JiQ Magazine

Magazine on climate and sustainability

vol. 23, no. 1 • April 2017 ISSN: 1877-606X

In this issue

Climate Policy: Leave it in the EU's Capable Hands Editor's note

The election of Donald Trump as president of the United States has been a blow to efforts to combat climate change, as he ordered to dismantle Obama's climate change policies. Also the United Kingdom's contribution to climate change mitigation is at stake: Prime Minister Theresa May abolished the Department of Energy & Climate Change, and since the vote for Brexit the UK's participation in the EU Emissions Trading Scheme has become uncertain.

This year three of the EU's founding members have national elections: the Netherlands voted for a new parliament in March, the French presidential elections will take place in April/May, and in September the German federal election will be held. This series of elections is seen as crucial for Europe, with a choice between nationalist options in line with 'Brexit' and 'Trump' and the more traditional options that support a strong European Union.

With climate change being (quoting the 2015 G20 statement) "one of the greatest challenges of our time", one would expect it to be a major issue in electoral campaigning. In the run-up to the Dutch election, however, there was hardly any attention for climate, despite the call of major companies including Shell and Siemens upon politicians to consider climate change as the crucial topic of the campaign and the formation of a new government.

It is not that Dutch political parties have no interest in climate change as an issue. On the contrary, most parties included a chapter on climate or sustainability in their programmes. However, when the election campaigns moved to their climax, debates between party leaders were mostly about social and financial issues to be addressed in the short run, i.e. the next four parliamentary years. It has, again, demonstrated the difficulty for a relatively long-term issue such as climate change to become a key topic during elections on a government for the next few years.

Luckily, despite the popular criticism that it lacks a democratic mandate, climate-concerned citizens can rely on the EU for medium to longer term climate policies. Currently, the EU is the main policy-making body in Europe that can take a time perspective that is sufficiently long to consider both costs and benefits of an ambitious climate policy. Let's appreciate that too, despite Brexit and despite the popular criticism to Europe's internal collaboration.

Wytze van der Gaast and Erwin Hofman

Low-Emission Transition Strategies in Livestock in a Multi-Objective Decision-Context

Challenges and Drivers of Livestock Sector Development in the EU

By Eise Spijker*

Global demand for agricultural commodities will grow in the coming decade, mainly due to population growth in developing countries. With rising economic development and per capita income, developing countries "pass through a 'nutrition transition', by which higher incomes translate first into a demand for more calories, and then into a demand for more protein (typically from animal sources) as well as for other nutrients coming from fruit and vegetables. This trend is accompanied by more consumption of sugar, oils and fats, and greater consumption of processed foods."[1]

Higher demand for animal protein is likely to be met by an increase in its production, e.g. the production of poultry, dairy, fish, and pig/cattle meat. As a production increase will have implications for the environment and use of resources, countries face the challenge to develop a more sustainable, low-emission livestock sector.

At the country level, both market actors and policy makers must ensure that production and consumption of animal protein fit within social, economic, and environmental boundaries. Reducing greenhouse gas (GHG) emissions is then 'just' one of various development objectives: "On 1 January 2016, the United Nations' 17 Sustainable Development Goals took effect, launching the countdown towards the achievement of 169 targets by 2030, and even by 2020, in some cases. Many of these ambitious targets are deeply significant for agriculture."[2] One of these targets is meeting climate goals.

To get a better understanding of the impact of a low-emission transition in livestock on other development objectives at the country level, agricultural sector (policy-)experts from three countries (Lithuania, the Netherlands, and Latvia) were asked to fill in a short survey. The survey aims to reveal the different challenges and drivers of livestock sector developments.

Drivers of change in the livestock sector

Experts from the countries were asked what are the top-five drivers for development in livestock (Table 1).

Table 1. Top-five drivers of change in livestock.

	Netherlands	Lithuania	Latvia
Export	1		1
Rural development	5	1	3
Food quality security	2	3	5
Economic growth	4	4	2
Employment creation		2	
Food independence	3	5	4

The experts all listed economic growth, food security, and food supply independence as important drivers, although they do not all have the same priority ranking. The experts from both Latvia and the Netherlands consider export of livestock products as the most important driver, while the Lithuanian expert

Acknowledgement

The author would like to thank the following three (groups of) experts for their contribution to this article.

- Gediminas Vagonis. Livestock unit chief specialist at the Lithuanian Ministry of Agriculture.
- Laima Berzina, Dina Popluga, Dzidra Kreismane, and Kaspars Naglis-Liepa. Researchers at the Latvia University of Agriculture.
- Martijn Root. Senior policy advisor at the Ministry of Economic Affairs of the Netherlands.

This survey is not representative or statistically significant, nor does it represent the official position of the entities the interviewed experts are working for.

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1 OECD/FAO, 2016. OECD-FAO Agricultural Outlook 2016-2025. Paris: OECD Publishing (link); p.31.

2 See footnote 1; p.29.

lists rural development as most important driver. Employment creation was listed only by the Lithuanian expert.

Whatever the national development priorities in the sector, it is clear that policy and market need a balanced approach to meet all (most?) of these development objectives / targets.

What kind of change is expected?

Although at a global level production and consumption of animal proteins is expected to rise in the coming decades, at the national level there can be various changes in the structure and composition of the livestock sector. For that, we first asked the experts in the three countries what changes they expect (see Table 2).

Table 2. Expected change in livestock (key animal categories).

	Netherlands	Lithuania	Latvia
Poultry	stagnate	stagnate	decline
Pig	stagnate	stagnate	decline
Beef	stagnate	grow	grow
Dairy	stagnate	decline	stagnate

While for the Netherlands a stagnation of growth in the livestock sector has been indicated by the experts in all four main animal categories, in Lithuania and Latvia growth is expected in beef production. Cattle farming for beef production is generally more extensive, which could imply that sufficient (grass)land is available at competitive prices. The trend with dairy, pig and poultry farming is towards larger-scale stable systems, which typically have more restrictions for outside grazing.

From a more general perspective, the respondents were asked to indicate their expectations regarding the future size of the livestock sector relative to its current size. The Latvian experts expect a decline of the overall livestock sector to about 75% of its current size, while the Lithuanian expert expect a growth to about 150% relative to current levels.

The Dutch expert indicated that "the maximum size of the livestock herds in the Netherlands is already limited by laws and regulations to meet environmental standards. I guess these limitations will keep the size of the livestock herds almost stable in the Netherlands, but maybe due to increased efficiency there could be a small increase in numbers. At the same time, a number of political parties in the Netherlands have voiced a desire to reduce the size of the domestic livestock sector."

Also the other country experts highlighted the role of improved resource and conversion efficiency in managing the size and/or environmental impacts of sector, while increasing output. Both the size and existing (infra)structure (e.g. stable systems and manure management systems) of the livestock sector are a major determinant of a future development strategy. Especially in animal categories where change is anticipated it may be easier to develop new greenfield technological infrastructure that meets the needs of today and the future.

Key past achievements?

Experts were asked to indicate major achievements in the sector in the past decade (Table 3). Both Latvian and Lithuanian experts indicated investments in farm system modernisation as a major achievement. The Dutch expert highlighted good progress in environmental performance (soil and climate), as well as animal welfare.

