Facing the Challenges of Climate Change: The Case of South Africa and its Potential Collaboration with Other Southern Economies

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As a result of important changes in the global geo-political landscape, there is a need to explore new areas of engagement between traditional actors and new partners on issues of international concern. The challenge of climate change is well beyond the capacity of any one country or region to tackle alone. It is a common challenge that requires the promotion of mutual trust and a sense of a common destiny.

South Africa has become an increasingly significant global actor and a key promoter of equitable global environmental governance structures. South Africa is looking for partners, both traditional and emerging, that share similar challenges of dealing simultaneously with energy security, climate change and socio-economic development. These common foreign policy issues have become key pillars around which the South African government has sought to find potential allies and appropriate forums for dialogue with key Southern partners, or with allies that offer support in dealing with national concerns.

Looking at the level of national scenarios and mitigation pledges it is clear that there are stark differences in each country's approach and level of ambition. Some see themselves as being more responsible for addressing global challenges and take the lead; others are happier to follow. South Africa, for example, is by far the largest emitter of greenhouse gases in Africa with the majority of its emissions originating from the energy sector, a key facet of its economic structure. South Africa's climate question simultaneously involves energy (carbon and development). Its national response is motivated by the strategic dilemma of how to balance factors such as development and poverty alleviation goals, energy access and security and international competition against pressures to curb greenhouse gas emissions. Because of South Africa's energy dependence on fossil fuels it needs to participate in co-operative

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alliances both for political support in pushing its agenda but also co-operate for alternatives to coal, namely renewable energy technologies.

Thus far South Africa has formed alliances with similar emerging economies that share some of its development priorities. These shared economic, developmental and security implications have generated a perceptible shift in the way that decision-makers in the South are talking about climate change, as well as the way they are beginning to co-operate at a myriad of levels. This includes co-operation: to develop comprehensive international strategies to manage mitigation through common but differentiated responsibilities; to share the most innovative approaches for adaptation; to administer shared resources and technologies; and to cope with insecurity and climate-related development challenges.

South Africa increasingly projects its power in the international scene through multilateral institutions by building multilateral or bilateral alliances with countries that share similar international interests and objectives. In particular (in classic 'middle power' fashion) South Africa is increasing its voice and visibility through institutions which have been traditionally dominated by the 'great powers' – like the United Nations and the World Trade Organization – and newer grouping such as the India-Brazil-South Africa Dialogue Forum (IBSA)[1], the BASIC group comprising Brazil, South Africa, India and China (BASIC) and the G8+5 group invited to attend G8 talks. All offer platforms for alliances, provide opportunities for grandstanding and enable as well as devising positions based on shared interests, values and capabilities. For a more detailed list of partnerships, please see Appendix 1.

Despite being a vocal negotiator at the international climate talks, South Africa is often reluctant to speak on behalf of the continent – especially given the stark disparities between itself and its neighbourhood. In this regard, South Africa is more likely to form partnerships and co-operative alliances to push an agenda, rather than pursue a self-interested agenda with unilateral ownership of a process.

While a global deal is far from being concluded, there are issue items and thematic agreements that are non-politicised and can be addressed by informal coalitions and alliances. In the absence of a binding agreement, other practical and technical measures are still possible, including the exchange of climate data and information, comparison of practices and capacity building. After all, BASIC countries are sites of innovation in key areas of energy alternatives and agricultural development, and have valuable best practices methods to share.

In order better to understand the feasibility and likelihood of these alliances, it is necessary to explore the national climate scenarios and experiences of individual member states. This chapter will interrogate the scope and nature of South Africa's emissions profile and analyse the challenges it faces in

[1] See http://www.ibsa-trilateral.org/ (accessed 31 March 2011).

adopting a more stringent carbon reduction targets. It is interesting to analyse what South Africa's approach is to curbing climate change at the national level and what role it pursues at the regional and international level in climate negotiations – for example: whether South Africa plays a leadership role in the developing-country alliances; whether it is a key player in the international debate on climate change; who are South Africa's natural partners in this debate and why?; and what concrete areas exist for the potential collaboration in technology transfer, best practice in adaptation schemes, pre-emptive disaster mechanisms and information sharing.

Given South Africa's ambitious foreign policy, there is also an expectation that it will play an important role at the multilateral level and that it will use its capabilities and capacity to represent the region's interests and the developing countries more broadly. In order to pursue South Africa's aspirations for international status it will have to act responsibility and make pledges at the global level.

