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KING'S College LONDON

EUCERS Newsletter

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Introduction

Dear readers and friends of EUCERS,

It is my great pleasure to welcome you to this latest edition of the EUCERS newsletter, in which we present you with two articles.

In the first article, Daniel Scholten, an assistant professor at the Delft University of Technology, develops a concept of renewable energy security. In the second article, former EUCERS undergraduate fellow Benjamin Abbs outlines a warning about future water-related conflicts.

We would also like to kindly ask you to save the date for our third EUCERS/KAS Energy Talk in 2017 that will take place on 14th of June.

You will find a report of our second EUCERS/KAS energy talk, which focused on "The role of natural gas in the EU energy mix in context of the Paris Agreement," in this newsletter

Feel free to keep us informed about your research projects and findings as we look to remain at the forefront of new knowledge and innovative ideas.
Thank you for your interest in EUCERS and for being part of our community.

Yours faithfully,
Thomas Fröhlich
EUCERS Newsletter Editor

In this Month's Edition:

ARTICLES

Renewable Energy Security

By Daniel Scholten

The geographic and technical characteristics of renewable energy systems are fundamentally different from those of coal, oil and natural gas. Renewable energy sources are abundant and intermittent; renewable energy production lends itself more to decentral generation and involves rare earth materials in clean-tech equipment; their distribution, finally, is generally electric in nature and involves stringent managerial conditions. These stand in clear contrast to the geographically fixed and finite nature of fossil fuel resources, their general reliance on large centralized production and processing installations, and their ease of storage and transportation as solids, liquids, or gases around the globe.

Daniel Scholten is Assistant Professor at the faculty of Technology, Policy and Management at the Technical University Delft. He specializes in the geopolitics of renewables and the governance of renewable energy systems. Daniel defended his dissertation on the organizational requirements of future energy systems at the TU Delft in 2012 and holds degrees in Political Science (Radboud University, 2003) and International and European Relations (University of Amsterdam, 2006, with distinction). His current research focuses on the societal implications of a transition to renewable energy. It combines engineering insights on renewable energy systems with institutional economics, political science and international relations.

The specific characteristics of renewable energy bring new energy security challenges while alleviating other, fossil fuel related challenges. For example, concerns are likely to shift from getting access to overseas resources to availability at the right time and access to rare materials, from an oligopolistic global market to regional markets with many potential producers, and from diversification policies to an emphasis on control over infrastructure operations (Scholten and Bosman 2016).
Some of the renewable specific challenges are well-captured by existing energy security dimensions while others are not. What follows is a call for attention to these challenges and a plea for their inclusion in the energy security lexicon.

The Energy Security Concept
The concept of energy security is notably hard to define, but its core dimensions are relatively clear (Winzer 2012; Sovacool and Mukherjee 2011; Chester 2010; Kruyt et al. 2009).

At its narrowest, energy security is generally synonymous with security of supply at affordable prices.[1] Such a definition relates to dimensions such as geological availability, political accessibility, economic affordability, and infrastructure resilience (or reliability and robustness). Typical concerns relate to the scarce and geographically concentrated nature of oil and gas reserves, policies of diversification of source, origin, and route, price volatility due to political instability in producer countries, and a variety of technical, human, and natural risks to infrastructure. Avoiding dependence and vulnerability are key (Percebois 2003; Gnansounou 2008; Egenhofer and Legge 2001). Focus is on energy supply continuity (Winzer 2012), encompassing continuity of commodity supply, continuity of service supply, and the political-economic impact.

At its broadest, the term also includes dimensions such as environmental sustainability and social acceptability (Sovacool and Mukherjee 2011). Typical concerns are local pollution, climate change, public acceptance, and equity. It expands the impact assessment of supply disruptions beyond the political and economic into the diverse societal impacts of an energy disruption (Winzer 2012).

In all, these dimensions have been operationalized in quite some detail[2] and capture the energy security challenges of oil and gas well, though it can be argued that most of the literature was established with these resources in mind.

The Specific Security Challenges of Renewables
The geographic and technical characteristics of renewable energy systems (vs oil and gas) raise a number of renewables' specific security issues.

[1] For a thorough overview of security of supply definitions see Winzer (2012, 41-43).

[2] Sovacool and Mukherjee (2011) for example distinguishes 20 components within these dimensions, and a staggering 320 simple and 52 complex indicators to assess in a more quantitative fashion the energy security of countries. They also add a technology development dimension.

First, due to the relative abundance of renewable sources every country is able to diversify their portfolio to the extent domestic capacity allows, but some countries will be more efficient than others. Concerns about access to overseas resources and strategic reserves shift to a strategic make/buy decision between secure domestic production and cheap imports. In addition, the intermittent nature of renewable sources (with predictability also varying) raises concerns about availability at the right time and price volatility. We may hence expect a move away from oligopolistic markets to more competitive ones, i.e. a shift from strategic leverage of producers to many countries having leverage: efficient producers, large consumers, and countries able to render cheap balancing services.