The Dutch respondent remarks that future efforts to improve the overall sustainability performance of the livestock sector will be innovation driven, including farm system modernisation, and increasingly focussed on sustainable value chain management (not only on farm-level improvements).

Table 3. Key past achievements.

Netherlands	› Increase in animal welfare › Improved nutrient use efficiency › Decrease in climate footprint
Lithuania	› Rural development funds allow farmers to replace obsolete farming systems with modern environment and animal welfare friendly.
Latvia	› Farm modernisation, possibility to do this thanks to EU support › Breeding development, increase of productivity › Stronger export markets

In all three countries, there is a need for sustainable farm and value chain management systems and practices in the livestock sector. Here policy makers and the private sector will face the problem of technology selection. For example, which stable, stable flooring, manure storage, manure handling, manure processing, anaerobic digestion and fertilisation technologies and practices will/should be applied? How can new technologies and practices be implemented efficiently and effectively in the existing livestock infrastructure? And how do we avoid a certain technology lock-in that could make meeting other future development objectives more difficult?

Typically, technology-specific emission and environmental standards are in place (e.g. best available technologies), to ensure that impacts are low(er). However, to minimise lock-in (as a result of one-sided focus), such standards for individual technologies should ideally also have a value chain perspective in mind to ensure a 'good fit' with other activities in the sector. Also, the standards should consider multiple relevant pollutants.

Future development challenges?

But what specifications should the technological infrastructure in the livestock sector have? What kind of technical and environmental performance is needed?

The country experts were asked to develop a top-five of key challenges that the livestock sector faces within their country (Figure 1). These can include economic challenges, such as fierce international competition and competitiveness, but also socio-environmental ones, such as improving animal welfare, mitigating climate change and reducing emissions of local air, soil and water pollutants.

Figure 1 shows that all experts have included climate change mitigation and air quality as key development challenges. Latvian and Lithuanian experts assign a higher priority to animal welfare, while the Dutch expert assigns a higher priority to limiting (in)direct land-use change impacts. The latter is in line with the ambition to improve the sustainability performance of the entire livestock value chain (e.g. to also include the production and import of animal feed).

Win-win-win or win-lose-win?

Within the multi-objective setting of livestock sector developments, it is unlikely that all targets can be met, as some targets may cause conflicts. Increasing sector output while lowering GHG and air polluting emissions can be achieved (synergies), but this is can come at the expense of the (international) competitiveness of the sector, low food prices, and/or food supply security (conflicts).

The ‘balancing act’ that is needed to (a) maximise synergies and (b) minimise conflicts of any transition strategy in this sector is bound to a local/national context, where various societal and economic forces and environmental impacts shape a country’s development strategy for the future.

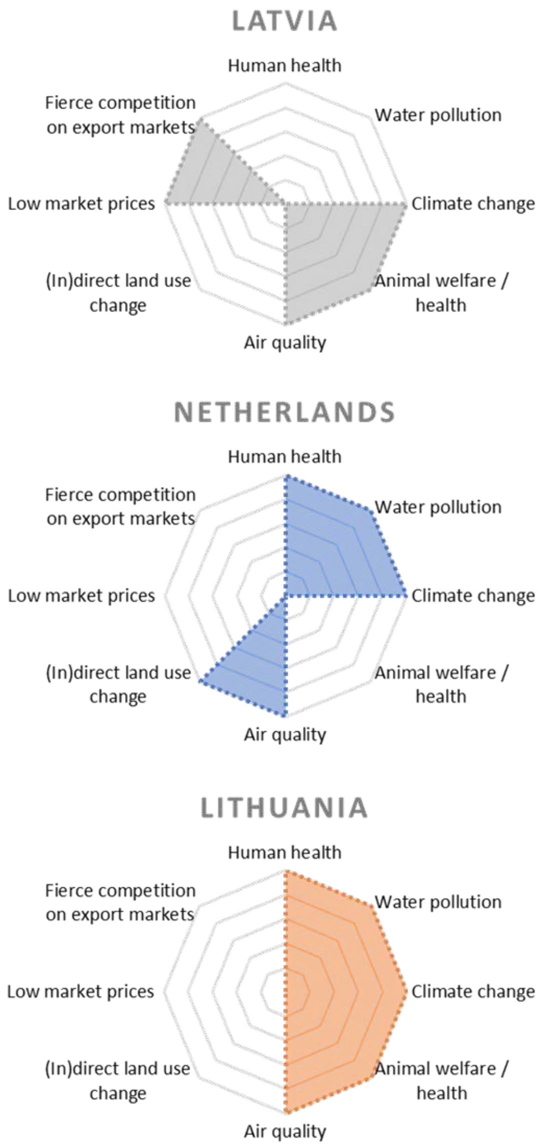

Figure 1. Top-five development challenges in livestock.

Setting development priorities at the country level and balancing these against each other is of key importance for policy making. Questions like "is climate change mitigation more important than meeting animal welfare standards or maintaining food supply security?" or “Is employment growth in the sector more important than human health?” will be raised at some point. When such questions arise, the policy framework needs to be able to provide answers!

More insights: follow TRANSrisk

Within the EU-funded TRANSrisk project (transrisk-project.eu) case study research is dedicated to shed more light on the issue of managing transitions in the livestock sector in a multi-objective world. Please feel free to contact us (eise@jin.ngo).

Converting Offshore Wind Energy into Green Hydrogen on Existing Oil and Gas Platforms on the North Sea

By Catrinus Jepma and Miralda van Schot*

In a recent study carried out via the Energy Delta Institute on behalf of the energy innovation board of the Netherlands and Gasunie (the TSO for gas in the Netherlands and part of Germany), we have analysed whether the production of 'green' hydrogen from wind energy could start offshore, i.e. on the North Sea.

The North Sea increasingly develops into one of the major energy hubs of Europe, and a massive energy transition laboratory. The reason is that offshore wind capacity is being installed with tremendous speed, such that the current about 13 GW may grow towards about 40 GW by 2030, with further increases foreseen beyond 100 GW or even 150 GW on the longer term. At the same time, the traditional oil and gas production — after having reached a maximum capacity around the year 2000 — is now being reduced and will most likely be phased out during the net decades. Around 600 installations and platforms across the North Sea will therefore have to be decommissioned — this process has already started — unless somehow the platforms can be given a second life. In this process of massive installation of renewable capacity and decommissioning of fossil capacity the question arises if somehow synergies between the fossil and renewable energy sectors can be created.

Using existing infrastructure

One possible way for that is to use oil and gas platforms and other existing infrastructure as a future location to convert part of the offshore wind energy into 'green' products in general and 'green' hydrogen in particular. It is common knowledge that the power produced from the wind energy is costly to transport and difficult to store. As a result, a serious part of the wind power produced is expected to generate little economic value. Conversion of wind power into 'green' hydrogen may solve this issue, because hydrogen can be stored and transported relatively easily. Moreover. massive amounts of hydrogen are used worldwide, especially in the chemical industry.

Figure 2. The study considered two gas platforms owned by ENGIE on the Dutch continental shelf on the North Sea: main production complex G17d (pictured; photo credit HSM Offshore) and unmanned satellite platform D18a.