South Africa as a Global Carbon Dioxide Emitter

South Africa is the largest emitter of greenhouse gases in Africa, primarily because of the relative size of its economy, its large manufacturing and industrial base, and its dependence on coal for energy. It is responsible for 39 percent of emissions on the continent,[2] and is one of the greatest sources of pollution on a per capita basis in the developing world.[3] In 2004, South Africa emitted 436.8 million tonnes of carbon dioxide (CO_2), equalling 9.8 tonnes per capita.[4] South African parastatal electricity producer, Eskom, alone generates about 350 million tonnes of CO_2 per annum.[5]

While South Africa's progress towards energy sustainability does not fare well on indicators such as per capita carbon emissions, particulate concentrations, clean energy investment, energy intensity and the use of renewable energy sources; South Africa, like most developing countries, faces particularly acute challenges given the internal disparities in income and sustainable living and the make-up of its industrial and energy complex. In order to reduce its emissions significantly, South Africa would have to seriously reconsider its

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[2] UN Economic Commission for Africa, *Harnessing Technologies for Sustainable Development* (Addis Ababa: UNECA, 2002), p. 33, available online: http://www.uneca.org/harnessing (accessed 31 March 2011).

[3] UN Development Program, 'Indicators: CO_2 emissions, total (Mt CO_2)', available online: http://hdrstats.undp.org/indicators/232.html and 'Indicators: CO_2 emissions per capita', available online: http://hdrstats.undp.org/indicators/237.html.

[4] Ibid.

[5] B. Unmüβig and S. Cramer, 'Climate change in Africa', *GIGA Focus*, Vol. 2 (2008).

current energy and industrial trajectories as carbon dioxide from the supply and use of energy is the biggest contributor to emissions in South Africa. The economic structure is energy intensive because of heavy industries like mining, an inefficient fossil fuel electricity supply system and sprawling urban areas. South Africa's mineral-energy complex, for example, comprises large scale primary extraction, minerals processing and linked industries based on mining and beneficiation, underpinned by some of the cheapest electricity in the world.[6] In its growing big cities, transport emissions have increased substantially over the past few decades.

It is also important to realise the importance of the South African economy to the region. South Africa is an economic hegemon, generating two-thirds of the gross domestic product of the Southern African Development Community (SADC) and 60 percent of all intra-SADC trade in sectors like mining, electricity, oil and gas. South Africa's economic success has major implications for the entire region and until recently South African electricity was inexpensive by international standards, making other energy sources less competitive. Against that, cheap electricity has been an important incentive for attracting international investors to the region.

For a country like South Africa, which has poverty alleviation and job creation as its top priorities, the challenge of reducing emissions while retaining competitiveness remains daunting. However, South Africa recognises an unwillingness to commit to mitigation responsibilities will have negative reputational and competition risks for its economy. Its carbon-intensive exports will also be negatively affected by international border-tax adjustments. Of South Africa's greenhouse gas emissions, 40 percent originate from export-related goods, predominatly precious minerals and resources.[7]

Coal provides 72 percent of South Africa's total energy mix[8] and, in 2008, more than 90 percent of electricity. Eskom produces almost all its electricity through coal-fired power stations, including the production of 45 percent of the continent's electricity,[9] including supplies to the neighbouring countries of Swaziland, Mozambique, Zimbabwe, Botswana and Namibia.[10]

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[6] Fine and Rustomjee, *South Africa's Political Economy: From Minerals-Energy Complex to Industrialisation*, (London: Hurst, and University of Wits Press, 1997).

[7] Developed countries are generally net importers of CO_2 emissions, as emissions associated with production are lower than emissions associated with consumption. For developing countries, more greenhouse gases are emitted in production than in consumption.

[8] Imported oil accounts for only 20% of primary energy used, mainly for transport .

[9] Eskom, *Together, rising to the challenge. Annual Report 2008.* (2008) Available online: http://financialresults.co.za/eskom_ar2008/ar_2008/downloads/eskom_ar2008.pdf (accessed 31 March 2011).

[10] Eskom generates 5% of its electricity for use outside South Africa.

