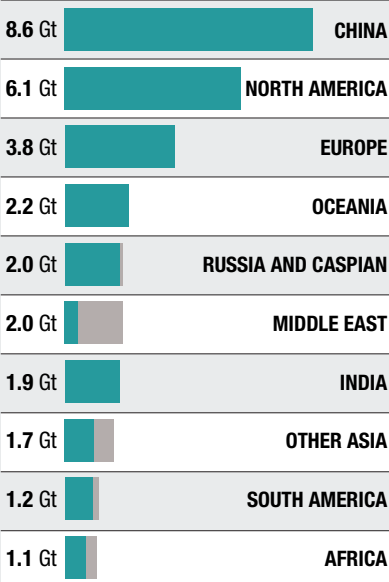
Source: Energy and Climate Change: World Energy Outlook Special Report, OECD/IEA, Paris, 2015.



The graph shows the increases in global energy capacity in terms of renewables according to the type and proportion of increases in overall capacity.

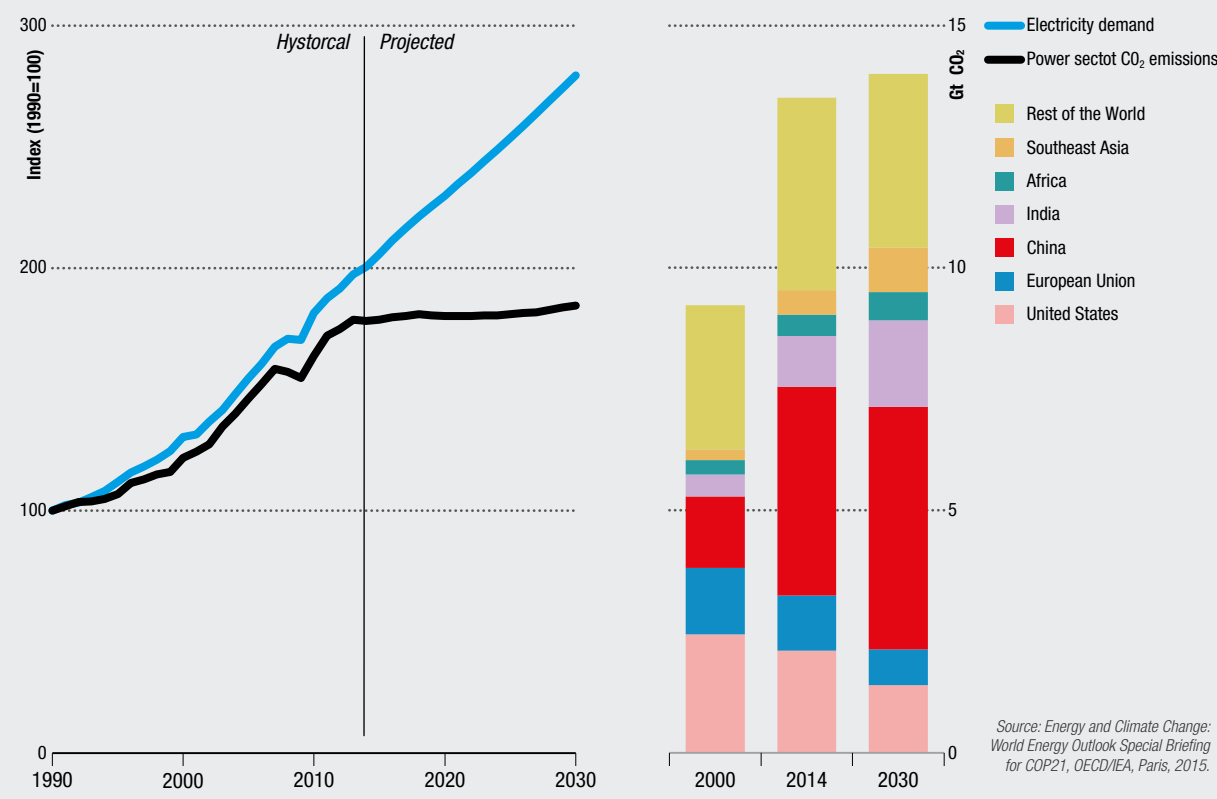
## 2. COMMITMENTS

Source: Energy and Climate Change: World Energy Outlook Special Briefing for COP21, OECD/IEA, Paris, 2015.



The histograms represent the total carbon dioxide (CO<sub>2</sub>) emissions related to energy. The share of emissions covered by an INDC (until mid-October) is highlighted in green, while the share of emissions not covered is colored in gray.

## 3. ENERGY DEMAND AND EMISSIONS



Highlighted here is the growth in the global electricity demand and related CO<sub>2</sub> emissions from 1990 (left) until 2030 and related CO<sub>2</sub> emissions by region (right).



**THE AUTHOR.** Fatih Birol became the Executive Director of the IEA on 1 September 2015. Dr. Birol has been named by Forbes magazine among the most powerful people in terms of influence on the world's energy scene. He is also the recipient of numerous awards from government, industry and academia. He previously was the IEA Chief Economist and Director of Global Energy Economics, with responsibilities that included directing the Agency's flagship *World Energy Outlook* publication, which is recognized as the most authoritative source of strategic analysis of global energy markets. He is also the founder and chair of the IEA Energy Business Council, which provides a forum to enhance co-operation between decision makers in the highest levels of government and industry.

methane releases from oil and gas production and reforming fossil-fuel subsidies (while providing targeted support for the poorest) are key measures in the Middle East and Africa, and a portfolio of options helps reduce emissions in Southeast Asia.

by the United States, the European Union and others. The share of worldwide final energy consumption that is covered by energy efficiency regulations reached 27 percent in 2014, almost twice the level of 2005. The first commercial power plant with CO<sub>2</sub> capture came online in Canada, while the European Union agreed in 2015 to reform its Emissions Trading Scheme (the world's largest) and China confirmed its intention to introduce a national carbon trading scheme in 2017.

The decisions that come out of COP21 must address the needs and the responsibilities of the energy sector if the outcome is to carry conviction about governments' determination to achieve the two degree celsius climate goal. The role of industry and other actors is also of crucial importance, and actions and declarations taken are very welcome. But we will need more. Ultimately, all energy sector actors must work together to bring about deep cuts in greenhouse-gas emissions, while sustaining the growth of the world economy, boosting energy security and bringing modern energy to the billions who lack it today. If the energy sector is to make the right investments to achieve this, it needs COP21 to deliver clarity of vision and certainty of action. COP21 is the best chance to get a global climate agreement, but world leaders need to come ready to

do a deal. Any agreement that does not have the energy sector at its core risks being judged a failure.

### COP21 AND NATIONAL CLIMATE CONTRIBUTIONS

National climate pledges—so-called Intended Nationally Determined Contributions (INDCs)—are at the heart of COP21, as they contain, among other things, a proposed national target for mitigating greenhouse-gas emissions. The coverage of these climate change pledges is impressive: more than 150 countries have submitted pledges, accounting (collectively) for around 90 percent of global economic activity and almost 90 percent of global energy-related greenhouse-gas emissions today (Figure 2). By world region, all of the countries in North America have submitted INDCs, almost all in Europe, around 90 percent in Africa, two-thirds in developing Asia, 60 percent of those in Latin America and one-third in the Middle East. These countries currently account for around 90 percent of global fossil fuel demand and almost 80 percent of global fossil fuel production.

Around half of all INDC submissions include explicit energy-focused targets, either alongside a GHG target or as a stand-alone goal. The most common energy-related measures are those that target increased re-

newables deployment (40 percent of submissions) and improved efficiency in energy use (one-third of submissions). But other energy sector measures that could help to cut energy-related GHG emissions in the short term, such as reducing the use of inefficient coal-fired power plants, lowering methane emissions from oil and gas production, fossil-fuel subsidy reform or carbon pricing, are reflected in the INDCs of just a handful of countries. Some of the energy sector technology or policy options that are required for a long-term transformation of the energy sector, such as nuclear power, carbon capture and storage, and alternative vehicle fuels (advanced biofuels, electric vehicles etc.), are rarely mentioned. Finally, there are many cases in which an overall GHG target is specified within an INDC, but without making clear the expected contribution of the energy sector vis-à-vis non-energy sector sources of these emissions (which, for some countries, can be very significant).

### CLIMATE PLEDGES WILL MAKE A DIFFERENCE

IEA analysis—published as a World Energy Outlook Special Briefing for COP21—shows that full implementation of the unconditional pledges would slow the growth in energy sector GHG emissions dramatically.

Our analysis shows that global energy- and process-related emissions would increase in the period to 2030 at a pace equal to one-third of the increase observed since 2000. The annual growth in global energy-related emissions slows to a relative crawl by 2030 (around 0.5 percent per year); but does not yet come to a halt—a critical and urgent milestone in achieving the global climate goal. Countries accounting for more than half of global economic activity are projected to either see their energy-related GHG emissions plateau or be in decline by 2030, including the likes of the European Union, the United States, China, Japan, Korea and South Africa. As such, climate pledges help to broaden the necessary decoupling between economic growth and energy-related GHG emissions—emissions per unit of economic output being 40 percent lower than today by 2030. The power sector is both the largest source of energy-related CO<sub>2</sub> emissions and the greatest focus (to date) of energy sector efforts to decarbonize. The full implementation of climate pledges would also result in world CO<sub>2</sub> emissions from power generation remaining broadly flat through to 2030. While global power sector emissions are projected to stay broadly flat, electricity demand would increase by more than 40 percent by 2030. In essence, at the global level, the link

between rising electricity demand and rising related CO<sub>2</sub> emissions would be broken—an important step towards further decarbonisation (Figure 3). Seven out of every ten units of additional electricity generation through to 2030 is projected to be low-carbon, bringing the share of total electricity generation from low-carbon sources up from one-third today to nearly 45 percent in 2030. The full implementation of climate pledges will require the energy sector to invest \$13.5 trillion in energy efficiency and low-carbon technologies from 2015 to 2030, representing almost 40 percent of total energy sector investment. Around \$8.3 trillion is needed to improve energy efficiency in the transport, building and industry sectors, while much of the remaining investment is to decarbonize the power sector. More than 60 percent of total investment in power generation capacity is projected to be for renewable capacity, at \$4.0 trillion, with one-third of this being for wind power, almost 30 percent for solar power (mainly solar photovoltaics) and around one-quarter for hydropower. Pledges for COP21 will have a positive impact on future energy sector trends, but fall short of the major course correction required to achieve the agreed climate goal. If climate ambition is not raised progressively, it is estimated that the path set by the INDCs would be consistent with an av-

erage global temperature increase of around 2.7°C by 2100, falling short of the goal of limiting the increase to no more than 2°C. The INDCs must, therefore, be viewed as an important base upon which to build ambition.

### BUILDING A BRIDGE TO FURTHER ACTION

The energy sector can do more to restrain and reduce its GHG emissions; for all countries, there are many ways in which energy sector actions can still be accelerated. The IEA's Energy and Climate Change Special Report highlighted how just five energy sector measures (relying only on proven technologies and policies) could help achieve an early peak in total energy-related GHG emissions, at no net economic cost. A near-term peak in global emissions will send a powerful signal of the determination of governments to transform their energy economies. These measures, which were presented as a "Bridge Strategy" and intended to be a bridge to further action, still hold true. They are:

1. Increasing energy efficiency in the industry, building and transport sectors.
2. Progressively reducing the use of the least-efficient coal-fired power plants and banning their construction.
3. Increasing investment in renewable energies to \$400 billion in 2030.

4. Gradually phasing out subsidies to fossil fuel consumption.
5. Reducing methane emissions from oil and gas production.

The rapid and broad adoption of the measures in the Bridge Strategy could result in total energy-related GHG emissions reaching a peak around 2020. Both the energy intensity of the global economy and the carbon intensity of power generation improve by 40 percent by 2030. China decouples its economic expansion from emissions growth by around 2020, much earlier than otherwise expected, mainly through improving the energy efficiency of industrial motors and the building sector, including thorough standards for appliances and lighting. In countries where emissions are already in decline today, the decoupling of economic growth and emissions is significantly accelerated; compared with recent years, the pace of this decoupling is almost 30 percent faster in the European Union (due to improved energy efficiency) and in the United States (where renewables contribute one-third of the achieved emissions savings in 2030). In other regions, the link between economic growth and emissions growth is weakened significantly, but the relative importance of different measures varies. India utilises energy more efficiently, helping it to reach its energy sector targets and moderate emissions growth, while the reduction of

### IN CONCLUSION

Achieving an energy system that is compatible with climate goals remains a formidable challenge. As the IEA's *World Energy Outlook* consistently makes clear, the world's energy system will need to undergo a fundamental structural change if it is to put itself on a path consistent with the 2°C climate goal. This is likely to take decades, and fossil fuels will continue to be an important part of the energy system while this transformation unfolds. But it would be a grave mistake if energy companies shape their business strategy without taking climate change into account. It is therefore encouraging that many of the commitments made by several key energy industries are consistent with the IEA's own view of the actions needed to accelerate climate progress, such as the need for improved energy efficiency, reducing methane emissions from oil and gas operations, greater R&D in energy technology innovation and the need to end energy poverty for all. It is already clear that if the world is to put itself on a trajectory consistent with its agreed climate goal, it must manage the legacy of its existing energy system, while harnessing established low-carbon energy sources and accelerating the development and deployment of new technologies that have yet to be adopted at scale.



Interview/Christiana Figueres, Executive Director UNFCCC

# “Environmental neutrality” goal

The planet is able to self-determine its own protection if timely, concrete steps are taken towards the widespread introduction of renewable energy sources and even the developing countries will be supported on this inevitable path

turning point

natural resources

*threshold of temperature increasing to 2 degrees*

*prices of renewables reduced*

*\$100 billion for developing countries*

*decarbonised global economy*



#### CHRISTIANA FIGUERES

She was elected Executive Director of the United Nations Framework Convention on Climate Change (UNFCCC) in 2010, and was re-confirmed for a second three-year term in July 2013. Involved in the negotiations on climate change since 1995, Christiana Figueres was a member of the Clean Development Mechanism executive committee and Vice President of the Bureau of the Conference of the Parties in 2008-2009. She began her career in the institutional service at the Embassy of Costa Rica in Germany in 1982, after holding posts in many boards of directors of non-governmental organizations involved in issues related to climate change. She is also the author of numerous books on planning solutions for the climate.

**T**here is no time for second thoughts. The world finds itself at a crucial crossroads, and everyone, especially all players seated at an ideal planetary negotiation “table”, are called to action, or else risk the defeat of mankind. The tones used in this exclusive negotiation granted to us by Christiana Figueres, Executive Secretary of the UNFCCC, landlady of the house of COP21, are not so apocalyptic, but if you think of the constant growth of extreme weather events of our atmosphere with unprecedented violence, even remote areas of our atmosphere then you can understand that the urgency of taking concerted and effective strategy to significantly stand up against the effects of climate change cannot be delayed. Paris is also there for this, to keep attention focused on the →

by GIANCARLO STROCCHIA



# 4 absolute priorities



## THE INSTITUTIONS' COMMITMENT

Governments are increasingly aware of the fact that it is in their national interest not just to "save the planet," but it is in their national interest to move forward with their response on climate change because of benefits to the food, water and energy matrix, in addition to creating more jobs.

Carbon Expo – Barcelona, 28 May 2015



## THE IMPORTANCE OF FUNDING

There is no doubt that financing is the most crucial component... credible clarity must be provided on the pathway to the \$100 billion per year, including special and most urgent attention for Least Developed Countries and Small Island Developing States.

High-Level Event on Climate Change - New York, 29 June 2015



## THE URGENCY FOR SAFETY

Changes to rainfall patterns is causing a scarcity of clean, safe water to some places and floods to other places, with the respective host of health problems and food insecurity to each. And global temperature increase is expanding the range of vector and water-borne diseases.

WHO Conference on Health and Climate - Geneva, 27 August 2014



## TODAY'S CHOICES FOR TOMORROW'S PEACE OF MIND

There are two paths. One is a path of rising temperatures, rising insecurity and rising economic instability. The other is a path where a stable environment sustains growth over generations.

Boston 46<sup>th</sup> Commencement, University of Massachusetts, 30 May 2014

problem and to review the solid commitments made by the international community in this regard.

## What is the international community's most urgent goal with regard to combating climate change? What are the main issues on the negotiating table in Paris?

Paris needs to be a turning point in the way the global economy manages pollution and the planet. Nearly two centuries of development based on the burning of fossil fuels and the over-exploitation of natural resources has generated extraordinary benefits for countries and communities, especially in what is termed the developed world—but it has come at a price.

Science underlines that if the 21st century continues on that same development path, global average temperatures could rise 3, 4, 5 degrees Celsius or even higher. This will dramatically increase the risk of more frequent and intense extreme weather events that will undermine humanity's ability to survive, let alone thrive. The UN climate conference needs to harvest and accelerate the growing momentum among countries but also cities, states, regions and companies towards a new development paradigm where growth is decoupled from damage. Paris needs to put in place policies and pathways that will ensure that global average temperatures are kept below a 2 degrees Celsius rise this century—a threshold or defense line that has been agreed to by governments.

Thus, it needs to put in place a process to dramatically bend down emissions over time with a clear signal that by the second half of the century we have reached climate neutrality—a point where those emissions left are so low they can be safely absorbed by healthy forests and other natural ecosystems allied to cost effective absorption technologies like carbon capture and storage for those fossil fuels that remain. This transition must also be matched by clear financial support for developing countries so they can take part and achieve their climate action ambitions, plus a plan that will allow all countries to ratchet up their climate action plans every five or ten years in line with their achievements and the science.

## What are the difficulties still preventing the creation of a solid international front against this issue?

Over the past few years, much of the mistrust that has characterized international climate negotiations has been replaced by confidence; growing cooperation and a sense that it is doable and in the national self-interest of nations. Prices of renewable energies have been tumbling such that a solar panel, for example, today is around 80 percent cheaper than six or seven years ago, and cities and companies are setting extraordinary targets ranging from up to 80 percent emission reductions to going 100 percent renewable energy.

The real challenge now is providing a sense of certainty that the \$100 billion promised by rich countries to poorer ones by 2020 will be realized and that the Least Developed Countries and Small Island Developing States in particular will see much needed support. There are good signals, including those from the recently concluded World Bank/International Monetary Fund meeting in Lima, Peru that this key piece in the international climate puzzle is maturing—this is important for Paris.

## Countries such as China and India are increasing their investments in protecting the environment and lowering rates of pollution. How do these decisions affect the future of the world's climate?

The importance of climate action by these two key developing countries is playing a critical role in building international confidence and action, and they are not alone: we are also seeing other key developing countries stepping up to the mark from Indonesia and Brazil to South Africa,



Mexico, the Republic of Korea—the list goes on and is part of the sea change we are seeing across the globe.

## The areas of the world that are still developing, such as Africa, ask for their growth not to be hampered by over-restrictive environmental measures. How can development and the environment be effectively combined?

I do not think the nations of Africa see this as a contradiction, far from it—from Morocco in the North and South Africa in the South, Ghana in the West and Kenya in the East, investments in solar, wind and geothermal have been growing apace in recent years. Indeed, African Heads of State and Ministers have been clear that they see growth and environmental management as key to Africa's future — crucial to this future will be investments in the kinds of clean energy infrastructure that can lift people out of poverty and provide universal access while reducing emissions. A good example that will be showcased in Paris this December as part of the Lima-Paris Action Agenda is the Africa Clean Energy Corridor. It aims to boost the share of renewables in Eastern and Southern Africa from 12 percent to 40 percent by 2030.

## In addition to governments, how can the private sector intervene to combat climate change? Can it be a channel for finding economic resources in this regard?

By some estimates, \$90 trillion will be invested in infrastructure world-wide over the next 15 years—a lot of that investment will be linked to the private sector, leveraged by public sector finance: so yes, greening financial flows from private investors are critical.

There are some really good signs that shift in capital is

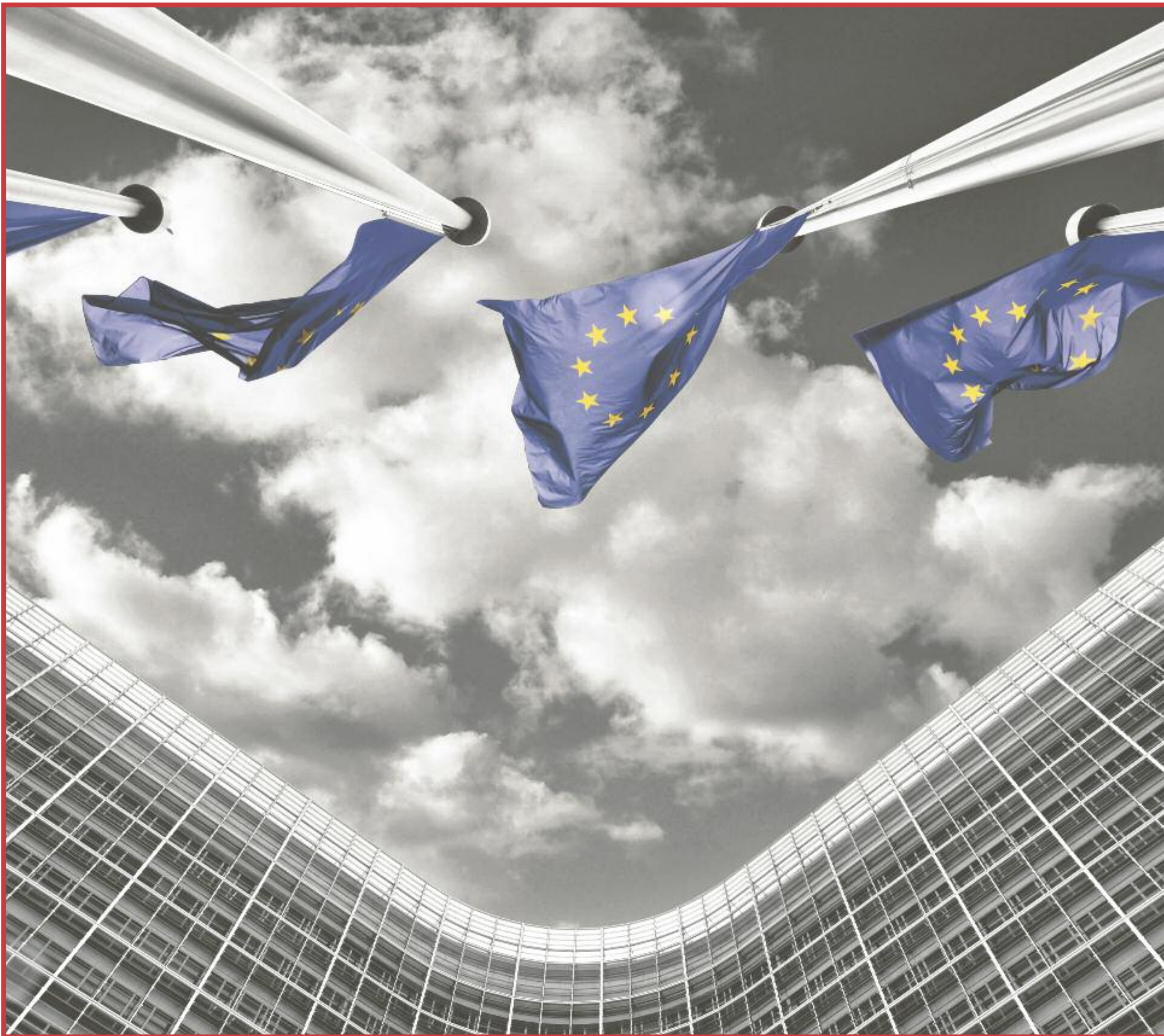
underway. For example in September the Divest-Invest initiative, involving more than 400 institutions, including pension funds and foundations, announced it had over \$2 trillion worth of capital supporting a divestment from fossil fuels. Another example is banks. Recently, six major U.S. banks—Bank of America, Citi, Goldman Sachs, JPMorgan Chase, Morgan Stanley and Wells Fargo—issued a joint statement calling for cooperation among governments in reaching a global climate agreement. The statement voiced support for policy frameworks that "will provide greater market certainty, accelerate investment, drive innovation in low carbon energy, and create jobs."

## What can major energy companies do to actively contribute to improving the world's climate?

I think major energy companies have a pivotal role to play, perhaps especially in planning for the orderly transition to a low carbon, decarbonized global economy. The engineering and research and development skills they have could, if deployed on the switch from fossil fuels to clean energy solutions, take us further and faster towards a climate-safe world. I would also encourage them to move further and faster with carbon pricing within their operations and among suppliers alongside increased operational efficiencies. Above all, I would look to major energy companies to vocally and forcibly back an ambitious and durable Paris Agreement. I have been in dialogue with several oil and gas majors, and I am happy to share the last letter I wrote to them, which sets out in detail the extraordinarily positive and constructive role I believe they can play. Primary energy demand in 2040 is likely to be 37 percent higher than it is today—how that demand is met will in many ways define the future for what will be close to 9-10 billion people. ■

**FUTURE EXPECTATIONS**  
Primary energy demand in 2040 is likely to be 37 percent higher than it is today—how that demand is met will in many ways define the future for what will be close to 9-10 billion people.





**Interview/Miguel Arias Cañete, EU  
Commissioner for Energy and Climate Action**

# An ambitious view

The European Union has the means and the ambition to complete the transition towards a sustainable economy. Its mandate to negotiate a significant agreement in Paris demonstrates its indisputable mandate for and commitment to reducing emissions

**S**eparating economic growth from carbon emissions while reducing the emissions themselves are two big challenges, and the European Union has shown significant progress on both. Strengthened by these successes, Brussels brings to the table of the climate conference in Paris a plan of ambitious commitments, backed by its strong results. Miguel Arias Cañete, the EU's Commissioner for Energy and Climate Action, tells *Oil* about Europe's strategy towards a sustainable economy, its work in progress and its goals and expectations for COP21.

by SIMONA  
MANNA

**The EU has a mandate to negotiate an ambitious agreement at COP21. What is the European Commission's plan to halve emissions by 2050 and become climate neutral by the end of the century?**

The European Union is well equipped to successfully transition to a climate neutral economy. The mandate to negotiate an ambitious agreement in Paris is the sign that Europe's objective of tackling emissions is undisputed and widely supported.

I must stress that the EU already met two fundamental challenges: (i) the successful decoupling of economic growth from carbon emissions and (ii) an irreversible emission →



**MIGUEL ARIAS CAÑETE**

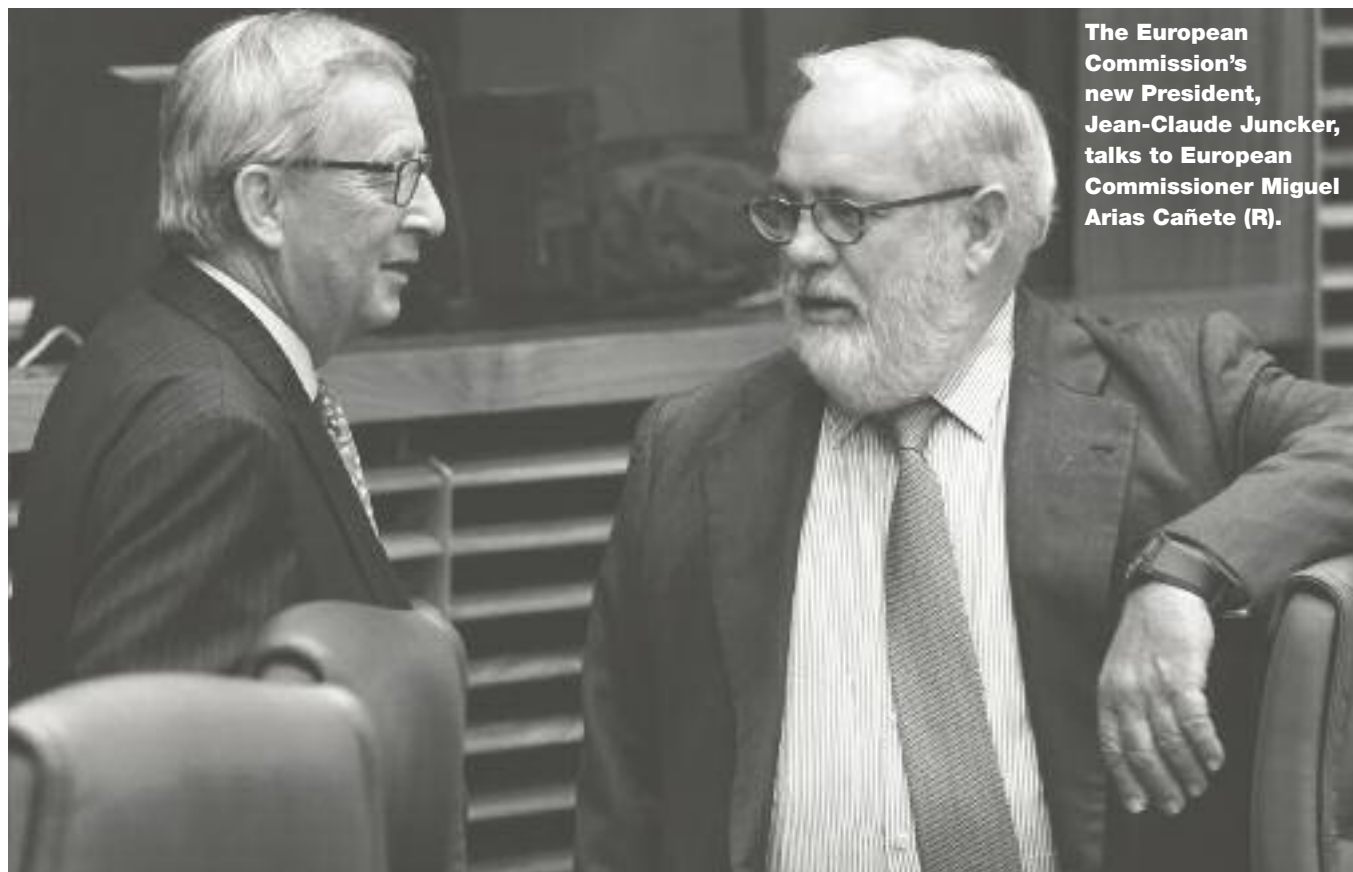
A Spanish Law graduate from the University Complutense of Madrid in 1971, he has been the European Commissioner for Climate Action and Energy since 2014. A member of the European Parliament, he was Minister for Agriculture, Food and Environment in Spain from 2011 to 2014 and, previously, from 2000 to 2004. He also served as President of the Joint Committee of the European Union, Spanish Congress, from 2008 to 2011.



## THE COMMITMENT

# -50%

greenhouse gas emissions reduction by 2050 compared to 1990 levels, with the goal of becoming carbon neutral by 2100.



The European Commission's new President, Jean-Claude Juncker, talks to European Commissioner Miguel Arias Cañete (R).

reduction path. On the first point, Europe succeeded in cutting emissions by more than 20 percent between 1990 and 2014, while the European economy grew by 46 percent over the same period. These results speak for themselves. We have shown consistently that climate protection and economic growth go hand in hand. This is a strong signal ahead of the Paris climate conference that Europe stands by its commitments and that our climate and energy policies work. And we have already taken the first steps towards implementing our Paris pledge with new proposals presented earlier this year.

On the second point, the latest projections show that the EU is heading for a 24 percent reduction by 2020 with current measures in place, and a 25 percent reduction with additional measures already being planned among the Member States. The EU is clearly working towards its 2030 goal of an emissions reduction target of at least 40 percent, the EU's contribution towards the new global climate change agreement in Paris in December.

Energy efficiency has a central role to play in meeting our climate objectives—after all, the cheapest and cleanest energy is the energy we don't use. Fully implementing existing legislation will take us a long way towards meeting our goal of improving energy efficiency by at least 27 percent by 2030, and more proposals will come to improve further the effectiveness of these policies. Becoming a world leader in renewable energy is also a key priority for the Juncker Commission. To do this, we need to achieve collectively the target of at least 27 percent renewables by 2030. Today we are at 15 percent, with nearly three times more renewable energy per capita than anywhere else in the rest of the world, and we have to continue along this path.

**The experience of the Copenhagen Climate Summit in 2009 teaches us that Europe cannot act alone against climate change. What has changed since then in the European Union's approach to this global challenge and what are the chances of striking a deal with the U.S., China and India in Paris?**

Europe alone cannot tackle climate change. This is a global challenge that requires the widest possible agreement. It is now time to translate the political will we have seen at recent meetings, such as the UN General Assembly and the World

Bank and IMF, into concrete negotiation results. President Juncker made it clear in his State of the Union speech that the EU is not prepared to sign just any deal. That's because the agreement in Paris matters to every citizen in every country of the world.