Typical advantages of energy conversion at offshore locations include:

- Safety issues, if at all a point of concern, will be less important under offshore conditions than under onshore conditions;
- Existing installations can be given a second life so that decommissioning can be postponed; and
- Under appropriate engineering, transport of hydrogen to shore can be cheap to the extent that existing gas infrastructure can be used.

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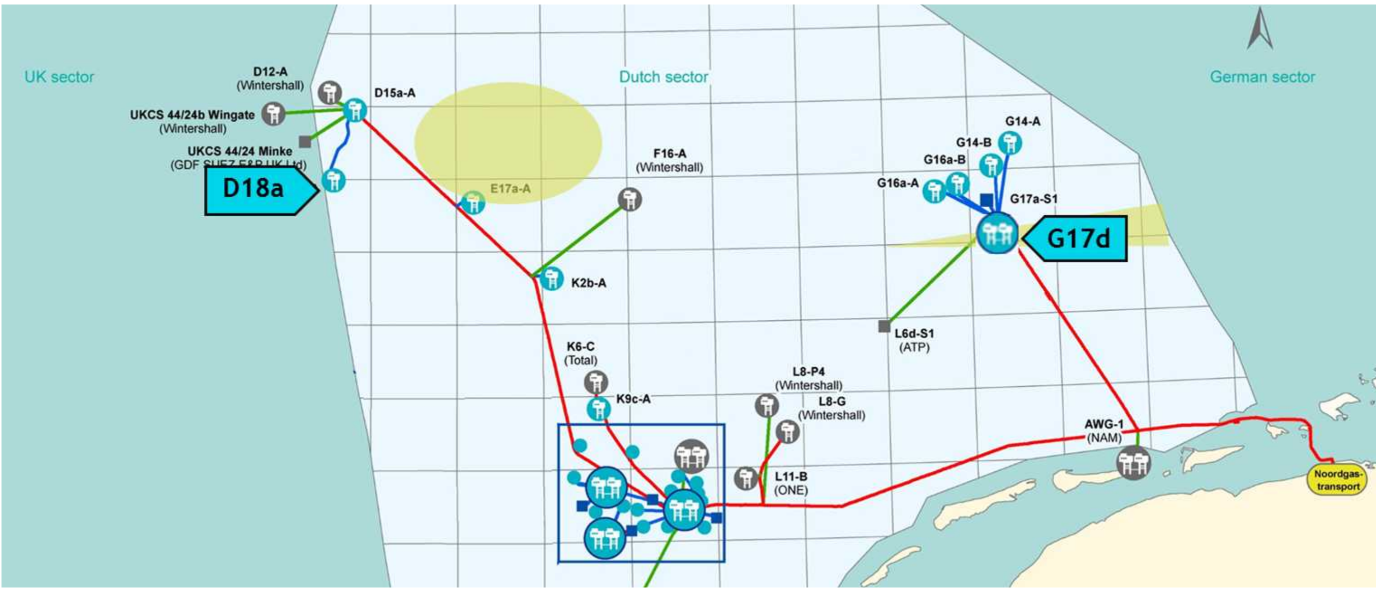

Figure 3. Locations of platforms on the Dutch continental shelf of the North Sea, with the platforms considered in the study highlighted. Source: Noordgastransport, adapted by EDI.

Study of two North Sea gas platforms

The issue in the study therefore was what the cost price would be if such conditions would apply, i.e. if an existing platform nearby a new offshore wind farm would be used to convert all the power from the wind farm into 'green' hydrogen, and transport this to shore by using existing gas infrastructure.[1] An additional assumption was that the savings on the e-grid, that otherwise would have been installed to connect the offshore wind farm with shore, would benefit the conversion project.

Another assumption that came out of an economic optimising algorithm was that the capacity of the electrolyser (the device to convert power into hydrogen and oxygen) in the optimum equals about 80% of the wind farm capacity. In other words, to run the electrolysers more hours it was economical to curtail a small part of the wind power produced (i.e. shut down part of the wind park temporarily).

In the analysis a detailed data compilation was carried out for energy conversion on two specific North Sea platforms (see Figures 2 and 3), covering all the relevant capital and operational expenditures (CAPEX and OPEX) related to the offshore conversion, as well as the data on the time profiles of power deliveries, prices, transport costs, and returns on the sales of the 'green' hydrogen (potential sales of oxygen were disregarded). Based on these data a net present value (NPV) analysis was carried out to determine internal rates of return as well as the break-even costs of the green hydrogen. (For details on the assumptions and methodology, see the report that can be acquired via the authors.)

Results of the analysis

The analysis revealed that the break-even cost value of the 'green' hydrogen lies between €2.84/kg and €4.63/kg, depending on a range of assumed parameter values. More specifically, it turned out that this value relatively strongly depended on:

- the CAPEX costs of the electrolysers;
- the price of the power intake; and
- the degree to which 'green' hydrogen would benefit from a special support regime as compared to 'grey' hydrogen.

With respect to the electrolyser CAPEX, it is clear from the literature that prices may reduce due to a learning curve effect, such that the current prices of around €1 million per MW installed capacity may well decline during the next decade or so to half that level or even lower.

With respect to the wholesale market power prices, currently averaging in the range of €30-40/MWh, views on future developments differ widely: while

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1 An analysis of the platforms revealed that a main platform (e.g. G17d) can host about 25 electrolysers of 10MW, or about 250MW electrolyser capacity in total.

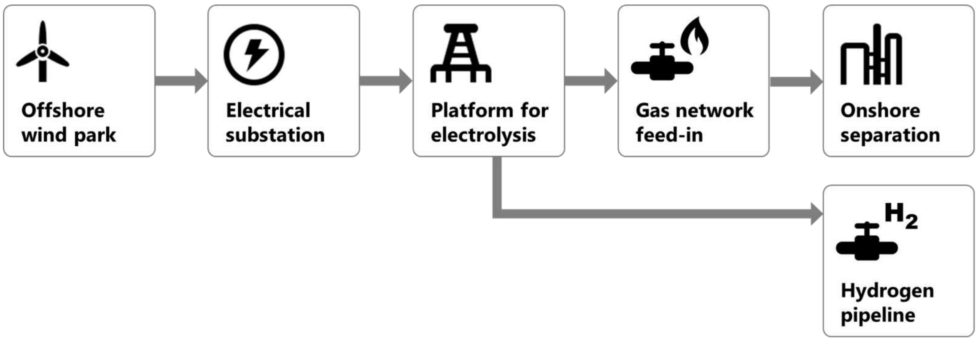

Figure 4. Options for transporting hydrogen to shore: hydrogen is fed into the existing natural gas grid and reseparated onshore, or a separate hydrogen pipeline is used.

some argue, given the very low marginal costs of intermittent renewable energy, that such prices may decline much further, others instead expect power prices to rise again from the current declining trend.