In industry, coal is also used, among other things, to produce coke for the steel industry, steam and synthetic liquids. According to statistics from the International Energy Agency (IEA), South Africa's two commercial-sized coal-to-liquids plants (Sasol II and Sasol III) can produce 150,000 barrels of fuel a day, supplying 36 percent of the country's total petroleum fuel requirements.[11]

It is therefore evident that the South African economy is highly dependent on income from producing, processing, exporting and consuming coal. According to Keaton Energy, South Africa is the fifth-largest producer in the world and the fourth-largest exporter.[12] In 2007, South Africa had proven coal reserves of 48 000 million tonnes.[13]

Emissions relating to coal, considered a dirty energy source, make up more than 40 percent of South Africa's total emissions.[14] Sasols' Secunda plant is the world's second-largest single emitter of CO_2, having emitted approximately 73 million tonnes of greenhouse gas in 2008.

Climate Change Challenges Facing South Africa: Present and Future

While the energy sector generates a massive percentage of the South Africa's greenhouse gas emissions, a huge number of households are still without electricity: approximately 30 percent). More challenging still is that alternatives to coal-based electricity are expensive. South Africa has little or no hydro-electricity potential, and for security reasons the country cannot depend solely on countries in the region with an abundance of hydro power. Solar and wind power are only viable in areas remote from the national grid.. Alternatively, fossil-fuelled thermal power stations can be easily renewed or built more quickly than nuclear ones, and South Africa's export potential is being boosted by increased international demand for low-grade coal.

South Africa has been looking to the region for alternatives to coal: hydroelectricity from Cahora-Bassa in Mozambique and the Great Inga

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[11] International Energy Agency, 'IEA energy statistics: Energy indicators for South Africa', (2009), available online: http://www.iea.org (accessed 31 March 2011) and International Energy Agency, "Investment in coal supply and use' (November 2005).

[12] Keaton Energy, available online: http://www/keatonenergy.com/cm/why_coap.asp (accessed 19 September 2008). The current level of proven coal reserves world-wide stands at roughly 850 billion tonnes, of which about 50 billion tonnes occur in Africa. Coal is much more widely distributed geographically than any other fossil fuel.

[13] Renewable Energy and Energy Efficiency Partnership, 'The Republic of South Africa' (Imbewu Sustainability Legal Specialists (Pty) Ltd, 2009).

[14] Department of Environment and Trade (Republic of South Africa, 2004).

Dam project in the Democratic Republic of the Congo. Mozambique is also providing natural gas to Sasol in Secunda.

However, despite the myriad opportunities and abundance of natural resources indicated above, regional co-operation is limited and the Southern African Power Pool has produced delayed results. The region does not produce clean technologies, relying on expensive imports. It lacks expertise and governance is still a challenge. Instability and civil war have stalled progress. The Inga megaproject centralises much of Africa's electricity sources and requires transmission lines through politically unstable regions. Dams, power plants and transmission lines are often targeted in political conflicts.

In South Africa's pursuit to find a cost-effective solution towards a global transition to a low-carbon economy, there is much scope for co-operation with international partners.

The country is also looking to a variety of international partners to provide it with nuclear facilities (such as France, China and Germany), coal efficiency technology and storage (such as Australia and Norway) and renewable energy technologies and components (such as China, Israel, Germany and Spain).

Assessing Future Mitigation Options for South Africa

In 2006 South Africa's then Department of Environmental Affairs and Tourism initiated an ambitious exercise to determine an appropriate national climate change response. It created long-term mitigation scenarios aimed at identifying South Africa's main carbon mitigation options. This showed that these conclusively lie in the energy sector, particularly in shifting away from coal.[15] The country, with some of the best natural resources in the world, has committed to a target of 10,000 GWh of electricity from renewable energy resources by 2013 – essentially 5 percent of the electricity mix. Critics charge that government has achieved only a small portion of its initial target after six years – and that the goal was less than ambitious anyway. If the target were achieved by 2013 it is estimated that it will generate more than 35,000 jobs, add R5 billion to GDP and R687 million to the income of poor households.[16]

At a national renewable energy summit from 19-20 March 2009 in Pretoria, the Energy Minister indicated that more ambitious targets for 2013–18 should be set, starting at 6–9 percent and rising to 9–15 percent of South

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[15] Winkler (ed), 'Long Term Mitigation Scenarios: Technical Report', (Pretoria: Energy Research Centre for Department of Environment Affairs and Tourism, October 2007), available online: http://www.erc.uct.ac.za/Research/publications/07-Winkler LTMS Technical% 20Report.pdf.

[16] G. Prasad and E. Visagie, 'Renewable Energy Technologies for Poverty Alleviation: Initial Assessment Report: South Africa' (Cape Town: Renewable Energy Technology Working Group, Global Network on Energy for Sustainable Development and Energy Research Centre, University of Cape Town, June 2005).