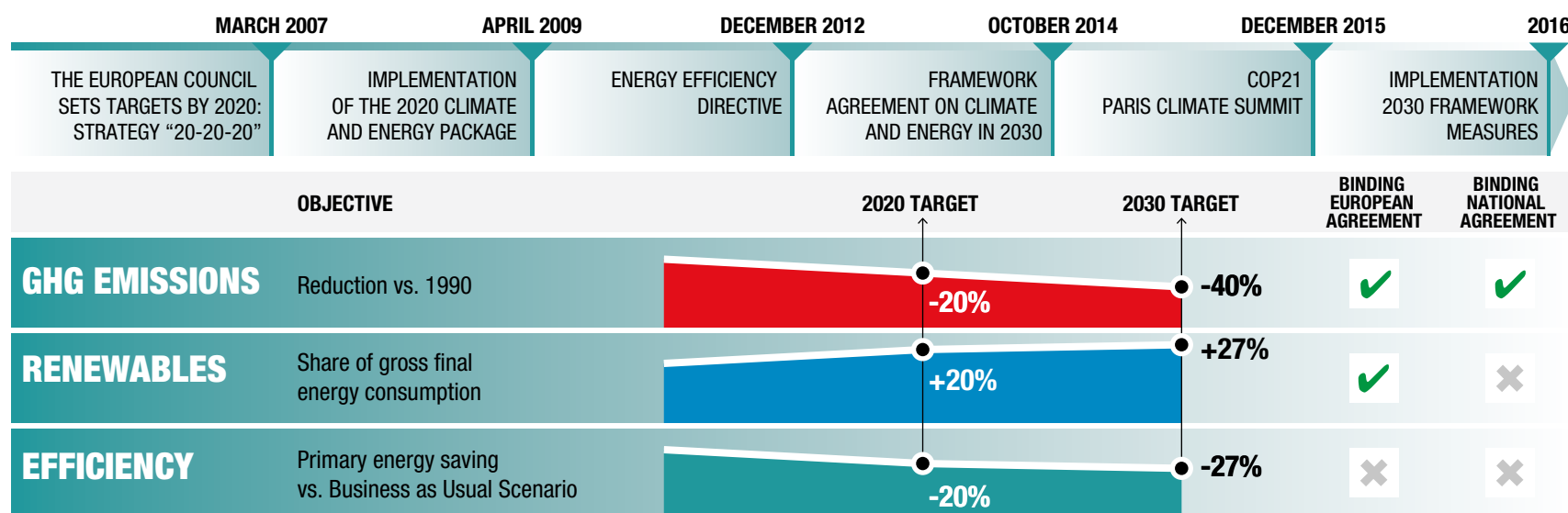
Thanks to the consensus achieved during last month's Environment Council, the EU is now equipped with a solid negotiating position. I have to start by saying that what we currently have on the table is a success story in itself. What we are seeing is an unprecedented global effort to tackle climate change. To date, 170 parties to the COP, representing around 95 percent of global emissions, have announced their intended emissions reduction contributions. This goes way beyond what we already have today under the second commitment of the Kyoto Protocol. It is a clear signal of the collective determination for Paris to be a turning point towards a new era of low-emissions and climate resilient economies. And while the current collective effort doesn't quite get us to our below 2 degrees objective yet, it does put us within reach of it. So our priority now is to ensure that the deal we agree in Paris is capable of keeping us on track to our below 2 degrees objective. As far as I am concerned this comes down to three key elements that underpin our negotiating position:

**1** Firstly, a long-term goal. A clearly defined pathway will provide a strong long-term signal and a shared vision of our destination of travel for all stakeholders, including local authorities and other subnational actors.

Global emissions need to peak by 2020 at the latest, be reduced by 50 percent by 2050 compared to 1990 levels and be near zero or below by 2100. The 50 percent target translates to 60 percent by 2050 when using 2010 as a base year. The Commission used this value in its Paris Communication. It is in line the latest findings of the Intergovernmental Panel on Climate Change. It is also consistent with the June Declaration by the G7, and the EU objective of reducing emissions by 80-95 percent by 2050 compared to 1990 by developed countries as a group.

**2** Secondly, the flexibility to strengthen ambition over time. We know that when we get to Paris, and in the event we fall short of what is needed to stay below 2 degrees C, it will be essential that countries come together regularly every five years to consider and strengthen emission targets in light of the latest science and progress made to date.

## EUROPEAN TARGET



**3** And finally, strong transparency and accountability rules. The Paris outcome will also need to address adaptation to the impacts of climate change and the mobilization of financing for climate action. The EU is ready to play its part. In 2013 alone, we delivered 9.5 billion of euros to support climate action in developing countries. Moreover, as we advanced at the Economics and Financial Affairs Council (ECOFIN) conclusions in November, the EU's contribution to climate finance in 2014 increased to €14.5 billion. This represents a substantive increase compared to 2013. But we must not forget the important role of private investment, which will be key to scaling up climate finance. The role of regions and local entities in promoting the involvement of our industry and SMEs is essential in this regard. I believe that our vision for the new global climate deal is both ambitious and realistic, and should get everybody on board and keep us on track to keep global warming below 2°C.

**While renewables grow steadily in the energy mix, and energy efficiency is growing in all sectors, the CO<sub>2</sub> reduction targets remain very ambitious. In your opinion, what is the most difficult issue Europe needs to face in order to tackle climate change?**

The targets are ambitious, but also achievable. Existing European policies already go a long way in supporting our objectives. With the help of Member States, we will also deliver on the 2030 and Energy Union objectives to address the regulatory and physical bottlenecks that currently prevent the full exploitation of our potential. For instance, there has been a lot of investment in renewables, but grids aren't up to standard. That's also why Brussels supports increasing cross-border power interconnections and making political and financial efforts to link up at least 10 percent of the EU's installed electricity production capacity by 2020. The creation of a common gas market also goes in the same direction and supports the idea of a competitive energy transition. The reform of the EU carbon market (Emission Trading System) and the creation of an innovation fund to support the conversion of the most affected industrial sectors will spur investments and innovation while contributing to reducing emissions.

**Governments are not alone in the fight against climate change. Corporate players have also been increasingly active in providing concrete solutions ahead of the climate summit. What kind of contribution do you expect from them?**

I cannot stress enough the importance of involving non-state actors such as businesses, cities and civil society organisa-

tions. We see several helpful initiatives emerging from various sides, and we strongly encourage the industry to show support and bring concrete solutions to the table. We must not forget that a lot of technologies delivering emission savings and increased efficiency installed around the world come from the EU.

Every year we export 35 billion euros worth of renewable equipment. European companies build about 40 percent of the world's wind turbines. Our businesses lead the world in the number of patents for renewable technologies (40 percent come from Europe), efficiency of their industrial processes and other clean technologies applicable to a multitude of sectors. But we need to keep up with our competitors, and to do that we need to keep innovating.

**What, realistically, do you expect to achieve at COP21? Do you believe Paris might be a turning point in the quest for a global price on carbon?**

We want a binding agreement and a deal that is valid for the whole century. We do not want COP21 commitments ending in 2030; this cannot be an agreement that starts in 2020 or 2021 and finishes in 2030, like the Kyoto Protocol (which finishes in 2020). There is a gap between what will be put on the table in Paris on November 30 and what is needed to fight global warming. If it is just an agreement until 2030, and if it falls short on the 2 degrees C target, it does not solve the problem of the actual gap in the INDCs submitted by 150 countries. The EU was the first major economy to deliver its emissions pledge in March and we have a clear mandate from Member States to negotiate. We promised to cut emissions by at least 40 percent by 2030 compared with 1990 levels (global objective according to the EU mandate). We need to be able to assess every five years whether we are at 2 degrees, 2.75 degrees, or 2.5 degrees, and we must have the instruments to correct the path effectively if need be.

I am positive on the outcome of COP21—there is goodwill on all sides of the table. Most countries seem to be on board; the degree of ambition varies amongst participants and will ultimately depend on the outcome of the negotiations. We are very ambitious, thus we will have to play our cards well in Paris.

**In the graphics you can see the 2030 energy and climate framework targets compared to "20-20-20" objectives, reporting on greenhouse gas emissions, renewables and efficiency. Above, the milestones in the fight against climate change.**



**GINA MCCARTHY**

She is the Administrator of the Environmental Protection Agency, a position she has held since July 2013. She previously served as Assistant Administrator for the EPA's Office of Air and Radiation. Prior to her appointments to the EPA, McCarthy served as Commissioner of the Connecticut Department of Environmental Protection. During her 30-year career, McCarthy has worked at both the state and local levels on critical environmental issues and helped coordinate policies on economic growth, energy, transportation and the environment. McCarthy and has been a leading advocate for common-sense strategies to protect public health and the environment.

**Exclusive/** Gina McCarthy, Director of the U.S. Environmental Protection Agency (EPA)

# Obama specifies the roadmap



America's recent leadership on climate change has brought countries such as China and India to the negotiating table. In Paris it will be hard to achieve a definitive solution, "but the kind of deal we're working toward will make an enormous difference"

*"The time to act on climate change is now"*

**G**

by MOLLY MOORE

ina McCarthy, Director of America's Environmental Protection Agency, has been the face of President Obama's climate change policies for the past two and a half years. With the dysfunctional U.S. Congress refusing to pass new laws to curb greenhouse gas emissions, McCarthy has helped President Obama use the power of her agency to enact rules requiring tougher standards for automobile and industrial emissions and to promote clean fuel alternatives. She gives *Oil* her take on the upcoming climate negotiations in Paris.

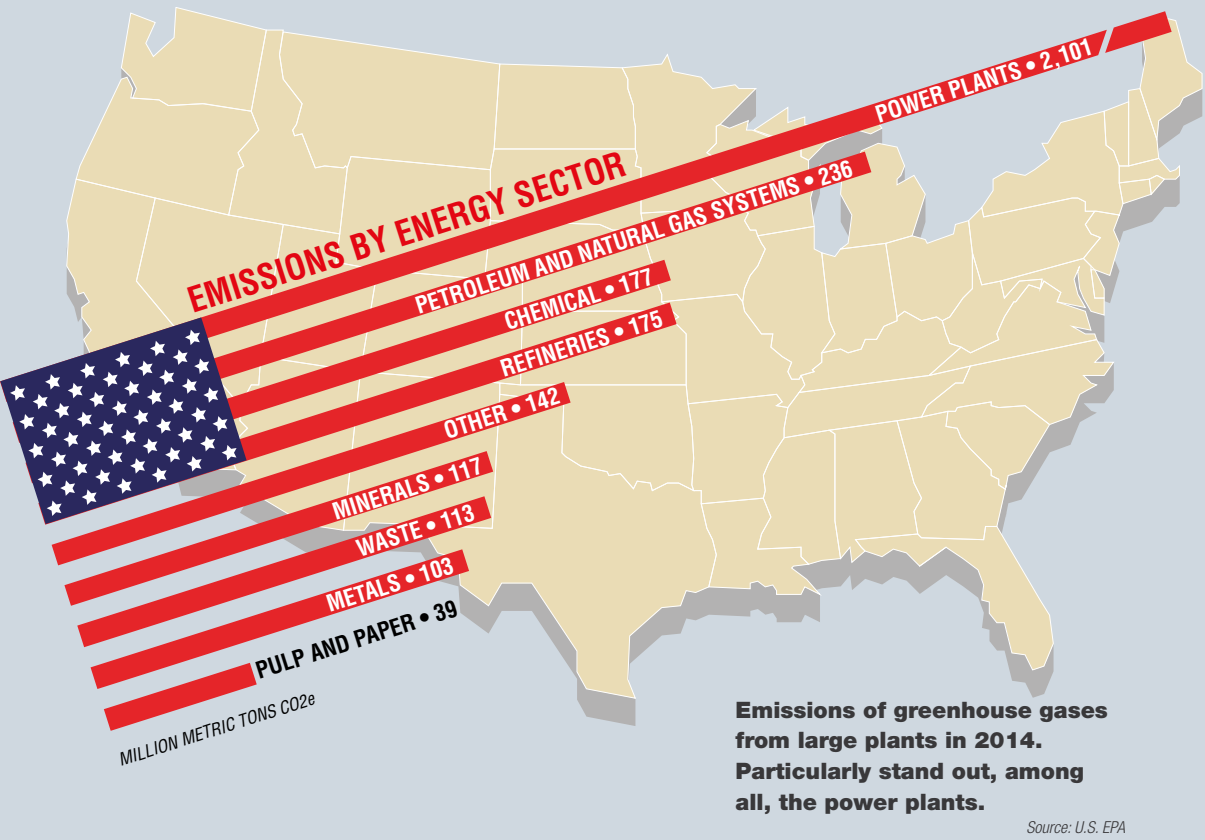
**How will the U.S. measure success in Paris? Do you believe it is possible to achieve a legally binding universal agreement on climate change?**

You know, no one is expecting to leave Paris with a single silver-bullet solution, but the kind of deal we're working toward will make an enormous difference. It will ensure that America's actions to address climate change are met by equally ambitious actions from countries around the world and that, ultimately, the impacts of climate change are reduced. President Obama is leading the world on this issue, and other countries are already stepping up to follow his example. Our international leadership has brought China, India and oth-



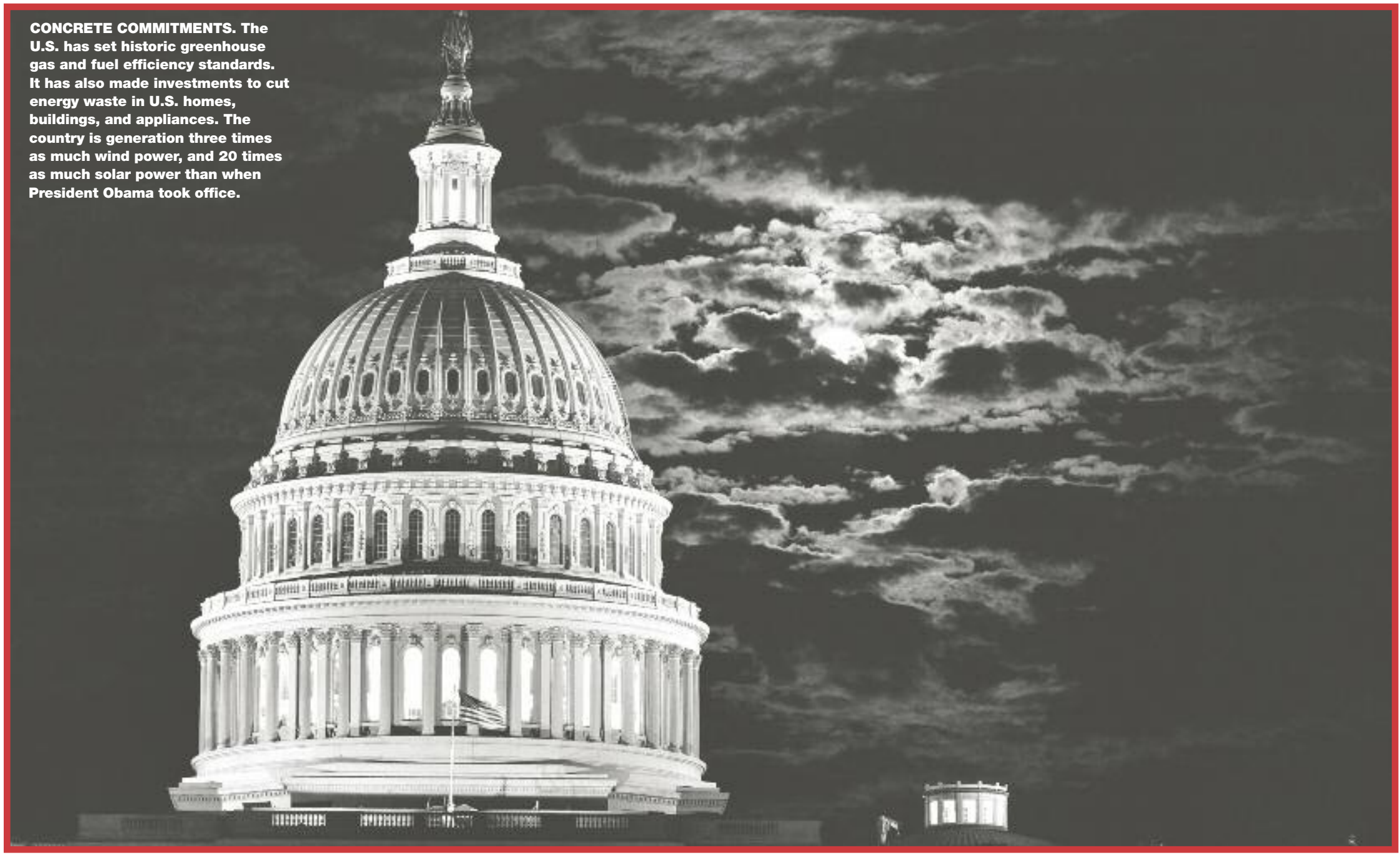
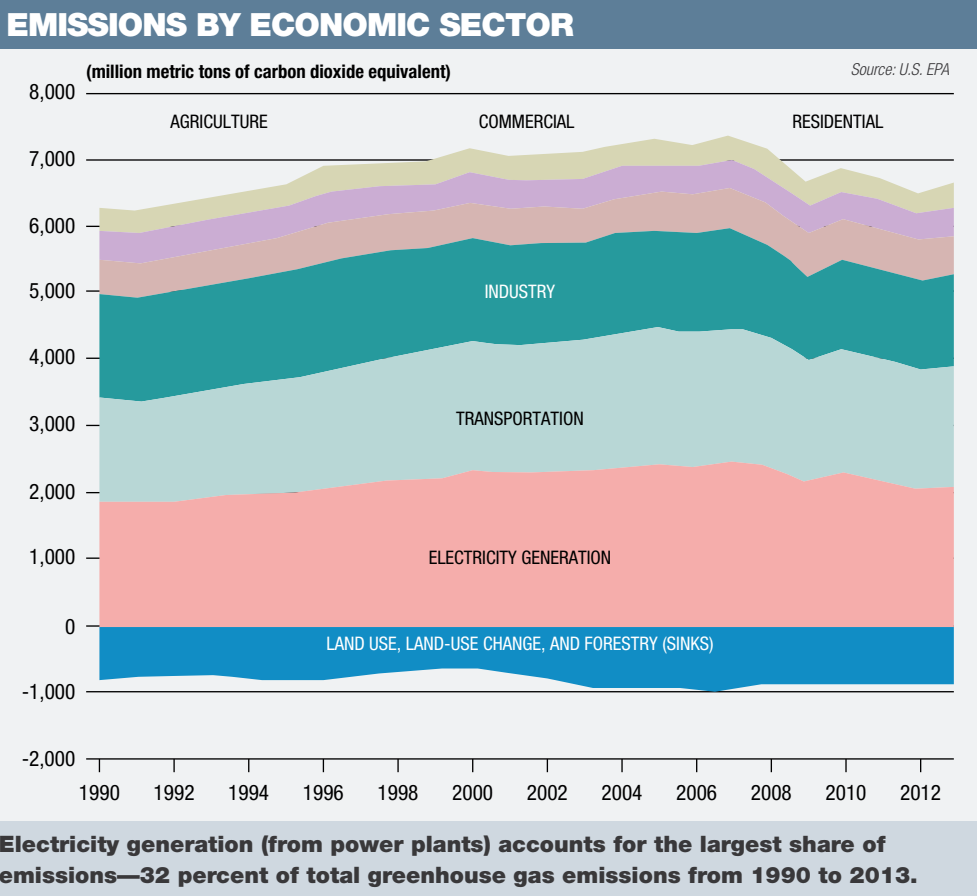
TAKEN FROM THE SPEECH OF U.S. PRESIDENT BARACK OBAMA (WHITE HOUSE, NOVEMBER 6, 2015)





# The american turning point

The Clean Power Plan gathers the first set of federal rules aimed at reducing emissions from energy plants. It is a historic plan for the United States, officially announced by President Barack Obama on August 3, 2015. The proposed goal is to **reduce levels of air pollution from power plants by 32 percent, compared with 2005 levels, by 2030.** In the plan, the EPA sets a goal for each state to reduce emissions from their power plants. The states can choose which measures to take to reach the goal: switching from coal to natural gas, increasing the use of renewables, and promoting energy savings. The states must submit the plan by 2018 and start to cut emissions by 2022.



er countries to the table, and I think the global community is well positioned for success. Over a hundred countries, representing 85 percent of global emissions have announced climate targets. So we're well on our way.

**Can you describe the specifics of what the U.S. will bring to the table in Paris?**

Paris is our opportunity to make sure that other major emitters step up and join the United States in making serious cuts to carbon pollution. What we'll push for is an agreement that, first and foremost, reflects ambitious climate targets from all countries. But we're also going to push for a framework that incentivizes countries to ratchet down their emissions over time, and in a transparent manner. And importantly, a successful agreement will need to provide the necessary financial and technical support to the poorest and most vulnerable countries.

**How do you respond to countries that say the U.S. is not doing its fair share to curb climate change given America's rate of emissions and relative wealth?**

I think our record of progress over the past several years speaks for itself. We've set historic greenhouse gas and fuel efficiency standards that will send our cars twice as far on a gallon of gas by the middle of the next decade. We've invested to cut energy waste in U.S. homes, buildings, and appliances. We're now generating three times as much wind power, and

20 times as much solar power as we did when President Obama took office. And we're seeing the U.S. private sector is stepping up to the plate—committing more than \$4 billion to scale up investments in clean energy innovation. And of course, this summer, EPA issued our historic Clean Power Plan—putting our nation on track to slash carbon pollution from power plants 32 percent below 2005 levels by 2030. There are so many actions we're taking—on methane, on HFCs, and more. These are concrete actions that are making a tangible difference. I think countries around the world see that and are motivated by it.

**What do you consider the Obama administration's greatest achievement thus far in terms of efforts impacting climate change?**

I'd say our collective record of progress over the course of this administration is something we can all be proud of. But there's a lot of work to do. For EPA's part, our Clean Power Plan is—hands down—the largest single step ever taken by our country to combat climate change. The plan will cut emissions from the U.S. power sector—which makes up a third of U.S. emissions—by more than 30 percent by 2030 and will save more than \$50 billion in climate and health-related costs in the process. This is a huge win for public health, for our environment, and for the economy.

**How do U.S. negotiators in Paris convince other nations that the promises made by this**

**administration on environmental issues will be kept if a Republican is elected to the White House? In fact, do you fear that many of your achievements—which have been the result of regulations rather than Congressional laws—will be reversed if the Republican Party wins the White House in the next elections?**

We're past promises—we've taken concrete action. The steps in EPA's Clean Power Plan are grounded firmly in the Clean Air Act; they are codified in law, and that's where they'll stay. Anyone who questions the durability of the Clean Power Plan is betting against history—and against EPA's 45-year legacy of protecting public health and the environment.

**If you could name one thing every country attending the Paris climate talks could do to have a measurable impact on curbing climate change, what would it be?**

We need ambitious climate targets from all countries. Everyone needs to step up to this global challenge, it really is all hands on deck.



# A historic U.S.-China agreement

This announcement, given on November 12, 2015 by Washington, marked a memorable moment, which came after long, secret negotiations: the powers **responsible for 45 percent of total CO<sub>2</sub> emissions** expressed their willingness to collaborate to save the environment by making specific commitments to reducing them. **China**, for the first time, declared the goal to reach peak emissions by 2030 and to begin to cut them from then on. Moreover, by 2030, clean energy sources such as solar and wind power could account for 20 percent of total Chinese production. The **U.S.** has confirmed that by 2025, it will cut its emissions by 26-28 percent. The agreement not only has a practical value in reducing pollution, but also an international political value, as it gave momentum to the negotiations ahead of COP21, and because it reconfirms the leadership role of President Obama, and, consequently, the U.S.



On [www.abo.net](http://www.abo.net), read other articles by the same author.

Molly Moore is a senior vice president of Sanderson Strategies Group, a Washington, D.C. media strategies firm, and a former *Washington Post* foreign correspondent.





**Climate & corporation/The profitable path of market-based solutions**

# Achieving profitable carbon reduction

There is much that can be done to improve the energy efficiency of existing businesses, universities, and other institutions without new regulations or subsidies

**C**

by JOSÉ MARÍA FIGUERES

orporations, governments, and energy companies are finding record profits in strategies that exploit the revolution in energy efficiency and clean energy technologies. Our organization, Rocky Mountain Institute-Carbon War Room, is at the forefront of this movement and is committed to working with partners and corporations on the implementation of profitable and innovative strategies in this field. After all, there is much that can be done here without new regulations or subsidies.

## OFFICE SPACE AS A VALUE CENTER

Let's begin with something every institution has: commercial building space. We worked with the new owners of the Empire State Building to do an energy efficiency retrofit of the iconic 2.7 million square foot office building. The Empire State Building is in most respects (other than size) a fairly typical U.S. office building. This includes similarities in its energy-use profile and in the return available on energy retrofit, which is substantial. The cost-effective retrofit reduced annual energy use by 38 percent for an annual savings of \$4.4 million, and also reduced the building's annual carbon emissions by 4,000

metric tons. Today we are driving similar savings across the United States federal government's entire portfolio of buildings. In partnership with the General Services Administration, the U.S. government's landlord and the largest property owner in the country, we have been slashing energy use and creating significant savings on energy costs. The GSA has aggressive, long-term goals for energy reduction and we are meeting them using Energy Service Performance Contracts, a type of contract that requires no cash outlay and relies on saved energy costs to calculate compensation for the energy service companies that accomplish the retrofits. Across a sample of GSA

retrofits, including an embassy complex, a naval base, and several suburban office campuses, we achieved an average 58-percent energy saving. These deep retrofits paid for themselves, and then some. The economics are so good that we are now working in the city of Chicago to do similar retrofits on 250 commercial buildings over the next three years, with more buildings in more cities to follow.

## UTILITY-SCALE CLEAN ENERGY WILL SOON BE THE ONLY GAME IN TOWN

We are also working with major corporations on their renewable energy procurement through the Business

Renewables Center (BRC). The BRC is an entity that we set up in partnership with founding corporate members including General Motors, Bloomberg, and HP, along with leading renewable energy project developers, as well as transaction intermediaries. Working together, the partners in the BRC streamline and accelerate the corporate procurement of wind and utility-scale solar energy, and we are making off-site renewable energy simple, fast and effective. The BRC is working to innovate and scale market transactions. In this, as in so many other areas of energy efficiency and clean energy, institutions are scrambling to keep up with technology. Wind power is

already cheaper than any other utility-scale energy source in many areas of the U.S. without subsidies, and the price continues to fall. The cost of solar continues its downward trend of the last years. Our efforts are targeted at helping corporations evolve their business models to take advantage of the profit opportunities that maturing wind and solar technologies make available. The market is scaling up rapidly: corporate procurement of utility-scale renewable energy reached a record 1.2 gigawatts in 2014, and the market had already hit 1.4 gigawatts by August of 2015. Nearly 75 percent of those deals involved a Business Renewables Center advisor, member and/or sponsor. Today,

the BRC's corporate members have a collective market capitalization of \$1.4 trillion and consume 36 terawatt-hours of electricity per year. They are also sharing their knowledge widely.

## EMISSIONS REDUCTIONS FROM SHIPPING

Ninety percent of global trade moves by ship, and the carbon footprint of all this commerce is huge—shipping emits more CO<sub>2</sub> than Germany, the world's fourth-largest economy, exceeding one billion tons per year. Global shipping is another area where we are making concrete, large-scale reductions in carbon emissions while increasing prof-

itability. Evolution in shipping markets, business models, and information sharing is the limiting factor holding existing available technologies back from realizing monetary value and deep emissions cuts. We have been tackling that head on by promoting and piloting a basket of self-financing energy efficiency technologies which, when deployed together, boost a ship's fuel efficiency by 10–15 percent and are paid for out of the resulting fuel savings, which can reach two million dollars per year for the largest ships. We are also working to optimize the alignment of incentives in the shipping industry, where fuel costs are often borne by the shippers of goods who do not control the fuel effi-→



**THE AUTHOR.** After a successful business career, José María Figueres Olsen served as Minister of State and was later Elected President of Costa Rica (1994–1998) at the age of 39. As President, he created a comprehensive national development strategy based on the tenets of sustainability: sound economics, investment in human development and a strong alliance with nature. He was the first person to become CEO of the World Economic Forum (2003). Figueres joined Carbon War Room in 2009 as its President. Today, he is Chair of the Board of Trustees of Rocky Mountain Institute and Carbon War Room.





## THE INITIATIVE U.S. business community to tackle climate change

# Multinationals in support of the White House

**The American Business Act on Climate Pledge gathers 81 top global companies ready to embark on a journey towards environmental change. Their role will be essential, according to Brian Deese, a Senior Advisor to President Obama**

Eighty-one global companies are signatories of the American Business Act on Climate Pledge. They have committed \$160 billion toward working with the White House to counter climate change, and will use COP21 in Paris as an opportunity to take a significant step towards "a sustainable low-carbon future."

Sealing the agreement with Barack Obama were companies such as General Electric, Apple, Ikea, Intel, General Motors, Google, Nike, Bank of America and Coca Cola. The companies are active in all 50 U.S. states, which employ over 9 million people, generating over \$3,000 billion per year in revenues and have a combined market capitalization of over \$5,000 billion. "If America is to lead" on the climate, observes Brian Deese, senior advisor to President Obama, when asked during a call with some members of the press, "not only will other countries follow us, but so will the world of business."

**This is the second group of companies to commit themselves with the White House on climate change. What is the U.S. administration's goal ahead of the Paris Summit?**

The goal is to raise its profile. We started last July, with the first thirteen companies that had signed the American Business Act on Climate Pledge. Now another 68 have been added. We do not have a precise target on the number of companies to be involved, but we hope that others will join us in this effort. I hope that we can continue to gather support. It is a very important and significant drive that aims to involve the entire supply chain of major companies. This means that if a company sets certain goals, its action extends to the entire production chain, in terms of energy efficiency or cutting emissions. This is really a very significant aspect.



**President Barack Obama enters an electric car at a technologically advance General Motors plant in Michigan. GM is among a team of companies in this sector that are committed to addressing the problem of greenhouse gas emissions.**

**What commitments have been made by signatory companies?**

Each company essentially commits on two fronts: the signing of a positive international agreement in Paris and the demonstration of being active in combating climate change, by reducing harmful emissions, increasing the use of clean energies and aiming at "zero deforestation."

Every company adhering to the agreement has set, on a voluntary basis, specific targets. Nike, for example, intends to derive 100 percent of energy from renewable sources in all its factories by 2025. Ikea wants to produce, by 2020, an amount of renewable energy equal to that consumed. Johnson & Johnson plans to cut 80 percent of its greenhouse gas emissions and power all of its facilities using renewable energy sources by 2050.

These are ambitious goals, demonstrating the fact that the international

commitment on the climate is not only positive for the planet but also for the economy. This means that when the U.S. takes on the leadership of initiatives against climate change, not only is it joined by other countries, but it also moves the industrial sector and other key players forward. In addition, a consortium of independent investors, created during the White House summit on investments in clean energies last June, has already announced a first round of investments amounting to \$1.2 billion.

**How do you intend to monitor compliance with the commitments made by the companies?**

One of the most important assumptions of the agreement concerns the task that the companies take on in terms of greater transparency, in addition to that of identifying additional steps to be made with regard

to actions already taken on cutting emissions or on the use of clean energies. Easy access is expected to data that certifies the ways in which the companies work. This will allow this administration, and also other players, to monitor performance against commitments made. We will continue to check and monitor the behavior of companies. We are also encouraging the signatory companies to intervene in the areas in which they operate so that they define the conditions to be able to all operate under the same rules, even on an international level. I would stress, however, that if the American Business Act on Climate Pledge represents a milestone, this is just the beginning. It is the first step in a series of initiatives that the White House wants to take on. We will continue to work beyond Paris. Our aim is to reach an ambitious and lasting agreement. But our effort is also to provide a degree of certainty and

encouragement to the business community committed to climate change that we hope, over time, will continue to grow.

**The absence of U.S. Oil & Gas majors among the signatories stands out. How do you plan to involve them?**

The companies that have joined us cover the entire spectrum of the American economy, from the technological sector to the retail sector, from services to manufacturing, to energy. They include major American utilities, producers and consumers of oil and gas, with coal in their portfolio. We are conducting a very constructive dialogue with the utilities, on their commitment to move towards cleaner sources and on how we can work together. The very constructive discussion is proceeding both internally and internationally and we have found a lot of support in this direction. We

will continue to have this kind of dialogue with all companies, in all sectors.

**What incentive does the White House use to involve the business community?**

We need certainty in the rules. It is clear that in the United States, as in other countries of the world, the support and backing of the business community is an important factor to be able to implement ambitious and sustainable actions. President Obama has clearly pointed out that if the right choices are made, targeting investments towards cleaner energies and developing smart, long-term regulations for all market players, the private sector will be placed in a position to enable new investments, opening up more business opportunities and creating new jobs. This is what we are beginning to see; this is the reflection of an economic reality. It must be demonstrated that they can take action to address the risks posed by climate change, by reducing emissions in a manner favorable for our economy. We are moving in this direction, but this needs to become a central argument. This is what we, at the White House, are trying to emphasize, as we have done over the past two decades.

**The carbon markets are considered an essential political tool for mitigating climate change. Will the U.S. advance proposals in this direction?**

For now, please note the important joint effort of the U.S. and China, taken during the visit of Chinese President Xi Jin Ping to the White House. On the path towards Paris, progress has been made: China has announced its intention to launch a national "cap and trade" program. Since then, that is, since the U.S.-China summit, dozens of countries have submitted their national plans for reducing emissions (INDCs) to the point that we have now



**BRIAN DEESE**

He is currently serving as Senior Advisor to the President Barack Obama. His duties include overseeing climate, conservation and energy policy and advising the President on a range of domestic and international policy issues. Previously, he served as Deputy Director of the Office of Management and Budget.

reached 150, equal to over 85% of global emissions. This is an unprecedented achievement. Clearly, there remain problems to solve but it is an encouraging result in the final stage. Negotiators continue to work, while the breadth that is found within the plans of 150 countries to limit global emissions indicates the seriousness with which the international community is addressing this topic. In addition, the support of the business and entrepreneurial community will definitely help to guide the negotiations and progress towards Paris.

**RITA KIRBY**

ciency of the shipper's fleets. So that cargo owners can steer their business to the most efficient ships, we worked with the premier maritime risk-vetting firm, RightShip, to develop a freely available A to G rating system for every ship in the business. Then we worked with the largest cargo-shippers in the world so they would favor the cleanest 'A' ships and shun the dirtiest 'G' ships. Just four years into this effort, one-fifth of the world's shipped cargo—about two billion tons on about 25,000 voyages—moves in ships chosen with the A to G system. As cargo-owners and ship-charterers

## WHO ARE WE TALKING ABOUT?

**Rocky Mountain Institute (RMI)** and **Carbon War Room (CWR)** transform global energy use to create a clean, prosperous, and secure low-carbon future. The two organizations engage businesses, institutions, entrepreneurs, and others to accelerate adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables.

move away from the least efficient ships, those ships are becoming less and less profitable. The market is catching up to this fact and the banks that finance the shipping industry are taking note, including HSH Nordbank and KfW IPEX-Bank. Lenders with a loan volume of more than 40 billion dollars now consider a ship's efficiency before making a loan, and at least one private-equity firm is in the business of financing energy retrofits of shipping fleets. Ports around the world and the Liberian ship registry, the world's second-largest, are also offering preferential rates for the most efficient ships.