With respect to the public support schemes for 'green' hydrogen, much is still unclear as little 'green' hydrogen is available on the market. The overwhelming majority of hydrogen offered to and by the chemical industry is produced from methane via steam conversion. This conversion is relatively carbon-intensive because, roughly speaking, 10 kg of CO_2 is released to produce 1 kg of hydrogen. It is still to be seen to what extent in the future 'grey' hydrogen will be replaced by 'green' hydrogen, and whether a serious 'green' hydrogen demand will develop, e.g. in mobility or in market segments where one, for instance, may prefer fertiliser produced with the help of 'green' rather than 'grey' hydrogen. The little market data available suggests that the current bulk prices for 'grey' hydrogen are approximately €1.60/kg; at niche markets much higher prices are paid per kg of hydrogen (we took €4.67/kg as the highest value, but some cases are known where prices are paid above €10/kg).

Long-term outlook

In a scenario for the post-2025 period in which we assumed that electrolyser prices reduce to € 300,000 per installed MW capacity, that power prices drop towards €20/MWh, and where 'green' hydrogen have a market price (including potential subsidies and/or ETS allowance prices) of about €6.40/kg, substantial positive NPVs of the offshore conversion activities emerged. In this case, the break-even cost price of the green hydrogen turned out to be lower than €3/kg.

Obviously, power-to-gas conversion is still in its infancy. Even onshore, so far, little conversion of solar and wind energy into hydrogen has come off the ground, except for some dozens of pilot testing facilities, primarily throughout Europe. Compared to that, offshore conversion is still a completely new concept that has not yet been put into practice, not even by way of testing pilots. Still, we believe that it may be promising to consider this technology. Data clearly shows that transporting all future wind power generated on the North Sea (some prospects are that capacity may grow towards 180 GW) will be not only very complex, but also a very costly process. It is even possible that as the extension of offshore wind progresses at full speed during the next decades, it is technically very difficult for transmission system operators (TSOs) to keep up with that speed in extending the electricity grid.

It is clear that storing part of that energy is absolutely necessary to take the full benefit of it and to be able to balance the grid. Storage of power, however, requires conversion or more generally power-to-gas technology. This will need to be developed much more forcefully than nowadays. Now that the North Sea energy playing field is still open, why not start such conversion technology development offshore?

Report

The report "On the economics of offshore energy conversion: smart combinations" has been published in February 2017 by the Energy Delta Institute. The report can be acquired via the authors; please contact Miralda van Schot at vanschot@energydelta.nl.

Follow-up: Political Backing for the Emissions Trading Scheme Simulation in Mexico

By Andrés Prieto*

Emissions trading has increasingly become a topic of interest within the Mexican private sector. The Mexican Stock Exchange, which is hosting a year-long emissions trading scheme simulation, delivered a number of workshops illustrating the main components of emissions trading in the country's three main cities: Mexico City, Guadalajara, and Monterrey. These workshops included the participation of a diverse array of 81 firms hailing from every major industry.

JIQ Magazine vol. 22, no. 3 (October 2016) included an article by Andrés Prieto and Eduardo Piguero, introducing the Emissions Trading Scheme Pilot in Mexico. The pilot consists of a voluntary, web-based simulation of an ETS, with the objective of providing companies with insight in how an ETS operates as well as building capacity in the private sector for participating in an ETS.
JIQ Magazine will keep following the development of emissions trading in Mexico.

The workshops served multiple purposes, mainly to create awareness of emissions trading as a business-friendly alternative to command-and-control schemes. Another important aim of the workshops was to encourage firms to identify key activities in preparation of emissions trading (i.e. identification of abatement strategies) and pinpointing the adequate departments to enact them. The Mexican Stock Exchange's simulation itself has been postponed for a couple of months in order to improve the abatement component of the digital platform. However, this minor chronological setback has not slowed down the country's thrust towards emissions trading.

Indeed, since the announcement of the simulation in August 2016, three key partnerships have been established:

1) A Memorandum of Understanding (MoU) between the governments of California, Mexico, Ontario, and Quebec to promote the expansion of carbon market instruments in North America;
2) An MoU between the International Emissions Trading Association (IETA) and CESPEDES, the Mexican representative of the World Business Council for Sustainable Development, to jointly develop a comparison of core policy elements of existing carbon markets, including private sector views on lessons learned and best practices, with the intention of developing a high-level roadmap for the Mexican carbon market; and
3) A partnership between the Environmental Defense Fund (EDF) and the Mexican Ministry of Environment (SEMARNAT) that aims to explore potential improvements in key components of Mexico's National Emissions Registry (RENE).

With clear political signals pointing towards emissions trading, a number of important public-private discussions are about take place in the country. These discussions include, but are not limited to, the establishment of industrial benchmarks, defining the range and scope of the emissions trading system and its degree of similarity to other North American carbon markets. As the emission trading simulation and the public private discussions continue to evolve, we will get a clearer picture of what an ETS in Mexico will look like.

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European Energy Efficiency Policies for Industry: Energy Efficiency Obligations and Alternative Measures

By Erwin Hofman and Krisztina Szendrei*

The industrial sector is one of the dominant sectors when it comes to energy consumption. In the European Union, about 26% of the 1.06 billion tonnes of oil equivalent of final energy is used by the industrial sector.[1] Industry is therefore an important strategic target of the EU's and its Member States' energy efficiency regulations, including the EU Energy Efficiency Directive (EED).

Article 7 of the EED stipulates that EU Member States should set up an energy efficiency obligation (EEO) scheme and/or alternative policy measures leading to yearly energy savings of 1.5% of annual sales to final consumers. All 28 EU Member States have implemented one or more policies in this framework, including policies specifically aimed at the industry sector.

The EU-funded energy efficiency project EU-MERCI has analysed the key industry-relevant energy efficiency policies in the 28 EU Member States and Norway. For each country, a maximum of four of the most important policy measures were selected based on their expected energy savings and impact on the industrial sector, verified through interviews and expert consultations. For the 29 countries in total 71 key measures were identified.

The EU-MERCI project has received funding from the the European Union's Horizon 2020 research and innovation programme.

The overarching objective of the EU-MERCI project is to support energy efficiency in the European industry sector. It will develop methods and tools for assisting industry in implementing effective energy efficiency improvements and monitoring of energy savings, and assist policy makers in the assessment of the effectiveness and transparency of energy efficiency mechanisms.

Energy efficiency obligation schemes

In EEO schemes, 'obligated parties' (often energy companies) are required to achieve energy savings in end use customers' premises. In order to reach the target, companies have to carry out measures helping final consumers to improve their energy efficiency. This can be done through for example subsidies to end users for energy efficiency measures or soft measures such as information campaigns. Some EEO schemes, such as the one in the United Kingdom, only focus on households, but many focus on multiple or all end use sectors including industries. Financial penalties may be applied if the obligated party fails to deliver the savings.

Out of the 29 countries considered, 16 have implemented an EEO scheme that is applicable to the industrial sector (see Figure 5). Most of these countries have combined this EEO scheme with alternative measures, but for five countries the EEO scheme is the sole relevant energy efficiency measure for industry: Denmark, Hungary, Lithuania, Luxembourg, and Poland.

An example of an EEO scheme is the white certificate obligation scheme as implemented in Italy. It has a tradable market and works both as an EEO and as an incentive scheme for voluntary market parties. White certificates are used to certify the achievement of energy saving in the final uses of energy through energy efficiency measures and projects. The scheme

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1 2014 data from Eurostat (2016). Statistics explained: Consumption of energy (link).