Africa's energy mix.[17] By pursuing a higher target, most likely dominated by large-scale rollout of concentrating solar power, South Africa's greenhouse gas emissions may (if other mitigation action is pursued) peak and then stabilise by 2025.

South Africa's long-term mitigation scenarios process provides a basis for a broadly supported, robust policy. A South African climate change summit in Midrand in March 2009 also saw the adoption of an ambitious National Climate Framework. This framework – named 'Draft Zero' – incorporated: the government's vision, individual responsibilities of key ministries, a strategic framework and a timetable for action. –Draft Zero will underpin future policy decisions and will be used to inform its international negotiating position.[18] By 2012 it is hoped that policy will be translated into national law.

South Africa in International Climate Change Negotiations

These key developments in climate policy at the national level must align and reinforce South Africa's international position and commitments.

In current climate change negotiations there is increasing pressure on non-Annex I[19] polluters to initiate their own mitigation strategies and to participate more actively in climate change regimes. While South Africa agrees that developing countries have a substantial role to play in greenhouse gas emission reductions (especially because future emissions are likely to be dominated by the growth in developing countries), it also highlights the development challenges faced by all developing countries and recognises that any additional constraint on growth creates a further burden. In this regard South Africa has been playing a significant role at the United Nations Framework Convention on Climate Change (UNFCCC) negotiations. It was the first country openly to contemplate international commitments on mitigation and subsequently initiated the concept of nationally appropriate mitigation actions that are measurable, reportable and verifiable.[20] In January 2010, South Africa

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[17] Speech by Ms Buyelwa Sonjica MP, Minister of Minerals and Energy at the Renewable Energy. Summit (Centurion, Gauteng: 19 March 2009), available online: www.dme.gov.za/pdfs/speeches/2009%20RENEWABLE%20ENERGY%20SPEECH.pdf.

[18] Ministries are currently conducting greenhouse gas inventories of various sectors, including agricultural and transport, to facilitate the adoption of the second national climate change response.

[19] 'Non-Annex I' countries refer to developing countries that do not have legal obligations to reduce greenhouse gas emissions in the Kyoto period 2008–12 for developmental reasons. This is a UNFCCC classification.

[20] R., Worthington. WWF ' Cheaper electricity with renewable energy: Costing a 15% target for 2020 for South Africa', published by WWF Living Planet unit (1986) available online: http://assets.wwfza.panda.org/downloads/cheaper_electricity_with_renewable_energy.pdf (accessed 31 March 2011).

signed the Copenhagen Accord and pledged to cut its emissions by 34 percent below business as usual emissions by 2020 and by 42 percent by 2025 conditional on financial and technical assistance, as well as on technology transfer.[21]

South Africa plays a leading role in the Africa Group at the UNFCCC negotiations, insisting on more funding for adapting to climate-related impacts for those least responsible for climate change yet those most vulnerable to its effects. South Africa insists that contributions to the Adaptation Fund should be in addition to existing development assistance and that the fund should be transparently governed with equal board representation of developed and developing countries. South Africa's negotiating team is also vocal on building capacity, transferring technology and increasing funding for cleaner technologies.

South Africa is a vocal member of the G77+China Group, pushing for 'climate equity' and 'climate justice'.[22] It believes that countries responsible for historical emissions should bear the brunt of obligations to reduce emissions; in addition emission reductions should be based on the most ambitious scenarios of the Intergovernmental Panel on Climate Change (IPCC). South Africa suggested that Annex I countries reduce 1990 emissions by at least 40 percent by 2020 and by at least 80 percent by 2050. South Africa's former Environment Minister Marthinus van Schalkwyk also spoke about a post-Kyoto regime with comparable targets and binding compliance, recognising the importance of incentives. He emphasised that developing countries should accept their share of responsibility, albeit in a differentiated way, taking their current level of development, economic growth, population or industrialisation into account.[23] South Africa, for example, contributed only 1 percent of global greenhouse gas from 1950 to 2000 and currently contributes 1.5 percent.[24] This is a small contribution compared to other developing nations. Africa on the other hand, in its entirety only contributes 3 percent of global emissions.

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[21] A list of Copenhagen Accord pledges are available online at: http://unfccc.int/home/items/5265.php (accessed 31 March 2011).