## TRUCKING FLEETS ARE CARRYING HIDDEN VALUE

We are also making great strides in trucking, where fuel efficiency has historically been much lower than in shipping and is even more amenable to improvement with today's technologies. In fact, we calculate that the U.S. trucking industry spends about \$40 billion more per year than currently available technologies could allow.

Our trucking experts regularly publish confidence reports on this growing array of profitable technologies—about 70 to date—so that trucking-fleet owners and operators

can rely on information they can trust. This spurs adoption beyond what vendors can do on their own. Last year, U.S. trucking fleets using technologies that we vetted saved about \$500 million dollars and cut their emissions by nearly 20 percent. Furthermore we're not just a trusted voice within industry, but we work to be heard by all institutions. Our meetings with federal agencies helped inform the new fuel economy and emissions standards announced by the federal government in June. The proposed standards will save about 1.8 billion barrels of oil and cut greenhouse gas

emissions by about one billion metric tons.

## CARBON PRICING IMPROVES ALREADY POSITIVE ECONOMICS

As these examples demonstrate, we are making great strides using technologies that are profitable at today's prices without subsidies or carbon pricing. The call for carbon pricing by Europe's top six oil companies (and others), while an encouraging sign of the clear-eyed response to climate change among the global corporate community, is not absolutely critical to reducing CO<sub>2</sub>

emissions. The economic fundamentals of energy efficiency and clean energy are already so advantageous that the benefit of possible future carbon pricing, while real, could go a much longer way to make winning propositions even better than flipping losing propositions into the black.

## CATCHING UP WITH THE TECHNOLOGICAL REVOLUTION

We live in a world where energy efficiency and clean energy technology is outpacing the capacity of most businesses to exploit it optimally. Just as it took years for the business

community to fully take advantage of the digital revolution, industry is somewhat challenged today with catching up to what has been made possible by the energy revolution. That's another reason why we work diligently to innovate new strategies that capitalize on these new opportunities, which can scale rapidly with robust business models supporting them. As I often say, "there is no Planet B," and thus the need to ensure we continue our path towards increased wellbeing around the world, while significantly lowering carbon emissions.



**Proposal/**The route to success in Paris is through dialogue

# Like pieces of a puzzle

IPIECA, the global oil and gas industry association for environmental and social issues, represents its members' views on climate change. Its involvement in the UN's climate negotiations over the last twenty years has allowed the oil and gas sector to contribute its unique knowledge and perspective to the effort toward sustainable development

**T**he United Nations Framework Convention on Climate Change (UNFCCC) negotiations have the potential to instigate a significant increase the ambition of both governments and the private sector with regard to the global effort to reduce greenhouse gas (GHG) emissions and manage the risks of climate change. Over the past two decades, IPIECA has actively participated in UN climate negotiations. Ahead of, during and after COP21, we're renewing our efforts to engage with stakeholders and governments in the UNFCCC process. Over the past two centuries, oil and gas have become central pillars of the global energy system and the main drivers of economic development. Today, oil production alone keeps one billion cars on the road, some 20,000 commercial jet airliners in the air and at least 50,000 trading vessels at sea. Natural gas provides almost 40 per-

by BRIAN SULLIVAN

cent of global residential space heating, and 22 percent of electricity generation, while also providing heat and motive power to a significant portion of the world's industrial base. Both oil and gas are essential feed stocks for many manufacturing processes. Together, they currently provide over 50 percent of global primary energy supply. The widespread use of these two resources arises from their many important benefits, including energy density, storability, transportability, flexibility of use and affordability. Demand for oil and gas continues to rise in tandem with population size and the industrialization of developing economies. Given the primary role of energy in raising living standards, access to energy is widely recognized as a fundamental priority. As such, the UN has listed "access to affordable, reliable, sustainable and modern energy for all" as goal #7 in the draft UN Sustainable Development Goals. While enabling over 200 years of industrialization and development, the use of coal, oil and gas have contributed substantially to the

rise in atmospheric carbon dioxide (CO<sub>2</sub>) from 275 ppm in 1750 to 400 ppm today. This in turn has contributed to a warming of the climate system. Non-energy sectors such as cement calcination, agriculture, farming, forestry and land-use change are also major contributors to GHG emissions, and are equally or more difficult to mitigate. In order to stabilize atmospheric GHG concentrations and global temperature, the world will need to transition to a lower-carbon energy system.

## THE PATHWAY TO A FUTURE OF LOW-EMISSIONS

IPIECA is the global oil and gas industry association for environmental and social issues, and we represent over 60 percent of international and national oil and gas production. We bring together industry leaders to work collectively towards progress on environmental and social performance. In June 2015, six months before the 21<sup>st</sup> session of the Conference of Parties (COP21), we released *The Paris Puzzle: The Pathway to a Low-emissions Future*.

This lays out our global membership's views on the challenges the world faces in transitioning to a low-emissions future, and identifies the critical parts of the puzzle: *Meeting energy needs; effective policy; managing our emissions; natural gas; and, carbon capture and storage*. We recognise that a low-emissions global energy system would look significantly different from today's and that such a transformation poses a major challenge to accomplish. IPIECA with the Paris Puzzle proposal:

- recognises that addressing the risks of climate change is a challenge for our generation and will be for those to come. Meeting the challenge will require actions from all parts of society. Significant policy action, technological development and business response will be needed over many decades. The oil and gas industry can play a key role in helping society to meet the challenge;
- supports and encourages governments in their efforts to reach an effective and clear international agreement to reduce greenhouse gas emissions and to manage the risks of climate change;
- believes it is possible to address climate change risks while also meeting growing global energy demand and supporting economic development. As an industry, we are already taking a range of actions across our own operations and products to support these goals.

Today, global CO<sub>2</sub> emissions from all anthropogenic sources stand at some 40 billion tons per annum. Energy use and CO<sub>2</sub> emissions occur far beyond the power generation and transport sectors, and are associated with the manufacturing or provision of almost everything we use, buy, wear, eat and do.

## THE SUSTAINABLE ENERGY DILEMMA

Recently, the concept of net-zero or near-zero CO<sub>2</sub> emissions has been put forward by stakeholders and proposed as a possible long-term goal under the UNFCCC. Net-zero CO<sub>2</sub> emissions means the sum of all emissions, including those from fossil fuels and various land-use sources, would match the emissions removed by carbon capture and storage (CCS) and sinks including land and forestry. The achievement of a net-zero emissions goal would be extremely challenging. Transforming the global energy system to be low-carbon would require extensive changes to many parts of society and local and national economies. Significant support for mitigation technologies and approaches would be needed, energy economics and consumption patterns would need to change substantially, and consumers would need to accept these shifts. But whatever the final destination, society, policymakers, business and civil society should start now in making the long transition. We support and encourage the international community's efforts to address the risks of climate change and believe the oil and gas industry has an essential part to play in this transition, by improving the efficiency of existing technologies and resources and contributing to the development of new ones. An energy system that powers and moves a modern society while also delivering significant global, economy-wide carbon reduction presents a sustainable energy dilemma. Each energy option has challenges that

## WHO ARE WE TALKING ABOUT?

IPIECA is an **organization representing the oil and gas industry** on climate and energy, environmental and social issues. With its global membership consisting of a diverse group of international oil companies, independents and national oil and gas companies, it works to achieve a consensus view on climate change. Eni is an active member of IPIECA.

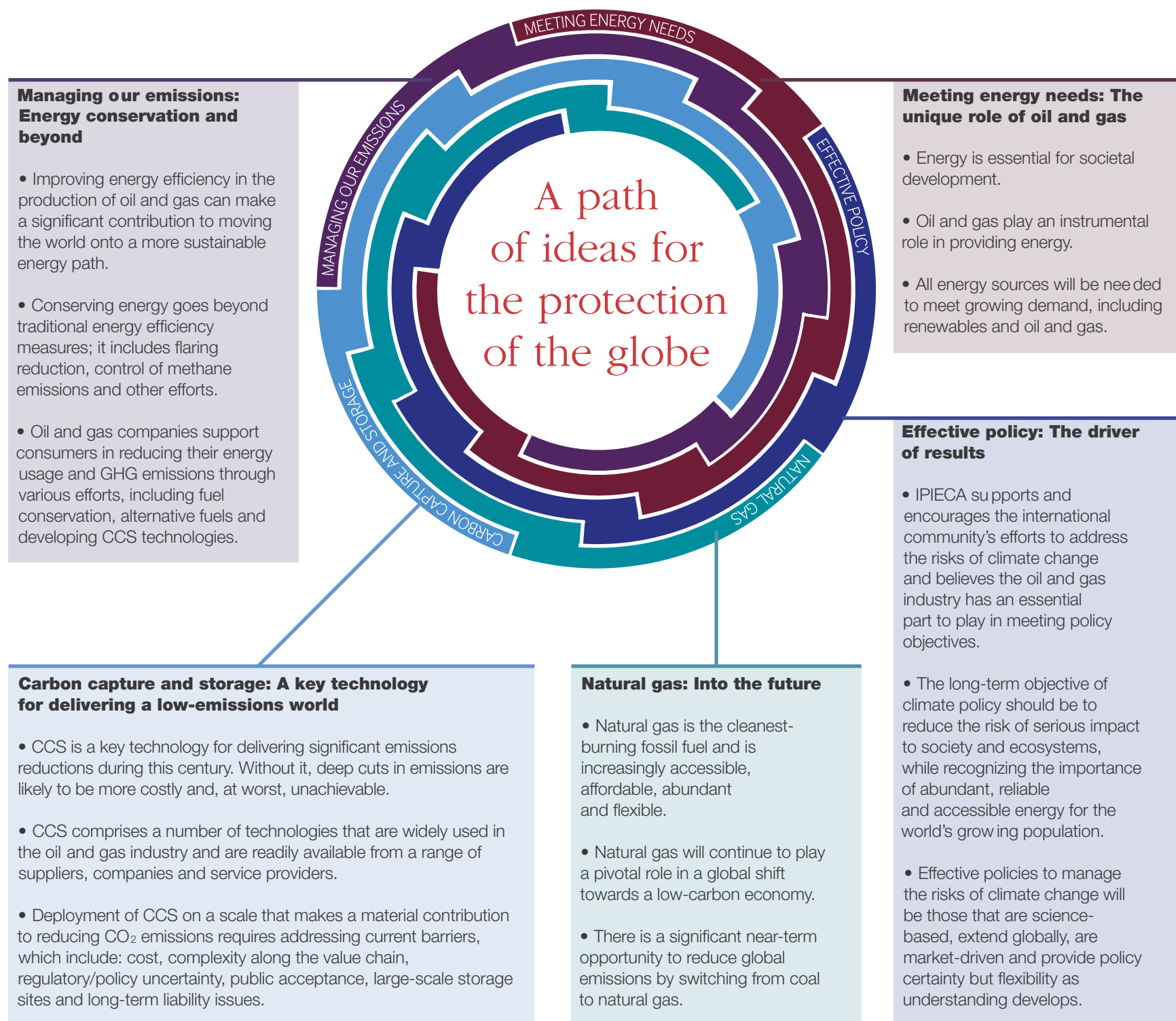
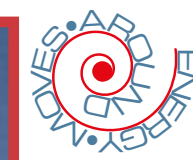
## THE AUTHOR



Executive Director of IPIECA, Brian Sullivan joined the association in 2011 from the biofuels industry and following a 23 year career at BP.

Over the course of his 23-year career, he had assignments in London, Copenhagen, Budapest, Athens and Johannesburg, and business experience in over 60 countries. During his time with BP, he has had a varied career of technical, commercial, financial and leadership roles across the downstream value chain including crude and products trading, marine fuels, lubricants and alternative energy.





## Reflections/The decarbonization of the global economy

# Proof of facts

An assessment of the prospects for a low carbon future, considering both the economic powers and the countries of the developing world, in particular those of Asia and Africa

**T**he only proper way to assess the decarbonization prospects of the modern energy supply is to do so on a global scale, as the emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from fossil fuel combustion contribute to rising atmospheric temperatures regardless of their sources or national origins. Such realistic assessments—taking into consideration many national peculiarities, economic and technical imperatives and environmental concerns—

differ from wishful scenarios that disregard these things. Affluent countries in general, and the EU in particular, are vocal about the perils of global climate change and are willing to mandate and subsidize new “green” solutions in order to accelerate the decarbonization of their energy systems. Germany calls for a 50 percent cut by 2050, Sweden aims at completely eliminating all fossil fuels. In contrast, the main preoccupation of the low-income countries of Asia and Africa, whose annual per capita energy use is an order of magnitude smaller than in Europe, is continued economic growth energized by any domestically avail-

able resources, be it coal in India, crude oil in Angola or newly discovered natural gas in Mozambique. Their efforts will, inevitably, increase national CO<sub>2</sub> (and also CH<sub>4</sub>) emissions for decades to come. And then there is China, always a unique player—the world's largest population, the world's largest energy consumer and the world's largest emitter of greenhouse gases—which promises to reduce the carbon intensity of its economy but will see emissions continue to rise before peaking sometime during the late 2020s. The following key elements should be thus kept in mind as we look ahead. ➔

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will need to be addressed to resolve this dilemma. In general, most energy sources have issues to varying degrees around public acceptability and environmental impact. For fossil fuels, their use can be combined with CCS to mitigate CO<sub>2</sub> emissions, although significant barriers remain. Renewable resources and technologies have significant long-term potential and are growing fast, but suffer from high cost, intermittency and other barriers, and so are starting from a very low baseline of energy delivered.

### ALL THE PIECES OF THE PUZZLE CAN FIT TOGETHER

We believe the oil and gas industry must be a key part of the climate change solution. Our industry's history of innovation, global reach, knowledge and technical expertise uniquely positions it to help develop and provide credible future energy solutions, with many pieces of the puzzle

already being addressed. IPIECA has created a series of papers intended to address what we see as key components of efforts or ‘pieces of the puzzle’ to address climate change and demonstrate our commitment to meeting the challenge.

### THE IMPORTANCE OF AN OPEN DIALOGUE

We strive for ongoing transparency and dialogue with stakeholders on the crucial topic of climate change. Our members have been engaging in UN processes on climate change for over 20 years. Improving our understanding of the physical science of climate change, potential impacts, and options for mitigation and adaptation provides a solid foundation for decision making. The association continues to partner with a number of academic institutions and projects aimed at improving knowledge, such as the MIT

Joint Program on the Science and Policy of Global Change and the EU Joint Research Centre on the life-cycle analysis of our products. We regularly engage in the Intergovernmental Panel on Climate Change (IPCC) scientific assessment process and have contributed to both its Assessment Reports as well as Special Reports. The association also organizes side-events at the UNFCCC's meetings to further facilitate and encourage active dialogue. Reporting also helps to establish a basis for transparency and facilitates the development of emission mitigation and risk management processes. Many companies within the industry were early adopters and developers of methodologies for accounting and reporting GHG emissions, with IPIECA developing the first sector guidance back in 2004. Understanding the sources and quantity of emissions is essential to achieve the emission reductions that are needed. The association-

continues to develop guidance for oil and gas companies on GHG reporting, including the Sustainability Reporting indicators, and the GHG reduction project guidance series. Our industry is a central part of the dialogue on the pathway to a low-emissions future. We underscore the importance of partnerships between all sectors and stakeholders to build on existing performance and expertise, improve understanding and ultimately make progress in meeting this complex challenge. ■





## Decarbonization

There is nothing new about relative decarbonization of economies. A combination of rising energy conversion efficiencies, greater reliance on natural gas (particularly as it replaces much more carbon-intensive coal), and higher shares of renewables (wind and solar) in electricity generation has been reducing carbon emissions per unit of economic product. Some countries have shown impressively rates of reduction but on the global level this has been a very slow process, with the carbon content of the world's primary energy supply declining from about 25 kilograms per gigajoule in 1900 to less than 19 kilograms per gigajoule in 2010, a 25 percent drop in 110 years that translates to an average decarbonization rate of only about 0.2 percent per year.



## A comparison of different countries

Absolute decarbonization is a recent phenomenon that has been restricted to affluent countries, especially those with stagnating economies and populations. Until the 1980s, all major economies were emitting more carbon. Many EU countries (and also the U.S.) have seen their emissions either stagnating or declining during the past generation, while the totals for modernizing countries, be they India and Indonesia, Brazil and Egypt, or China and Bangladesh, have been rising, in some cases quite steeply. Germany's carbon emissions from fossil fuel combustion declined by about 25 percent between 1990 and 2015 but Brazilian emissions, in contrast, more than doubled, and Chinese emissions nearly quadrupled. Global emissions rose by almost 60 percent during the same period.



## Biofuel opportunities

The only possible alternative for these key transportation uses are modern biofuels, but their output amounts to a small fraction of overall demand and scaling up of their production faces serious economic and environmental limits. Only a few land-rich countries could replicate U.S. or Brazilian reliance on ethanol (the U.S. now diverts a third of its corn crop, the world's largest, to make ethanol), but its production may, or may not, reduce overall carbon emissions. Similar limits apply to biodiesel derived from oil crops. The only possible mass-scale alternative is fuels derived from ligno-cellulosic biomass that is not digestible by humans and that comes from logging and crop residues whose exploitation does not compete with food and food needs and does not require additional nutrient-rich land. The world's first cellulosic ethanol plant opened in Iowa in 2015 and will produce about 100 million liters a year, while the world's demand for liquid transportation fuels is about 25,000 times higher than that. Clearly, even if the costs of cellulosic ethanol prove to be acceptable, a very long scaling-up task lies ahead before cellulosic ethanol could supply a large share of transportation fuels leaving out the need for a practical substitute for diesel fuel.



## Fossil fuels

Even after more than two decades of promoting and subsidizing new renewables (wind, solar and modern biofuels), their overall contribution to the global primary energy supply remains minuscule. European media love

to point out that on one sunny day half of Germany's electricity during one noon hour came from photovoltaics or that on a windy day Denmark got all of its electricity from wind. But these are fleeting, localized achievements that have, so far, done little to change the fundamental nature of global primary energy supply. In 1990, 90 percent of the world's commercial primary energy came from fossil fuels, with hydro and nuclear energy delivering nearly all of the rest. In 2015, a generation later, fossil fuels still supplied about 86 percent of all commercial primary energy, with hydro energy contributing nearly 7 percent and nuclear energy more than 3 percent, while the combination of wind turbines, photovoltaics and modern biofuel provided less than 3 percent of the total.



## Africa and the future

More than half of the world's population increase between 2015 and 2050 will take place in Africa, where average per capita energy use is a small fraction of the rate in affluent countries. Even in hydrocarbon-rich Nigeria, the annual rate is merely 6 gigajoules per capita (less than 150 kg of oil) compared to the average of more than 150 gigajoules (more than 3.5 tons of oil) for leading EU economies, and in most sub-Saharan countries the consumption of modern energies is only a few gigajoules per capita. In order to develop their economies all of those rapidly growing countries will require badly needed infrastructural and agricultural investment and hence large amounts of fossil fuels to produce steel, cement, farm machinery and fertilizers and to fuel their trucks and tractors.



## "Carbon neutral" industry

In many countries, significant shares of electricity now produced from fossil fuels can be replaced by renewables, but solar and wind electricity will do little or nothing to secure energy for several key industrial processes whose mass-scale output defines modern civilization. Steel production rests mostly on the smelting of iron from iron ore, a process that now requires about one billion tons of coal to produce metallurgical coke. No carbon-free process is ready to be deployed on a mass commercial scale, and none looks to be able to fill the need anytime soon. The synthesis of plastics and ammonia (the first step to all nitrogenous fertilizers) requires large volumes of liquid and gaseous (above all methane and ethane) feedstocks. Again, there are no alternative carbon-free commercial process to synthesize plastics and ammonia that could be deployed soon on mass scales.



## Mass transportation

Renewable electricity generation will also have a limited impact on three key forms of mass transportation: trucking, shipping and flying. While it is not unrealistic to foresee large shares of passenger cars running on electricity or eventually relying on hydrogen-based fuel cells, trucking, marine shipments (both bulk carriers and container vessels) and flying (now consuming about 65 percent of the global supply of fuels refined from crude oil) will rely on high energy-density fuels for decades to come as, yet again, no mass-scale alternatives are on any practical engineering horizon.



## Non-carbon energies require a lot of fossil fuels

The term non-carbon energies is actually a misnomer, as all such conversion techniques require large inputs of raw materials that we now produce only by using large amounts of fossil fuels. Construction of hydro stations and nuclear power plants needs large amounts of concrete and reinforcing and structural steel, as do wind turbine farms. For example, I have calculated that if wind-generated electricity were to supply 25 percent of the global electricity demand by the year 2030, the requisite number of large (5 MW) wind turbines would need an equivalent of more than 600 million tons of coal to produce steel for foundations, towers and nacelles (but not for high-voltage transmission towers), and an equivalent of nearly 100 million tons of crude oil to make large plastic blades.



## We need a multi-generational effort

Mandates and subsidies can accelerate the adoption of non-carbon (or, more accurately) low-carbon energy conversions, but we are a predominantly fossil-fueled civilization and will remain so for decades to come. The world's economies and populations now depend on annual extraction of more than 11 billion tons of fossil fuels, amounting to about 470 exajoules of energy used at the rate of 15 terawatt. Substantially reducing our dependence on this enormous, deeply embedded system (the world's most extensive and the most expensive infrastructure worth more than \$20 trillion) cannot be done—regardless of the desirability of such a shift—in a matter of few decades; it will be a multi-generational effort. A new energy system must emerge gradually and should develop organically: such complex transformations cannot be rigidly planned according to government targets and quotas because their eventual progress, composition and performance cannot be fully envisaged decades before it take place.



## Shift the energy basis

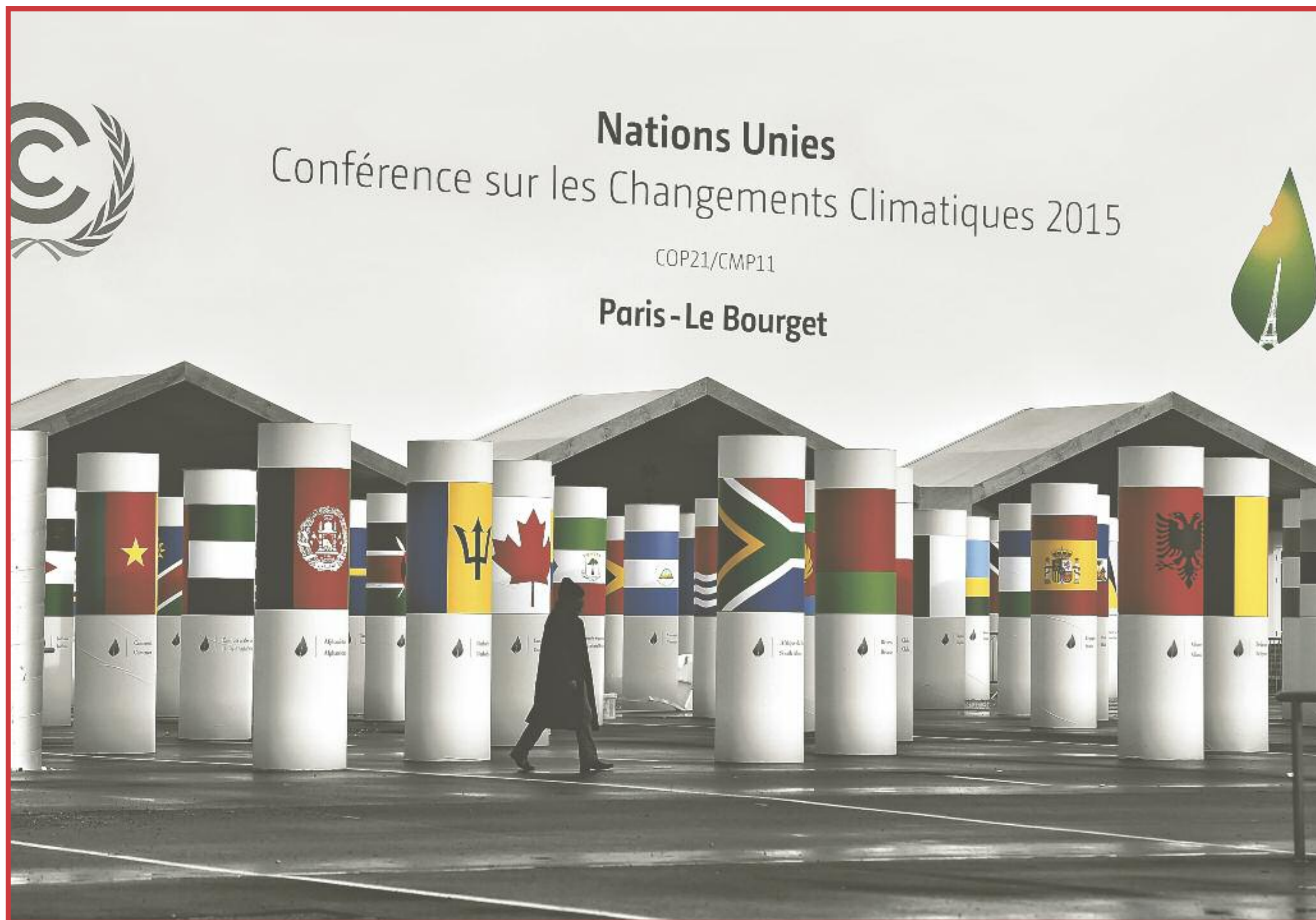
This slow market penetration is as expected because global energy transitions are inherently protracted affairs: a small country can shift its energy basis fairly quickly, but on the global level it takes many decades before a new energy source claim a significant market share. I have shown that after coal reached 5 percent of the global energy supply (when it began displacing wood) it took another 35 years for it to provide 25 percent of total consumption; oil took 40 years to go from 5 percent to 25 percent, and it was 55 years before natural gas rose from 5 percent of the world's energy to 25 percent—and new renewables are yet to reach the 5 percent mark.



Analysis/Results and intentions in the near future

# Turning points

We start with the Conference of the Parties. It is an achievement that we'll have almost all countries sitting together at the table. Success will come in the effective governance of a long-term process rather than in the goals for 2030



**T**

by CARLO CARRARO

a new comprehensive climate agreement to guide international action toward 2020. The stakes are high: countries must find common ground not only with regard to goals for reducing emissions, but also for adaptation measures, funding plans to support developing countries, and technology transfers. A key pillar of the Paris agreement is the so-called INDCs, or "Intended nationally determined contributions." a tool under the United Nations Framework Convention on Climate Change (UNFCCC) with which both developed and developing countries adopt a series of national actions and measures to address climate change.

## COMMON AWARENESS: A HISTORIC TURNING POINT

The Paris agreement represents a historic turning point. Overcoming the historic dichotomy between Annex I countries and Non-Annex I countries, the Paris agreement in fact sees the participation of all nations—developed, emerging and undeveloped—all aware that climate change is no longer an environmental issue, but a global economic development problem requiring effective, albeit unevenly distributed, action by all. To date, at least 168 countries have submitted their commitments to reduce or control their emissions. These countries account for almost all global emissions. This is the second major turning point. For the first time, all greenhouse gas emissions are controlled, although not yet reduced, by the concerted action of almost all countries. According to UNFCCC estimates, total global emissions will grow very little if, by 2030, the INDCs are effectively implemented. This is a major achievement given that over the past 40 years, emissions have always increased, and that over

the last decade, they have grown at an average annual rate of 2.3 percent, almost double the average of the previous thirty years. However, despite having the same goal, the INDCs reveal a number of substantial differences. On the one hand, the most advanced economies, including the U.S. and E.U., propose economy-wide reduction targets from a base year. On the other hand, it is not unusual to find the target of reducing carbon intensity among the developing countries, such as China, Singapore and Tunisia, which have chosen to reduce greenhouse gas emissions per unit of GDP, or more frequently, one percentage deviation from a BaU (Business as Usual) scenario. Moreover, in the case of developing countries, a lower "unconditional" commitment and a higher "conditional" commitment are usually proposed, the latter only feasible with the economic and technological support of the international community. Finally, the contributions of the developing countries →



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## Encyclical on the environment/Pope Francis issues a wakeup call

# Calling for an ecological conversion

In the first official document published by the Catholic Church on the environment, the Pope invites all to take on “the serious commitment to respect and preserve God’s creation, to be attentive to every person, to counter the culture of waste and scrap”

“We are preserving Christ in our life, to look after others, to look after Creation!” On March 19, 2013, Pope Francis was inaugurated, and he immediately signaled that climate change would be a priority. Looking after Creation and people are the two tasks that the new Bishop of Rome, “summoned almost by the end of the world,” feels that he and today’s Church have been entrusted with. He has seized an evangelical mandate to seek the salvation of the entire human race, not only in the promise of another life, but in experiencing justice and peace, which can and must start here and now. “This land of ours,” he explained, in a November 25, 2014 speech to the European Parliament in Strasbourg, “actually needs constant care and attention and every one of us has a personal responsibility to look after Creation, the precious gift that God has placed in the hands of

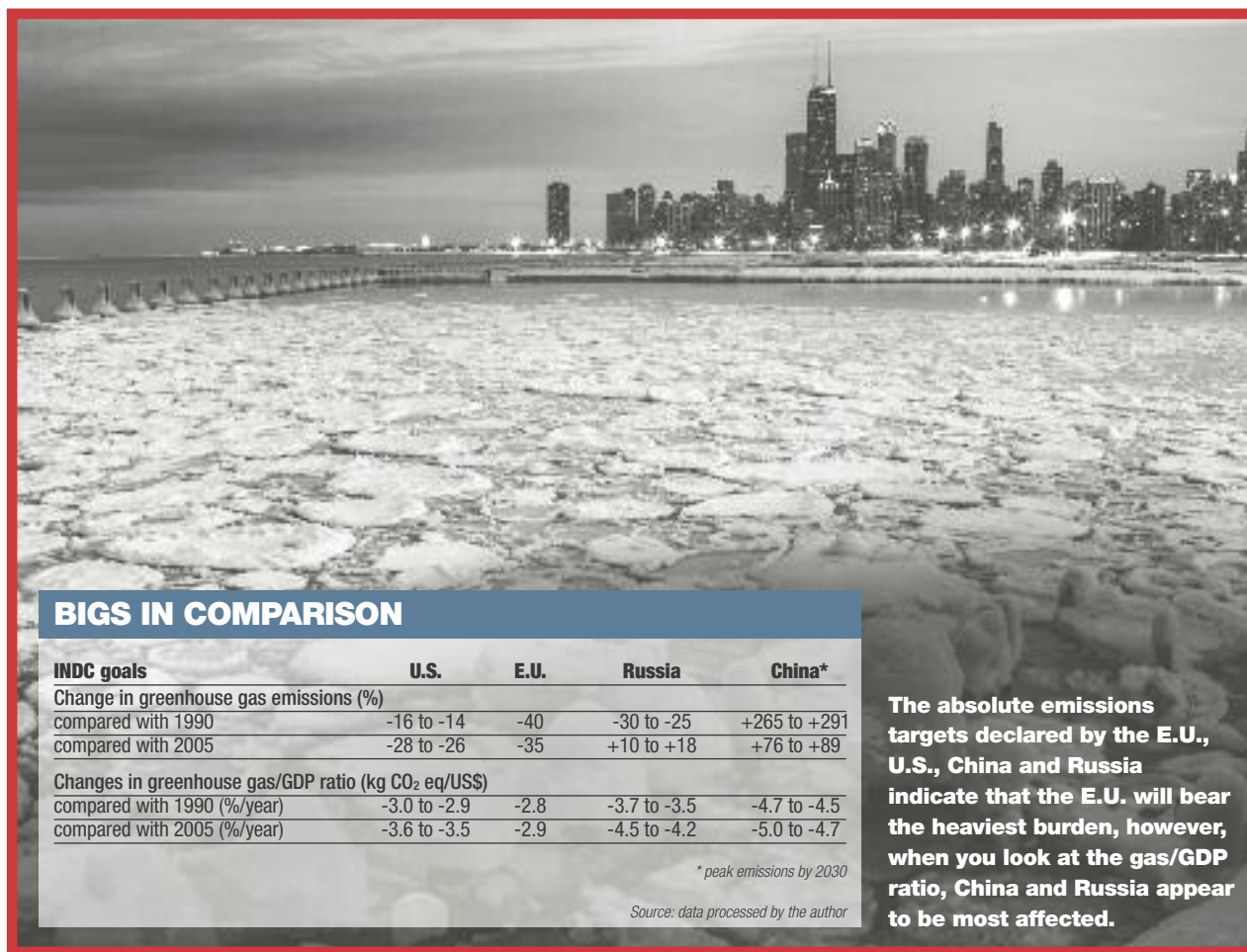
mankind. This means, on the one hand, that nature is at our disposal, we can enjoy it and make good use of it; on the other hand, however, it means that we are not the masters of it. We are the guardians, but not the masters. We must therefore love it and look after it, but we are often driven by the pride of dominating, possessing, manipulating, exploiting; we do not ‘look after’ it, we do not respect it, we do not think of it as a free gift that we must take care of.”

In the Encyclical “Laudato Si”—a revolutionary document in the same way as the *Rerum Novarum* of Leo XIII, which launched the Social Doctrine of the Church, which then took great strides forward with the *Pacem in Terris* of John XXIII, the *Populorum Progressio* of Paul VI and the *Laborem Exercens* of John Paul II—Pope Francis exhorted us to “rethink the obsolete criteria that continue to govern the world” and to “guarantee increasingly balanced environmental conditions,” warning that “this cannot be achieved by excluding anyone.”