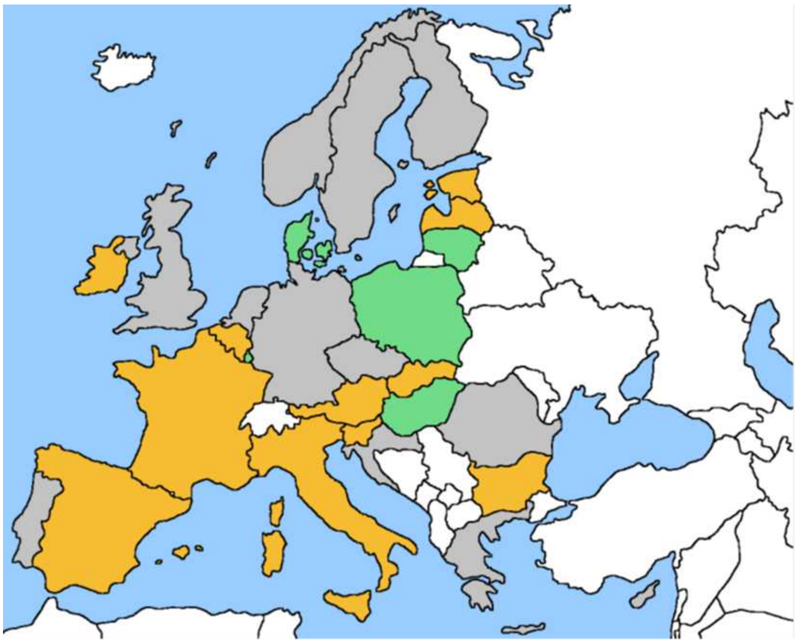

Figure 5. Map representing how EU Member States and Norway have met the requirements under Article 7 of the Energy Efficiency Directive.

places an obligation on electricity and gas distributors with more than 50,000 end users, and focuses on all end use sectors including industry. Under the Italian scheme, all types of technologies and measures are permissible. In some other countries limits are set, such as in France where only investment in hard technology is eligible under the EEO scheme.

Alternative measures

Apart from the five countries mentioned above that have only implemented an EEO scheme, all countries have introduced alternative measures. Alternative mechanisms and measures may include taxation schemes, subsidies, regulations and standards, or information campaigns. When using alternative measures, similarly strict rules need to be followed for determining the resulting energy savings as used in EEO schemes.

The most common alternative measure type is financial support. Out of the 24 countries that have implemented alternative measures, 19 have introduced at least one financial support policy, such as incentives for energy efficiency equipment. Also the policy type of information and training is rather popular, with 12 countries having introduced such policies, followed by fiscal measures (9 countries). It must be noted that this is not an overview of all policies implemented in the EU and Norway, but rather a subjective selection of the most important policies for industrial energy efficiency in those countries, based on discussions with national policy makers and literature and database findings on their effectiveness.

An example of a country that has implemented financial incentive programmes is Germany. The government-owned development bank KfW supports energy-efficient construction and renovation. A criterion for financial support for investment is that the energy consumption must be at least 15% lower than the average for the industry. In the case of replacement investments, the energy consumption should be at least 30% lower than the mean consumption for the last three years.

Other examples of alternative measures include Bulgaria's regulation for mandatory industrial energy efficiency audits, Croatia's voluntary agreement 'Industrial Energy Efficiency Network' mainly to increase awareness, Finland's energy auditing programme in industry, the Netherlands' long-term voluntary agreements on energy efficiency with ETS and non-ETS companies, and Slovenia's Eco Fund financial contribution scheme for energy efficiency measures, just to name a few.

Energy savings calculations

Several methods can be used for the calculation of energy savings as a result of each policy measure in industry. There are four types of basic methodologies applied in the EU Member States:

- Deemed savings: ex-ante defined, standard values based on previous monitoring;
- Metered savings: ex-post recording of the actual energy use reductions;
- Scaled savings: based on engineering estimates;
- Surveyed savings: based on surveys (this approach is only to be used for measures on

consumer behaviour, and is therefore usually not appropriate in the industry sector).

For EEO schemes, several countries prefer the deemed savings method, because of its relative simplicity for participants. However, it is also acknowledged that for more complex technologies and measures the deemed savings method is not appropriate. Therefore none of the Member States regard the deemed savings method as the only possible method.

The Italian scheme uses a typical framework with three options for energy savings calculations for different complexities of the implemented projects: deemed savings for simple projects; simplified monitoring for more complex projects, and metered savings for the most complex projects. Simplified monitoring in this case refers to a combination of one or more meters (metered savings), and a calculation of the savings of the entire project based on these metered results and other parameters (scaled savings).

For many of the alternative measures, metered savings methods are much less commonly used. For example, the majority of Member States use a form of scaled savings methods for their financing support schemes, and some countries only use a set of deemed savings. It also appears that scaled savings methods used here are simpler than those used for the EEO schemes, with for example for Germany's support programmes simply assuming an energy saving value per amount of the investment.

Monitoring and reporting

Monitoring energy savings and achievements of targets are generally the responsibility of national ministries and occasionally of some kind of agency (e.g. National Energy Agency) or independent public bodies. Considering the different types of measures (obligation, financing and other), reporting protocols in the 29 studied countries vary significantly.

Obligations such as EEOs or certificate schemes are in most countries monitored annually, where obligated parties need to provide an energy audit or draw up a summary report on energy savings. Audits are usually carried out and verified by energy experts and in most cases energy auditors need to be accredited (e.g. certified and/or registered). As an example, in the Italian scheme the national energy service operator GSE monitors and verifies compliance with the white certificate obligation scheme. Site visits and inspections may be carried out at installation sites to check the correct fulfilment of the obligations, and penalties may be imposed if assigned obligations are not met.

Alternative measures, such as financing schemes, are in most cases either monitored annually or biennially (via financial reporting or auditing) or by random checks. An example of a combined approach is that of the Climate Change Agreements (CCA) in the United Kingdom, where the scheme is monitored and verified every two years in milestone reviews by the Environment Agency based on reporting by the individual businesses, while selected operators are audited following a mixed 'risk-based and random selection' approach.

Conclusion

The key energy efficiency policies in the 28 EU Member States and Norway, that are relevant to the industrial sector, show large variety in types, calculation methodologies, as well as monitoring and verification processes. While in most Member States a wide range of policy measures has been implemented, given the differences in country contexts, it remains to be seen which strategies and measures are the most effective in reaching the 1.5% reduction target.

Report and webinar

The full report with an overview of the key industry-relevant energy efficiency policies in EU Member States and Norway can be downloaded from the EU-MERCI website: Comparative report of industry-relevant energy efficiency policies in Europe.

In February 2017, an EU-MERCI webinar was held on the energy efficiency policies in industry, including presentations with practical policy examples from Italy, the United Kingdom, Austria, and Poland. A video recording of the webinar, as well as the PowerPoint presentations, are available on the EU-MERCI website: Proceedings of the webinar: Energy efficiency policies and schemes for Industry.

Join EU-MERCI stakeholders community

Within the EU-MERCI project, technical and non-technical organisations concerned with the implementation of energy efficiency projects in the industrial sector are invited to join the EU-MERCI stakeholders community. The role of the stakeholders community is to validate the project outputs and cooperate through orientation, correction, proposition, and finalisation actions. A registration form is available on the website.