Second, the possibility for decentral power generation and the use of rare earth materials in clean-tech equipment (at least for now) set the scene for local empowerment, new business models that take market shares away from established power companies, struggles for access to rare materials, and possibilities for industrial leadership in clean-technology as strategic priority. Another issue is the relatively high capex and very low opex of renewable generation that deter investments, whereas some overcapacity may be desired for strategic reasons.

Finally, the generally electric nature of renewable energy distribution brings own challenges. Electricity transport requires a physically interconnected grid and instantaneous balancing of demand and supply, storage being costly, and on the spot emergency response as accidents may cascade in a matter of seconds. These stringent managerial requirements make acquiring control over infrastructure development, operation and regulation a strategic priority. In addition, electricity grids tend to span countries and continents as electricity transport faces long-distance losses; power relations are likely to be regional rather than global. The interconnected and regional nature also affects the possibility to interrupt delivery to single countries. Lastly, while renewable sources may be a source of diversification away from oil and gas, in the long run an increasing electrification of the energy system is the opposite.

Towards Renewable Energy Security

Renewables' characteristics have specific energy security implications. Some of these are well-captured by existing framing of energy security dimensions, but others urge for an update.

If we look at geological availability, the notion should more explicitly consider availability at the right time and the possible shortages of rare earth materials currently employed in clean energy generation technologies. The matter of geopolitical access needs to include the storage difficulties of electricity (lack of efficient and sufficient strategic reserves) and the physically interconnected nature of electricity networks as opposed to diversification of source, origin, and route. The economic affordability dimension already captures such issues as price volatility and investment challenges, though price volatility is inherent rather than politically induced. The infrastructure resilience component should more explicitly include the difference between the managerial requirements of operating oil, coal, natural gas, and electricity infrastructures, and the size of the network (regional vs global). The existent environmental concerns and indicators become less relevant for renewables but do not disappear. Many GHG emissions are unnecessary for renewables, but local environmental effects (hydro power, biofuels) certainly remain. The use of rare earth materials, and the mining involved, also deserve inclusion, but mining hazards are well-established as an aspect. Social acceptance, finally, has already proven to be an important factor for decentral generation and new concerns over local empowerment by national governments certainly is a new aspect that begs inclusion.

Rethinking, Expansion or Different Emphasis?

Considering the novel challenges renewables bring to energy security, an update of the concept seem in order. While the dimensions of energy security do not require a complete rethinking, they certainly benefit from expansions to capture the concerns renewables raise. By and large, the infrastructure, economic and environmental dimensions seem well-attuned, but the availability, accessibility and social dimensions do not always capture renewables' specific concerns. Moreover, an increasing use of renewables is also likely to lead to a shift in emphasis from continuity of commodity supply to continuity of service supply. There is time for such an adjustment though, as renewables mostly alleviate energy security concerns of fossil fuels in the coming decades. Then again, renewables may well change the energy security landscape more than their share in the energy mix implies via the expectations that they bring, stranded oil assets being a case in point here.

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The 'Petroleum' of the 21st century: Water Security in the Face of Growing Population, Economies, and the Advance of Climate Change

By Benjamin Abbs

Benjamin Abbs is a graduate of King's College London and was the EUCERS undergraduate fellow in the 2015/16 academic year.

It is estimated by 2030 there will be a 40% shortfall in the global water supply.[3] Clearly this presents a major resource supply challenge, but of equal significance is the ability of local water tensions to quickly mushroom to have national, regional, and global political consequences.

While the quantity of fresh water in the world is not decreasing, population and economic growth is massively fuelling demand whilst global warming is increasingly affecting water distribution. In the past century, the world population has tripled, water use has increased six fold, and it is predicted that supplying a planet of 9 billion (population projection for 2050) would require at least 50% more water than we use today.[4] Economic growth further increases the strain on water resources through pollution caused by industrial growth and improving living standards which encourage more water-demanding lifestyles and diets (the average hamburger takes 2400 litres of water to produce).[5]

Global warming is affecting hydrological patterns, droughts and floods are more common. Of equal concern is 'water polarisation', the loss of 'relative hydrological stationarity'; the decline in our ability to predict the flow of the world's water based on historical patterns.

Water scarcity can have devastating consequences. A 2015 UN report, 'Water in the World We Want', concluded, "people do not have the luxury of living without water and when faced with a life or death decision people tend to do whatever they must to survive". Survival instincts are the original biological motivation for conflict and the report notes that the intensity of the impetus will create "new kinds of conflict" more vicious than most seen in modern warfare.[6] However, the most concerning effects of water scarcity is the somewhat abstract myriad of severe, but often subtly indirect, environmental, political, economic and social pressures it causes. These will influence stability around the world.

Water pressures can drive inter-state conflict. Chris Patten estimates that, as of 2011, over 30 countries depended on their neighbours for 1/3 or more of their water supply.[7] The Pacific Institute has noted a fourfold increase in the number of violent conflicts over water in the last decade.[8] Yet, this political turmoil rarely remains localised or even regionalised, often dragging in outside players. Indeed, it is fair to argue this has increasingly occurred in recent years in Middle East and North Africa (MENA region) as water has become more scarce. Violence and political turmoil have commanded global attention and intervention in the MENA region since the Arab spring in 2010/2011.