### CHANGING LIFESTYLES IN ORDER TO STOP DEPLETING THE EARTH

The Pope also recommends that we should consider the needs of future generations, handing over the Earth to them as if it had been on loan to us. Sustainable development, to Francis, implies respecting the environment, but also real social justice. “Austerity is not against development, rather it is now obvious that it has become a condition for it,” the Pope summed up, proposing principles and guidelines “on taking care of our shared home” in his

green Encyclical. He then explained his appeal to “change lifestyles” to the participants at the 39th session of the Food and Agricultural Organization International Conference, held to discuss the sustainability of the increase in agri-food production needed to satisfy the demands of the world population. “The statistics on waste are very worrying,” he confided in a speech on May 20, 2015, “one third of the food produced ends up wasted. It is equally disconcerting to know that a large amount of agricultural products are used for other purposes, albeit for good pur- ➔



**The absolute emissions targets declared by the E.U., U.S., China and Russia indicate that the E.U. will bear the heaviest burden, however, when you look at the gas/GDP ratio, China and Russia appear to be most affected.**

are usually more focused on adaptation measures, while the developed countries mainly focus on actions to reduce emissions.

### DIFFERENT COUNTRIES, DIFFERENT COMMITMENTS

Faced with this situation, the first attempts to assess and compare the various pieces of such a fragmented picture are emerging. Looking, for example, at the targets declared by four of the major greenhouse gas emitters, that is, the EU, the U.S., China and Russia, which together produce approximately 60 percent of global emissions, it can be seen that—comparing absolute emission levels—the European Union will bear a heavier commitment than the other countries. On the contrary, considering the changes in the greenhouse gas/GDP ratio, China and Russia will carry the burden of climate action (see graph). But what matters is not so much a comparison in relation to a base year, but an assessment of the effectiveness of the INDCs. It follows that comparison of the various INDCs should especially consider the distance between each INDC and the path towards reducing emissions necessary for the purpose of achieving the goal to limit global warming to within two degrees centigrade by the end of the century. Let us consider, for example, the European Union. It is well known how the E.U. has for years taken the lead in the fight against climate

change by adopting a large number of climate policy tools, from the emission permits market to significant subsidies for renewables. There is no doubt, therefore, that there is both the political commitment and the operational tools to achieve the goal, by 2030, of a 40 percent reduction (compared with 1990) in greenhouse gas emissions. Not just that: this goal, and the next announced for 2050 (-80 percent greenhouse gas emissions) are fully in line with the trajectory that emissions should follow so that the average temperature by the end of the century does not increase by more than 2°C. The situation is similar in the United States, although with some doubt about the political commitment. The U.S. aims to reduce emissions by 26-28 percent by 2025 (from 2005 levels). This goal is also in line with that of limiting the increase in average temperature by no more than 2°C. It is highly likely that for the U.S. it is technically and economically feasible to reduce greenhouse gas emissions in order to achieve the expected goal. However, in the U.S., the main barrier to action on the climate front will be of a political nature. The U.S. Congress, which currently has a Republican majority, may oppose many interventions aimed at effectively reducing greenhouse gas emissions. In response to these political obstacles, President Obama could develop, through regulatory mechanisms, a framework for action that does not require the approval of the Congress. Among

these regulatory mechanisms, the most significant are the Clean Power Plan, the energy efficiency standards, and the standards for heavy-duty engines and vehicles. The situation in China is less positive. The country is committed to reaching its peak emissions by 2030, if not before. A peak in emissions in 2030 does not appear to be consistent with the 2°C target. As this goal will be reached by the end of the century, the peak in China’s emissions should occur between 2020 and 2025. Nevertheless, it is worth looking positively at the effort made by China. With the previous target (2005-2020), the country would have had to reduce energy intensity by approximately 3 percent per year (hardly feasible for China). With the new commitment (peak emissions by 2030), the implicit rate of reduction in emissions is approximately 4 percent per year. It is still a significant and costly commitment to be accepted in the logic of a fair distribution of commitments. It is also important to emphasize the importance for China of the goal regarding the use of energy from non-fossil fuels. Solar power in China is developing at an unprecedented rate. Nuclear power is also growing rapidly. China aims to increase the share of energy from non-fossil fuels to 20 percent, at least by 2030. This is certainly a challenging goal. Currently, only 10 percent of China’s energy mix comes from renewable energy sources as an alternative to fossil fuels. 20 percent of the “clean” energy sought by Chi-



“Europe has always been in the front line with its commendable commitment to ecology. Respecting the environment, however, not only means refraining from damaging it, but also using it for good. I am thinking, in particular, of the agricultural sector, called upon to sustain and feed mankind. It is unacceptable that millions of people in the world are dying from hunger while tons of foodstuffs are thrown away every day from our tables”

poses, but not for immediately satisfying the needs of those who are hungry.” “Let’s ask ourselves,” he suggests “what we can do. Or rather, what I am actually doing.”

Pope Francis specifically condemned “transnational businesses and countries hoarding land that can be cultivated, which not only deprives farmers of an essential asset, but directly attacks the sovereignty of nations.” Specifically, the Encyclical attacks those who claim that the right to private ownership is absolute or untouchable, emphasizing, on the other hand, “the social function of any form of private ownership.” Pope John Paul II also spoke about legitimate private ownership rights, but burdened by “a social obligation so that the goods are used for the general purpose that God gave them for.” According to the Encyclical, “every ecological approach must include a social perspective that takes into account the fundamental rights of the most disadvantaged. The principle of the subordination of private property to the universal destination of the goods and, therefore, the universal right to use them, is a ‘golden rule’ of social behavior, and the main principle of the entire ethical-social order. Christian tradition, moreover, has never recognized the right of private ownership as absolute or untouchable, and has emphasized the social function of any form of private ownership.”

“Our shared home is being plundered, devastated, humiliated with impunity,” Pope Francis noted with disappointment, citing “international summits taking place one after another, but not producing any important results” and leaving “a clear, precise and ethical imperative to act, which cannot be postponed” unfilled. “Time, brothers and sisters, time seems to be running out; fighting among ourselves hasn’t been enough, we have managed to attack our own home. The earth, communities and people are being penalized in a way that is almost savage,” he admonished again in a speech to the World Meeting of Popular Movements in Santa Cruz last July, using words that could not fail to arouse compassion. And Laudato Si underlined that “war always causes serious damage to the environment and the cultural wealth of peoples, and the risks become enormous when one thinks about nuclear energy and biological weapons. Actually, in spite of international agreements

banning chemical, bacterial and biological warfare, research is going on in laboratories into the development of new offensive weapons, capable of altering the balance of nature.” This is why the Encyclical asks for policies that pay more attention to preventing and resolving situations that may give rise to new conflicts.

#### INCREASING ALTERNATIVE ENERGY SOURCES

In his speech to the European Parliament, the Pope deals in a very practical way with the subject of alternative sources of energy, the development of which would help greatly in the protection of the environment. “Europe has always been in the front line with its commendable commitment to ecology. Respecting the environment, however, means not only refraining from damaging it, but also using it for good. I am thinking, in particular, of the agricultural sector, called upon to sustain and feed mankind. It is unacceptable that millions of people in the world are dying

from hunger while tons of foodstuffs are thrown away every day from our tables. In addition, respecting nature reminds us that man is a fundamental part of it.”

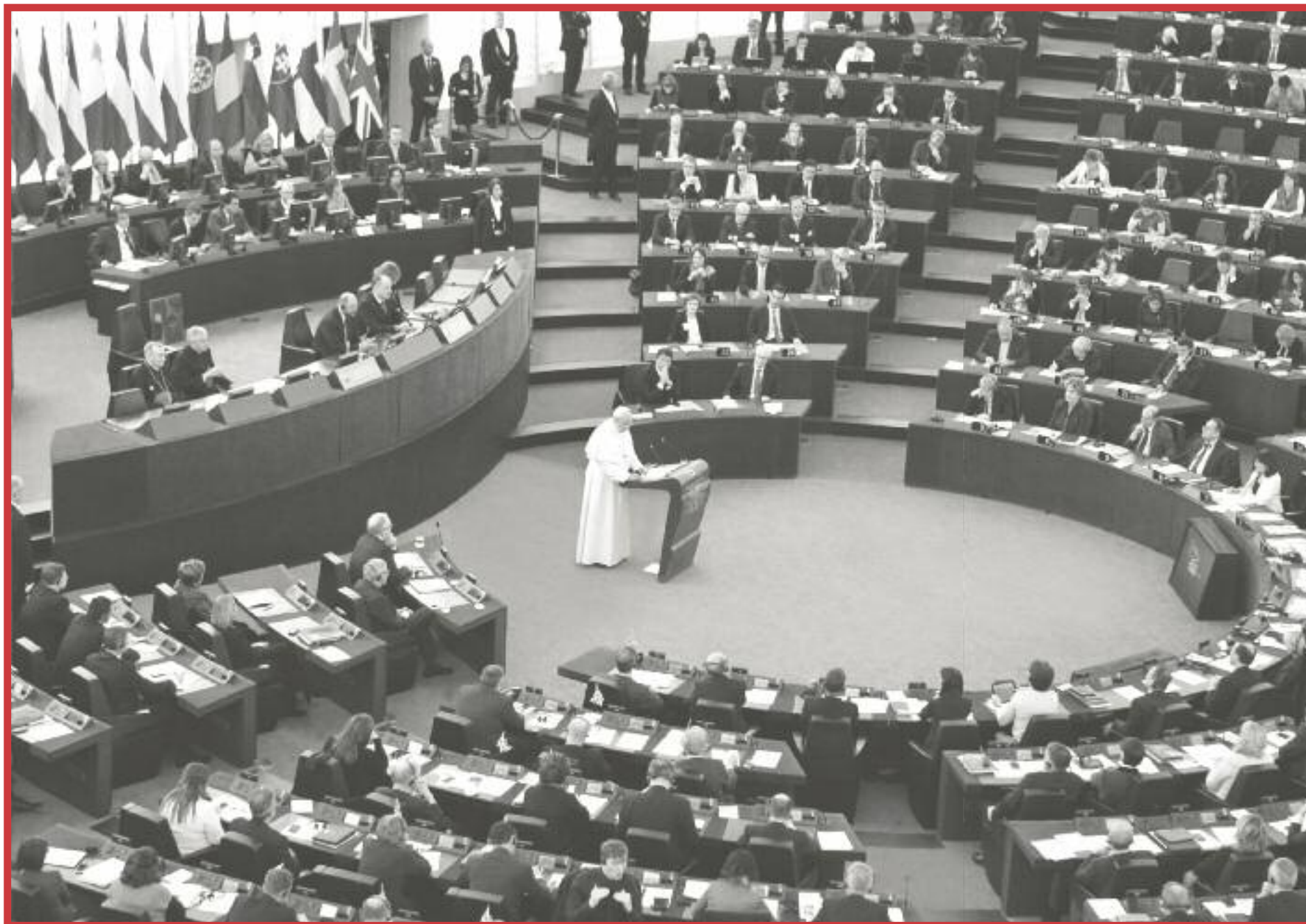
Pope Francis didn’t shrink from offering practical suggestions directly to participants in Laudato Si: “It is very noble to take on the task of looking after creation through small, daily actions, and it is wonderful that education is capable of providing motivation to create a lifestyle. Education about environmental responsibility can encourage various forms of behavior which have a direct and important impact on caring for the environment, such as avoiding the use of plastics or paper, limiting water consumption, separate waste collection, only cooking as much as one can reasonably eat, treating other human beings with respect, using public transport or car sharing, planting trees, switching off lights that are not needed, and so on.” Integral ecology, therefore, “also invests in everyday life,” specifically in an urban environment where, as the document

pleads, there is “an all-round improvement in the quality of human life: public spaces, housing, transport.” Human beings have a great capacity to adapt, and for Bergoglio “the creativity and generosity of people and groups, who are capable of overturning the limits of the environment, learning to direct their existence in the midst of chaos and uncertainty is admirable.”

“We need—he writes in the Encyclical—a mutual exchange that joins everyone together, because the environmental challenge we are experiencing, and its human roots, concern us and touch everyone. The world ecological movement has already forged a long and fruitful path, and has created numerous groups of citizens who have promoted a raising of consciousness.” Unfortunately, according to Pope Francis, “many efforts to search for concrete solutions to the environmental crisis are often frustrated, not only by being dismissed by those in power, but also through the lack of interest of others.” “Attitudes that are hindering the

#### THE ADDRESS TO EUROPE

The Pope, in his speech before the European Parliament, addressed the issue of renewable energy, the development of which “would greatly benefit the environment.” Pictured below, the Pope visiting Strasbourg on Nov. 25, 2014.



way to solutions, including among believers, range from denying there is a problem to indifference, convenient resignation or blind faith in technical solutions. We therefore need new universal solidarity: in the words of the Bishops of South Africa, “talent and the involvement of everyone are necessary to repair the damage caused by human beings to God’s Creation.” “All of us,” assured Pope Francis “can work together as the instruments of God in taking care of Creation, everyone through their culture and experience, initiative and abilities.”

#### THE ENVIRONMENT IS NOT BEING PROTECTED IF PEOPLE ARE NOT TAKING CARE OF IT

Pope Francis places the incredibly far-reaching subject of human ecology, in other words defending the integrity of people, alongside the question of the environment. “We are living,” he explained to the general audience on June 5, 2013, “in a moment of crisis; we see it in the environment, but above all, we see it in mankind. Mankind is in danger: this is definite, mankind today is in danger, that’s why human ecology is an urgent subject! This danger is serious because the cause of the problem is not superficial, but deep: it’s not just a question of economics, but of ethics and anthropology.” He soon zeroed in on the Bible’s environmental message: “When we talk about the environment, Creation, my thoughts turn to the first pages of the Bible, to the Book of Genesis, where God claimed he put man and woman on earth to tend it and look after it. And some questions spring to mind: what does tending and looking after the earth mean? Are we actually tending to and looking after Creation? Or are we exploiting and neglecting it? The verb ‘to tend’ reminds me of a farmer cultivating his land so that it yields fruit that can be shared: what attention, passion and dedication! Tending and looking after Creation are instructions

given by God not only at the beginning of the story, but to each one of us; it is part of his project; it means making the world grow in a responsible fashion, transforming it because it is a garden, a place that everyone can inhabit. Benedict XVI reminded us several times that this task entrusted to us by God the Creator needs the rhythm and the logic of Creation to be embraced. We, on the other hand, are often driven by the pride of dominating, possessing, manipulating, exploiting; we do not ‘look after’ it, we do not respect it, we do not think of it as a free gift we must take care of. We are losing our ability to be surprised by, to contemplate and to listen to Creation, and in doing so we are no longer managing to see in it what Benedict XVI called ‘the rhythm of the history of love between God and man.’ Why is this happening? Because we think and live in a horizontal fashion, we are moving further away from God, we are not reading his signs.”

According to Pope Francis, “tending and looking after” not only includes the relationship between ourselves and the environment, and between man and Creation, but it also involves human relations. “The Popes,” -he recalled “spoke about human ecology, closely connected to environmental ecology” and “the Church stressed it several times; many say: yes, it’s right, it’s true ... but things continue as before, because what dominates are the dynamics of an economy and a financial system lacking in ethics. What rules nowadays is not man, but money, it’s money that calls the tune. And God Our Father gave the job of looking after the earth not to money, but to us: to men and women: it’s our responsibility! Men and women, on the other hand,

are being sacrificed to the idols of profit and consumption: the ‘throw-away culture.’ If a computer breaks it’s a tragedy, but the poverty, needs, dramas of so many people end up being the norm. If, for example, someone here near via Ottaviano dies on a winter’s night, it’s not news. If, in so many parts of the world, there are children with nothing to eat, that’s not news, it’s the norm. It must not be like that! Even things like this have become the norm: people without a roof over their head dying by the wayside and not making the news. On the contrary, the stock exchange in certain cities falling by ten points constitutes a tragedy. Someone dying is not news, but the stock exchange falling by ten points is a tragedy! People are being discarded in this way, as if they are rubbish.” For Bergoglio, this ‘throwaway culture’ tends to become a shared mentality, infecting everyone. Human life, people are no longer felt to be the main thing to be valued and respected and safeguarded, especially if it is poor or disabled, if it is no longer needed, like an unborn child, or no longer useful, like an old person.”

It is precisely this throwaway culture “which has also made us insensitive to food waste, which is even more sinful when many people throughout the world are suffering from hunger and malnutrition.” “Once,” recalled Pope Francis, “our grandparents were very careful not to throw away any leftover food. Consumerism led us to become used to daily excess food and food waste, which we are sometimes no longer capable of attributing the right value to, something which goes way beyond mere economic parameters.” For this Pope, “it is as if the food that is thrown away was stolen from the canteen of poor people, of hungry people! I invite everyone to reflect on the problem of the loss and waste of food in order to find the ways and means, by tackling this problem with the seriousness it deserves, that become the vehicle of solidarity and sharing with those most in need.” The Pope told the Evangelical tale of the Miracle of the Loaves and Fishes: Jesus fed the multitude with five loaves and two fish. “The conclusion of the story,” he stressed, “is important: Everyone ate until they were satisfied and the leftovers were removed: twelve baskets. Jesus asked the Disciples that nothing should go astray: no waste! What was the point of twelve baskets? What did it mean? Twelve is the number of the Tribes of Israel, it symbolically represents the entire nation. This tells us that when food is shared fairly, with solidarity, no one goes without what is needed, every community can accommodate the needs of the poorest.”

“Are we actually tending to and looking after Creation? Or are we exploiting and neglecting it? The verb ‘to tend’ reminds me of a farmer cultivating his land so that it yields fruit that can be shared: what attention, passion and dedication!”





**Gas/**The ultimate answer to the climate change challenge

by  
**DEMOSTENES  
FLOROS**

To date, fossil fuels account for 87 percent of the global energy mix, and for decades to come oil, coal and natural gas will continue to be the main raw materials of our economies, while we wait for the urgently-needed development of renewable resources, as well as a much-desired solution to the thorny issue of radioactive waste. Thus, we can no longer postpone considering how to use fossil fuels in the most environmentally friendly way possible. Among the main fossil fuels, natural gas—in which planet Earth is rich—has clear advantages in terms of reduced pollution, especially in comparison with coal, but also with oil (compared to which it is less expensive). New technologies have allowed for its more efficient use—think, for example, of new car engines compared with those of a decade ago—and it is relatively easy to store and transport. In fact, almost all estimates regarding the future energy mix indicate an increase in the use of natural gas.

It follows that those countries with big reserves of “blue gold” will have the opportunity to play a greater role within the international arena. Above all, the Russian Federation, currently the largest exporter of natural gas in the world, as well as a net exporter of primary energy, will play a more forceful role, which will be further strengthened by its participation in an organization known as the Gas Exporting Countries Forum (GECF), mistakenly renamed by many as the “Gas OPEC.” The aim of this survey is to highlight the link between natural gas and geopolitical influence. This concept has been clear for some time to Vladimir Putin who, noting in 2003 that blue gold would act as a bridge between the era of fossil fuels and that of renewables, opined that “Russia’s role in the global energy markets largely determines its geopolitical influence.”

#### FUTURE TRENDS IN THE GLOBAL ENERGY MIX

In 2014, global primary energy consumption reached 12,928 Million Tons of Oil Equivalent (MTOE). Compared with 2013, it had increased by 0.9 percent, equivalent to 198 MTOE, approximately 133 percent of Italy’s annual consumption (149 MTOE), to give an

order of magnitude. In particular, the growing trend of 2013/14 shows a deceleration, both with respect to the +2 percent recorded in 2012/13, when demand was at 12,730 MTOE, and compared with the +2.1 percent annual average of the last decade. The causes lie, in all likelihood, in the economic crisis and, to a lesser extent, in improved energy efficiency.

In 2014, the People’s Republic of China was the world’s largest energy consumer, with 2,972 MTOE, followed by the United States (2,299 MTOE), the European Union (1,611

specifically, by oil at 33 percent, coal at 30 percent and natural gas at 24 percent. In relative terms, the composition of the basket is substantially unchanged compared with the previous year. Natural gas occupies a role of primary importance since covers a little less than a quarter of the global consumption. In absolute terms, we have on the other hand witnessed an increase in all sources. In particular, oil recorded +0.8 percent (+1.1 percent in 2012/13), coal +0.4 percent (+2.8 percent in 2012/13, a higher absolute increase +103 MTOE, 42 per-

cent of the new demand), natural gas +0.4 percent (+1.1 percent in 2012/13), hydroelectric power +2 percent (+2.7 in 2012/13), nuclear power +1.8 percent (+0.6 percent in 2012/13), renewables +12 percent (+16 percent in 2012/13). Estimates show that the total global consumption in 2030 will grow significantly, up to 16,720 MTOE. In relative terms, the gas component will remain substantially unchanged compared with the current situation, unlike that of oil and coal which, it is estimated, will drop by 4 percentage points. As we shall see later in detail, the use of gas will increase considerably in absolute terms.

draw a number of conclusions. The E.U. shows the least use of fossil fuels (76 percent) compared with a global average of 87 percent. This is no doubt due to its greater use of nuclear power and renewables. In the other major economies, however, the percentage of fossil fuels is between 80 percent and 90 percent. In Japan, the third largest economy in the world, it reaches 93 percent. Japan (43 percent), the E.U. (37 percent) and the United States (36 percent) show a greater percentage of oil in their energy mix than the global average (33 percent), and compared to that of the other major economies. The People’s Republic of China (17 percent) and the Russian Federation (22 percent) are the lowest consumers of oil in relative terms. In absolute terms, the U.S. is the largest oil consumer in the world. The energy mix of China (66 percent) and India (57 percent) show the highest use of coal among the major economies, while that of the Russian Federation (12 percent) and Italy (9 percent) show the lowest use. In absolute terms, China is the largest consumer of coal, followed by the United States and India. The energy mix of the Russian Federation and that of Italy are characterized by a greater use of natural gas: 54 percent and 34 percent, respectively. Even the U.S. energy basket shows a significant use of gas (30 percent), of which, however, a significant amount is derived from fracking. According to the IEA, in 2013, the percentage of shale gas over the total amount of gas produced in the U.S. amounted to 39.5 percent. Based on estimates by Gazprom—not officially confirmed—this value will reach 52.5 percent in 2015. The People’s Republic of China (6 percent) and India (7 percent), on the other hand, make the least use of the least polluting fossil fuels. The →

Natural gas is the only fossil fuel that will see an increase in total consumption, in Europe and Asia particularly over the next decade, with positive implications for the global economy and the environment

# The revenge of blue gold



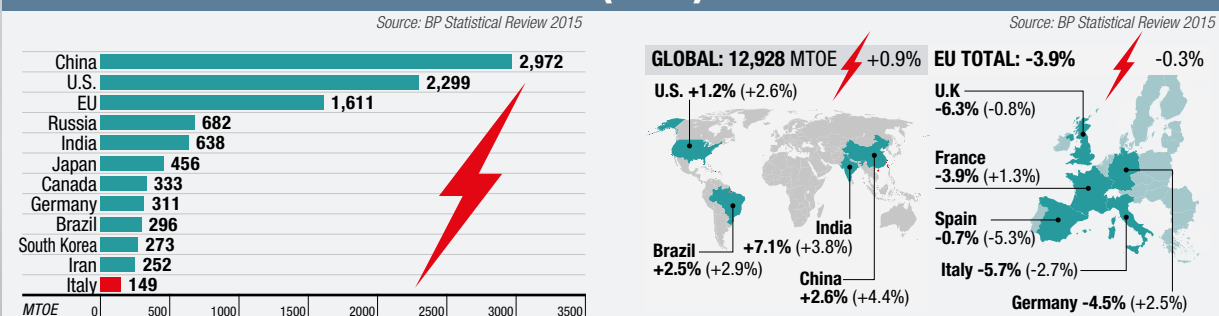
**THE AUTHOR**  
Demostenes Floros, a geopolitical analyst, is a professor of the Masters’ in International Relations Italy – Russia, at the University of Bologna Alma Mater, as well as being the head and professor of the third course in Geopolitics, established at the Open University of Imola (Bologna). He collaborates with the Energy International Risk Assessment (EIRA) and geopolitical magazine *Limes*.

#### FUTURE PROSPECTS IN THE MAJOR GLOBAL ECONOMIES

By looking at the energy mix of the most important economies, we can

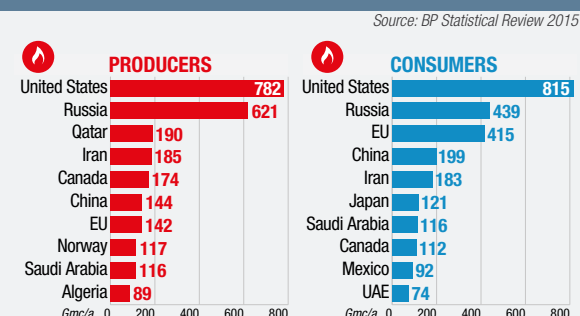


## 1. GLOBAL ENERGY CONSUMPTION (2014)



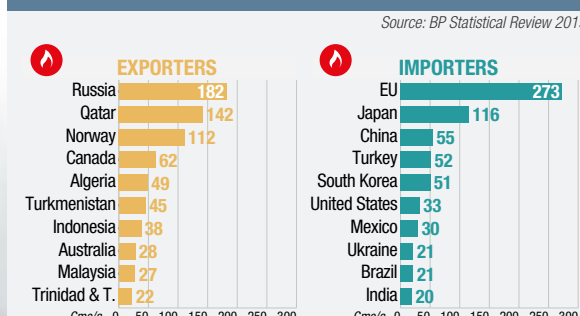
Data provided by the 2015 BP statistical review shows the top 11 global energy consumers for 2014, with Italy included as well. The largest increases in consumption occurred in India, China, Brazil and the United States, respectively. The largest decreases, on the other hand, took place among the major economies of the European Union, especially in the United Kingdom, Italy and Germany.

## 2. PRODUCERS AND CONSUMERS



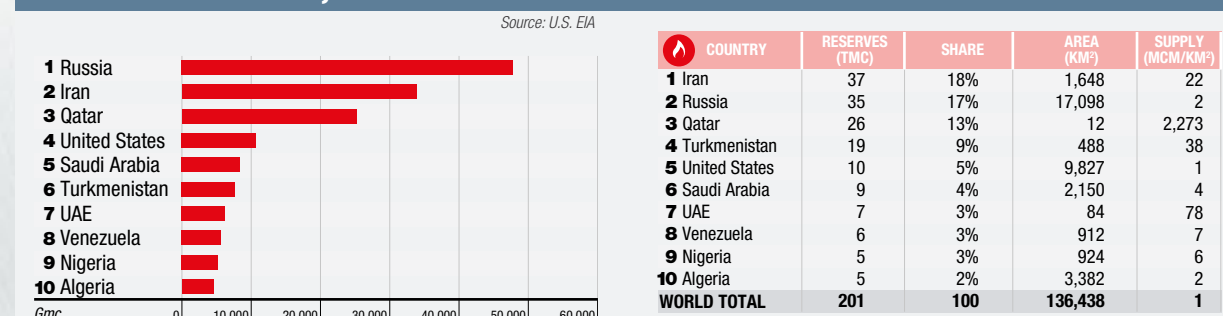
The world's ten leading countries for gas production and consumption respectively. The United States, China and the European Union consume more than they produce, while Iran and Saudi Arabia have an output equivalent to the needs of their domestic markets.

## 3. EXPORTERS AND IMPORTERS



The top ten gas importing and exporting countries in the world, according to BP. The Russian Federation, Qatar, Canada, Norway and Algeria, each with an output well above their domestic consumption, are the leaders in exports.

## 4. GAS RESERVES, THE TOP TEN IN COMPARISON



The top ten countries in the world for proven gas reserves. In first place, according to the U.S. Energy Information Administration, is the Russian Federation. However, according to BP's calculations, Iran owns the most reserves.

above considerations must be assessed in the light of the level of each individual country's foreign dependence.

Among the major raw material importing economies, the only that has reduced its dependence (measured by the ratio between the energy raw materials imported by a country and the total amount of primary energy consumptions of the same country) is the United States—from 21 percent to 13 percent in the period between 2011 and 2014—thanks to the revolutionary—if environmentally questionable—technique of hydraulic fracturing. On the contrary, China has seen an increase in its dependence to 16 percent (in 2011 it was 6 percent). In the period 2003–2012, China's consumption has more than doubled in absolute terms, increasing its share of the world total from 12.5 to 23 percent. The Russian Federation is the largest net exporter of energy. In 2014, Moscow sold 629 MTOE on the international markets, equal to 48 percent of that produced and 92 percent of that consumed internally. We will now consider the trends in energy consumption to 2030, which will increase to up to 17,720 MTOE, according to estimates by the International Energy Agency. Showing strong growth will be China (4,010 MTOE), India (1,364 MTOE), the Russian Federation (770 MTOE) and the rest of the world (6,384 MTOE); in slight decline will be the U.S. (2,197 MTOE), the E.U. (1,552 MTOE) and Japan (434 MTOE).

## GAS: PRESENT AND FUTURE

The Russian Federation leads the world in proven natural gas reserves,

with just under 50,000 Gmc3. It is followed by Iran, Qatar and the U.S. (see table 4).

The world's largest gas producers and consumers are, respectively, the United States and the Russian Federation. (see table 2) More precisely, in 2014, the United States was world's top gas producer, at 782 Gmc3. In 1996, its output was equal to 528 Gmc3, which decreased slightly to 515 Gmc3 in 2006. This considerable growth is attributable to the country's shale gas effect. Although the U.S. leapfrogged the Russian Federation—the latter produced 579 Gmc3 in 1996 and 632 Gmc3 in 2006—due to the amount of its total consumption of 815 Gmc3, Washington is, however, forced to import gas from abroad. The output of U.S. gas—conventional and unconventional—has been decreasing for the past three months due to the effect of stopping a large number of drilling rigs. According to Bank of America Merrill Lynch, in 2016, for the first time in a decade, production could record a decrease.

The Russian Federation, Qatar and Norway are respectively the largest gas exporters, while the European Union, Japan and China are the main importers of blue gold. (see table 3) Finally, future estimates regarding global gas consumption indicate a 3.5 percent increase by 2030, from the 2,844 Gmc3 of 2012 to 3,797 Gmc3. In particular, the largest increases will occur in China (from 123 Gmc3 to 353 Gmc3, +287 percent), India (from 49 Gmc3 to 116 Gmc3, +237 percent) and the rest of the world (from 1,192 Gmc3 to 1,712 Gmc3, +144 percent). According to the arguments put for-

ward by Laura Cozzi during the 15th Italian Energy Summit, natural gas is the only fossil fuel that will see an increase in absolute consumption in Europe by the end of the next decade.

## THE RUSSIAN FEDERATION: FROM A "RELATIONSHIP OF CONSTRAINT" WITH EUROPE TO A "TWO-FURNACE MARKET" WITH EURASIA

The energy relationship between the European Union and the Russian Federation has, to date, been one of a sort of mutual constraint. In the medium term, the more rapid growth, compared to that of the EU, of gas demand in the Asia-Pacific countries offers Moscow the opportunity to move into a new Eurasian energy context, which has long been stigmatized as "the two-furnace market." To be precise, the gas demand in the countries of Asia-Pacific will increase from the current amount of 280 Gmc3 to the 400 Gmc3 expected for 2025. This situation is generally irreversible in addition to being the logical result of the rapid geographical redistribution of manufacturing activities towards Asia. China has been the world's leading industrial country since 2011, with 21.7 percent of global manufacturing production. Meanwhile, the European Union was unable to resist American pressure to isolate Russia in response to events in Ukraine. It contributed to this failed attempt, apparently convincing itself that it can do without Russian natural gas, as repeatedly called for by the former Commissioner for Energy, Günther Oettinger. In doing so, it seemed,

instead, to have achieved an acceleration of Russia's process of looking to the east, strengthening political and trade relations between Moscow and Beijing to the extent that they appear to have gone back to those of the early 1950s.

According to recent assessments, China has been the world's largest consumer of coal for the last 25 years, using more than all of the other world economies combined. And according to Matteo Verda, it won't be the only country heavily using coal in the years to come: "Thanks to its low cost, coal is in fact consistently the main source of energy of the major emerging economies, a situation that, in the predictions of the IEA, is expected to continue over the coming decades. In the benchmark scenario, China's consumption could grow steadily over the next decade, reaching 10,200 MTOE in 2030. The latter is already almost 2.5 times that of all 28 EU countries combined and, in 2020, will be double that of the United States." Meanwhile, however, the government of Beijing has already announced that it could continue to grow until 2030.

These data highlight the urgent need, especially that of China, but also of India, to change the structure of their energy mix, by moving from the massive use of coal—amounting to 66 percent and 57 percent, respectively, of their total consumption—towards the "cleaner" and less expensive (even compared with oil) natural gas, to date constituting only 6 percent of Beijing energy mix and 7 percent of New Delhi's.

The Russian Federation and the People's Republic of China have further strengthened their strategic alliance aimed towards reconstruct-

ing a new world order, by recently signing a number of new energy-related agreements, especially in the gas sector, as well as towards constructing the so-called Western Route and Eastern Route.

Over the next 30 years, the Altai gas pipeline will transport 30 Gm3 of gas from the Yamal Peninsula and Western Siberia to China through the Kanas Pass, without passing through the territories of Kazakhstan and Mongolia. This agreement is complementary to that reached for the Eastern Route and includes the Russian-Chinese thirty-year "take or pay" agreement signed in May 2014 for the supply of 38 Gm3 of natural gas via the Power of Siberia pipeline, which will not be supplied from Yamal, but from the reserves of central and northeastern Siberia. Supplies could be paid for using the yuan and ruble instead of the dollar. Work on the construction of the Eastern Route has already started in both directions, although it is likely that these supplies will be postponed by a year or two after the nonbinding 2018 date agreed to by both countries. The Eastern Route will carry gas to 8 provinces of northeast China (including Beijing). For the Western Route, however, some aspects remain to be established regarding the price of the raw material.