GHG Emission Benchmarks from a Demand Perspective

By Jasper Starrenburg*

Recently, at the University of Groningen, a master's thesis was completed on creating benchmarks for greenhouse gas (GHG) emissions for individual countries. The benchmark helps to determine, using several variables, what emissions level could be reasonably expected from a country, given its domestic circumstances. Benchmark emissions have then been compared with countries' actual emissions to see whether they performed better or worse than the benchmark.

Methodology

The benchmark uses production data from the World Input Output Database (WIOD), which contains information about 41 'countries': 27 EU Member States, 13 large non-European economies, and the rest of the world (RoW) treated as one country. For each of these countries, the database contains production data for 35 sectors, and tracks how much each sector supplies to which sector in which country. The database also contains information about the embedded GHG emissions in each production flow. Connecting trade flows with emission data show emission levels per activity and how much a country emits due to its total production activities.

As a last step, it was calculated (using the 'Leontief inverse')[1] how much output is needed from e.g. the sector 'agriculture, hunting, forestry, and fishing' to satisfy a certain demand in the sector 'food, beverages, and tobacco'. Combining this with GHG emission data shows how one extra unit of demand in a country leads to higher emissions elsewhere (within the country or in other countries). An important difference with production-generated accounting of emissions (which was the basis for the commitments for industrialised countries in the Kyoto Protocol) is that in a demand-based accounting system, emissions are accounted for where a product or service is consumed, instead of where it is produced. This difference can be substantial.

One of the biggest bottlenecks for researchers and policymakers is the lack of data. In this benchmark, it is no different. The WIOD database, made possible by the European Commission, took a tremendous effort to create. Still, it only includes countries that accurately keep track of their National Accounts. For this reason, it might be too early to require developing countries to adhere to the benchmark created via demand-generated emissions, since we simply do not have accurate accounts for each country individually.

Country factors

With this perspective we now know how many emissions can be ascribed to countries, based on their demand for goods and services. In a next step, it is determined whether these emissions are in line with what could be reasonable expected. For that, demand-generated emissions per capita were regressed using four country factors and assumptions:

- Affluence: the higher a country's GPD, the higher will be its consumption level and, thus, its GHG emissions level;
- Fuel mix: availability of green energy substitutes or natural resources, or lack thereof, considerably affect emissions;
- Economic structure of a country, such as industrialisation profile: strongly industrialised countries have higher GHG emissions; and
- Urbanisation share of a country: an increase in urbanisation leads to higher emissions.

The first three factors have been derived from the Triptych approach used by the EU for differentiating

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1 Leontief's inverse is a technique for calculating the required increase in production in different sectors for meeting an increase of demand by one unit. Leontief, W., 1953. Structural change, in: W. Leontief et al. (eds). Studies in the Structure of the American Economy, pp. 17-52. Oxford University Press, New York.

2 Phylipsen, G.J.M., Bode, J.W., Blok, K. 1998. A Triptych sectoral approach to burden differentation; GHG emissions in the European bubble. Energy Policy, 26(12): 929-943.

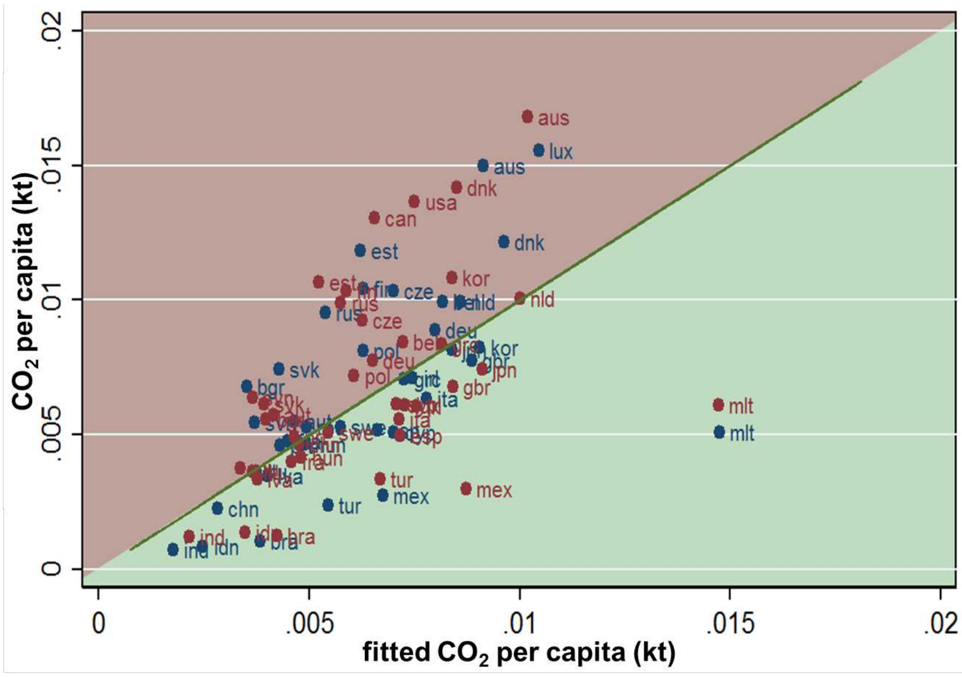

Figure 6. The 45°-line divides the countries into a green zone and a red zone. Countries in the green zone are doing better than predicted, given the values of the benchmark variables, while countries in the red zone are doing worse than predicted.

an overall EU climate target among the Member States, as input for the Kyoto Protocol negotiations in 1997.[2] The urbanisation factor has been added to address the impacts on GHG emissions of global urbanisation trends. While the economic structure variable can become irrelevant when ascribing emissions to demand instead of production, we still include it in the study to assess the previously-used variables under a new accounting system.

Results

The regression was performed for 39 countries for the time period 1995-2009, which are all the years available in the WIOD. Due to data limitations, 'RoW' and Taiwan were not included in the regression. With the regression, the impact of the above factors on GHG emissions were then calculated. For example:

- an increase in GDP per capita of 1,000 USD leads to 0.9% higher emissions per capita;
- a 1% increase of the share of green energy in the total fuel mix reduces emissions by 0.13%;
- a 1% increase in urbanisation leads to a 1.76% increase in emissions; and finally
- a 1% increase in the share of industry in a country's GDP leads to 0.06% higher emissions.

With these findings, GHG emission benchmark figures can be calculated per country, showing what emission level could be reasonably expected in a country, given its domestic circumstances. In Figure 6, these levels are compared with actual emissions. The 45°-line represents situations where a country's actual emissions are exactly in line with the benchmark.

This figure provides interesting insights. For example, from a demand-perspective, China, which has been a large emitter of GHGs since 2000, emits less than its benchmark emission level. Most developed countries emit more than their benchmark levels. Moreover, between 1995 and 2009, countries above the benchmark collectively moved further away from it (difference between blue and red dots in Figure 6).