Water scarcity was a crucial cause of the Syrian Civil War which has now developed toward a proxy war between Russia and Iran against the US.[9] Syria's water resources halved between 2002-2008 and it suffered droughts from 2006-2010. These induced agricultural failure causing 1.5 million farmers to move to cities. These farmers were poorly skilled to enter an already strained, urban employment market; non-agricultural sectors of the economy had also deteriorated due to water scarcity. These farmers were to become the core component of opposition urban unrest as they blamed

[3] https://mic.com/articles/111644/why-water-shortages-are-the-greatest-threat-to-global-security#.gtzomUvJ7, accessed 09/01/2016.
[4] https://mic.com/articles/111644/why-water-shortages-are-the-greatest-threat-to-global-security#.gtzomUvJ7, accessed 31/08/2016.; http://www.newyorker.com/news/daily-comment/coming-water-wars, accessed 31/08/2016.
[5] http://environment.nationalgeographic.com/environment/freshwater/freshwater-crisis/, accessed 31/08/2016.; http://www.newyorker.com/news/daily-comment/coming-water-wars, accessed 31/08/2016.
[6] United Nations University, 'Water in the World We Want: Catalysing water-related sustainable development', (2015),8.
[7] Chris Patten, *What Next,* (London, 2008),240.
[8] https://www.theguardian.com/environment/2014/feb/09/global-water-shortages-threat-terror-war, accessed, 28/08/2016.
[9] http://www.bbc.co.uk/news/world-middle-east-26116868, accessed 12/10/16.

the government for not solving their plight.[10] The spark for the Syrian conflict was in fact over water distribution between the governor and inhabitants in the town of Daraa.[11]

This article shall now look at the possible future hotspots of water security that may negatively impact regions and the world.

Euphrates and Tigris Basin

Since 1975, Turkish dams have cut the amount of water reaching Iraq by 80% and Syria by 40%.[12] The water from these rivers is not just vital for Iraq and Syria's food and water, it is also important for their economies. For example, before the rise of ISIS, Iraq used 1.8 billion cubic metres of water a year in its oil industry. Once GAP is completed, it is estimated that half the water from the Tigris and Euphrates may never leave Turkey.[13] This forward Turkish foreign policy is likely to lead to political problems if stability returns to the region.

Regardless of these actions, water would have been a contentious issue in this region in the future. By 2050, Iraq's population is predicted to grow from 36m to 54m, Syria's from 23m to 36m, and Turkey's from 79m to 99m.[14] A conservative estimate is that over the coming years climate change will reduce rainfall by 20% and massively increase evaporation, halving the amount of water available per person in the Middle East.[15] Indeed, in 2014 there was less than half the normal rainfall in the Turkish highlands during the wet season.[16] The effects of climate change will be greater in some places, it is predicted weather patterns could result in desertification of 60% of Syria.[17] Unsustainable water management, which is profuse throughout the region, has deepened this crisis; between 2002-2009, agriculturalists dug 420,000 illegal wells in Syria, lowering the ground water and contributing to a halving of Syria's water resources in this period.[18] Turkish control of 'blue gold' with the completion of GAP would be an added dynamic to this already complex and growing problem.

The Jordan Valley

Syria, Jordan, Lebanon, Palestine and Israel all have vested interests and points of access to the Jordan river, Lake Galilee or the wider water basin. Control of water in this arid region has been a part of the many political conflicts in the area. The Arab League's plans to divert the Jordan, to deny Israel water, was a factor in the 1967 war. The territory Israel occupied during this conflict, such as the Golan Heights contributes 33% to Israel's sustainable annual water yield whilst denying this water to the Arab nations.[19]

Israel's predicted population growth alone is set to result in water demand outstripping supply by 40% by 2040.[20] Jordan's population will also increase from 7m to 12m.[21] Such population growth will fuel demand without a commensurate increase in supply; scientists predict that the Jordan river may shrink by 80% by 2100.[22] Considering the region's history, opposing beliefs and identities, inter-state antagonism is more likely than cooperation. Whilst the Jordan basin may be relatively small, in terms of geography and population, the significance of the friction between the ideologies and identities present could easily have global consequences.

The Nile

The Intergovernmental Panel on Climate Change has reported that water loss in the Nile could amount to up

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[10] http://www.smithsonianmag.com/innovation/is-a-lack-of-water-to-blame-for-the-conflict-in-syria-72513729/?no-ist, accessed 28/08/2016.; http://www.nytimes.com/2010/10/14/world/middleeast/14syria.html?pagewanted=print&_r=0, accessed 09/09/2016.; Chris Patten, *What Next,* (London, 2008),239.

[11] http://europe.newsweek.com/world-will-soon-be-war-over-water-324328?rm=eu, accessed 28/08/2016.