Among the new energy agreements, some also concern oil. In 2014, Beijing purchased 36 percent more oil from Moscow (665,000 b/d) and 8 percent less from Riyadh, which, while remaining the Empire of the Center's leading supplier, at 997,000 b/d, has seen a decrease in its share from 19 percent to 16 percent. Moreover, in May, the Russian Federation became China's leading oil

supplier, overtaking Saudi Arabia. In 2015, Riyadh is still Beijing's leading supplier of crude oil, followed closely by Angola, but exports of Russian oil to China have increased by a third compared with May 2014. This change of pace does not seem motivated by a preference for less expensive quality Russian crude oil, but rather by a political choice.

As reported in the *Financial Times*, in 2015 Gazprom Neft began to peg its oil exports to China in renminbi rather than in dollars. From an oil market perspective, the supremacy of the dollar is not currently under discussion. However, the overriding centrality of the dollar is a concern, particularly given the role of Federal Reserve monetary policies in pushing down oil prices.

The link between natural gas and geopolitical influence was clear when the Russian Federation aimed its center of gravity towards Asia, even orientating itself in the direction of consumer countries such as Japan and South Korea, thus clashing with liquefied natural gas producers such as Australia. The latter, while managing to avoid the abandonment of major projects under construction relating to LNG exports due to excessively low prices per barrel, will face less favorable margins.

The Russian Federation, also thanks to gas, is more clearly outlining the new concept of Eurasia, the pivot of which came in the recent political-economic integration reached on May 28, 2015 by the Customs Union with Belarus and Kazakhstan (which are close to the full membership of Armenia and Kyrgyzstan) and the increasingly consolidated diplomatic-military alliances of the CSI Collective Security Treaty

Organization (CSTO) and of the Shanghai Cooperation Organization (SCO).

## A RESOURCE THAT SHOULD BENEFIT THE GREATEST NUMBER OF PEOPLE

Natural gas undoubtedly offers one of the answers—if not the ultimate answer—to the challenge for sustainable development and the planet's fight against pollution by virtue of its relatively low emissions compared with other traditional fossil fuels. The problem we face is to determine how to use this resource in the best possible way in order for the greatest number of countries and people to derive benefit from it. It is therefore an issue whose importance extends far beyond its benefits to any individual country.

In the knowledge that its role in the global energy markets will largely determine its geopolitical influence, the Russian Federation in 2001 strongly promoted the foundation of an international body known as the Gas Exporting Countries Forum (GECF) the aim of which is to promote natural gas's use in sustainable development. It comprises 12 states and another 2 countries with observer status. Unlike OPEC, the GECF does not agree to production levels or aim to influence prices. It is perhaps for this reason that GECF was identified by Jonathan Stern, Director of the Oxford Institute for Energy Studies, as "a relatively chaotic organization." It is certainly no secret to anyone that around the South Stream, Nord Stream, Turkish Stream and Nord Stream II gas pipelines, a series of contradictions that resulted in a war. Specifically, the events in Ukraine represent a

real geopolitical conflict that has the United States of America, on the one hand, and the Russian Federation on the other as its protagonists. This clash involves China supporting Russia (not to be misled by the UN's stance on Crimea), albeit from a more secluded location. From an energy perspective, the U.S. administration has pursued a strategy seeking the reduction of Russian gas supplies to Europe to be replaced by that from American shale. Currently, the United States is essentially the world's largest gas producer, thanks to fracking, the limits of which, however, are becoming increasingly evident. Doubts have arisen about whether the U.S. can able maintain its current production of tight oil, of which shale gas is a by-product. If so, in all likelihood it would also have a negative effect on the currently declining trend of Washington's level of energy dependence. In fact, of the 2,010 MTOE produced (compared with the 2,299 MTOE consumed) the main item is gas with 668 MTOE, followed by oil with 520 MTOE.

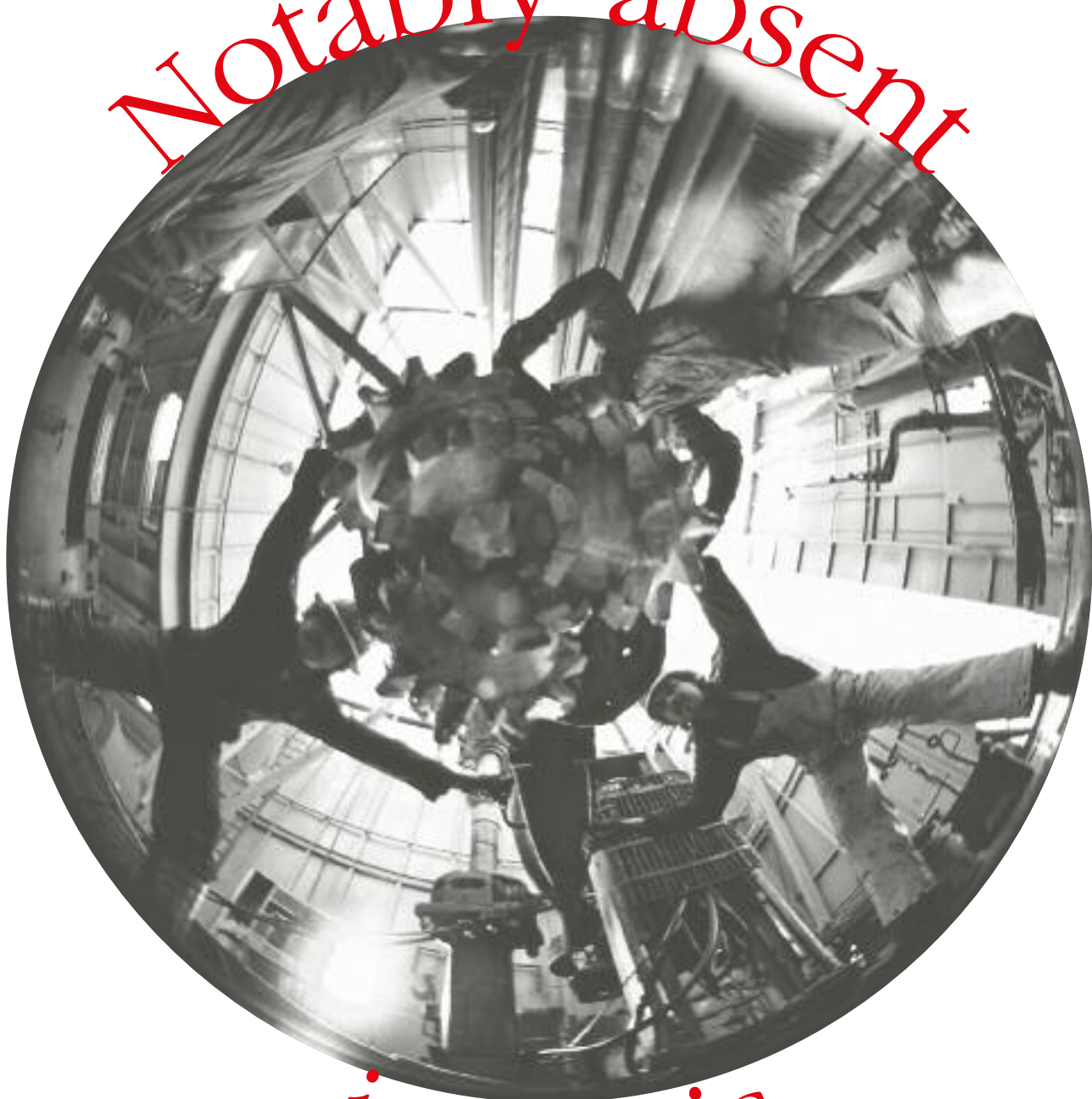


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**Technology/Michael Lynch, economist and advisor for the Obama administration**

Notably absent



in Paris

On the table of the COP21 lacks a firm resolve on the part of governments to invest in innovative energy techniques. It will produce a deal, but implementation and enforcement are less certain

**S**ustainable development will be a crucial part of redefining environmental policies in the coming years, and this is the focus of the United Nations Climate Change Conference in Paris (COP21). But governments are still too undecided on whether they should “live with the formula of the stringent and ambitious objectives,” which in the end are

by FRANCIS OSBORNE

always disregarded, or whether they should push themselves towards policies of growth shared to lower, in a coordinated manner, the levels of greenhouse gasses. Michael Lynch has spent 30 years at MIT, first as a student and now as a researcher. He is one of America's foremost experts on the oil and gas markets, having served stints as an advisor for the Obama administration, the UN, the World Bank and major energy companies. Lynch notes “the indecision of governments, which prefer to avoid spending money on

technology that is not yet fully developed, more than investing in research and development for methods that will bring results in the long term.” In all of these discussions, he notes, there is always a serious omission: talk about tools, about the indispensable technological developments necessary to cut emissions. For Lynch this is a huge limitation that will affect the ultimate success of the Paris conference. He predicts an agreement whose content will please the environmental community but whose imple-

mentation and enforcement will be largely ignored.

**Do you agree that, in the preliminary discussions for COP21, there has not been enough discussion about new technologies with the potential to revolutionize energy production?**

Yes, I think this is basically true. Most of the discussion is focused on existing technologies, like, for instance photovoltaics, which are proving expensive and not competi-

tive in most markets with strong government support. Another example: the big potential for more efficient automobiles is often overshadowed by advocates' promotion of electric vehicles, a technology that is still not mature and therefore not effective. Looking to nuclear power is often avoided largely for emotional reasons and the great expansion of natural gas in the U.S. power sector thanks to hydraulic fracturing of shale gas is considered distasteful by many, also for mostly emotional reasons rather than a logical understanding. I believe solar power has great potential, but we need new technologies coming from Research & Development (R&D). Battery technology needs vast advancement and improvement to become more useful both in automobiles as well as for power storage. Carbon sequestration represents an appealing possibility, but this also is currently far too expensive. It appears that governments feel it better to waste money on undeveloped technology than spend it on R&D to develop new and potentially effective technology. The reasoning is that R&D results are long-term and not as certain.

**How can governments support this revolution?**

There are two primary approaches: first, governments could raise energy prices, especially in countries with heavy subsidies, but also those, such as the U.S., with cheap energy. Secondly, governments should spend much more money on research.

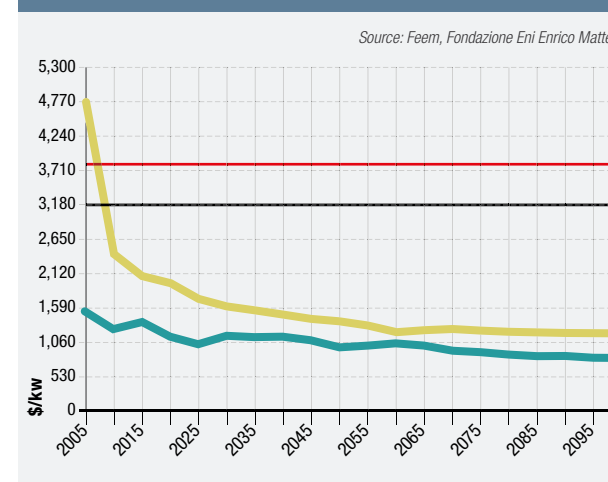
**More generally, how can technology revolutionize energy production?**

The primary goal of new technologies should be to achieve economic competitiveness, bringing consumers to employ it willingly. Cost is not the only factor, but it is usually the biggest factor. So what you have is too many innovators thinking that the public will ignore cost against a “good” technology, but really this is only true to a limited extent.

**What do you think of Obama's strategy for energy independence?**

I think energy independence as a strategy receives too much emphasis. The primary goal should be to achieve a degree of diversification, while optimizing the energy mix from an economic standpoint. In 1973, U.S. President Nixon proposed to make U.S. energy independent, but the conclusion of the massive research project was that first, it would be very expensive, and

## COSTS



**The evolution of the cost of a kilowatt of electricity produced using wind and solar power plants and electric backstop technology (costs are assumed to be the same across regions) in a “Weak pledges” scenario, with fragmented action on climate change.**

second, it would actually not be very valuable. The world economy would still be vulnerable to energy shocks, and the U.S. economy would therefore be indirectly vulnerable.

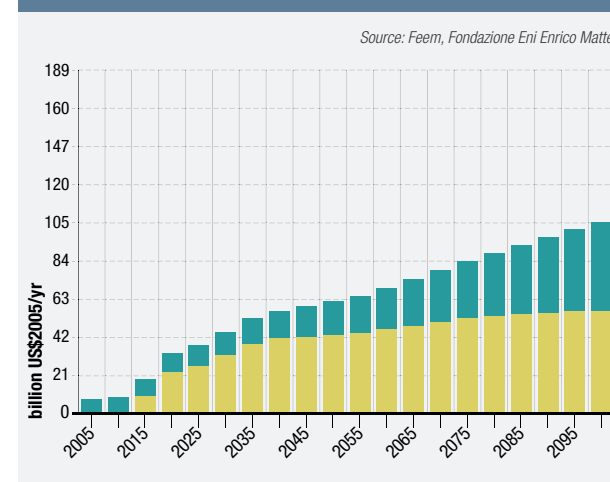
**Meanwhile Europe has seen a 10 percent increase in the use of coal for energy production between 2010 and 2014. Doesn't this undermine the 20-20-20 Energy Policy targets?**

This is an embarrassment for some countries and environmental groups. Although in theory, most people want a cleaner environment and to reduce greenhouse gas emissions, the reality is that renewables are not able to provide cheap power or adapt to rapidly changing conditions; consider, for example, the German shut-down of nuclear power plants. I also believe that natural gas prices will drop in Europe due to a booming supply worldwide, and that this will help to reduce coal consumption in the medium term (5-10 years) if not longer.

**Is sub-\$50 oil likely to limit technological resources allocated to innovation?**

The price of oil being under \$50 is a double-edged sword. It discourages research in new, not yet commercial technologies, but it also encourages efforts to make existing technologies better and cheaper, so that they can still compete. A classic example is the oil sands of Canada, which were first developed in the late 1970s, when the price of oil was approximately \$100 (adjusted for inflation) and expected to stay high. When

## INVESTMENTS



**The level of investments in research and development required at the world level to improve the energy efficiency of final production, and make electric and non-electric backstop technologies cost competitive. The data here also relates to the “Weak Pledges” scenario, with fragmented action on climate change.**

prices collapsed in 1986, investment slowed, but by the mid-1990s, producers announced that they had cut costs enough to be competitive at \$30 per barrel. (Of course, since then, inflation has hit the oil sands projects, making them more expensive.)

**If you had to bet on the outcome of COP21: will governments find a definitive agreement on the environment?**

I think an agreement will be reached that will please the environmental community and those concerned about climate change, but that implementation and enforcement will be largely ignored.

**The Kyoto Protocol will be retired during COP21. What happened to the platform that was supposed to save the world?**

The original Kyoto Protocol agreement was unrealistic in that it was designed and agreed to mainly by environmental ministers, without consideration for economic effects. Government leaders, including ministers of industry and commerce, were largely uninvolved and didn't feel that they were bound by the agreement. What this did was teach us a lesson that a broad consensus is necessary to ensure effective implementation. ■



**MICHAEL LYNCH**

He has over twenty years of experience analyzing international energy, particularly oil and gas markets. He spent nearly 30 years at MIT as a student and then researcher at the Energy Laboratory and Center for International Studies. Then he spent several years at what is now IHS Global Insight and was chief energy economist. Currently, he is president of Strategic Energy and Economic Research, Inc., and he lectures MBA students at Vienna University. He has been president of the U.S. Association for Energy Economics. His work consisted primarily of advising corporations, governments and industry associations on world oil and gas markets and energy security policy.





China/The Dragon's relentless battle against pollution

# The increasingly green Celestial Empire

Persevering on the path towards sustainable development, balancing reductions in emissions and environment compatibility: in this way, by 2030, Beijing wants to achieve a goal of 30 percent renewables with respect to its total energy need

**T**he world is experiencing a tremendous transformation, especially in the fields of resources and climate change. The 2015 Paris Climate Conference can be an important opportunity to reach a decisive new international climate agreement. The ambitious goal of the conference is to reach an

by LIFAN LI

agreement that can be applied to all the contracting parties with legal validity within the UN Framework Convention on Climate Change. China will strive to achieve the goal. It is expected that China will promise to limit the emission of greenhouse gases and the usage of fossil fuels, raise the percentage of renewable energy sources in proportion to total energy used to about 20 percent, and lower the carbon emission level per GDP by 50 to 60 percent compared to the level of 2005.

Since the 1992 UN Conference on Environment and Development (UNCED) Conference's push for sustainable development, China has been exploring a way with Chinese characteristics from both theory and practice. However, due to poor resources possession, low quality of resources, fragile ecological environment and fast industrialization and urbanization. The path to harmonious and sustainable development is full of obstacles.

## CLIMATE CHANGE AND THE ENERGY DEVELOPMENT PROGRAM

Responding to climate change initiatives is an important strategy for China's economic and social development, and a vital opportunity to hasten economic mode transformation and structure adjustment. Researching low-carbon technology, growing low-carbon industry and promoting low-carbon lifestyles are effective approaches to control the emission of greenhouse gas and help

establish new growth poles in economic development. Five principles have been proposed by China in combating climate change: insisting on a framework for sustainable development, sticking to the idea of "common but different responsibilities," making balanced reductions compatible with Chinese growth, focusing on comprehensive management and promoting extensive international cooperation. Based on the five principles, China suggests that the developed coun-

tries should take the initiative to reduce and qualify their emission of greenhouse gas, while the developing countries make endeavors to contribute as well as preserve the basic framework of the UN Framework Convention on Climate Change and the Kyoto Protocol.

## ENERGY SAVINGS AND REDUCTIONS IN EMISSIONS

China takes the development of efficient energy resources and

preservation of the environment as its fundamental national policy to build an environmentally-friendly society. Although progress has been made, challenges are still emerging. The first challenge is to control the conflicts between energy demands and GDP growth. From 1990 to 2010, China has developed with an average GDP growth of 10.45 percent while its energy consumption has increased 6.14 percent per year averagely. The elasticity of energy consumption, which has reached 0.59, has supported the rapid development of economy and society. However, with the fast development, the energy consumption and the emission of CO<sub>2</sub> has been increasing tremendously. Currently, the increase of CO<sub>2</sub> emission accounts for more than half of the increase globally. To contain the rapid growth of the energy demands and CO<sub>2</sub> emission is still considered an arduous task.

The second challenge is to optimize the energy structure. Although the renewable and nuclear energy are developing quickly in China and taking a larger proportion in its energy mix, they cannot satisfy the increasing energy demands over the long term. Therefore, the consumption of fossil fuels like coal will continue to grow.

From 2005 to 2010, the supply of renewable and new energy has increased 60 percent, occupying 8.3 percent of primary energy up from 6.8 percent. However, during the same period, the consumption of coal has grown 38 percent, which means 890 million tons, and a significant increase in CO<sub>2</sub> emissions. The downward trend of international oil prices poses the third challenge to China's future energy policy. The fall of international oil prices that began at the end of 2014 has affected the development of domestic coal, natural gas and shale gas. Top leaders in China are facing difficulties in deciding whether to change their energy policy. It is estimated that oil imports will account for 75 percent of its energy demands in 2035 and China will be the largest oil-consuming country in the world then. To develop a new energy industry will be one of the important initiatives to reduce dependency on overseas energy.

To develop a new low-carbon strategic industry has become the fourth challenge for future energy development. The trend of a low-carbon economy will bring enormous transformation for global economic and social development, further changing the climate of global economic and technological competition. Low-carbon will become an exemplar of the core competitiveness of a

nation. To attain the competitive advantage of low-carbon technology is the main driver and strategic goal of China as it participates in the game of climate change. Generally speaking, China should manage both its domestic and overseas situation, striving for development space internationally and realizing low-carbon development at home.

## GOALS FOR ENERGY SAVINGS AND REDUCTIONS IN CO<sub>2</sub> EMISSIONS

Before the Copenhagen Convention held in 2009, China proposed the goal of reducing CO<sub>2</sub> emission per unit of GDP at a level 45-50 percent that of 2005 and increasing the proportion of non-fossil energy in primary energy to 15 percent from 6.8 percent in 2005. The goal was the strategic choice based on domestic requirement of energy saving and emission reduction to promote sustainable development and the international trend of combating climate change and reducing greenhouse emission.

During the 12<sup>th</sup> "Five-year Plan," the CO<sub>2</sub> emission per unit of GDP has been decreased 17 percent and the energy intensity per unit of GDP has declined 16 percent. Therefore, only a 15-16 percent further drop in the 13<sup>th</sup> "Five-year Plan" period is needed to reach the goal suggested in 2009.

## THE MAIN METHODS AVAILABLE TO CHINA IN ORDER TO ACHIEVE ITS EMISSION REDUCTION GOAL

The energy dependency of China's GDP growth is relatively high compared to the developed countries, while the energy transformation capability and efficiency is low. Regarding industry, high energy-consuming industries take a large proportion and the manufacturing industry has a low added value. To establish an industry system and consumption style with low-carbon characteristics, the following channels should be followed.

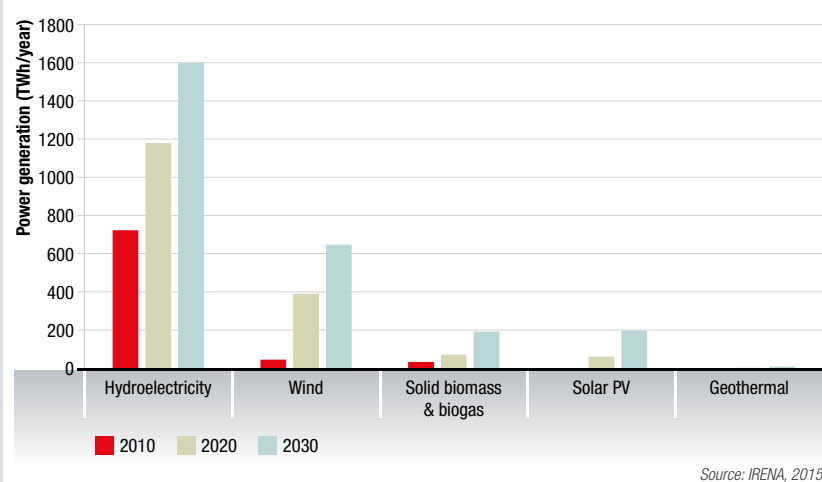
The first channel is to strategically transform the industry structure and promote energy saving. For example, the high-tech industry and modern service industry can be priorities in development. Other measures such as restricting the growth of the high energy-consuming industries can be taken to reduce their proportion in the national economy.

Promoting the technology of energy saving can be the second channel to raise the efficiency of energy transfer and usage. China →





### THE PROGRESS OF BEIJING'S RENEWABLES



It is expected that overall energy production will more than double (by at least 5,000 TWh), increasing from 4,200 TWh/year in 2010 to approximately 9,300 TWh/year in 2030. According to forecasts, by 2030, renewable energy production will increase by approximately 800 TWh to over 2,600 TWh.

### PROJECTS The solar energy in the desert and the North wind

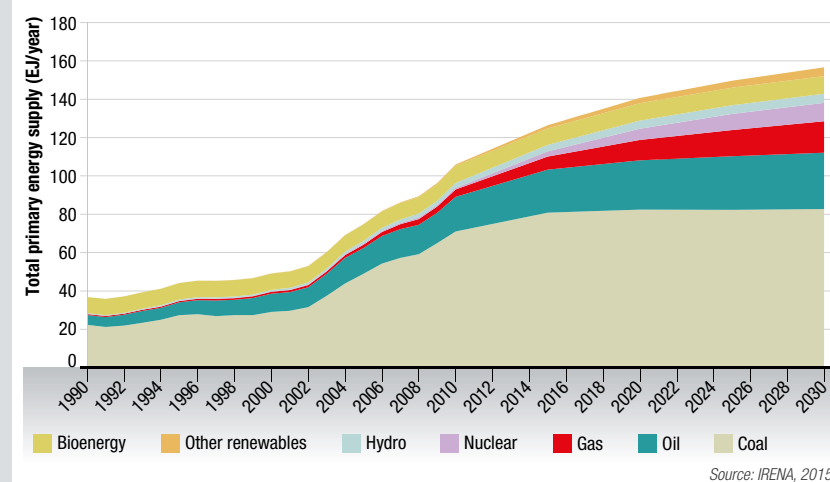
# Record recovery

Until a few years ago, China seemed far from the development of clean energy sources. Now, however, the country is preparing to become an example of energy virtuosity, focusing on solar (especially in the Gobi Desert) and wind power, where it has already overtaken the United States

The future of renewables in China will produce large projects which, especially in the photovoltaics sector, Beijing is promoting in the country. The goals in terms of energy production from renewable sources are particularly ambitious. The National Energy Administration has set new goals for solar power: over the next five years, photovoltaic plants are expected to quadruple compared with current volumes, according to China's energy regulatory body, with the aim of increasing the number of plants in the north and west of the country, home to some of the largest solar farms on Chinese soil. Among these is that of Dunhuang, in Gansu, which has grown at record levels over the last three years and is now one of the

largest in the whole of China. Some satellite images have shown its size, which has tripled compared with 2012 levels. The plant in Dunhuang is one of the symbols of the development of renewables in China, but is not the only case that captures people's attention due to its size. Another interesting case, due to its size it will be once completed, is that of the solar plant to be built in Golmud, in the Gobi Desert, which will be the largest in the country, with an area of 2,550 hectares. The project, to be carried out by the Qinghai Solar Thermal Power Group, will supply electricity to approximately one million homes and one of its positive effects will be that of reducing the use of coal by 4.26 million tons per year in the re-

### THE DRAGON IN SEARCH OF CLEAN ENERGY

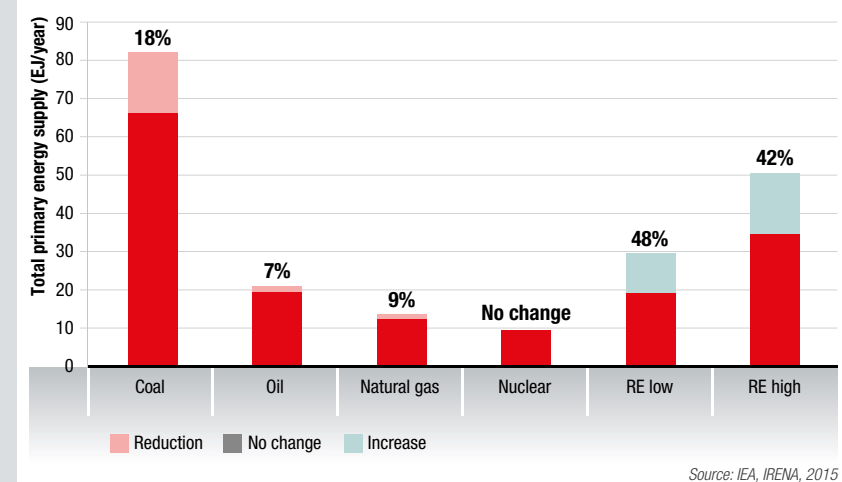


The exponential growth in the supply of primary energy between 1990 and 2010 will experience a slowdown over the next two decades, until 2030. Coal consumption will remain unchanged or will increase only slightly, while the greatest consumption will be represented by natural gas, followed by oil and nuclear energy.

gion of Qinghai – one of the most underdeveloped regions in the country – with an overall cut in CO<sub>2</sub> emissions estimated at 896,000 tons per year. The increase in plants in China has led to an upward revision of estimates, which were already ambitious, for the current year: by the end of 2015, Beijing aims to construct 23.1 gigawatt photovoltaic plants, compared with the 17.8 gigawatts initially placed in the budget, with a 30 percent increase compared with previous estimates. The connection of the new plants with the national energy distribution network must take place within the first half of next year. The acceleration given to the sector is of crucial importance to the plan for reducing polluting emissions: by 2020, China

aims to have between 15 percent and 20 percent of energy produced from renewables, to the detriment of that produced from coal. The wind energy industry is also involved in projects of ever increasing scope. The north and north-east of the country are the focus of a campaign promoting wind energy for heating in the winter. Announced last June, the campaign has not yet produced significant figures, but the goal is to reduce the use of coal in a vast area in which the mining industry has driven development over the past decades. Wind power is one of the most developed areas in the field of renewable energy sources. According to data of September 2015, there are wind farms on Chinese territory that

### THE RISERS AND FALLERS IN CHINA'S ENERGY MIX



The Chinese primary energy scenario, in 2030, will see renewables become the second largest energy services industry, with an increase that will fluctuate between 42% and 48%. Coal will undergo the most significant reduction, with a fuel saving of 18%, reaching approximately 65 EJ of primary fuel.

produce 109 gigawatts of energy and, in the first nine months of 2015, the annual increase in energy production was 28 percent. As early as 2011, China overtook the United States, according to Bloomberg rankings, in terms of investments in the sector, but in wind power, as in other fields of energy produced from renewables sources, the challenge for Beijing is to avoid losses due to lack of adequate infrastructure. Recently, the National Commission for Development and Resources, the powerful government agency for economic planning, sent a note to the regions most affected by the development of renewables to resolve the problem of connecting renewable energy plants, especially wind and pho-

tovoltaic power plants. The problem is not of secondary importance: Beijing is increasingly focusing on renewables to achieve its "green economy" and the Commission intends to prioritize connecting wind and photovoltaic power plants to the distribution network, rather than on the conventional plants that produce energy through coal-fired or hydroelectric power stations. In the eyes of the Chinese regulatory body there are regions in which there are larger projects, such as Xinjiang and Gansu, in the north-west of the country when, often due to a lack of adequate infrastructure, energy dispersions from renewables are among the highest nationwide.

YAO JIN

has launched a strategy of energy saving preference and advanced technology promotion to reduce energy consumption per unit. For example, coal consumption in the thermal power industry reduced from 370gdc/kWh in 2005 to 335 gce/kWh in 2010, a decrease of 9.5 percent. New energy and renewable energy can be developed to optimize the energy mix. Raising the proportion of nuclear power, hydropower, wind power and solar power in primary energy can satisfy the energy demands as well as reduce CO<sub>2</sub> emission. To replace a fossil fuel like coal with renewable and nuclear power will be the long-term strategic choice for China to reduce CO<sub>2</sub> emission. The fourth channel is to guide the consumption style of the public to establish a low-carbon society. To

construct a low-carbon industry system and consumption style is an urgent task which requires persistence for a long period.

### STRATEGIC ENERGY MEASURES TO COMBAT CLIMATE CHANGE

Currently the energy development of China is restricted by the domestic energy supply capability and environment requirement, as well as the challenges brought by global climate change. To achieve nearly zero emissions at the end of the century and follow the trend of low-carbon development, China shall launch following long-term energy strategies.

**I.** Follow a way to industrialize and modernize economy supported by technology innovation and energy saving. In the context of combating global climate change, China can-

not follow the western modernization way supported by high energy consumption. Therefore, the long-term energy strategy should control the demand as well as promote efficiency and new energy technology. According to the suggestions made in the large-scale consultation project "China's Mid and Long-Term Energy Development Strategic Study," the energy demands based on scientific calculation of production capability, should be controlled at 4 billion tce, 4.5 billion tce and 5.5 billion tce respectively in 2020, 2030 and 2050. In 2050, average personal energy consumption will be controlled at about 3.8 tce, far below the 6.7 tce reached by OECD countries in 2010.

**II.** Strictly restrain the increase of fossil fuel consumption and establish sustainable energy systems with

new and renewable energy as the main source. Renewables and nuclear power will account for 20-25 percent of primary energy in 2030 with an annual supply of more than 1 billion tce and become a main source of energy as fossil energy like coal, oil and natural gas. In 2050, the proportion can be further raised to 1/3, while the proportion of coal will be reduced below 40 percent.

**III.** Strengthen the research and development of advanced energy technology. The technological innovation strategy should be made to support low-carbon development. Grasping the advanced technology is an exemplar of national core competitiveness.

**IV.** Explore Carbon Capture and Storage (CCS) technology, taking advantage of the energy transformation period. If China expects to realize the peak of CO<sub>2</sub> emission in

2030, CCS technology should be introduced.

**V.** Strengthen the legislation concerned with combating climate change. China has formulated many laws and regulations in facing the climate change within the framework of sustainable development. From a long-term perspective, China should formulate a special law in the area to coordinate and implement the initiatives in combating climate change.

**VI.** Mobilize the public to participate in national management and combat climate change. The main actor of energy structure transformation and climate change coping should not be restricted to the government. Only in combining all interested parties, can social resources be mobilized and national activities be effective. The public can monitor the implementation of national policies

and promote the say of developing countries in international media context.

With the background of a global battle against climate change, China's long-term energy strategy should consider the emission goal set by global agreement, follow the low-carbon development trend, and support sustainable development with a global insight and forward-looking perspective. Chinese traditional energy companies should actively promote green competitive advantage (GCA) in the low-carbon economy. GCA is the most core competitive fact in its particular development and management. It includes energy-saving and environmental protection management and improves product differentiation with regard to environmental quality, as well as reducing costs through energy con-

servation and environmental protection management. Chinese oil and gas companies should strengthen the R&D inputs of clean energy and renewable energy development effectively to produce high clean energy products. On the one hand, to improve the quality of refined oil products through technological innovation to reduce emissions of carbon dioxide when using oil products, on the other hand, to increase the development and use of renewable energy, clean energy, in particular, is developing and using huge potential of bio energy. By making these efforts, Chinese oil and gas companies can transform themselves into comprehensive energy companies that produce complementary energy products.



On [www.abo.net](http://www.abo.net), read other articles by James Crabtree, James Hansen and Yao Jin on the same topic.