With this analysis, it is shown per country, taking a demand-perspective, what GHG emissions level can be considered to be in line with national circumstances and how countries have performed against this benchmark. With a view to future international climate policy making, a benchmark can be an important way forward to reach the required emission reduction for meeting the Paris Agreement goals, for two reasons. Firstly, taking a demand perspective makes it no longer attractive for countries to move polluting activities abroad in order to appear greener. Secondly, the benchmark can be helpful as a reference for the Global Stocktake which will take place every five years under the Paris Agreement. While in the longer term, for a decarbonised society, the benchmarks should be close to zero, for intermediate Stocktakes, a benchmark can help to accurately show which countries are 'in the green' and on a decarbonisation pathway, and which are not.

Read more

The research has been published as a master's thesis at the University of Groningen. Contact the author (jasperstarrenburg@gmail.com) for receiving a copy.

Climate Change Mitigation: Options and Policies — Summer School in Nijmegen, the Netherlands

The EU-funded CARISMA project on innovation for climate change mitigation and the UN Climate Technology Centre & Network (CTCN) jointly organise a summer school course on climate change mitigation. The course will take place from 14 through 18 August 2017 as part of the Radboud Summer School programme in Nijmegen, the Netherlands. The course is targeted at post-graduates, PhD students or junior professionals in public service working on the topic of climate change mitigation.


The city of Nijmegen, the Netherlands.

Climate change mitigation, i.e. human intervention to reduce greenhouse gas emissions or enhance sinks of greenhouse gases, is firmly on the international policy agenda since the Paris Agreement of 2015. For meeting the Paris Agreement goals, an acceleration will be required of global development, deployment and diffusion of technologies and practices for mitigation. The summer school course will take a multidisciplinary perspective and discuss climate mitigation technologies, practices, costs and benefits as well as related policies and needed governance.

In short, the course starts with an introduction on technology transfer for climate change mitigation: what are potential technology options for reducing greenhouse gas emissions, what are their climate footprints, what are cost items to consider, how to enhance public acceptance, and what R&D activities exist (are needed) to accelerate development, deployment and diffusion of technology options?

As part of the course, an interactive workshop will be organised by the UN Climate Technology Centre & Network (CTCN), introducing students into technology transfer practice, with a specific focus on developing countries. Based on concrete examples, students will work in small groups on case studies about how to prioritise sectors and technologies for mitigation within different country contexts. The final part of the programme contains lectures on policies and governance for technologies for mitigation, including a key note lecture by a senior policy practitioner on technology transfer from an international climate policy and negotiation perspective.

The deadline for application for the summer school course is 1 June 2017, with an early-bird registration open until 9 May 2017. Up to five participants from developing countries may be financially supported to attend the summer school by the CARISMA project (please indicate in your motivation letter if you need this).

More information, a preliminary programme, and the registration link are available at the Radboud Summer School website: ru.nl/radboudsummerschool.

'Inspiring for a Circular Life' — Collaboration Between Business and Education for Circular Economy

A consortium of organisations active in business and education in the Netherlands carries out the project 'Inspiring for a Circular Life'. The project aims at a plan of action for a better integration of activities to support a circular economy in the Northern Dutch province of Fryslân (Friesland). The project has a specific focus on collaboration between small and medium-sized enterprises (SMEs) and schools at different educational levels.

The challenge

A transition to a circular economy is needed in all facets of society. It is recognised that — in Fryslân and beyond — all kinds of initiatives already exist to support a 'green', circular economy, both by businesses and educational institutions. However, an integrated approach is lacking. For example, 'circular economy' is no standard feature of educational programmes at schools. As a result, graduates often have insufficient knowledge of and skills on circular business practices, once they are employed by SMEs. An integrated approach would consider knowledge and skill needs at the level of businesses and integrate these as concrete lessons at schools. The project partners aim at identifying potential directions towards such an integrated approach.

The project

The project 'Inspiring for a Circular Life' is co-funded by the province of Fryslân through its DuurzaamDoor (sustainably forward) programme. The project consortium consists of six organisations from the Northern Netherlands that have an extensive expertise with regard to sustainability and circular economy in the various target groups in business (JIN Climate and Sustainability) and education (GOED on primary education, IKcircuLEER and IVN on secondary education, NL Projecten on applied education, and SRF on higher education).

The project, first, makes an inventory of existing and potential activities related to circular economy in Fryslân. Second, based on the inventory, actions for an integrated approach on circular economy by education businesses will be identified. Third, for these actions, a plan of action will be prepared, to be considered in a next stage of the project.

Stocktaking and analysis

For the inventory of existing activities, a stocktaking is carried out, with a questionnaire and in-depth interviews, of the projects, programmes, and activities in Fryslân related to circular economy in schools and businesses, with a specific focus on joint activities between them.

A key topic in the stocktaking is to what extent 'circular economy' is a theme in the curriculum of schools, and in which forms this is implemented. This could encompass for example inclusion in course materials, project work, or guest lessons/lectures. An important question in this regard is to what extent a collaborative approach is employed with (local) SMEs, for example through internships, company visits, or (at the higher levels of education) research work.

The aim of the stocktaking is to obtain a representative overview of the status of the circular economy in education and business in Fryslân. In addition, 'good practices' of joint business-education activities on circular economy are identified in Fryslân, as well as in other provinces in the Northern Netherlands, and elsewhere. Moreover, missing elements ('gaps' or 'blind spots') for an integrated approach are identified. Based on that, actions are identified to build further on what exists, learn from good practice and address what is still missing.

Report

The final report including the results of the stocktaking and suggestions for an integrated approach in the province of Fryslân will be published in Summer 2017 on JIN's website www.jin.ngo. A following JIQ Magazine issue will include an article on the results.

Reports

Open access / free of charge

Brack, D., 2017. Woody Biomass for Power and Heat: Impacts on the Global Climate, Chatham House, London, United Kingdom.
The use of wood for electricity generation and heat in modern technologies has grown rapidly in recent years. For its supporters, it represents a relatively cheap and flexible way to supply renewable energy, with benefits to the global climate. To its critics, it can release more greenhouse gas emissions into the atmosphere than the fossil fuels it replaces, and threatens the maintenance of natural forests and the biodiversity that depends on them. The report gives an overview of the debate around the impact of wood energy on the global climate. It provides conclusions and recommendations for policymakers on the appropriate way forward.

CAN Europe, 2017. CAN Europe's Position on the Energy Efficiency Directive review, Climate Action Network Europe, Brussels, Belgium.
In the position paper, it is argued that the European Commission's proposal on the review of the Energy Efficiency Directive (EED) is not consistent with the ambition of the Paris Agreement. CAN Europe gives four key recommendations for improving the proposed legislation: (1) introducing an at least 40% energy savings target for 2030, (2) strengthening the 2030 binding EU energy efficiency target with national binding targets, (3) removing several loopholes that weaken the level of ambition, and (4) introducing revision clauses to allow for adjustments following future developments.

Elkerbout, M., 2017. The EU Emissions Trading System after 2020: Can the Parliament’s Environment Committee achieve its ambitions?, CEPS Policy Insights 2017/03.
The brief discusses the recent report of the European Parliament's Committee on Environment, Public Health and Food Safety (ENVI) on the revised EU Emissions Trading System (ETS) for the post-2020 period. The brief explores the implications of some of the ideas proposed by the ENVI Committee and reviews the main points of contention. It concludes that the ENVI Committee's position would increase the ambition of the EU ETS compared to the original proposal of summer 2015. However, the final outcome of the EU ETS revision may be more modest in ambition, as it will still need to pass the plenary in the European Parliament, and the Council of Ministers is yet to form their position.