[12] https://www.theguardian.com/environment/2014/jul/02/water-key-conflict-iraq-syria-isis, accessed 09/09/2016.

[13] http://europe.newsweek.com/world-will-soon-be-war-over-water-324328?rm=eu, accessed 09/01/2016, accessed 09/09/2016.

[14] http://www.photius.com/rankings/world2050_rank.html, accessed 09/09/2016.

[15] http://blogs.worldbank.org/arabvoices/numbers-facts-about-water-crisis-arab-world, accessed 09/09/2016.

[16] http://europe.newsweek.com/world-will-soon-be-war-over-water-324328?rm=eu, accessed 09/01/2016.

[17] http://blogs.worldbank.org/arabvoices/numbers-facts-about-water-crisis-arab-world, accessed 09/09/2016.

[18] http://www.nytimes.com/2010/10/14/world/middleeast/14syria.html?pagewanted=print&_r=0, accessed 09/09/2016.

[19] Chris Patten, *What Next,* (London, 2008),241-243.

[20] Chris Patten, *What Next,* (London, 2008),241-243.; http://www.photius.com/rankings/world2050_rank.html, accessed 09/01/2016.

[21] United Nations, 'World Population Prospects, The 2015 Revision', *Department of Economic and Social Affairs Population* Division, (2015),20.

[22] https://www.theguardian.com/environment/2015/aug/27/middle-east-faces-water-shortages-for-the-next-25-years-study-says, accessed 09/01/2016.

to 78% by the end of this century due to global warming and exploitation.[23]

The ten African states within the Nile Basin are some of the poorest countries in the world. Their populations are also growing and far more substantially than Egypt. Ethiopia's population is expected to rise from 113 million to 188 million by 2050, Sudan from 40 million to 80 million, and South Sudan from 12 million to 26 million.[24] Economic growth will increase demand as industry and agriculture expand and hydroelectric projects are pursued. Ethiopia's economic growth averaged 10.8% between 2003-2014, it controls the upper reaches of the Blue Nile which contributes 59% of the water in the Nile in Egypt.[25] Such demographic and economic pressures are already creating tension in the basin; Ethiopia's construction of Grand Ethiopian Renaissance Dam, announced whilst Egypt was embroiled in the unrest of the Arab Spring, is already causing tension with Egypt and Sudan.[26] Further shudders in the political systems of the Nile Basin can be expected as water decreases in the face of rising demand in the context of widespread poverty.

The Punjab

The Indus Water Treaty (IWT), signed in 1960 and ending over 10 years of water disputes between India and Pakistan, is considered one of the most successful treaties to avoid a water-war. The treaty allocated the water in rivers and tributaries to India and Pakistan; each controls three of the six main rivers that enter the Indus. However, India is the main upstream riparian, giving it a strangle hold on Pakistan's water supply.[27] The long running territorial dispute between India and Pakistan, Kashmir, has a significant water facet; all the main rivers that enter the Indus begin in Kashmir.[28]

The future does not look pretty if large population growth compounds this hydrological development. Pakistan relies on the Indus for agriculture, and India uses hydroelectric dams for energy, these are increasingly incompatible needs. Pakistan's population is set to grow from 188 million to 309 million by 2050 and 90% of Pakistan's agriculture already relies on water from the Indus.[29] A water shortage would cause massive socio-economic convulsions; 44% of the workforce is employed in agriculture and the sector contributes 23% of GDP.[30] Pakistan-based Arshad H Abbasi, a trans-boundary water expert, states that there are serious violations of the IWT emerging as India is planning and constructing 155 hydro-projects in Kashmir.[31]

Water Crises in the Big Economies: China and India

India and China are already key global economies and are set to grow further; in 2015 the Chinese economy accounted for 17% of the global economy and India 7%; they are predicted to increase to 19.3% and 8.5% respectively by 2020.[32] The IMF refers to China as the locomotive of the global economy.[33] Global warming, poor water management, and growing populations and industry could result in economically inhibiting water shortages, causing convulsions in these states with the reverberations influencing the global economy.

[23]https://www.theguardian.com/global-development-professionals-network/2016/jan/27/from-the-nile-to-the-amazon-climate-change-threatens-hydropower, accessed 09/01/2016.

[24]United Nations, 'World Population Prospects, The 2015 Revision', *Department of Economic and Social Affairs Population* Division, (2015),22.; Chris Patten, *What Next,* (London, 2008),245-246.

[25]https://era.library.ualberta.ca/files/sq87bv237#.V3ui5_krJ9M, accessed 09/01/2016.; http://www.worldbank.org/en/country/ethiopia/overview, accessed 09/01/2016.

[26]http://shoebat.com/2015/03/23/the-nile-and-the-euphrates-are-drying-up-both-rivers-are-in-the-news-and-both-rivers-are-in-the-bible-an-inevitable-famine-is-plaguing-the-muslim-world/, accessed 09/01/2016.

[27]Chris Patten, *What Next,* (London, 2008),249-251.