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India/The Asian giant finds a balance between development and sustainability

# The yoga strategy

Inspired by Gandhi, India's plan to counter climate change, supported by Prime Minister Modi, provides for a 40 percent increase in renewables compared with the current energy mix

by JAMES CRABTREE

India was the last country to unveil its plan to curb carbon emissions in the run-up to the crucial climate change summit in Paris. The delay was chosen with care, allowing it to be released on October 2nd, the birthday of Mohandas Gandhi. Each participant in the Paris talks had brought out what is known as an Intended Nationally Determined Contributions (INDC) plan, putting forward steps that, taken together, would go on form the basis a hoped-for agreement to hold down increases in global temperatures. India's final contribution struck a folksy tone, referencing yoga and ancient Vedic Sanskrit texts, while including a quote from Mr Gandhi that seemed to chide the world's richer nations: "Earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed." Yet while the document's tone seemed in keeping with India's previously unwavering view that industrial countries should bear the full costs of any future action to

remedy the planet's changing climate, its pledges signaled an unmistakable change in approach.

## A TRANSFORMATION THAT FOCUSES ON RENEWABLES

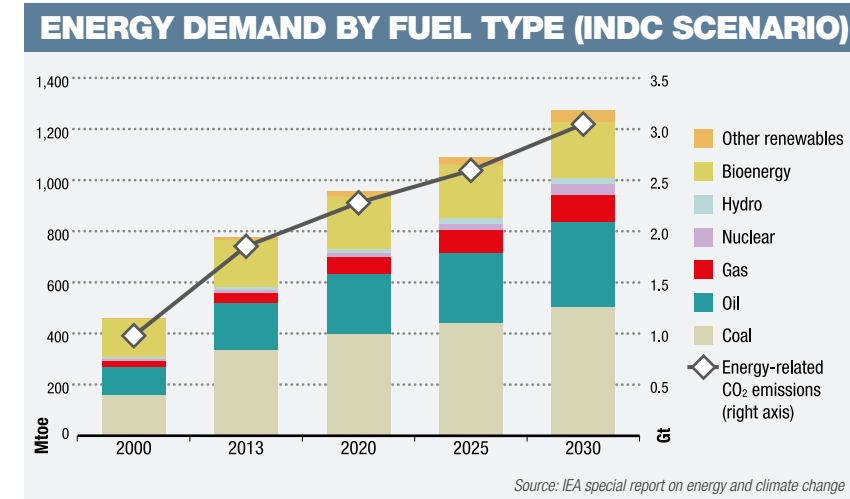
For a start, India pledged to cut the carbon intensity of its economy — the amount of greenhouse gases emitted per unit of gross domestic product — to around a third of the level seen in 2005. There would be a rapid increase in renewable energy, hitting 350 gigawatts by 2030, up nearly ten-fold from the current level, with an especially dramatic jump in solar generation. And while India's carbon emissions would continue to rise over that period, it pledged that 40 percent of its energy would come from non-fossil fuels by 2030. "It is a huge jump for India, therefore it is a very ambitious target," environment minister Prakash Javadekar said at the INDC launch in New Delhi, referring in particular to the energy intensity target. Many observers agreed. "It was impressive, and chock full of policy specifics in a very helpful way," says David Waskow, director of the climate initiative at the World Resources Institute. "If they can be achieved, it



would be a real leap ahead." India's newly ambitious policy is just one element lying behind a tentative sense of optimism among climate activists that two weeks of frenetic negotiation at the Paris summit might produce a reasonable deal. If that is to happen, India's involvement will be critical. Asia's third largest economy is already the world's third largest greenhouse emitter, behind only China and America. But India's rapid growth over the coming decades, as well as the ample reserves of inexpensive coal which lie temptingly beneath its soil, mean that a successful pact to limit climate increases will be all-but impossible without its say-so. Going on to strike such a deal remains a formidably complex task. The Paris summit is widely seen as the last chance to deliver one that has a hope of limiting global temperature increases to two degrees celsius above pre-industrial levels, the benchmark target for global climate policy. This follows a range of previous failed agreements, ranging from 1997's Kyoto protocol, which was never signed by the United States, to the 2009 Copenhagen summit, which ended with no agreement at all.

## THE ESSENTIAL ROLE OF THE DEVELOPING COUNTRIES

This time, negotiators shifted tactics, with each nation given the task suggesting its own targets—the INDCs—prior to the talks. This coincided with a wider intellectual shift, in which emerging economies such as China and India began to view climate action not simply as the responsibility of western nations, but of developing economies as well. "Now each country has to look at what they can do on the ground," says Saleemul Huq, a climate scientist at the London-based International Institute for Environment and Development. "In the past, it was much more about trying to get other countries to do things, and resisting having to do things at home, which is one of the reasons why India was often seen in the past as a spoiler, or having a recalcitrant attitude, on climate issues." In the past India's was perhaps the strongest advocate that the moral responsibilities for climate mitigation lay with richer nations, whose growth since the industrial revolution had produced nearly all of the world's carbon emissions. Often known as the principle of equity, this sat at the heart of the negotiation strategy of the so-called like-minded group of developing countries (LMDC), an influential group of a few dozen emerging nations. In this, India had plenty of



**In the INDC Scenario, India's energy-related CO<sub>2</sub> emissions are around 30% higher than 2013 by 2022, reaching 2.4 Gt, and go on to exceed 3 Gt in 2030. Emissions per capita also continue to grow through to 2030, but are still only around half of the global average at that time (at 2.1 tCO<sub>2</sub> per capita).**

of justification. Although a large carbon producer, it remains a relatively minor emitter in per capita terms, far below China, whose rapid recent growth has pushed per capita emissions above the global average. As one of the world's least developed nations, India is also among the most vulnerable to climate change, with hundreds of millions of citizens set to face climate-related hardships ranging from droughts to internal migration.

## ONE HUNDRED BILLION DOLLARS FOR SOLAR POWER

A number of other factors had also begun to break down the once clear climate divide between countries like India and the richer OECD nations. The most significant came last November, in a bilateral deal between the U.S. and China, in which the Chinese agreed to reduce and ultimately stop emissions increases by 2030. Although widely welcomed globally, some in India viewed the move with suspicion, implying that China, the world's most important emerging economy, had abandoned its fellow developing nations, in the process junking the principle that the west was responsible for clearing up the climate mess it had created. A swathe of further bilateral deals have since followed, including one between India and America in January. "You now have much more complicated coalitions than simply the developed world on one side, and the developing over on the other, which makes an agreement easier," says Mr Waskow. "There are some questions where the U.S. has been aligned with South Africa and Brazil, rather than the other rich countries, so you have all sorts of new alliances now." The changes provide some of the back-

ground context to India's changed climate policy. Much of the impetus for its new ambition, however, only arrived following the election of Prime Minister Narendra Modi last year. A reform-minded leader, Mr Modi is an enthusiast for renewable energy, and solar in particular, which is a popular source of power in his home state of Gujarat. Earlier this year, he unveiled a plan to plough \$100bn into increasing solar capacity to 100 gigawatts by 2022, up from just four gigawatts today, helping to reach a goal of 175 gigawatts of renewable power overall. October's INDC then bumped up this target further as part of India's new 40 percent non-fossil fuel pledge. "The point is that India has →



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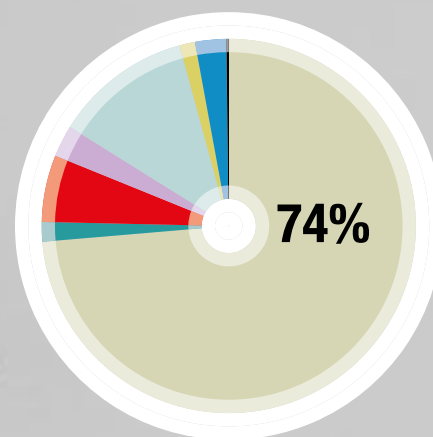


**THREE TIMES MORE  
“RENEWABLES” BY 2030**  
The three pie charts show how India's energy mix will change between now and 2030.

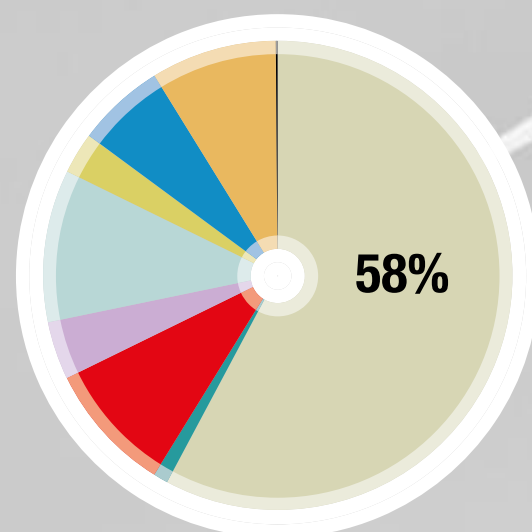
The INDC scenario plans for India, within the same time period, a doubling in the consumption of electricity. At the same time, the energy production capacity based on renewable sources must be tripled to reach the government's stated goal of 175 GW by 2022.

Source: IEA special report on energy and climate change

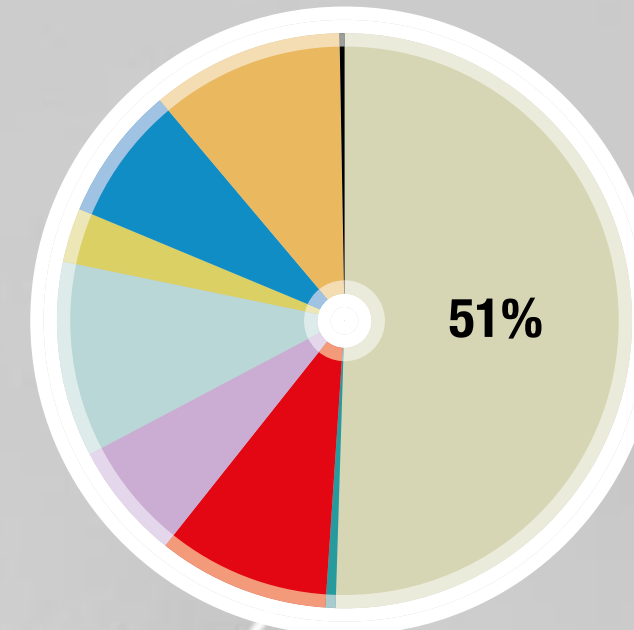
2013  
1210 TWh



2022  
1820 TWh



2030  
2550 TWh



Coal  
Oil  
Gas  
Nuclear  
Hydro  
Bioenergy  
Wind  
Solar PV  
Other

## A bulwark for the country's green future

The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The broad aim of the Ministry is to develop and deploy new and renewable energy to supplement the country's energy requirements.

1. Commission for Additional Sources of Energy (CASE) in 1981.
2. Department of Non-Conventional Energy Sources (DNES) in 1982.
3. Ministry of Non-Conventional Energy Sources (MNES) in 1992.
4. Ministry of Non-Conventional Energy Sources (MNES) renamed as Ministry of New and Renewable Energy (MNRE) in 2006.

The role of new and renewable energy has been assuming increasing significance in recent times with the growing concern for the country's energy security. Energy self-sufficiency was identified as

the major driver for new and renewable energy in the country in the wake of the two oil shocks of the 1970s. The sudden increase in the price of oil, uncertainties associated with its supply and the adverse impact on the balance of payments position led to the establishment of the Commission for Additional Sources of Energy in the Department of Science & Technology in March 1981. The Commission was charged with formulating and implementing policies and establishing programs for the development of new and renewable energy apart from coordinating and intensifying R&D in the sector. In 1982, a new department, i.e., Department of Non-conventional Energy Sources (DNES), that incorporated CASE, was created in the Ministry of Energy. In 1992, DNES became the Ministry of Non-conventional Energy Sources. In October 2006, the Ministry was re-christened as the Ministry of New and Renewable Energy.

expanded its renewable energy and non-fossil targets, which were already quite aggressive," says Arun- abha Ghosh, head of the Council on Energy, Environment and Water think tank in New Delhi. The targets are especially impressive, Mr Ghosh argues, because India's huge reserves of coal would otherwise have seen traditional fossil fuels make up roughly three quarters of electricity generation up to 2050, with renewables at around a tenth. Instead, India now aims to push its share of renewables to a level only achieved by a handful of rich countries like Germany, but to do so far more quickly. "It is a huge shift from what would otherwise have been the case," he says. Skeptics of India's new approach tend to fall into two camps, the first doubting that the renewables ramp up is achievable. Moving from 4 to 100 gigawatts in only 7 years requires an unprecedented expansion. Here India's record is patchy, with previous plans

to deliver significant increases from sources such as nuclear, as well as coal-fired power itself, struggling in the face of political obstacles. The bureaucracy involved in conducting large numbers of solar auctions and signing myriad new power agreements remains formidable. Even so, few disagree that a major increase in solar generation is likely. Sumant Sinha, chief executive of renewable energy company ReNew Power, says a dramatic ramp-up towards the end of this decade could even bring the 100 gigawatt target within reach. "I see no reason why this should not be achieved," he says.

### A GREEN FUTURE SUBJECT TO FUNDING

The second set of doubts focuses instead on what happens after 2022. If indeed Mr Modi can hit his earlier renewables target, hitting the newer goal for 2030 should be straightforward, making the INDC targets

seem unambitious. "Reaching the higher target from there [2022] is not a huge increase, my sense is they have given themselves plenty of room," Mr Sinha says. The fact that India, unlike China, has so far not put forward a data at which it expects emissions to begin falling has also been criticised by some climate activists. More generally, to hit its targets, India needs both money and technology, two areas likely to be a source of tricky negotiations in Paris. Funding is a major problem. India says meeting its climate pledges requires an investment of \$2.5 trillion. Some of that will be found domestically. But in common with other developing economies, it expects much of it to be provided by wealthier nations. In theory, these industrialised economies have pledged to put \$100bn per year into an initiative called the green climate fund, but contributions are currently running at a tiny fraction of that level. Much of that money would

fund the development of new technologies, another controversial topic. Mr Ghosh argues new tie-ups are needed to push forward technologies such as energy storage and power management. Although increasingly controversial in Europe, clean coal should be a priority to too, he adds: "Coal will remain an important part of the energy system. The question isn't coal or no coal, it is coal versus cleaner coal." Yet persuading industrialised economies either to stump up cash or to share advanced technology remains one of the biggest stumbling blocks to a deal in Paris. Overall, climate scientists are sanguine even about what even a relatively successful deal in Paris might achieve. Totting up all of the pledges made in the various INDC documents, few think the summit can achieve a plan to limit global warming to 2 degrees. At present, even with heightened contributions from countries like India and China, a deal capable of hitting slightly less

than 3 degrees is more likely. Even so, given the failures of past negotiations, many believe Paris can be the beginning of a process which could hit in time bring about the more ambitious target, with countries like India playing a full role. "If you want to compare things with the past, I think what India in planning is quite ambitious, but if you want to compare this to what we need to do, we are not doing nearly enough," says Mr Huq. "We need to be thinking about the next phase after this, of ratcheting up more.... But if we all start with this level of ambition, and get a deal, then it will be easier and easier to do the next stage."



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Japan/The aims of the world's fifth largest CO<sub>2</sub> producer

# Again at the forefront

The nuclear disaster at Fukushima has led to an increase in fossil fuel use, and with it, an increase in greenhouse gas emissions. This makes Japan's efforts to take a green path significantly more challenging

**J**apan's energy supply-demand structure changed dramatically after the massive earthquake in March of 2011. The subsequent Fukushima nuclear disaster was followed by the suspension of all of the country's nuclear plants, leading to a substantial increase in the use of fossil fuels and the highest ever volume of CO<sub>2</sub> emissions (1,235mil.t-CO<sub>2</sub>) in 2013 (see fig.A). This chaotic situation brought about a period—following the end of the first commitment period of the Kyoto Protocol in 2012—in which Japan, the fifth largest CO<sub>2</sub> emitter in the world, had no national energy and climate change policies for the years 2013 and 2014. This policy-less period finally ended in July of 2015, just before the deadline for submission of Intended Nationally Determined Contributions (INDC) in preparation for the Paris meeting. At that time, the government set up its GHG emissions reduction target for 2030 tied to an energy mix necessary to achieve that target. According to its submitted INDC, Japan's GHG emissions in 2030 will be 26 percent lower compared to the base year emission of 2013. Compared to 1990, that figure is only 18 percent, revealing the considerable rise in Japan's GHG emissions between 1990 and 2013.

by YASUSHI NINOMIYA

## THE COMMITMENTS MADE AHEAD OF COP21

The following four key points highlighting energy demand in 2030 are indicated in the INDC to achieve the 26 percent of GHG reduction target.

**1** In 2030, Japan's final energy demand level is expected to be reduced to 326mil.kloe, or roughly 10 percent lower than the present level. It is less known that the country's final energy demand, including both industrial and domestic/commercial sectors, has almost continuously decreased by around 0.8-1.0 percent p.a. over the past 10 years (see fig. B). Real GDP grew by 1.0 percent p.a. on average during the same period (see fig. C), suggesting that the nation's energy efficiency has constantly improved. Since a full range of energy efficiency measures will be taken, including an introduction of a tough efficiency standard for new building and deployment of demand side control with IT systems, it is not unreasonable to assume that the efficiency improvement rate of 0.8 percent p.a. will be kept towards 2030. A simple calculation based on this assumption gives an estimated value of final energy demand in 2030 that is slightly lower than the indicated value of 326mil.kloe. In addition, it is almost certain that the

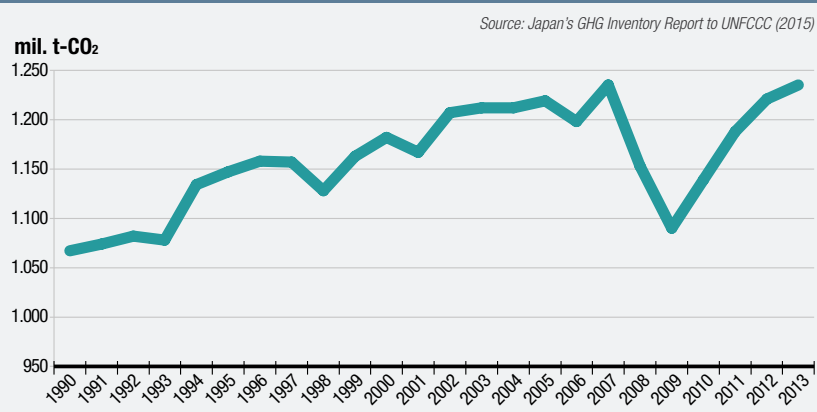
nation's population will decrease by roughly 10 percent. Therefore, the reduction of the final energy demand in 2030 to 326mil.kloe lies within an achievable range. Most of this decrease in final energy demand is expected to result from a cut of combustion use of petroleum products such as petrol and gas by final users, which is estimated to be 13 percent lower in →



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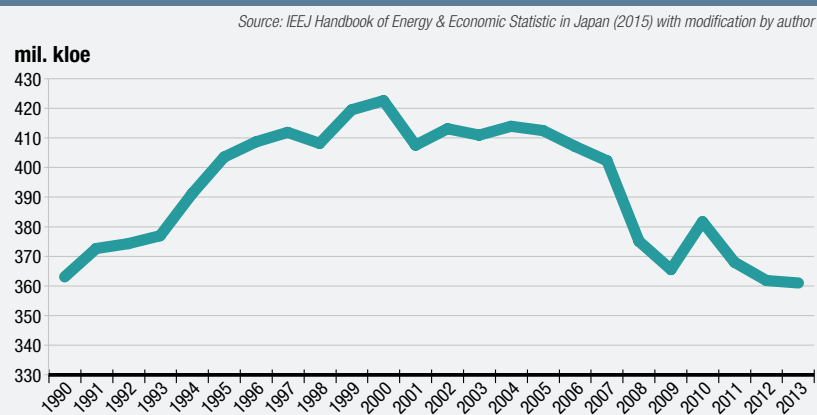


## A. EMISSIONS



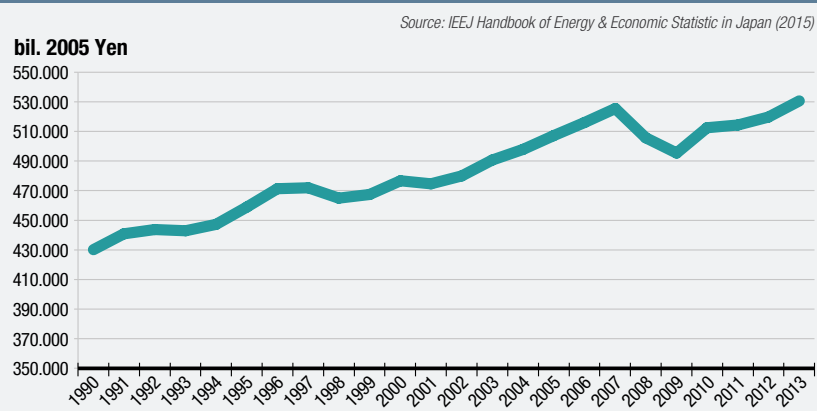
**CO<sub>2</sub> emissions from 1990 to 2013. Growth is evident after 2011, the year of the Fukushima disaster.**

## B. ENERGY DEMAND



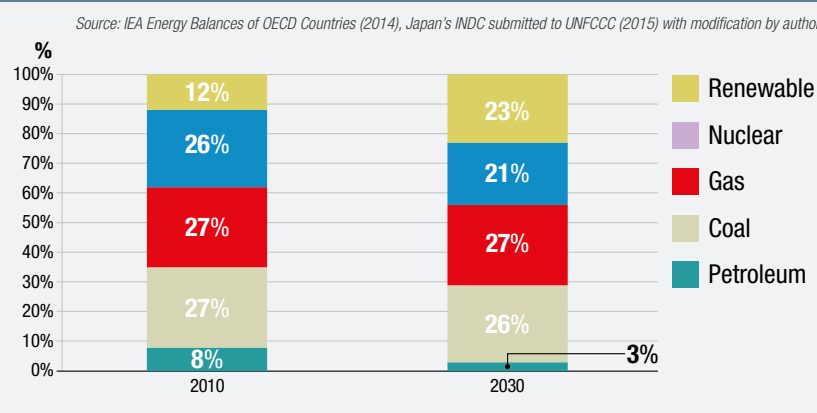
**The country's energy demand has almost always decreased by approximately 0.8-1.0 percent per year over the past 10 years.**

## C. REAL GDP



**Real GDP, over the past ten years, has grown at an average of 1 percent per year.**

## D. THE SHARE OF RENEWABLES



**The ratio between renewable energy and total energy production will almost double to approximately 23 percent by 2030.**

2030 compared to the 2013 level. In contrast to this, electricity demand is anticipated to increase to just above the 2013 level despite the decrease in population.

2 The ratio of renewable energy to total power production, which constituted 11 percent in 2013, will nearly double, to around 23 percent in 2030 (see fig. D). The figure includes 9 percent of energy from hydro, 7 percent from solar photovoltaic, four to five percent from biomass, 1.7 percent from wind and 1 percent from geothermal.

In particular, solar photovoltaic and biomass will expand enormously by 7- and 12-fold respectively compared to their actual amounts in 2013. Although the former has already had a sufficient number of projects authorized under the Feed-in-Tariff (FIT) scheme to fulfill the 2030 target volume, the latter is likely to face difficulties, such as challenges in finding a reliable supply of biomass fuels, though these should be solved.

A reformation of the Japanese electricity market over the next years is generally expected to bring a positive impact on the expansion of renewable energy.

However, a number of important issues are still left for consideration, such as technical challenges related to how to accommodate the higher share of variable renewable energy resources within the grid, and who should take on those associated costs.

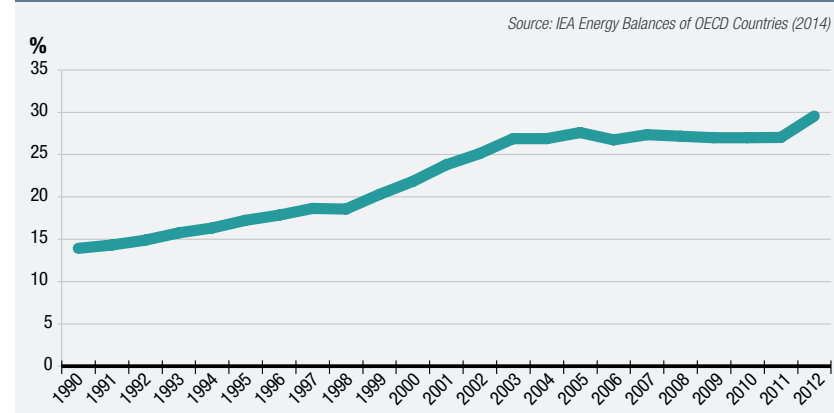
In addition, the current FIT scheme is likely to be amended significantly, since it is often criticized for putting a large amount of the financial burden on electricity users.

Those unsolved issues create a level of policy uncertainty, which would be a main obstacle to achieving the target.

3 The target proportion of nuclear power to total power production in 2030, like that for renewables, is 20-22 percent (see fig. D). This will obviously mark a significant increase from the current level of virtually zero; it was at between 25-28 percent before the 2011 earthquake.

Very recently, two nuclear reactors located in Kyushu, in Southern Japan, were re-opened in spite of the fact that opinion polls show that the majority of Japanese people do not support the reopening of the nuclear reactors. In order to achieve the 22 percent target, not only will many of the

## E. THE ROLE OF COAL



**The figure regarding the use of coal in the field of energy production has significantly increased reaching almost 30 percent in 2012.**



## AN EXTRAORDINARY EVENT

**Japan is alone among the major developed economies in having increased its share of coal use for power generation over the past years.**

existing nuclear plants have to be re-opened, but two new reactors will need to be opened, and some existing plants will need to be extended beyond their maximum 40 year-lifetime. The challenge here is that the public's skepticism about the safety of nuclear is not likely to go away soon, given the fact that more than 100,000 people were forced to evacuate after Fukushima, and the decommissioning process hasn't even been completed there yet. Moreover, many have gone to court against the re-opening of existing nuclear plants in various areas across the country. And so it won't be easy to re-open the nuclear plants in fast succession, and it will be even harder to build up new

reactors. Furthermore, the reform of the electricity market may bring a significant impact on this sector. It's by no means certain that re-opened nuclear plants will even be economically healthy under the coming competitive electricity market. All of these imply that the 20-22 percent target of nuclear power expansion will face significant challenges.

4 The percent share of coal use to total power production, which was around 26-27 percent before the 2011 earthquake, will more or less be kept at the same level in 2030 (see fig.D). This

continued reliance on coal has received little attention in Japan so far, in sharp contrast to other leading countries such as the U.S., Europe and China, which have made diminishing use of coal for power production a priority. Japan's approach could stand out in the international negotiation under UNFCCC. It is worth recalling that the main driver in the increase in Japan's GHG emissions over the past decade, as opposed to the decrease in final energy consumption over the same period, was an expansion of coal use for power generation.

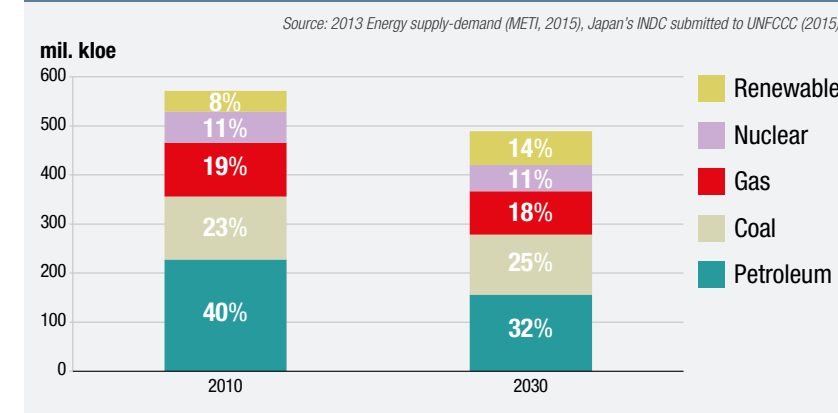
The ratio of coal use to total power production substantially increased from 14 percent in 1990 to 22 percent in 2000 and reached nearly 30 percent in 2012 (see fig. E).

Though the rapid rise in coal use after the 2011 earthquake may be discounted as an aberration, Japan is virtually alone in having increased the share of coal use for power generation over the past decades. Moreover, almost 40 new coal power stations are planned, reflecting many electricity retailers look for cheap electricity that can be competitive in the deregulated retail market after April 2016. These planned coal power stations could lead to a further increase in GHG emissions well beyond the indicated level in the INDC. Japan's continuous reliance on coal may face headwinds in various stages of international talks. Overall, the INDC

suggests that the most affected energy sector will be petroleum, whose share of primary energy demand in 2030 could be reduced considerably, to 32 percent from around 40-45 percent at present, although it would still have the largest share of the energy market, even in 2030. Accordingly, the actual volume of petroleum demand will be cut by 30 percent (see fig. F). In contrast to petroleum, use of other fossil fuels such as coal and gas would remain roughly at present levels. However, these figures may be altered by unexpected events related to renewable energy, nuclear and coal, which involve some degree of uncertainty.

*This article does not intend to evaluate to whether or not Japan's target is ambitious or fair enough in comparison with other countries. It will be one of the key negotiation issues under UNFCCC and COP21 and substantive discussions have been made in many other literatures.*

## F. THE ROLE OF OIL



**Comparing the primary energy demand in 2010 and 2030, the volume of oil demand will decrease the most, from 40 to 32 percent.**

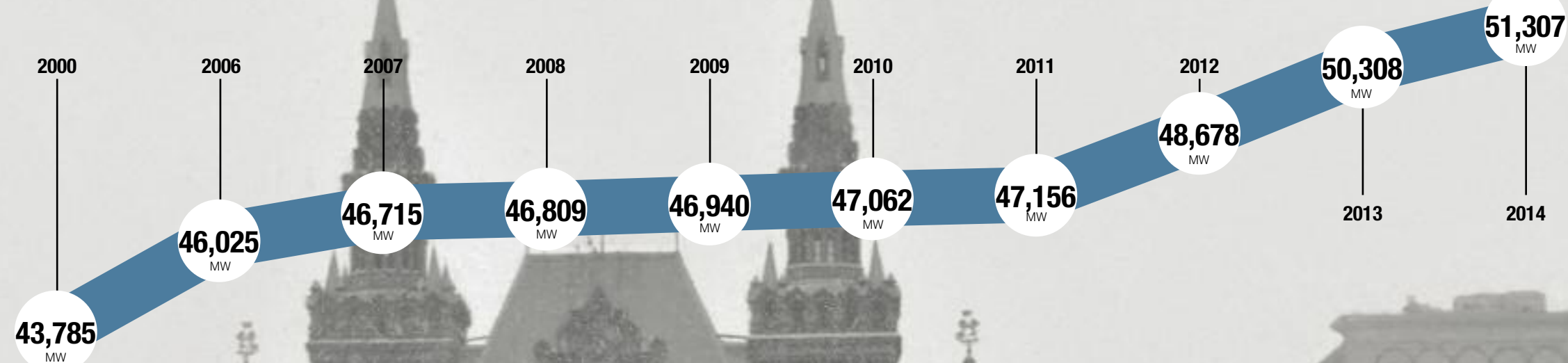




### AN INCREASINGLY GREEN ENERGY MIX

The graph shows the increase in overall installed energy production capacity from renewable sources in the Russian Federation. The aim of Russia's energy strategy is to maximize the efficient use of natural resources and the potential of new sources of energy. In this way, the country aims to reduce greenhouse gas emissions by 30 percent, compared to 1990 levels, by 2030.

Source: Irena/Government of the Russian Federation



## Russia/Energy efficiency: Steps taken and future prospects

# Fast, but not too fast to reach the goal

While Russia did not play a leading role in promoting the Kyoto Protocol, its participation was essential in passing the treaty. At COP21, the country can be expected to propose ambitious goals but its leaders will confront internal critics

by EVGENY UTKIN

In Russia, there are conflicting opinions on climate change and on what actions should be taken to address global warming. Some claim that the process will stop without too much effort made by governments, and there are others who believe that the consequences of global warming, at least for Russia, could be more positive than for the rest of the planet. It is true that the Russian coast, especially the northern coast, is sparsely populated and therefore any increase in the ocean level would probably lead to the displacement of few people, or at least of many fewer people than in the case of Italy. Even an increase in the average temperature could lead to benefits for Russia, generating an increase in arable land and the possibility of developing new hidden deposits. Only a few decades ago, the northern sea route and the development of oilfields in the North Sea were considered science fiction. Some time ago, this "science fiction" materialized into plans and projects, which only the global economic crisis and decreased use of gas and oil have temporarily stopped. Russia did not play a leading role in enacting the Kyoto Protocol, but it has made an essential contribution. The treaty, signed on December 11, 1997, only entered into force on February 16, 2005, thanks to Russia's ratification of the Protocol in November 2004. For the treaty to enter into force, it needed to be ratified by at least 55 countries responsible for at least 55 percent of global anthropogenic greenhouse gas emissions. This objective was achieved thanks to Russia's ratification. While the Federation was not among the first countries to enter the Kyoto club, it has certainly set a very ambitious goal: to reduce greenhouse gas emissions by 25 percent by 2020 compared to 1990 levels.