Grassi, G., J. House, F. Dentener, S. Federici, M. den Elzen and J. Penman, 2017. The key role of forests in meeting climate targets requires science for credible mitigation, Nature Climate Change, vol. 7, pp. 220-226.
The inclusion of forests in international climate agreements has been complex, often considered a secondary mitigation option. Assuming full implementation of (Intended) Nationally Determined Contributions following the Paris Agreement, the article shows that land use (and forests in particular) emerges as a key component of the Paris Agreement: turning globally from a net anthropogenic source during 1990–2010 to a net sink of carbon by 2030, and providing a quarter of emission reductions planned by countries. Realising and tracking this mitigation potential requires more transparency in countries’ pledges and enhanced science-policy cooperation to increase confidence in numbers.

ICAP, 2017. Emissions Trading Worldwide: Status Report 2017, International Carbon Action Partnership, Berlin, Germany.
The report takes stock of the latest developments in emissions trading, providing detailed factsheets on all systems under consideration or operating worldwide, as well as highlighting major trends and areas of policy debate. This year’s report focuses on three major themes: emissions trading in emerging economies (i.e. the Chinese ETS and a future national ETS in Mexico), market stability (e.g. a price floor or market intervention), and that international cooperation is crucial.

Lee, D.-H., D.-h. Kim & S.-i. Kim, 2017. Characteristics of forest carbon credit transactions in the voluntary carbon market, Climate Policy.
The study analyses the characteristics of forest carbon credit transactions in the voluntary carbon market using frequency analysis and logistic regression analysis. The results reveal that the co-benefits of forest carbon projects are an important factor influencing carbon credit transactions. The findings of this study suggest that developing co-benefits is important for strengthening the market competitiveness of forest carbon credits in the voluntary carbon market. Additionally, unlike the compliance carbon market, in the voluntary market stringent carbon standards do not always guarantee credit transaction performance.

Marcu, A. and W. Stroefs, 2017. The Role of Response Measures in Ensuring the Sustainable Transition to a Low-GHG Economy, International Centre for Trade and Sustainable Development, Geneva, Switzerland.
This ICTSD policy brief explores the issue of response measures in the context of the post-Paris climate regime from a practical and policy-relevant perspective, examining different options on how the issue may evolve. The increasingly interconnected nature of the global economy means that the impacts of climate change mitigation measures, or response measures, are not confined within countries implementing them. Such impacts will become of even more and growing importance under the decentralised and increasingly ambitious new climate regime. Managing the domestic and cross-border impacts of response measures is crucial for ensuring an orderly transition, as well as for the speed and ambition with which mitigation measures can be implemented.

Obergassel, W., C. Arens, L. Hermwille, N. Kreibich, F. Mersmann, H.E. Ott and H. Wang-Helmreich, 2017. Setting Sails for Troubled Waters. An Assessment of the Marrakech Climate Conference, Wuppertal Institut, Wuppertal, Germany.
In the report, a detailed analysis of the results of the UNFCCC climate conference of Marrakech (COP22) is elaborated. The report starts by discussing developments regarding the implementation of the Paris Agreement, in particular the detailed 'rulebook' and cooperative mechanisms. Next, it discusses developments in the various avenues for raising climate ambition that have been put in place by the Paris conference: the 2018 facilitative dialogue, the engagement of non-state and sub-national actors, and the elaboration of mid-century climate strategies. In addition, the article discusses other Marrakech developments, in particular on issues of climate finance and adaptation, as well as recent developments in the wider world that have an impact on the UNFCCC.

Oberthür, S. and L. Groen, 2017. Explaining goal achievement in international negotiations: the EU and the Paris Agreement on climate change, Journal of European Public Policy.
The authors develop a general framework that incorporates structural and actor-/process-related factors explaining goal achievement in international negotiations, paying particular attention to negotiation strategy and diplomacy. On this basis, it is argued that the high level of EU goal achievement at COP21 in Paris resulted from the interplay of evolving international structures, effective EU strategy fitting these structures and domestic politics, and favourable situational circumstances. The conceptual framework, in the article applied to the Paris Agreement, can build the basis of a fresh programme of work comparing the EU's performance in international negotiations across time and policy fields.

World Economic Forum, 2017. The Global Risks Report 2017 - 12th Edition, WEF, Geneva, Switzerland.
In the annual Global Risks Report, the key areas that need urgent action are highlighted, such as economic growth and reform and rebuilding communities. Environment-related risks stand out in this year's global risk landscape. Four of the top ten risk interconnections involve environmental risks, the most frequently cited of these being the pairing of "water crises" and "failure of climate change mitigation and adaptation". It is argued that issue-specific and organisation-specific 'silos' will need to be dismantled across the public and private sectors throughout the world economy, as new multi-actor alliances will be essential to respond adequately to the structural risks posed by climate change, extreme weather, and water crises.

Box 1. Climate Change Mitigation portal.

Online portal highlighting EU-funded research on reducing emissions

The ClimateChangeMitigation.eu portal highlights information from different EU-funded research and coordination projects emission reduction. The portal covers a range of mitigation-related topics, including mitigation technologies and practices, scenarios and models, links to relevant data sources, case studies, policy information, and stakeholder engagement. 13 EU-funded projects have joined the portal, and additional projects are invited to become involved!
Linked to the online portal, updates on mitigation research are shared on Twitter using the #mitigationEU hashtag.

JIQ Meeting Planner

8-18 May 2017, Bonn, Germany
46th Sessions of the UNFCCC Subsidiary Bodies
UNFCCC.int/meetings/items/6240.php

9-12 May 2017, Vienna, Austria
Vienna Energy Forum: Sustainable energy for the implementation of the SDGs and the Paris Agreement
viennaenergyforum.org

12-13 May 2017, Bonn, Germany
Interconnections Conference: Interconnections between the 2030 Agenda for Sustainable Development and the Paris Climate Agreement
interconnections2017.org

18 May 2017, Baarn, Netherlands
Solarplaza: The Solar Future NL 17
thesolarfuture.nl/english

22-24 May 2017, Berlin, Germany
MACSUR Science conference on Climate Change Challenges for agriculture
macsur.eu/macsur2017

22-26 May 2017, Barcelona, Spain
Innovate4Climate: Finance and Markets Week
innovation4climate.com

5-8 June 2017, Manila, Philippines
Asia Clean Energy Forum 2017: Achieving universal access and climate targets
asiacleanenergyforum.org

5-9 June 2017, Glasgow, United Kingdom
3rd European Climate Change Adapation Conference: Our Climate Ready Future
ecca2017.eu

JiQ Magazine

JIQ Magazine (Joint Implementation Quarterly) is an independent magazine with background information about the Kyoto mechanisms, emissions trading, and other climate policy and sustainability issues.

JIQ is of special interest to policy makers, representatives from business, science and non-governmental organisations, and staff of international organisations involved in climate policy negotiations and operationalisation of climate policy instruments.

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