[28]Chris Patten, *What Next,* (London, 2008),248-251.

[29]http://thediplomat.com/2016/06/kashmir-a-water-war-in-the-making/, accessed 09/09/2016.; United Nations, 'World Population Prospects, The 2015 Revision', *Department of Economic and Social Affairs Population* Division, (2015),22.; Chris Patten, *What Next,* (London, 2008),21.

[30]http://data.un.org/CountryProfile.aspx?crName=PAKISTAN, accessed 09/01/2016.; United Nations, 'World Population Prospects, The 2015 Revision', *Department of Economic and Social Affairs Population* Division, (2015),22.; Chris Patten, *What Next,* (London, 2008),21.

[31]http://thediplomat.com/2016/06/kashmir-a-water-war-in-the-making/, accessed 09/09/2016.

[32]http://www.economywatch.com/economic-statistics/India/GDP_Share_of_World_Total_PPP/, accessed 25/07/2016.; http://www.economywatch.com/economic-statistics/India/GDP_Share_of_World_Total_PPP/, accessed 25/07/2016.

[33]http://www.theepochtimes.com/n3/1930055-how-much-does-china-really-contribute-to-global-growth/, accessed 09/01/2016.

India

India has 18% of the world's population but only 4% of the world's renewable water resources.[34] Careful management of these resources will be needed as global warming accentuates India's water problems. India's economic performance is intrinsically linked to its water climate due to its environment, socio-economic structure, and population size. In April 2016 the 'above normal' rain forecast by the India Meteorological Society Department saw India's stock markets rally to its highest peak in 4 months.[35]

Parts of India face severe water problems from global warming. Between 2003-2009 northern India lost water at the fastest rate of anywhere in the world according to NASA's Gravity Recovery and Climate Experiment orbiters.[36] Two Successive dry years have left one quarter of the population – 330 million – facing acute water shortages.[37] The livelihood of 600 million Indians depends on agriculture and almost 2/3 of India's cultivated land relies on rainfall instead of irrigation.[38] Indeed, even meltwater, a significant contributor to the other 1/3, is at threat from global warming as the Himalayan glaciers have been melting at about 13.4 cubic kilometres every year since 1962.[39]

Poor management is compounding this growing problem. Reckless use and extraction of ground-water by farmers has lowered the water table by 0.3m/year on average across India, and by 4 metres in some areas.[40] Inefficient industrial plants in India consume between 2 to 3.5 times more water per unit of production compared to similar plants in other countries and the domestic water sector loses 30-40% of its total flow due to infrastructural faults.[41] While China has a larger population, it uses 28% less fresh water than India.[42]

While large water projects, such as the ambitious $165 billion water diversion scheme under construction, will make headway to resolve India's economic water scarcity it also needs to focus on encouraging local level solutions, awareness and efficiency.[43] The Agricultural sector should be targeted as it consumes 80% of water demand but also has the most inefficiencies.[44] Water hungry crops such as cotton and sugarcane are often grown in the water-starved regions. Age-old Rainwater harvesting techniques could allow monsoon rain to last the year, and check dams on riverbeds could improve groundwater levels. The government should be at the vanguard of raising awareness; using 10,000 litres of water to scrub the helipad to prepare for the arrival of a minister in Latur in April is not setting a good example.[45] India must confront its systematic problems to focus on the pressures of greater severity that are materialising. Climate change and population growth will seriously challenge its water security.

China

China's water is in the South, its agricultural core is in the North. A failure to meet water demand in China's agricultural North could have a spectrum of effects on the World. A less serious example would be in 2010/2011 when China bought up wheat on the international market in fear of a domestic shortage. China has only recently moved away from self-sufficiency in staple foods such as wheat. A crisis that engulfs two thirds of China's farmland, responsible for feeding the majority of 1.3 billion people, would have unimaginable consequences for domestic, regional and global prices and stability (in 2011 China bought wheat more in fear of having a shortage rather than actually having one).[46] One of the key security threats in a report

[34] Indian Ministry of Water Resources & Central Water Commission, *Guidelines for Improving Water Use Efficiency in Irrigation, Domestic & Industrial Sectors*, (November 2014), i.

[35] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed 08/02/2016.

[36] http://www.smithsonianmag.com/innovation/is-a-lack-of-water-to-blame-for-the-conflict-in-syria-72513729/?no-ist, accessed 02/08/2016.

[37] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed 09/09/2016.

[38] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed 08/02/2016.

[39] http://www.scientificamerican.com/article/is-india-running-out-of-water/, accessed 08/02/2016.

[40] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed 08/02/2016.

[41] Indian Ministry of Water Resources & Central Water Commission, Guidelines for Improving Water Use Efficiency in Irrigation, Domestic & Industrial Sectors, (November 2014), i.

[42] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed, 08/02/2016

[43] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed 09/09/2016.

[44] Indian Ministry of Water Resources & Central Water Commission, *Guidelines for Improving Water Use Efficiency in Irrigation, Domestic & Industrial Sectors*, (November 2014), i.