### INTERNAL DISPUTES AND COMMITMENTS

There is no lack of critics within Russia, firstly, because the country used 1990 as a parameter—a time when emissions were at very low levels. Why did it not use 2005 as a parameter, when the protocol entered into force? Why did it not set less ambitious goals, as the U.S. did, for example? However, overcoming these internal disputes, Russia is currently striving to achieve the goals it set. It has already made great strides, although there is still much to do. Firstly, it is



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necessary to think about energy efficiency in industry, transport and private homes, but, on the other hand, renewables must also be considered. With its ability to benefit from huge oil and gas deposits, Russia could not think about renewables, at least then, and wait until their energy is cheaper than that produced from fossil fuels. The Russian government's decree of January 2009, however, laid the foundation for the development of renewables, setting a series of goals: from 0.9 percent in 2008 to 2.5 percent in 2015, and to 4.5 percent in 2020. Also, if we take into account the contribution of hydropower, it is expected that 20 percent renewables in the production of electricity will be achieved by 2020. Until 2009, officials in individual ministries were responsible for energy efficiency and for monitoring the climate, then, the president appointed a chief advisor for issues related to climate change. This was Alexander Bedritsky, a well-known scientist, who previously served as President of the World Meteorological Organization from 2003 to 2011. It is he who is leading the Russian delegation at COP21 and who is preparing Russia's proposals. Speaking at COP20 in Lima, Bedritsky emphasized Russia's success: "In 2014, twenty years have passed since the entry into force of the United Nations Framework Convention on Climate Change (UNFCCC). During this period of time, the Russian Federation has been working actively to fulfill its obligations established as part of the UNFCCC and the Kyoto Protocol. We have successfully achieved the objectives set with 32 percent less emissions compared with the benchmark year, 1990, in the presence of a steady growth in GDP. The decline in emissions, generated only in Russia's energy sector over the last twenty years, has reached the level of the five-year emission of the countries of the EU and has exceeded the three-year emissions of the U.S.A." It is likely that Russia will de-



## Russian public opinion

**48.7%**

are concerned about climate change and its consequences, a level than the global average

**55%**

think that the UN, from 1992 to date has not achieved sufficient results for solving the problem

**52.5%**

believe that the results of COP21 should ensure global warming is limited to no more than 2 degrees centigrade

**57.5%**

consider the battle against greenhouse gases to be a global responsibility

**9%**

believe it is necessary to stop using fossil fuels

**40%**

believe that Moscow should continue to increase the extraction of fossil fuels

*What the Russians think about the fight against climate change, according to a survey conducted by the Russian Socio-Ecological Union, as part of the international World Wide Views on Climate and Energy project.*



clare an even more ambitious goal at the Paris conference: to reduce greenhouse gas emissions by 30 percent by 2030 compared with the benchmark year, 1990, taking into account the capacity of absorption of emissions by forests. It is evident that the forests of Siberia are the green lungs of Eurasia, and have the capacity to absorb large amounts of carbon dioxide. But a doubt has been raised by many experts, including Olga Serova, Head of the Russian Socio-Ecological Union's Climate Secretariat: with this formula the goal could shrink and be even weaker than that previously set (25 percent, but without taking the forests into account).

### POINT OF VIEW OF THE POPULATION

The Russian Socio-Ecological Union led the public debate in Russia as part of the international World Wide Views on Climate and Energy project. 104 surveys were conducted in 79 countries worldwide; Russia's took place in St. Petersburg. The numbers that jumped out are very interesting: almost half of the respondents from St. Petersburg (48.7 percent) are concerned about climate change and its consequences, but this number is much lower than the world average.

In St. Petersburg, they do not worry about climate change in the region (only 12.5 percent believe that it may endanger quality of life). 55 percent believe that the U.N., from 1992 to date, has not achieved sufficient results to solve the problem, while 52.5 percent believe that the results of COP 21 should ensure keeping global warming to a maximum of 2 degrees centigrade, but not "at all costs" (38 percent). 57.5 percent consider this battle a global responsibility, while 48.5 percent believe that it belongs to individual countries. Almost 38 percent of the respondents believe that production from renewable energy sources should be increased, although only slightly less than 9 percent believe that it is necessary to stop using fossil fuels. Over 40 percent of Russians surveyed believe that Moscow should continue to increase the extraction of fossil fuels. This is the answer that most contrasts that of the global trend, since approximately 45 percent of the total number of respondents believe that it is necessary to gradually reduce the use of all types of fossil fuels.

In fact, politicians agree with the people: the greatest resource for reducing greenhouse gas emissions is energy efficiency. In Russia, they have just started to reflect on the issues of

energy efficiency and the deficit of resources, given that in the Soviet Union energy was fairly inexpensive, as well as supported with subsidies. According to various estimates, the volume of inefficient energy resources in Russia exceeds 30 percent of the total annual volume of electricity consumption. It can be said that there is significant potential for increasing the efficiency, reliability and quality of the energy supply by way of the introduction of modern technologies. The potential for energy saving constitutes 40 percent of the current use of electricity. Of this, it is possible to save a quarter in terms of domestic consumption and homes, a third in terms of the energy sector (33 percent) and almost as much in the heavy industry sector (32 percent).



On [www.abo.net](http://www.abo.net), read other articles by Giuseppe Acconcia, Nicolò Sartori and Molly Moore on the same topic.



**Africa/A** continent makes great strides toward sustainability

## A mission possible

The African Union has launched several initiatives and partnerships aimed at developing the continent's vast quantities of untapped renewable energy resources

**T**he African continent is home to some of the world's fastest growing economies, which are playing increasingly prominent roles in global markets. According to 2010 data from the U.S. Energy Information Administration (EIA), 16 of

Africa's 54 countries are exporters of oil, namely Nigeria, Angola, Libya, Algeria, Sudan, South Sudan, Equatorial

Guinea, Congo (Brazzaville), Gabon, Chad, Egypt, Tunisia, Cameroon, Ivory Coast, Democratic Republic of Congo (DRC), and Mauritania. EIA data also show that Africa's proven oil reserves have grown by nearly 120 percent in the past 30 years, from 57 billion barrels in 1980 to 124 billion barrels in 2012. In addition, it is estimated that at least another 100 billion barrels exist offshore from Africa just waiting to be discovered.

Africa's oil production represented 12.4 percent of the world's total

crude oil output, while Africa's crude oil exports grabbed a higher share at nearly 20 percent of the world's total as a result of limited refining capacity and still limited oil consumption on the continent. Africa held 8.8 percent of the world's proven reserves of oil.

All of these improvements in oil findings, however, also lead us to the tragic fact of increasing greenhouse gas emissions. Consequently, the African Union is taking some steps, initiatives and active plans that will help African countries do their part

in achieving a global reduction of greenhouse gas emissions as well as attaining the "green" turn of the world economy toward sustainable development.

### A LAND AT RISK OF OVERHEATING

While Africa has contributed only marginally to global emissions, scientists predict that the effects of climate change will occur earlier here than in other places. Central Africa is already experiencing annual







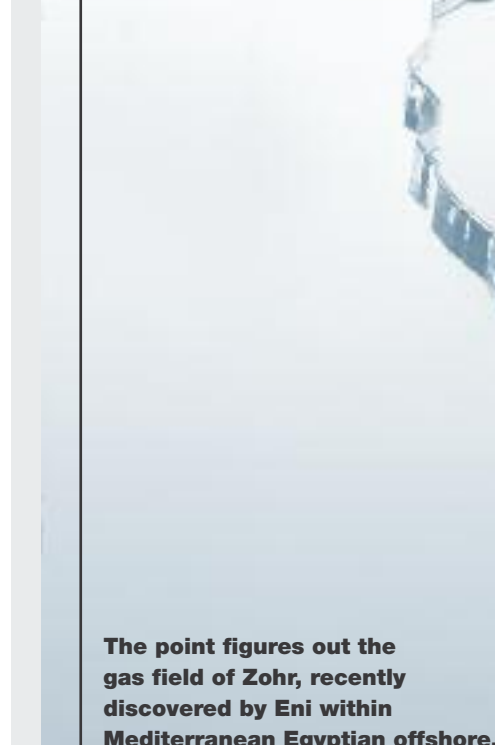
**THE AUTHOR.** Formerly Under Secretary of State for International Cooperation in the Ministry of Electricity and Energy in Egypt, Dr. Elham Ibrahim was Commissioner of Infrastructure for the African Union in April 2012. She was selected in 2012. Her current Commission covers Africa. She is responsible for Infrastructure and Environment to realize its vision to enhance regional and international efforts for accelerated infrastructure development for sustainable development, resources, and to carry out

mean temperatures consistently higher than those experienced historically, and the same is predicted for the entire continent within the next two to three decades. Warming projections under medium scenarios indicate that extensive areas of Africa will rise by 2°C in the last two decades of this century relative to the late 20th century mean annual temperature. Under a high warming pathway (an “over 4°C world”), this dramatic temperature change could occur by mid-century across much of Africa and reach between 3°C and 6°C by the end of the century. Africa is also the continent most affected by and vulnerable to the adverse impacts of climate change; even a warming of 2 °C globally would put over 50 percent of its population at risk of undernourishment, making adaptation as well as loss and damage a matter of urgency. Although Africa has energy resources and potential far exceeding its current needs, most of its people and productive sectors suffer from energy deficits. The case of electricity stands out: about two thirds of the continent’s population does not have access to electricity, the entire generating capacity of the 47 countries of sub-Saharan Africa excluding the Republic of South Africa is roughly 45 Giga Watts (GW), and about a quarter of this installed capacity is not currently available due to various causes, particularly aging plants and lack of maintenance. As a result, sub-Saharan Africa has the world’s lowest electricity access rate, at only 32 per

cent (IEA, 2014). Large parts of rural Africa remain non-electrified and current generation capacity is often unable to meet demand in rapidly growing urban centers. The recent high growth rates experienced across the continent are likely to be severely constrained if the existing situation is not ameliorated, as experienced in South Africa in recent years. Consequently, the African Union led efforts to accelerate and scale-up the harnessing of the continent's huge renewable energy potential, placing a focus on building integrated solutions for widening access to clean energy services. Not only does this promote human well-being and enhance sustainable development, it also puts the countries of Africa on a climate-friendly sustainable development path. Access to energy services is a prerequisite for human development as well as for prosperous economic development and job creation. The 12<sup>th</sup> AU Summit, held in February 2009 in Addis Ababa, Ethiopia, urged Member States and the Regional Economic Communities to "foster inter-African and international cooperation in the energy sector." For this reason, and in order to meet growing energy demand, increase energy access to the majority of the African population and to enhance energy security, the AU has launched various energy initiatives and partnerships for development of the continent's vast quantities of untapped renewable energies resources including hydro, solar, wind, geothermal and bioenergy. It has also promoted electricity trade between countries and regions. Africa has an urgent need to address "access to energy" through a rapid and wide scale expansion of electricity generating capacity, both on grid and off grid. There is growing optimism that the energy access gap can be closed without exacerbating climate change that threatens the foundations of Africa's development

## ALL AIMING TOWARDS ONE GOAL

In this regard, the AU is implementing and providing support to various energy sector development initiatives, including: (a) The Program for Infrastructure Development in Africa (PIDA), dedicated to facilitating continental integration, socioeconomic development and trade through improved regional infrastructure; (b) The Hydropower 2020 Initiative, aimed at harnessing the hydropower potential in the continent's major river basins; (c) The East African Regional Geothermal Programme, providing USD 140 Million for the Geothermal Risk



**The point figures out the gas field of Zohr, recently discovered by Eni within Mediterranean Egyptian offshore.**

Energy  
& Opportunity

The energy industry is at risk in Africa, as the reduced rainfall causes a decrease in the amount of water available to power hydroelectric plants. This is occurring in a place where the energy landscape is already challenging: only 219 million of the continent's 915 million people currently have access to electricity, and the situation is

getting worse. And it affects not just people but trade: approximately 10 million small and medium-sized businesses do not have access to electricity. Moreover, frequent blackouts cost the African economy 1-4 percent of GDP every year. On the other hand, however, Africa is a continent that offers huge energy potential (from which Africa benefits both in terms of energy requirements and in terms of foreign investment) especially as regards natural gas, a source that allows emissions to be significantly

reduced. One example, among the various recent discoveries, is that of global significance made by Eni **offshore Egypt** in the Mediterranean Sea, at the exploration prospect known as **Zohr**. The supergiant gas field, which has a resource potential of up to 850 billion cubic meters of gas on site (5.5 billion barrels of oil equivalent) and an area of approximately 100 square kilometers, is the largest gas discovery made in Egypt and in the Mediterranean Sea and may become one of the largest gas discoveries in the world. This

exploration success will provide an essential contribution towards meeting Egypt's natural gas demand for decades. Another opportunity is represented by renewables: according to the IEA, **renewable energy in Africa could quadruple by 2030**, reaching 22 percent, compared with the current level of approximately 5 percent.

Mitigation Facility (GRMF) to encourage public and private investors by providing grants; (d) The assessment of the solar energy potential in the Sahara and Sahel regions; (e) the Sustainable Energy for All (SE4All) Initiative in Africa, aimed at ensuring universal modern energy access, as well as doubling the use of renewable energy and energy efficiency by 2030; and (g) The U.S. Power Africa initiative, amongst others. The PIDA-Priority Action Plan (PAP) Energy component is composed of 15 projects and programmes costing around USD 40 Billion for 9 major hydropower projects, 4 power transmission corridors, one regional oil pipeline and one gas pipeline. The Africa-EU Energy Partnership (AEEP) is one of the main partnerships that adopted political targets at the First High Level Meeting (HLM) for the future of the Partnership up to 2020. These are la-

beled “the political targets of AEEP 2020,” and include 10,000 MW of hydropower, 5,000 MW of wind, 500 MW of solar energy and a tripling of the capacity of other renewables, doubling cross border electricity inter-connections, doubling the use of natural gas on the African continent, doubling the export of natural gas to Europe, and providing access to modern energy services to an additional 100 million Africans. The HLM launched the Partnership’s first initiative, the Africa-EU Renewable Energy Cooperation Programme (RECP) as a tool for implementation of political targets to be achieved by 2020. In a May 2014 submission, the African Group of Negotiators (AGN)—representing 54 African countries—called for the “establishment of a global partnership to accelerate the energy transformation required for a well below 2° Celsius world,” a call

that was endorsed by the African Ministerial Conference on the Environment (AMCEN) meeting in Cairo, which noted progress made since the 15th AMCEN meeting with regard to the African Renewable Energy Initiative (AREI) to address climate change and sustainable development. The AMCEN's Flagship Program on Sustainable Energy has made clear the group's potential, and also highlights the urgent need to establish contacts with the African Union Commission (AUC), the African Union Commission (AUC), NEPAD Agency, AGN, the African Development Bank (AfDB), the United Nations Environment Program (UNDP) and the International Renewable Energy Agency (IRENA), and to make sure that all other initiatives and proposals are aligned with the flagship program. It must seek funding from the Governors' Climate & Forests Fund

(GCF), with AMCEN's President leading the work in this regard. To this effect, African Heads of State also agreed that "a technical group chaired by AMCEN President, comprised of AUC, NEPAD Agency, AGN, AfDB, UNEP and IRENA formulate concrete proposals and projects, in order to avoid duplication and ensure unity of purpose for Africa, in line with Agenda 2063." The African countries and the African Union are making a significant effort to reach reliable solutions for sustainable development as well as to attain the "green turn" of which we dream. All of their efforts, research and action plans are surely lending a helping hand in eradicating the catastrophe of climate change that menaces the prosperity of nations and threatens the tranquility of our lives.

**NUMBERS** Richard Munang, Africa Regional Climate Change Coordinator of UNEP

# Those who risk the most

**The African continent is among the regions most vulnerable to climate change as well as those seeking the great benefits of economic growth. Its efforts to champion sustainable growth and promote global cooperation are thus both particularly urgent and worthy of attention**

Africa, facing disproportionate consequences of climate change relative to its own emissions, is particularly motivated to promote an effective and decisive fight against climate change. The impacts of greenhouse gas emissions seriously endanger the continent's environmental balance and, as a result, crops, food supplies and ecosystems. This is why Africa is working hard to make its own contribution to reducing CO<sub>2</sub> emissions, and, at the same time, to fund and launch sustainable industrial development initiatives, according to Richard Munang, Africa Regional Climate Change Coordinator of the United Nations Environment Programme (UNEP).

ment include in agriculture, which is 98 percent rain fed hence vulnerable to climate change. The 2015 Africa Adaptation Gap Report observes that for a below 20C global warming scenario due to climate change, projections point to seven to forty percent declines in key staples resulting in a twenty five to ninety percent increase in incidences of undernourishment, putting 50 percent of Africa's population under risk of undernourishment. This is particularly alarming considering that a colossal 25 percent of people in the continent, roughly 240 million, go to bed hungry. Malnutrition is high, affecting nearly 200 million people, and is the cause of death for more than 50 percent of children below 5 years. In water resources, which also support biodiversity in general as well as the agriculture and energy sectors, climate change is expected to cause increased water stress in the coming decades, with reductions in both surface and ground water resources. On coastal cities, the 2nd Africa Adaptation Gap report observes that for an above 4°C warming scenario, Africa will experience a 14 percent higher sea level rise (80 cm, compared to a global average of 70 cm) by 2100; this would further exacerbate flooding, disrupting road and rail transportation in coastal areas and complicating food supply and distribution networks. Flooding, declining precipitation, sea level rise (an average 10 – 90 cm rise in the century projected to destroy mangroves and saltmarshes across the globe, which are essential to maintaining wild fish stocks, as well as supplying seed to aquaculture) will result in significant challenges including damage to marine and coastal ecosystems.

The cumulative effect of climate change will produce a substantial reduction in marine fish production and a decline in fish protein supply in West Africa by the 2050s.

In the collective struggle to tackle climate change, Africa is not among the “accused”: those held jointly responsible for the increase in CO<sub>2</sub> emissions. It is rather among those who are suffering a disproportionate share of the consequences. The World Bank sounded the alarm on famine and the dramatic impact on agriculture, water resources, coastal ecosystems and cities. Is that right?

Absolutely. While Africa's emissions remain negligible, the region stands out as the most vulnerable to climate change, due to the fact that its major economic sectors are highly climate sensitive, underpinned by ecosystem services such as water, hydrologic regulation, soil fertility, biodiversity, etc. Its adaptive capacity is also relatively weak. This is clearly documented in scientific reports including the IPCC 4<sup>th</sup> assessment report, IPCC 5<sup>th</sup> assessment report as well as the recently released (2015) 2<sup>nd</sup> Africa Adaptation Gap Report. Specific impacts in the sectors you





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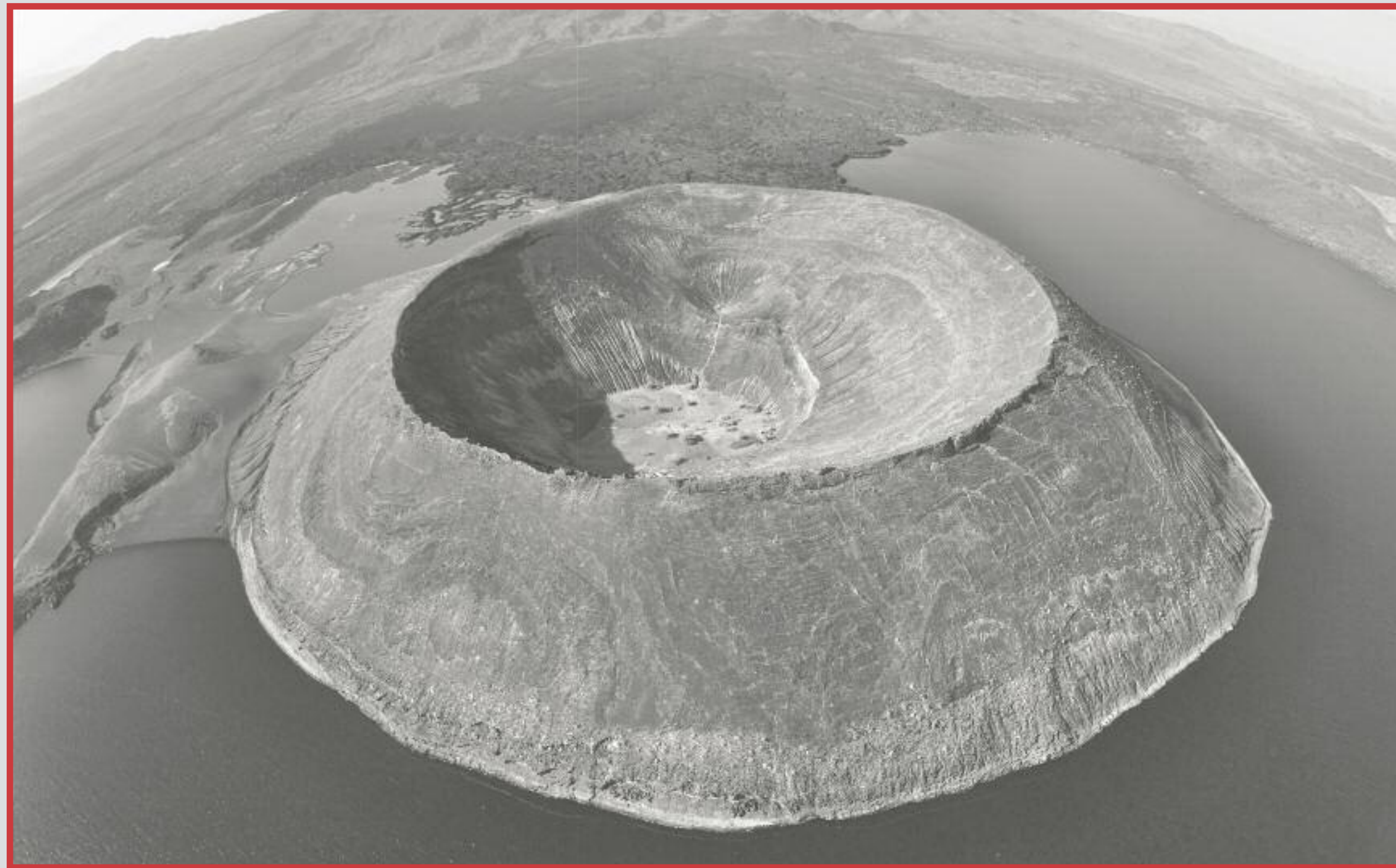
deal with consequences of past emissions and mitigation to stem further emission are an urgent imperative for the continent.

**The African continent can, however, do a great deal through regional policies to go down a more sustainable route and protect its resources. What have you been doing up until now and what are the medium-/long-term plans?**

The African continent has been actively involved in responding to climate change and ensuring a more sustainable path to its development. For a start, the 15<sup>th</sup> AMCEN concluded with the Cairo Declaration, which underscored the urgent imperative to combat climate change by ensuring a global policy focus dedicated to keep global average temperature rise to below 1.50C, and sought parity between adaptation and mitigation actions. Decision number 1 of the declaration specifies the need to optimize the use of Africa's natural resources for sustainable development and poverty alleviation, highlighting the pivotal role that the continent's natural resources and ecosystems should play toward achieving the AU's 2063 Agenda. Decision number 5 pushes for the continent-wide formal adoption of the AU climate change strategy by the AU, latest January 2017. The strategy is a comprehensive, major continental blueprint to combat climate change. A key component of this blueprint in the "means of implementation," which captures key operationalization parameters including capacity development, technology development and transfer, finance and resource mobilization, communication framework, and implementation roles & responsibilities. These are the parameters needed for effective implementation of mitigation and adaptation initiatives across Africa. Decision number 8 is on INDCs and calls for countries to ensure they capture both mitigation and adaptation components in their INDC submissions, indicating a continental commitment to implement both adaptation and mitigation actions. Specifically on INDCs, Africa is making substantial progress. Already a number of African countries, 43 out of 54, representing nearly 80 percent submission, have submitted their Intended Nationally Determined Contributions (INDCs) toward combating climate change. Africa is showing leadership and pro-activeness in the global fight against climate change.

**Large investments are needed to support Africa, its energy policies and sustainable development. Who will provide them and how will they be used?**

Climate change is widespread and presents risks for all key economic sectors in Africa, including the energy sector. The fact that emissions in Africa are negligible, and yet the continent is more vulnerable to climate change, means that making climate adaptation a priority is an urgent imperative for Africa. Nevertheless, Africa alone cannot af-



#### AN EXAMPLE TO FOLLOW

**For the Lake Turkana wind power project (the construction of a ground-breaking 310MW power project expected to be completed in 2017 and to become the largest plant of this kind in Africa) there is an investment of Euro 625 million, the largest private sector investment in Kenya.**

Fisheries are a vital source of food/nutrition security and livelihoods in this region. Economic loss as a result of reduced catches by 2050 under a 2°C warming scenario is projected at 21 percent of the annual total landed value baseline to 2000 (from USD 732 million in 2010/11 to USD 577 million, using constant 2000 dollars) and a 50 percent decline in fisheries-related jobs.

The energy sector is also at risk, with reduced precipitation causing declining water capacity to power hydro-power plants and increasing temperatures affecting the cooling of thermal power plants. These impacts are particularly catastrophic considering the continent's current energy situation: only 219 million out of 915 million people have access to electricity and the total number without access is rising. The fact that two-thirds of the region's population lacks access to electricity is undermining efforts to achieve more rapid social and economic development. On the business front, some 10 million medium-sized enterprises lack access to electricity. In addition, frequent power shortages cost African economies one to four percent in lost GDP annually. All these impacts have a net effect of major declines in productivity in the aforementioned key sectors and hence, a reversal and constriction of economic growth and food security. Consequently, effective adaptation to

ford the astronomical compliance costs that are expected to exceed USD 100 billion by 2050. While Africa cannot raise this sum on its own, the 2nd Africa Adaptation Gap Report, an AMCEN publication, documents a series of measures the continent can take to internally raise up to USD 3 billion for adaptation. These funds will then be leveraged to secure additional international support toward adaptation. In a further push for internal resource mobilization to climate adaptation, the African Union, in collaboration with UN Economic Commission for Africa, also commissioned a study on Illicit Financial Flows (IFFs), an elaboration of illicit capital flight from the continent, and recommendations of how it can be stymied. The findings of this high level panel documented that Africa loses USD 50-60 billion annually, and cumulatively, over the past 50 years, it has lost a total of approximately USD 1 trillion, a sum roughly equivalent to all of the official development assistance received by the continent during the same timeframe. Beyond this, Africa's immense clean energy

potential, vis-à-vis the low levels of exploitation, signify both environmental and socio-economic opportunities. The continent's hydro-power potential is estimated at 1852TWh annually, 3 times the continents' current demand of 554TWh per year. However, only 10 percent of the continent's potential is being exploited. This is in huge contrast to Western Europe, which uses 85 percent of its available hydropower potential. On solar, it is estimated that a mere 0.3 percent of the sunlight that shines on the Sahara and Middle East deserts could supply all of Europe's energy needs. However, currently, only about 5 percent of African households use some form of solar. In geothermal, the East Africa region has an estimated 15,000MW potential. Kenya, ranked the 8th largest global producer of geothermal power, has a potential of 10,000MW against current production at 579MW. On wind power, SSA has an estimated 1300GW wind potential against total deployed capacity of 190MW. All this is excluding significant natural gas potential. It is projected that the continent

can create a thriving electricity supply industry with an estimated 2.5 million temporary and permanent jobs. At the household level, switching from kerosene-based lighting to solar lighting can potentially accrue household energy savings in Africa of between 2-13 USD per month. Environmentally speaking, upscaling renewable energy offers Africa the potential to achieve a 27 percent reduction in CO<sub>2</sub> emissions. This immense potential, backed by immense interest in clean energy across the globe both in private sector, governments and development sector, constitutes massive socio-economic and environmental prospects for Africa, hence great chances for progress in this sector. An example to follow is the Lake Turkana wind power project investment at Euro 625 million (for the construction of a ground-breaking 310MW power project expected to be completed in 2017 and to become the largest plant of this kind in Africa): it is the largest private sector investment in Kenya and this model should be replicated across Africa.

**How can Africa, which is still developing, reconcile its economic and industrial growth with the measures that need to be taken to deal with climate change? Could it perhaps become a sort of "laboratory" where innovative methods to protect the environment are tested on industrial development?**

Africa's most important continental policies are demonstrating this much needed balance. The AMCEN Cairo declaration calling for a sub 1.5°C warming scenario and parity between mitigation and adaptation signifies the continent's ambitious approach to achieving low emission climate resilient development. Africa's developmental challenges in light of its rich natural resources define its priorities, a fact well captured in the Common African Position on post-2015, the AU Agenda 2063, the common African position on RIO+20, and the regional flagships prioritized under RIO+20. Furthermore, Africa's adoption of the 2030 agenda for

sustainable development and the SDGs signifies this priority. Africa's challenges revolve around environmentally sustainable and socially inclusive industrial development and sustainable industrialization. These can lead to economic growth, which will address hunger, malnutrition, poverty, health, social inclusivity, climate change, gender parity and education. Africa aims to foster effective partnerships needed to bridge the gaps in the implementation of policies and projects relating to sustainable industrialization, especially the SDGs and their derivatives.

**What do you expect from COP21 and what, in particular, would you like to see for Africa?**

The buildup to Paris 2015 is ongoing and providing hints to expected outcomes. From the INDCs, and the latest events in Geneva, Lima and Bonn, effort is being put forth by member states to create a level playing field for all parties, an acceptable baseline by both Annex 1 and Non-Annex 1 countries for

negotiations in Paris. This underscores efforts to reach a collective deal in Paris. Africa's expectations are captured in the 15th AMCEN outcome document, the Cairo Declaration which calls for inter alia, the need for parity between adaptation and mitigation in the Paris deal. These expectations are reflected in these trends of negotiations. Key outcomes of the Lima talks with relevance for Africa were finance, where additional pledges to the Green Climate Fund took the fund's capitalization beyond the initial target of USD10 billion; and the recognition that National Adaptation Plans (NAPs) offer an important way of delivering resilience. In Geneva, 194 Nations settled on the negotiating text, a possible blueprint for the Paris agreement. This 86-page negotiating document has provisions for mitigation, adaptation, finance, technology and capacity building, and this once again reflects Africa's expectations. While this is admirable, more should be done.

**SIMON TOMPKINS**



# watch CENTERS OF GRAVITY



by NICOLÒ  
SARTORI

The Conference of the Parties (COP21), is a key moment in the fate of the international agreements on climate change. Its outcome, in fact, will likely contribute toward clarifying the level of ambition of global climate policies as well as the future sustainability of the planet. If the negotiations in Paris fail—and the specter of previous failures in Copenhagen, Cancun and Durban linger—it would likely cause the final demise of a governance model that has so far struggled to provide the necessary answers to the environmental challenges we face. In this case, if the high expectations of COP21 were to be let down, it will be more necessary than ever to identify new architectures and new institutional mechanisms that take into account the interests and balances in place on a global level.

## United against the greenhouse effect: the duet between the United States and China

The awareness of the need for urgent action has resulted in a change of pace from certain major international players, who were definitely skeptical before, and who are now (at least officially) geared towards a greater involvement in the climate game. China and the United States, the first and second countries, respectively, in terms of CO<sub>2</sub> emissions, are certainly the most striking case. Since last year, the two countries, which together contribute towards 40 percent of global emissions, have launched an intensive political debate ahead of the conference in Paris. As part of the U.S.-China Joint Announcement on Climate Change of



The U.S. and China have strengthened bilateral agreement a few months ago against the greenhouse effect, in which they reaffirmed their commitments ahead of COP21.

November 2014, the Chinese government for the first time acknowledged its own responsibility and, from this, its role in the fight against climate change by committing to reducing emissions. While Beijing announced its efforts to anticipate a peak in emissions by 2030 and to achieve 20 percent non-fossil fuels in its national energy mix by 2030, the American government pledged to have reduced emissions by 26-28 percent by 2025 compared with 2005. The bilateral agreement was reinforced in September, 2015 with the U.S.-China Joint Presidential Statement on Climate Change, through which the governments reaffirmed their commitment to an ambitious agreement in Paris, based on common but differentiated responsibilities according to the various national capacities and experiences. This informal G-2 on climate change—although considered too unambitious with respect to the urgency of the situation—was worthy enough to have awakened attention within other

international formats and bring to the table a series of very different players, but with converging economic trajectories.

## The European Union and its commitment in the new global forum

The EU has long been “at the forefront” in the global fight against climate change. Despite the different views of some member countries and European political groups, in recent decades Brussels has promised ambitious policies for sustainable energy based on developing renewable energy sources and improving energy efficiency. These efforts are reflected in the new 2030 climate and energy policy framework adopted in 2014 by the Commission, which includes a commitment to reduce greenhouse gas emissions by at least 40 percent compared with 1990 levels. European activism, for the first time, was clearly reflected at an international level during the G-7 at Schloss Elmau on June 7-8, 2015. Led by Germany,

as China, India, Brazil, South Africa and Turkey, and the players that are most involved and at the forefront of the fight against climate change, such as the EU. The common sense of the G-20 group, in this sense, could help to overcome the entrenched stereotypical differences between industrialized countries and developing countries, which are becoming, over time, insurmountable barriers for the action of the United Nations Framework Convention on Climate Change (UNFCCC).

## In the event of a flop, will new governance be needed for post-COP21?

Despite the declared intent of the major governments, the encouragement of the major international industrial players and the pressures of global public opinion, the chances of the Paris Conference reaching a binding universal agreement for post-2020 are still tenuous. What is certain, however, is that despite UNFCCC going around in circles for the umpteenth time in Paris, the global fight against climate change cannot slow down, and therefore new formulas and political cooperation mechanisms need to be found as soon as possible. The experience gained in global fora such as the G-7/8 and especially the G-20 could represent a significant legacy in the attempt to balance the desire for sound economic development with the need to ensure the sustainability of the planet. To this end, unfortunately, the initiative of the G-7 at Schloss Elmau was not followed by an equally forceful stance by the G-20. Although it met for the first time in its “Energy” format under the Turkish Presidency on October 2, 2015, the group failed to send a clear message of commitment on the issue of reducing emissions. In the event of a flop in Paris, the approach of the major global economies could be called upon to change.