[22] 'Climate equity' or 'climate justice' refers to a just division of responsibilities by historical polluters. It is important that the Southern group places pressure on Northern emitters to adhere to stricter commitments.

[23] See for example: 'Speech delivered by Marthinus van Schalkwyk, Minister of Environmental Affairs and Tourism, at the National Climate Change Summit' (3 March 2009) available online: http://www.info.gov.za/speeches/2009/09030316451001.htm (accessed 31 March 2011).

[24] 2005 data from the World Resources Institute, available online: http://earthtrends.wri.org/pdf_library/data_tables/cli1_2005.pdf (accessed 31 March 2011).

South Africa was president of the Bureau of the African Ministerial Conference on the Environment from June 2008 to June 2009.[25] At its conference in Johannesburg in June 2009, Minister Van Schalkwyk called for 'an African Road Map for climate negotiations' and for serious commitment to the Bali Strategic Plan for technology support and capacity building. Although other countries in the region do not face the same political pressure for mitigation reductions, South Africa identifies with their adaptation needs and places regional concerns as an important foreign policy priority. South Africa is very aware of its regional image and therefore acts as an advocate for the region and for the continent. It brings a well-qualified negotiating team to push developed countries for more financial and technical commitments.

Developing country alliances seems a functional way for South Africa to achieve national goals. South Africa believes that developing countries should forge a common position to resolve key problems such as ensuring that a greater financial burden is born by industrialised countries that have historically high emissions, as well as to place heightened political pressure on countries like the US, Canada, Japan and Australia to make further mitigation commitments. The BASIC alliance emerged as a powerful negotiating force in the Copenhagen talks. South Africa, along with its partners China, Brazil and India, sought to protect the interests of fast-developing nations responsible for a growing percentage of the world's emissions. The group helped broker an agreement that has come to be known as the Copenhagen Accord, though South Africa did express disappointment in the deal. This Accord shows the commitment of countries voluntarily to reduce emissions and to make their reduction efforts subject to international review.[26]

Besides its role in BASIC and the African Group, South Africa is also an important member of the IBSA forum on energy and climate change and the G5/Outreach grouping.[27] It also plays an active role in the Major Economies Forum on Energy and Climate and within the G20.

As South Africa is by far the largest emitter of greenhouse gas in Africa with the majority of its emissions originating from the energy sector, South Africa's cheap but dirty electricity gives it a competitive advantage with energy-intensive sectors.

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[25] The African Ministerial Conference on the Environment was established in December 1985, after an environment meeting in Egypt. Its mandate is to advocate for environmental protection in Africa; to ensure that basic human needs are met adequately and sustainably; to ensure that social and economic development is realised; and to ensure that agricultural practices meet the food security needs of the continent.

[26] L. Friedman, 'South Africa wants to cut emissions, but lacks policies to match its rhetoric', *The New York Times*, (5 January 2010).

[27] The 'Group of 5' is an alliance consisting of China, India, Brazil, Mexico and South Africa. BASIC has the same membership with the exclusion of Mexico.

However, the country's large carbon footprint, particularly per capita, means that the international community calls on it to demonstrate responsible behaviour for the common good. As a large developing country, it will no longer be exempt from compulsory mitigation commitments under a post-Kyoto regime. Approaching future negotiations, it needs to consider innovative ways to retain economic growth and competitive advantage without jeopardising the environment that this development is based on. This can be done by taking advantage of its natural resources (particularly solar and wind) and investing in the research and dissemination of these green technologies. This can be enhanced through partnerships with like-minded states from the North and South.

South Africa is playing a positive role in climate change negotiations internationally and has clearly committed itself to a binding multilateral agreement that honours the principles and intent of the UNFCCC. At the same time it also remains dedicated to the developing world, pushing for climate equity and mobilising additional resources for climate change adaptation.

South Africa's approach to the climate challenge at the international level is driven by important domestic realities, political and economic. Thus, its participation at the UNFCCC is informed by the possibilities and limitations revealed in the long-term mitigation scenarios process which identified the compromises that may be required and the mitigation commitments it might undertake in sectors like energy and power generation. With its emphasis on national concerns and priorities – and a range of political and economic realities on the ground – a lack of commitments at the international level from the big polluters could provide South Africa with the excuse it needs to renege on greenhouse gas reduction commitments.