[45] http://www.economist.com/blogs/economist-explains/2016/05/economist-explains-11, accessed 08/02/2016.

[46] http://www.forbes.com/sites/chriswright/2014/02/11/when-chinas-food-runs-out/#772f075b3521

by the USA's National Intelligence Council was water and food shortages predicted in China by 2030.[47]
China's solution is a mega-project, the South-North Water Diversion Project. The centrepiece is a 1200km canal stretching from the Yangzi river to Beijing.[48]
The gap between water supply and demand is large and will grow fast with a growing population and industrial sector.[49] According to a report by the World Bank in 2009, China was using 10x more water per unit of production than the average in industrialised countries. Poor industrial management has polluted China's water; 70% of China's rivers and lakes are polluted to some degree and 28% are too polluted for irrigation.[50] These problems are becoming more pressing as climate changes causes supplies to dwindle.

Conclusion

The UN's 2015 water report estimated that within a decade 2.9 billion people across 48 countries will be facing water shortages that could destabilize and jeopardise "very existence" of some states.[51] It seems plausible that the 21st century could be dominated by the subtle consequences of water security. The Middle East, the region most affected so far, and who's issues have dominated the young 21st century, is set to become more water stressed. The World Resource Institute estimates that, of the 33 states that will be seriously affected by water shortages by 2040, 14 are in the Middle East, and 9 of those scored 5.0 out of 5.0 in the Institute's severity prediction meter.[52]

While policymakers should bear these issues in mind, perhaps the biggest challenge is awareness. Public knowledge about the less tangible effects of water stress should be developed. Furthermore, it is healthier to discuss how poor management, pollution, population and economic growth are also contributing to water shortages, not just climate change. Presenting a problem as a result of a huge phenomenon does hardly encourage local or individual action. This needs to change.

DISCLAIMER

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[47] http://fortune.com/2012/12/14/2030-chinas-coming-water-crisis/, accessed, 25/07/2016

[48] http://www.economist.com/news/leaders/21620202-vast-new-waterways-will-not-solve-chinas-desperate-water-shortages-grand-new-canals, accessed 25/07/2016

[49] http://fortune.com/2012/12/14/2030-chinas-coming-water-crisis/, accessed, 25/07/2016

[50] http://fortune.com/2012/12/14/2030-chinas-coming-water-crisis/, accessed 25/07/2016

[51] United Nations University, 'Water in the World We Want: Catalysing water-related sustainable development', (2015),28,73.; https://mic.com/articles/111644/why-water-shortages-are-the-greatest-threat-to-global-security#.l9adQyxIy, accessed 09/01/2016.

[52] http://www.wri.org/blog/2015/08/ranking-world%E2%80%99s-most-water-stressed-countries-2040

ANNOUNCEMENTS

Save the Date: 3rd EUCERS/KAS Energy Talk on "Industrial Carbon Performance - European and Global Perspectives" on **14th of June 2017**.

Join us for the 3rd Energy Talk 2017 on "Industrial Carbon Performance – European and Global Perspectives".

Report: The role of natural gas in the EU energy mix in context of the Paris Agreement 2nd EUCERS/KAS Energy Talk 2017

The second EUCERS/KAS Energy Talk on the 6th of April 2017 offered an overview of the future of natural gas in the EU and the degree to which the prospects of natural gas are impacted by the Paris Agreement. This overview draws on the inputs provided by experts from the industry, academia, consultancy, governmental and intergovernmental sectors during the talk organized by the Konrad Adenauer Stiftung (KAS) in London and European Centre for Energy and Resource Security (EUCERS) at King's College London. The event was chaired by **Professor Dr Friedbert Pflüger**, Director of EUCERS. As Professor Pflüger pointed out, gas is often regarded as a partner of renewable energy in helping countries meet their emissions reduction goals under the Paris Agreement. The data released by the Energy Information Administration (EIA) shows that starting with 2005 the presence of natural gas in the energy mix prevented over a billion metric tons of CO2 from being released by power plants in the US 2015 . Gas can be a bridge fuel to a decarbonised world, but there is a lot of uncertainty regarding how durable is this role.

In tackling climate change, energy systems need to undergo transformations, as according to the International Energy Agency the energy sector accounts for two-thirds of greenhouse-gas emissions. Gas is predicted to maintain its share in the global energy mix at least until the mid of the century. Even the most pessimistic predictions when it comes to natural gas in Europe (for instance, the results of the modelling exercise conducted by the European Commission) point to the fact that natural gas will account for 22% of the EU final energy consumption in 2050 . European oil and gas majors are already taking measures to increase the share of natural gas in their portfolio. However, there is substantial uncertainty related to what happens after 2050. **Dr Bernd Biervert**, Deputy Head of Cabinet to the Vice-President of the European Commission for the Energy Union, indicated that natural gas will continue to play for the medium term a very important role in the energy mix of the European Union. In the long term, given the EU decarbonization objectives, the role of gas will have to diminish. However, the long term prospects of gas will depend on the ability of gas to make a contribution to new sectors, such as transport that is currently dominated by oil, and on advances in the Carbon Capture and Storage (CCS) technologies, which benefit in the aftermath of Paris from substantial support from governments, financial institutions and energy companies.