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# watch ENVIRONMENT



by DAVIDE  
TABARELLI

We are approaching the twenty-first Conference of the Parties, “parties” meaning the countries that signed the 1992 United Nations Framework Convention for Climate Change: practically all of the 196 nations of the world. A consensus clearly does not exist in spite of the desperate need for a united front on climate change. Moreover, it is easy to agree if there are no binding commitments, even if the goal of stabilizing greenhouse gas emissions of human origin is very ambitious. The parties have met almost every year since 1992 as part of the famous COP, and one such meeting in December of 1997 led to the signing of the Kyoto Protocol, which committed the richest countries to reducing their emissions. The benchmark year is 1990, the first for which statistics were calculated on a global level as well as for individual countries. 23 years on, the political consensus has grown and the further away we have come from goals that were obviously set at unrealistic levels. Global CO<sub>2</sub> emissions from combustion, the main greenhouse gas, have increased by over 40 percent, approximately 12 billion tons more than the new record of 35 billion tons in 2014. Only Europe, which is at the forefront in supporting measures in the fight against climate change, has reduced its emissions by 1 billion, approximately 12 percent less, but this is thanks to conditions that are difficult to replicate elsewhere. Its production from renewable energy sources has

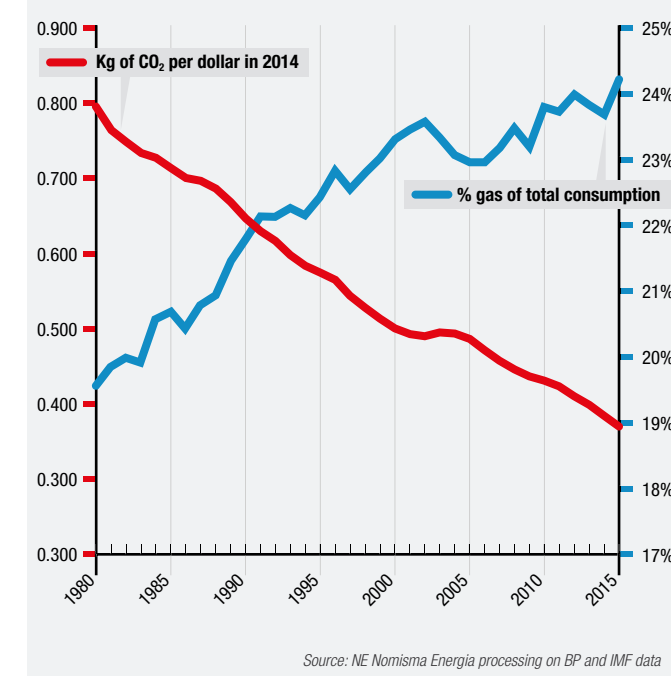
doubled, especially from wind and solar power, but this only after financial subsidies of around €50 billion per year, which will be difficult to sustain in the future and which is not practicable most other places. Growth is set to continue, even without incentives, thanks to reduced costs, but it will be slower. The modernization of the electric generation system in Eastern Europe following the collapse of the Berlin Wall in 1989, with the closure of coal power plants has, therefore turned out to be important.

## The environmental impact of industrial outsourcing

Energy efficiency has contributed significantly to the reduction in emissions, but the fundamental cause has been the decline in economic activity caused by the gradual de-industrialization of these countries, which have outsourced industries that produce more energy and therefore higher emissions. These same countries do not intend to give up the economic growth that necessarily comes from greater energy consumption and that will mostly still be produced from fossil fuels. The world population will grow in the future by two billion people; there will still be roughly one billion people among them who continue to rely on poor forms of energy production, such as wood, agricultural waste, dry dung, or biomass, burned in unaired environments, and causing the premature death, every year, of 7 million people, according to estimates by the World

# If environmental policies remain dead letter

## ECONOMY AND EMISSIONS



## The relationship between the carbon content in the global GDP and the share of gas in global energy consumption.

Health Organization. This is an emergency that is no less pressing than climate change; it requires efforts to arrange for the use of kerosene, diesel and natural gas in the poorest homes. Moreover, it involves the part of the world population whose per capita emissions do not exceed 2-3 tons of CO<sub>2</sub> per year, while each European citizen emits 8 tons and each American 18. These are also the reasons for the substantial failure of environmental policies, despite the rivers of ink consumed and the billions of kilometers travelled by negotiators of the various COPs. Greater realism will be absolutely necessary if concrete goals are to be

reached. Already in 2014, CO<sub>2</sub> emissions from energy consumption, which account for 60 percent of the total from human origin, increased by a fraction less than 1 percent, while the global GDP recorded an increase of 3.4 percent. The possibility of separating economic growth, energy consumption and CO<sub>2</sub> emissions is not as remote as it seemed a few years ago.

## The gas combined cycle for converting power plants

Among the reasons for improving the situation is a decrease in the use of coal in favor of gas in the production of electricity in some large countries, including China and the

U.S. The future of global energy will be supported mainly by electricity that must be produced, both from renewable sources, which we all hope will be able to grow further, as well as from traditional fossil fuels. The main cause of the increase of CO<sub>2</sub> emission over the last 15 years is due the greater use of coal within inefficient power plants. From these plants, which are mainly located in newly industrialized countries, emissions produced per kilowatt-hour are close to the kilo, a value almost three times higher than that generated by modern combined cycles, such as those constructed in Italy, which use natural gas. Theoretically, if it were possible to convert all coal-fired power stations into gas combined cycles, emissions would fall from 8 to 3 billion tons of CO<sub>2</sub> per year, an enormous reduction, which gives an idea of the importance of this measure. Obviously, in reality, a similar conversion is impossible, however, in the next thirty years, electricity production is expected to double and, even assuming a sharp increase in renewables, these alone will only cover 20-30 percent of the proposed increase. It would be extremely useful, however, to increase the introduction of gas in electricity production, especially in India and China. Only in this way might we hope, over the coming years, to observe a slowdown in growth, while in order to achieve a reverse trend, the timeframes still seem much longer.

Davide Tabarelli, President of Nomisma Energy from 1990 to 1996, was director of the RIE, where he worked on research projects on the electrical industry and environmental policies. He publishes major magazines devoted to energy issues.





by GEMINELLO  
ALVI

## Plato and the greenhouse effect. The fear returns

The fear of climate catastrophe resulting from excess carbon dioxide and greenhouse gasses is one of the economic anxieties that most torments us, in particular ecologists and economists, who in turn alarm us further. On closer inspection, this anxiety is similar to that attending the anticipation of a world depression or excess population growth. It can indeed be said that there is no economic conduct that does not involve some form of anxiety, driven out, however, by the promise, for instance, that low interest rates will relaunch the business cycle or that energy savings will improve our future. Therefore, our focus is constantly turning towards the years to come, on a problem that is always judged as recent and new. But this in itself is a symptom of the naivety and juvenility we bring to such catastrophes. This is to prove what Plato, in the Timaeus, says to the Egyptian priests: "You are all young in soul, for in your souls there is found no old view received through ancient word of mouth, nor any teaching that is hoary with age... we were and will be many different masses of men, huge masses for fire and water, except those for the other innumerable things." This has in fact reversed over time since Plato: a climate catastrophe due to rising temperatures in the future becomes the past that is repeated. An era that is judged wise and expert proves to be naive and distracted by a past that it anticipates.



Maxim Kantor: *Atlantis*. [240x220 cm, Oil on canvas, 2012. Exhibition: ATLANTIS, Zenobio Palace - Venice, 1.6 - 21.9.2013]

### Today's catastrophes were already imagined centuries ago

There is no catastrophe experienced or feared by modernity that has not already been previously imagined by Plato, and the economy itself, even in its very modern appearance, is still the topic now as it was centuries ago. In the story of Solon, the outcome of Atlantis corresponds to an economic catastrophe immediately followed by a flood and fall into the abyss. But a flood and the abysses that open, or air that heats up and burns life are, for Plato, the elapse of a moral

failing of the economy. Many blame excess consumption, or speculation, even the moral disgrace of Atlantis and its economic perversions, which are inseparable. As the Critias also explains: "For many generations, as long as the divine nature lasted in them, they were obedient to the laws, and well-affectioned towards the god... they possessed true and in every way great spirits, uniting gentleness with wisdom in the various chances of life, and in their intercourse with one another and as long as the divine nature lasted in them, all these goods increased. But when the

divine portion started to fade away in them, the human nature got the upper hand, and then, being unable to bear their fortune, behaved unseemly." The catastrophe of Atlantis for Plato is the outcome of a moral failure that makes the economy unsustainable. For our modern brains, the story certainly cannot be said to be fabulous; we mock the event indifferently. However, when facing a crisis, we use the same archetype every time: a moral failure is produced by economic serenity. Mankind becomes "intoxicated by luxury and deprived of self-control due to their wealth."

### Moral Failure and the Eternal make-believe

Is this not the same state of mind which gives rise to the prerequisite of any crisis reported, even now? Since, before derivatives, and their incomprehensible mathematics, there is a desire that is an understatement to call simply speculation or excess consumption. Every time, prior to a disaster, moral failure combines with a certain enticing appearance that is not acknowledged at first. The players in the future crisis "to those who had no eye to see the true happiness, they appeared glorious and blessed." Even this phrase, archaic as it is, has its modern counterpart. The human character that takes over, seeking happiness instead of living it, therefore only providing ephemeral relief that, however, becomes eternal make-believe, is the same as the modern economic calculation. It assumes, in fact, an infinite growth rate: an assumed exponential that appears to be technical but is first moral, involving an infinite growth in energy consumption and waste. At the base of all of the issues of sustainability there are, therefore, no specific cases of Plato's story of becoming, in those mythical times, "unable to bear their fortune". This is rather revealing of the severity of the problem we are experiencing, yet we rarely recall Plato, especially the primitive moral link, which generates good and bad economies, and the burden of fortune.

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## THE BENCHMARK MOVES THE NORTH SEA OVER THE ATLANTIC

# Brent leaves for the west

Oil prices rise and fall (again and again), but what kind of oil are we talking about? "Oil prices" is a convenient shorthand phrase for the media, but it's used at the expense of clarity

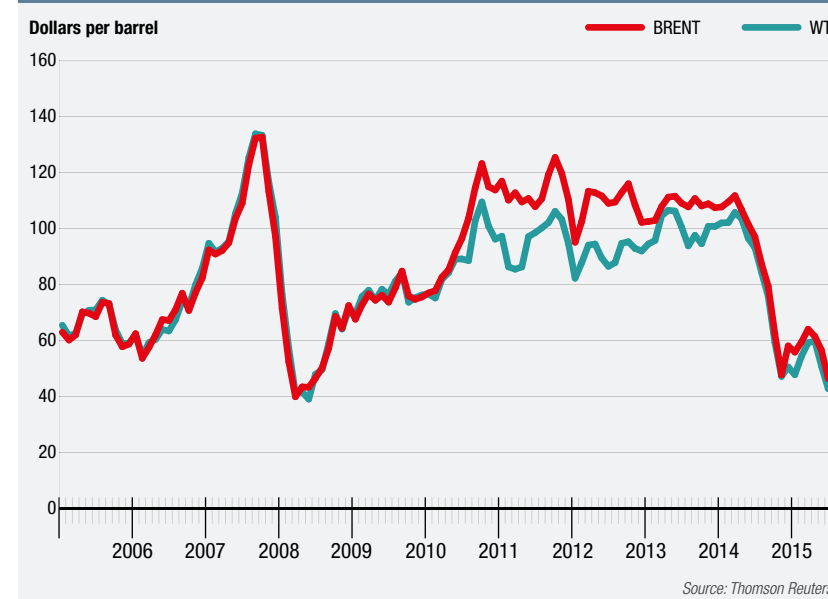
Oil prices may be up or (lately) down, but which oil? While the simplification is a useful convention for news media headline writers—the word "oil" is short—oil prices can vary considerably depending on which type or benchmark you are referring to. People who deal

directly with crude in one way or another, therefore, need to have a better idea of what they're talking about, both because there are many types of petroleum and because the differences between them can matter. The most familiar label for crude oil "types" are benchmarks. Some of these—*Brent*, *West Texas Intermediate*—are well known, if not necessarily well understood. Others, like *Western Canadian Select* (WCS), *Urals* or *Omani* crude—which is not just petroleum from Oman—may be a puzzle.

### What we mean when we're talking about Brent and WTI

The best known of all the benchmark crudes is Brent, a relatively light, sweet oil coming from Europe's North Sea. Originally, Brent crude was produced in the Brent oilfield. The "Brent" designation comes from the naming policy of Shell UK Exploration and Production, which originally named all of its fields after birds, in this case, the Brent goose. Brent, sometimes called London Brent, is today a blend of blends, comprising the original Brent, Forties Blend, Oseberg and Ekofisk crudes. It is the leading global price benchmark for Atlantic basin production and is used to price two thirds of the world's internationally traded crude oil supplies. Brent is a highly suitable feedstock for gasoline and middle distillates like diesel and fuel oil. West Texas Intermediate (WTI) is America's "ideal" petroleum: very light, very sweet, a refiner's dream. It is the underlying commodity of New York Mercantile Exchange oil futures contracts. Well-suited to low sulphur fuels, most of it is refined in the Midwest and Gulf Coast regions of the U.S. WTI has made a name for an otherwise unlikely place called Cushing, Oklahoma, a tiny town of only around eight thousand inhabitants in

### TRENDS IN QUOTES



The trend in Brent and WTI prices over the decade from 2005 to 2015. Prices of these benchmarks diverged in 2010 and converged again in 2014.

the middle of North America's great plains. Cushing has been the delivery point for crude contracts and so the price settlement point for West Texas Intermediate on the New York Mercantile Exchange for over three decades. Geographic chance made the remote location a star because many important pipelines intersected there. Storage facilities and its central position allowed easy access to refiners and suppliers. Its only other claim to fame is that, for a very small town, it has given birth to a surprising number of successful professional baseball players.

### Other benchmarks from the Middle East and Asia, from Oman to Urals

Beyond Brent and WTI, other significant pricing markers include *Dubai* and *Oman* crude, *Urals* and the *OPEC Reference Basket*—a weighted average of prices for petroleum blends produced by OPEC countries—as well as a few South Asian benchmarks. In theory, all of these benchmarks ought to march roughly in lockstep because, in spite of minor differences, crude oil is supposed to be what economists call a "fungible" commodity—that is, in the final analysis largely the same wherever it comes from in terms of productive

outcome. Gasoline is gasoline and diesel is diesel in every corner of the world. Historically, though, there have been price differences between Brent, WTI and other index crudes, based on stable physical differences in crude oil specifications and short-term variations in supply and demand. For many years, easy to refine West Texas Intermediate generally found higher prices, but since late 2010, Brent has been priced significantly higher than WTI. In 2011, the spread between the two benchmark prices at one point reached a record \$23 a barrel, the result of a supply glut at the Cushing terminus, before falling back. A differential persisted though, and was large enough that producers in North Dakota began shipping their oil by rail to the Gulf and East coasts, where it received Brent prices. Brent has continued to trade higher than WTI, though by July 2013, the spread had shrunk to about \$4. In early 2014 it briefly rose again to over \$14, but was back down to \$4 by the end of the year, roughly the current situation.

### The London crude Brent is more and more an American benchmark

The U.S. Energy Information Administration attributes the price

spread between WTI and Brent to an oversupply of crude oil at Cushing, caused by rapidly increasing production from Canadian oil sands and tight oil formations such as the Bakken, Niobrara, and Eagle Ford fields: that is to say, largely a result of the fracking revolution. Other factors may include dollar currency movements and regional variations in demand. Depletion of the North Sea oil fields may explain some of the divergence in forward prices. Geopolitics is also an important element. Brent moved up in reaction to unrest across the Middle East. Since WTI-priced stockpiles at Cushing could not easily be transported to the Gulf Coast, that crude could not be arbitrated to bring the two prices back to parity. Oil prices at coastal areas of the U.S. were closer to Brent than to WTI. Some American oil reversed its flow direction, transporting WTI-priced crude from Cushing to the Gulf Coast, where it received Brent prices. Because booming oil production in the American Midwest surpassed the capacity of pipelines to carry it to coastal markets, East Coast oil prices in the U.S. and Canada and parts of the Gulf Coast since 2011 have been set by the price of Brent crude, while markets in the interior still follow the WTI price. Much U.S. and Canadian crude oil from the interior now reaches the coast by railroad, which is much more expensive than pipeline, a factor that tends to maintain the Brent/WTI price differential. What all this means is that in some sense the North Sea appears to be slowly moving west. Falling European production and growing North American Brent pricing mean that "Brent" crude is increasingly a U.S. benchmark.

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## MARKET TRENDS

## The \$60/b illusion

The Shanghai effect and the re-entry of Iran held Brent below \$50/b, though future supply is at risk

## Oil prices

After a partial recovery halfway through the year brought the price of crude oil over \$60/b, Brent reached its lowest level in the last six years in August at \$46.5/b. In a still-weakened macroeconomic context, the Chinese financial crisis hit, with repercussions for the world's stock markets as well as oil prices, which fell dramatically at the end of August. Since then, crude oil has remained under pressure, facing strong resistance at \$50/b. Despite a strengthening demand for oil due to low prices, the market remains high, with a surplus of supply at record levels. Part of the excess is determined by the actions taken by the main producers to defend their market share and revenue. OPEC has almost entirely released its capacity in the Persian Gulf; non-OPEC producers in developed areas such as Russia drive volumes to maximize cash flow; U.S. companies benefit from an inertial growth, thanks to wells that have already been drilled. The agreement on the Iranian nuclear issue, concluded on July 14, and the formal adoption of the treaty of October 18—“adoption day”—fueled the “bearish” sentiment: the return of volumes, expected for 2016, will be gradual, but the market has been alerted of the inevitable worsening of oversupply and internal OPEC dynamics. The return of Iran and a possible recovery of Libya are indeed a serious issue, especially for Saudi Arabia and Iraq, which have driven production to historical highs. A short-term change in the Cartel's policy is

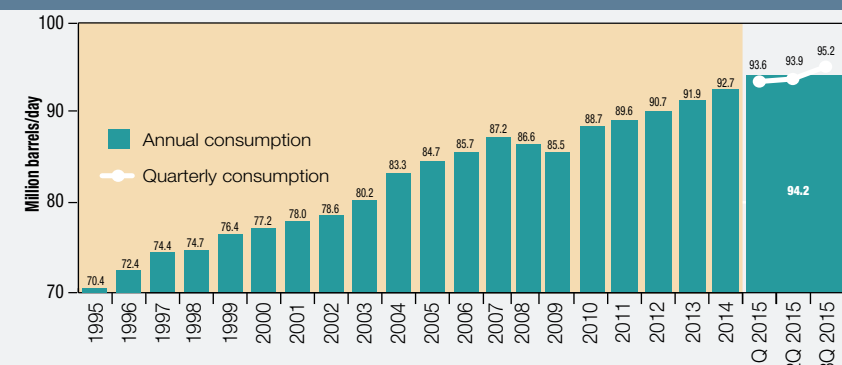
unlikely (its next meeting is on December 5), even in the absence of cooperation with the non-OPEC world. The OPEC-non-OPEC meeting of October 21, requested by Venezuela with the goal of bringing oil prices into a range compatible with the investments required to develop the future supply, concluded with a stalemate. At the end of October, the IMF released a warning on the countries of the Persian Gulf and on the fiscal sustainability of the new OPEC strategy, which will require fiscal measures and reductions in subsidies to guarantee domestic budgets. Even U.S. production, another key variable, is less reactive than expected towards the decline in prices. Tight oil faces a very different price level from that in which it developed; it's a business model that is difficult to predict, being foreign to conventional upstream dynamics. The climate of low confidence is reflected in the futures markets, where financial operators reduce bullish bets on oil commodities: on London's Brent ICE, non-commercial positions held switched to the net short position as of August to return to the net long in mid-October. The bearish sentiment prevails in uncertainty: the market reacts to the bearish news and appears indifferent to correction signs based on the fundamentals. The continuous downsizing of upstream investments, which will effectively translate into a slowdown in production in the years to come, have become of secondary importance.

## Oil demand

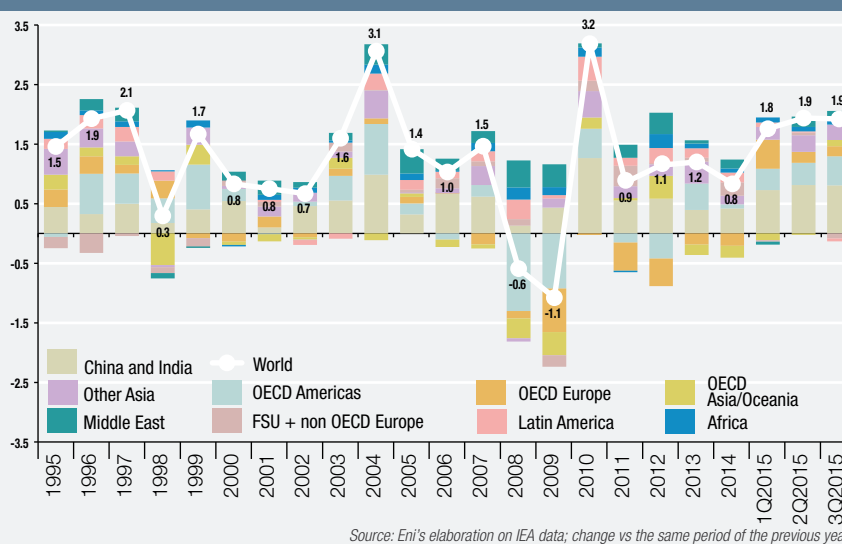
The global oil demand, with a growth of 1.9 Mb/d in the second and third quarters of 2015, recorded its highest increase since the fourth quarter of 2010. Almost a third of the increase comes from the OECD area (+0.8 Mb/d). The roles are reversed, compared with 2014, in the variation of consumption in Europe (+0.2 Mb/d) and the Asia and Oceania area (+0.1 Mb/d). In the non-OECD area, consumption is supported by Asia (+1 Mb/d), which benefits from the fall in oil prices, unlike in the case of producing countries, where a slowdown is recorded (in some cases, it's a full-blown decline, e.g., the Former Soviet Union and Latin America). In terms of products, gasoline has played a key role in contributing to almost half of global growth.

In the U.S., the largest consumer of gasoline, 70% of the increase in demand comes from this product (+0.4 Mb/d). Low prices at the pump, as well as consumers who have both increased their miles driven and turned toward SUVs and other less efficient cars, are the factors behind the robust dynamics in the consumption of gasoline. Europe, after nine years of continuous decline, is contributing positively to the growth in consumption during 2015, thanks to the fall in consumer prices and to the improvement in the economic environment, albeit with a slowing trend compared with the first quarter (+0.5 Mb/d Q1; +0.2Mb/d Q2 and Q3), characterized by a particularly harsh winter and post-recession rebound. Demand also increased in the OECD Asia Oceania region (+0.1 Mb/d) after five consecutive quarters of decline, thanks to the positive contribution of the naphtha and crude oil used in the thermoelectric sector in Japan (partly to replace the production of declining hydroelectric power). In the non-OECD area, the slowdown in the Chinese economy has had a limited impact on oil demand: the growth of Chinese consumption, (+0.6Mb/d in Q3 2015), a third of the global growth, is supported by the private transport sector. Despite recent declines in car sales, the impact on the consumption of gasoline remains negligible, since the total fleet continues to expand strongly. The transition from a model driven more by exports and investments to one focused on domestic consumption promotes the consumption of gasoline and jet fuel to the detriment of fuel oil and diesel, a product closely related to the industry and the construction sector.

## GLOBAL CONSUMPTION

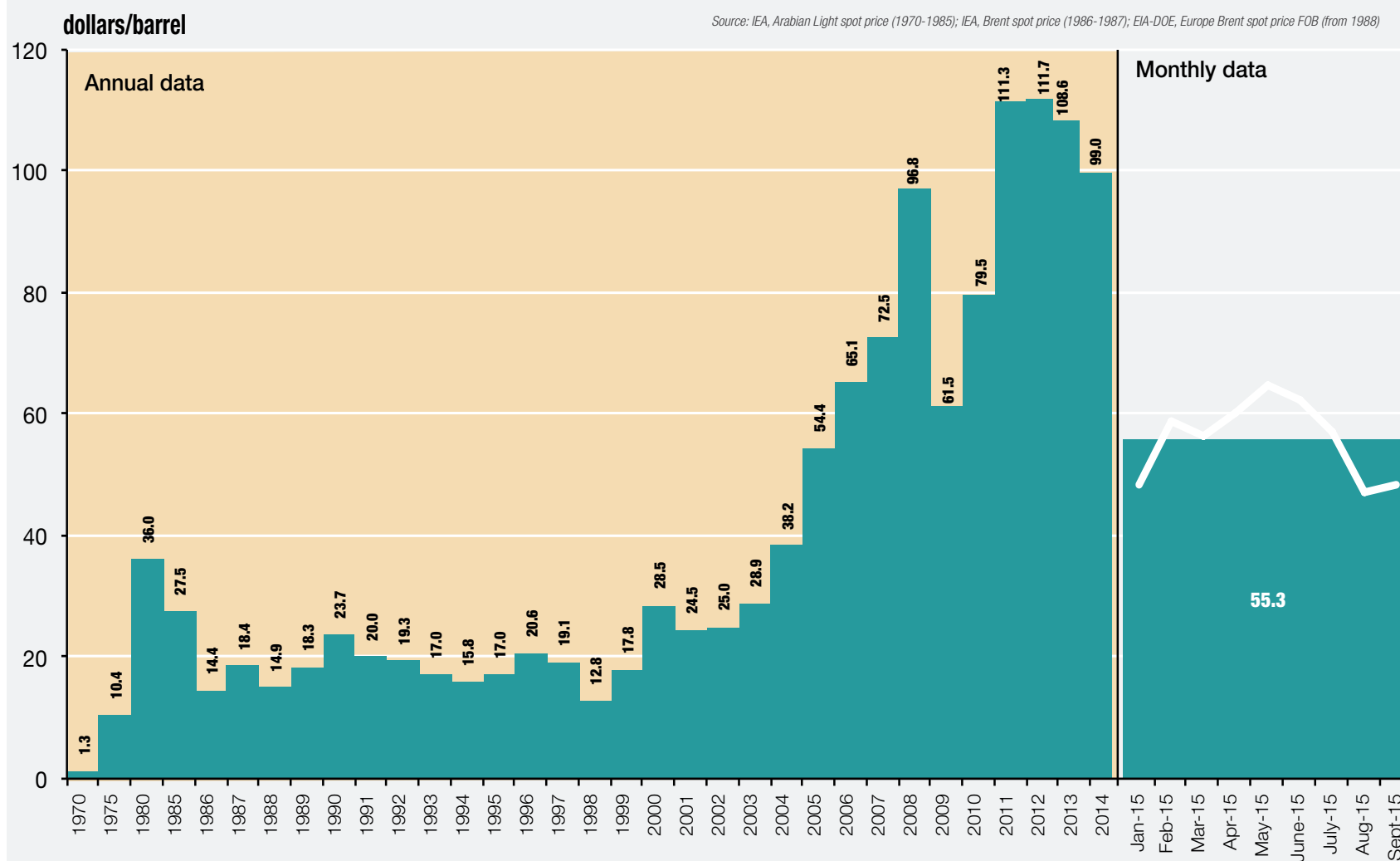


## CHANGE IN GLOBAL CONSUMPTION AND BY AREA



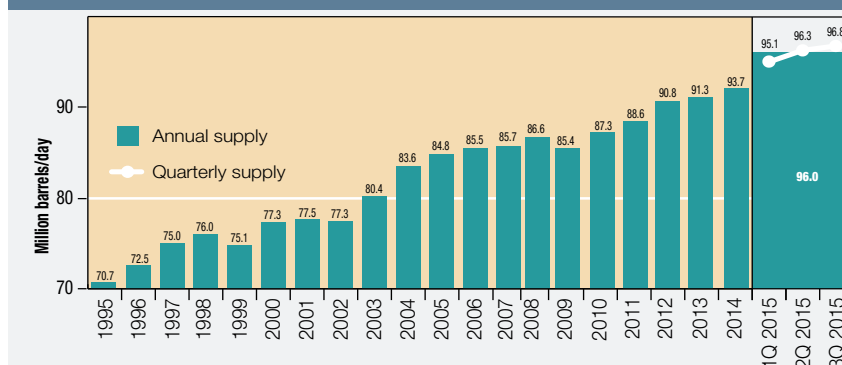
Source: Eni's elaboration on IEA data; change vs the same period of the previous year

## BRENT PRICES

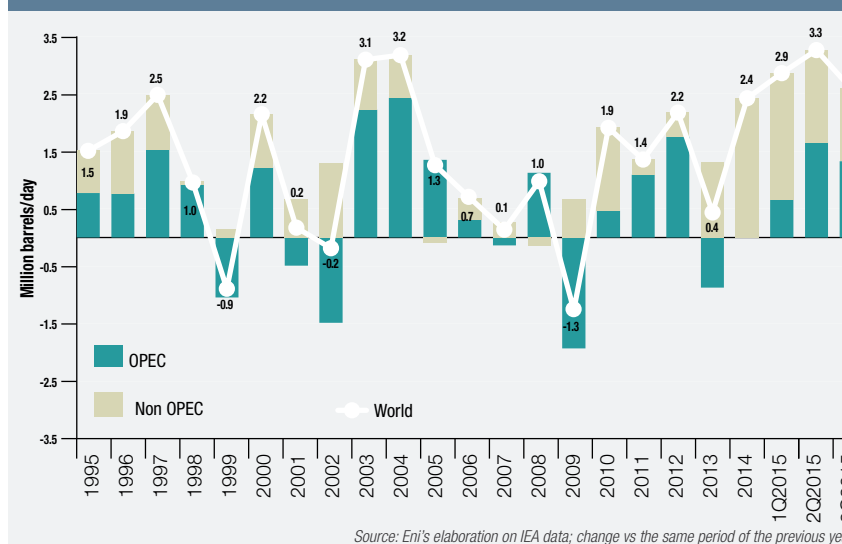


Source: IEA, Arabian Light spot price (1970-1985); IEA, Brent spot price (1986-1987); EIA-DOE, Europe Brent spot price FOB (from 1988)

## GLOBAL SUPPLY



## CHANGE IN GLOBAL SUPPLY AND BY AREA

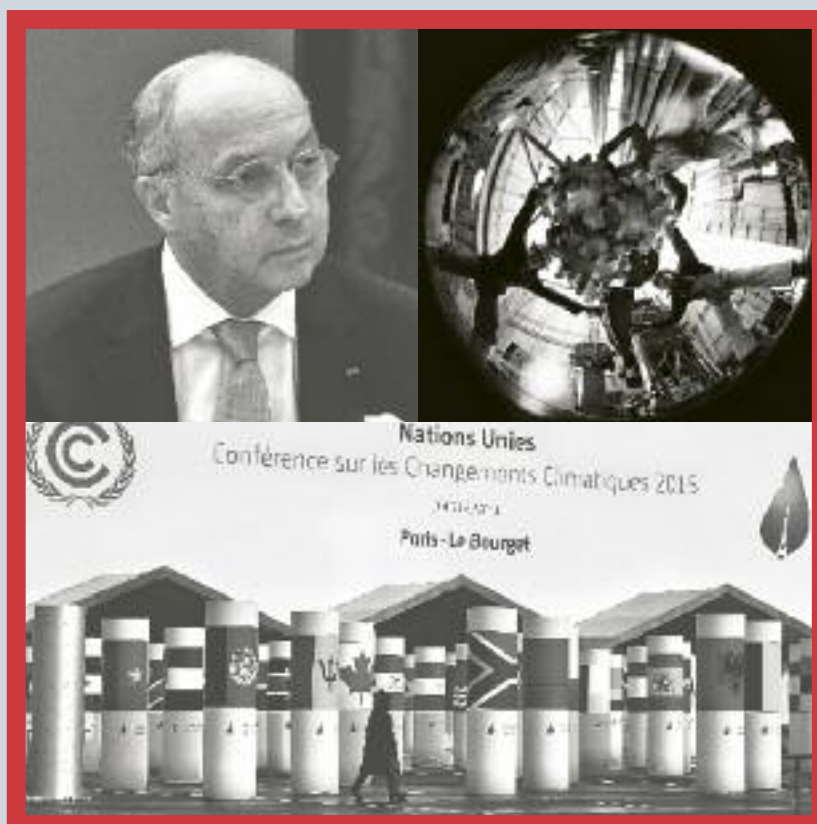


Source: Eni's elaboration on IEA data; change vs the same period of the previous year

## Oil supply

The global oil supply has grown steadily in the first three quarters of 2015 and, despite the fall in price during the summer months, is over 1.5 Mb/d higher than the previous year. While in 2014 the key player in the growth was non-OPEC crude (especially U.S. tight oil), in 2015 the increase is distributed between OPEC and non-OPEC. Non-OPEC crude oil continues to grow, but at a slower pace. U.S. production shows unexpected resistance to the decline in prices: despite the sharp fall in oil rigs, which began in October 2014, the output only started to slow as of May. In the third quarter, growth rates drastically declined (+0.3 Mb/d vs Q3 2014), returning to 2011 levels. An unexpected increase, after years of decline, occurred in Norway and the UK (Elgin-Franklin field development). Russia recorded an increase equal to double that of 2014 (+0.15 Mb/d) in the first nine months of 2015 due to a boom in drilling activities (+8.9% vs 2014), especially by independent producers, in contrast to the fall of the major producers (Lukoil and Rosneft). A positive trend was also recorded for Brazil, which, for the first time, exceeded 2.5 Mb/d thanks to the good performance of the giant Lula. Most of the other non-OPEC producers have been in decline. After two years of decline, OPEC has started to grow. Iraq, since June, has exceeded the threshold of 4 Mb/d, positioning itself at a historic high, with record increases in exports favored by the separation of Basra crude oil into light and heavy. An internal financial crisis and low prices cast a shadow of doubt over the sustainability of future production. Saudi Arabia, actively attempting to defend its market share, has, since March, been constantly over 10 Mb/d. The Libyan situation remains critical, with a slight recovery in October. Iran claims to be ready to place approximately 0.5 Mb/d on the market as soon as the sanctions are lifted. According to the IEA, in only 6 months, the country could reach a capacity of 3.6 Mb/d. Some uncertainty about the quick resumption of production remains, due to the conditions of the facilities and the lack of recovery measures and investments by international companies during the three years of the embargo.





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