While gas can help the EU decarbonise its economy and reach climate commitments made under Paris, it also increases the European Union's dependency on energy imports. Gas constituted 21% of overall EU gross inland energy consumption in 2014 . The EU's gas imports will most likely increase in the foreseeable future as domestic gas production is declining and there are little prospects for a European shale gas revolution to replicate the revolution taking place in the US in the last few years. Dr Biervert pointed out that there is a declining domestic production in the Netherlands and in the UK which increases the need for imports and makes the EU a sought after energy market from the perspective of exporters. In the medium term, the demand for gas will most likely stay stable around 400 bcm/year. Will a greater reliance on natural gas render the European Union more dependent on external energy sources and, implicitly, more energetically insecure? **Andrew Grant**, Senior Analyst, Carbon Tracker Initiative indicated that the EU is due to remain a heavy net importer of natural gas with 40% of its imports coming from Russia and a way to increase its security of supply can be to use less gas. According to Dr

Biervert, currently existing gas import infrastructure is sufficient to cover the EU gas import projections, if also the LNG import capacity is included. The existing infrastructure can handle 680 bcm/year. On the other hand, interconnectors internal to the EU are missing, for instance, interconnectors between the Iberian Peninsula and continental Europe. There is also missing diversification infrastructure in Southeast Europe and several bottlenecks in this region are currently addressed by the European Commission.

The prospects of gas in the EU energy mix until 2050 depend to a substantial degree on the competitiveness of gas in relation to coal, especially in power generation. Gas-fired power plants produce on average half of the carbon dioxide emissions produced by coal power plants when generating the same amount of power so gas is arguably preferable from an environmental perspective. **Dr Frank Umbach**, Research Director at EUCERS, challenged the fact that gas imported into Europe has, overall, a lower environmental footprint pointing to the fact that we need to look at the footprint of gas across its entire life cycle and not only at the emissions produced in power generation facilities. Dr Umbach argued that as domestic gas production is declining, the EU would have to replace domestic coal with imported gas. For the gas imported from the Yamal Peninsula, for instance, the life cycle emissions for domestic coal and imported gas are about the same. Umbach argued that, in this case, one reduces European emissions by importing gas and not using coal, but does not do much for global emissions generated also in the process of gas extraction and transport. Even if a stronger environmental case can be made for gas, in the absence of proper carbon pricing and a functional EU-ETS, coal remains a cheaper source of power generation.

The talk also touched on the role that natural gas can play in the national energy mixes. The case of Germany is particularly interesting to examine as Germany plans to phase out its nuclear power plants by 2022, opening a window of opportunity for other energy sources. Input on the case of Germany was provided in particular by **Dr Joachim Pfeiffer**, Member of the German Bundestag and Spokesperson for Economy and Energy of the CDU/CSU Parliamentary Group and by **Dr Timm Kehler**, Chairman of the German Natural Gas advocacy, Zukunft ERDGAS. Dr Pfeiffer argued that gas (be it conventional, unconventional natural gas or biogas) is a natural partner for renewable energy in the process of energy transition. Dr Pfeiffer argued that gas is a flexible fuel and can make a contribution to the power and transport sectors (in particular the shipping sector). By contrast to nuclear, coal or oil, gas infrastructure can be used not only for the fossil age, but also to transport hydrogen or biogas or a mix of different gases and the gas pipeline infrastructure is not limited to the fossil age. Pfeiffer stated that, from a German perspective, there cannot be enough pipeline infrastructure. In this regard there is a lot of support in Germany for the Russia-sponsored Nord Stream 2 (an addition of Nord Stream 1, a pipeline bringing natural gas from Russia to Germany, and implicitly to the Western European market, under the Baltic Sea). He also argued that the gas relation with Russia entails a two-way dependency where Europe needs gas, but Russia also needs customers and that the Russians came to realise that it is not easy to switch to other markets, such as China. Dr Pfeiffer showed a lot of optimism when it comes to the future of gas in the energy mix.

Dr Timm Kehler showed less optimism and pointed out the fact that Germany is failing to reach its 2020 climate targets. This is partly due to the low carbon prices supported by the EU-ETS not motivating a fuel switch (from coal to natural gas, for instance). And so gas is being squeezed out of the energy mix. In the current German policy, which is very much focused on energy efficiency and renewables, the incentives for fuel switch are missing, according to Kehler. From the beginning of the century, emissions did not decrease in Germany in the transport sector and this is an area in which improvements can be made. The frontrunners in decarbonisation are the industry and the households where a fuel switch from oil to gas took place. By 2022, Germany will phase out nuclear power facilities and it is not clear what will replace nuclear fuel in power generation. There is no clear strategy on decarbonising the electricity sector and

Germany is still relying substantially on domestic lignite in electricity generation. Germany is heavily subsidising renewable energy and faces the highest electricity costs in Europe, after Denmark. At the same time, the public support for the Energiewende in Germany is declining as indicated by polls, mainly because of high costs and because people think the process is not well managed.

Professor Dr Mike Bradshaw, Professor of Global Energy at Warwick Business School, tackled in his panel intervention the role of natural gas in the UK energy mix. He indicated that by 2025 coal will be gone from the energy mix and the question is, if you cannot use gas to replace coal, what does gas then do and how is gas then going to be compliant with the UK Climate Change Act of 2008 and the Paris Agreement? Quoting a study conducted for the UK Energy Research Centre on the future role of natural gas in the UK, he argued that gas is unlikely to act as a cost-effective bridge to a decarbonised UK energy system. The scenario in which the UK emissions reduction target is met (80% by 2050) and where there is significant gas demand in the UK is that in which gas is decarbonised. CCS is a must for an important gas presence in the UK energy mix. Professor Bradshaw argued that in the UK and European context it is simply not enough to replace coal with gas so instead of talking about gas as not being as bad as coal, we need to look at decarbonising gas. In the story of decarbonising gas it is important to deal with issues such as fugitive methane and properly analyse life cycle emissions associated with the gas supply chain. If gas is to have a future, it needs to be a decarbonised form of gas, concluded Professor Bradshaw.

Engaging in predictions when it comes to the future energy mix is tricky as technological breakthroughs (such as hydraulic fracking) can be true game changers. **Andrew Grant**, Senior Analyst, Carbon Tracker Initiative, pointed to the fact that one of the challenges in making predictions is that gas ticks a lot of boxes, it is good in a lot of aspects, without necessarily being the best in any of them (for instance is lower-carbon than coal, but not less than renewable and nuclear energy) and this leaves it open to being sandwiched between different fuels and other priorities.

The talk also covered financial incentives that can support a greater role for natural gas in the European energy mix. The Paris Agreement is already triggering changes in national and EU investment frameworks applicable to the fields of energy and climate. The industry itself started to invest more in R&D and to change its business model. **Richard Chatterton**, who leads Bloomberg New Energy Finance's research on global commodity markets and climate policy risk, pointed to the fact that investment in gas extraction and transport infrastructure is made for 2-4 decades so the future gas demand equation is seriously taken into consideration by the industry and investors. He argued that it is the decline in the costs of renewable energy that is going to force change in the power generation mix rather than any policy decisions on prioritising gas or prioritising CCS. Chatterton pointed out that the real value that gas can provide to the system is not in generation, but flexibility and its endurance will depend on its ability to cope with competitors that can generate flexibility (batteries, supergrids, bulk storage, etc.).

The introductory statements were followed by a lively discussion with participants from the energy industry, media, academia and policy-makers. Topics such as changes in energy financing under Paris and industrial carbon performance, that the 2nd KAS energy talk touched upon, will be explored each in additional detail during the next two talks of the series.

EUCERS ON THE ROAD

Our team represents EUCERS at various conferences and events all over the world. This section gives a regular update and overview of conferences and interview contributions by EUCERS Director Professor Dr Friedbert Pflüger, Research Director Dr Frank Umbach and Associate Director Dr Adnan Vatansever, as well as by our Research Associates.

24.04.2017 Hanover, Germany	Friedbert moderated a panel discussion with Secretary of State Rita Schwarzelühr-Sutter of the Federal German Ministry for the Environment, Nature Conservation and Nuclear Safety on "The Climate Protection Plan of the German Federal Government - From the Cabinet Decision to Climate Legislation" during the forum "Life Needs Power" at the Hannover Messe 2017.
24.04.2017 Hanover, Germany	Friedbert chaired the German-Polish Energy Forum in Hanover, which focused on the topic of "Electro Mobility in Germany and Poland - Perspectives and Cooperation".
30.03.2017 Singapore	Frank gave a presentation on "The South China Sea Conflicts and its Energy Dimensions" the Rajaratnam School of International Studies (RSIS) at the Nanyan Technological University (NTU).
28.03.2017 Singapore	Frank gave a presentation on "The Global Gas Oversupply and Its Impact on Europe and Asia: Where will the U.S. LNG Exports Go?" at the Energy Studies Institute (ESI).

IN THE MEDIA

Research Director Frank Umbach gave an interview about EU-Russia energy relations to the GASPacho Podcast of the University of Passau's working group on security policy.

Part 1: https://soundcloud.com/gaspacho-podcast/eu-russian-energy-security-grab-em-by-the-pipeline

Part 2: https://soundcloud.com/gaspacho-podcast/eu-russian-energy-security-grab-em-by-the-pipeline-teil-2 17. April 2017

PUBLICATIONS

Umbach, Frank, "Chinas neue geopolitische "Seidenstraße-Initiative" ("China's new geopolitical 'Silkroad-Initiative'"), in: Europäische Sicherheit & Technik (ESUT), April 2017, pp. 23-25 (http://www.esut.de/esut/aktuelle-ausgabe/).

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