At national level, however, existing policies on areas such as renewable energy technology and energy efficiency have not been implemented sufficiently. There seems a large gap between written policy and wide-spread implementation; in addition there is an absence of indicators to measure progress. South Africa's international negotiating position must be consistent in complementing domestic initiatives. It lacks a national policy that accelerates the demonstration, development and deployment of low-emission energy technologies, including renewable energy sources, smart-grid systems and energy storage. It needs to refurbish power-generating facilities and co-generation, improve sustainable mobility and the use of low-emission transport vehicles and advance the demonstration of carbon capture and storage and nuclear energy.

Reconciling energy-climate challenges with global climate responsibilities will not be an easy task for South Africa. The transition to a new energy mix requires a combination of approaches from government. These include policy instruments and legal tools to: encourage investment in renewable energy technology; facilitate their deployment into the market; and coordinate approaches in other domains to drive this transition. For South Africa to

achieve this goal all key stakeholders need to be fully involved and the government needs to play a strict role to ensure coordination and encourage a shift in the public mindset.

Co-operation with Partners to Addressing Climate Change: Mitigation and Adaptation

Tackling the challenges of climate change will require creating a consensus around these issues if emerging powers are to be drawn into actively participating in any international agenda. Part of that process will involve bringing leading developing countries together to share common experiences and concerns, providing an opportunity for them to assess the impact of climate change on their development prospects as well as the opportunities that alternative energy might afford them. It is important that leading economies in the developing regions of the world create their own initiatives to support a just and development-led agenda of the global South.

At the same time, while the conditions for co-operation among these emerging powers clearly exist, the form that such co-operation will take is not obvious. Constructive positions on climate change which reflect developing country interests but, nonetheless, contribute to the reduction of carbon emissions and are not a foregone conclusion. The internal debates and external positions on the subject of climate change differ greatly depending on their particular national interests. For co-operation between emerging countries to provide a platform that recognises the centrality of climate change in their respective development strategies and at the same time produces concrete constructive action aimed at alleviating carbon emissions, active engagement with policy relevant data and analysis is crucial.

According to Dr Chris Alden from the London School of Economics, it is for this reason any research on the politics of climate change and the prospects of policy co-operation between states in similar positions in the international power hierarchy will have to go beyond the analysis of rhetorical positions on multilateral gatherings to understand how they coincide with the actual domestic interests of actors involved on this debate.

Through exposure to the comparative data on emissions and its sources, the concomitant policy responses by each state, public and private sector initiatives on climate change and the host of domestic interests in each state that influence this process, the policy making communities in the broader emerging economies will be in a better position to produce a viable contribution to alleviating climate change that nonetheless conforms to their overriding development imperatives. With a more cohesive and ultimately constructive approach to the twin dilemmas of development and climate change formulated amongst the world's leading developing countries, the basis for a responsible – and truly global – policy reaction to this immense challenge is more possible.

To understand whether co-operation is indeed feasible it is important that there is in-depth research on the level of consensus on various issues such as: the approach and priority given development and poverty concerns; the role and reliance of natural resources within national economic and industrial structures; the main source of emissions; the level of ambition within response measures and policies; domestic stakeholders (both public and private) and their influence of public opinion; level of education and outreach; and access to climate-related information. Exchanging data in informal coalition and ad hoc arrangements assists in understanding emerging countries' development aspirations and providing a platform for interaction between policy making elites within these countries.

Developing country co-operation on mitigation

Many of these countries coalesce with other developing countries around carbon emissions and articulate a multilateral arrangement on 'restricting' emissions rather than 'reducing' emissions. The Kyoto Protocol will remain in force as the international climate change regime until 2012. The second phase of the Protocol is currently being negotiated, with the most high profile round of talks having taken place in Copenhagen in December 2009. The next phase will entail penalties for the non-compliance of mitigation actions by big emitters. In this regard, developing economies such as South Africa, China, India, Brazil, Indonesia and Korea are faced with significant mitigation and development challenges. It is thus important and particularly timely to strengthen and extend the dialogue and partnership among fossil-fuel producing and consuming countries (such as Australia).

The mitigation of greenhouse gas presents a common challenge to all emerging economies whose energy profiles are predominantly made up of cheap coal-based energy. According to Professor Winkler from South Africa's Energy Research Centre: "developing countries have a substantial role to play in GHG emission reductions, as future emissions are likely to be dominated by the growth in developing countries".[28] In the current round of climate change negotiations there is increasing pressure on developing country polluters to initiate their own mitigation strategies and to participate actively and responsibility in the post 2012 climate change regime. However, considering the immediate development challenges that all developing countries face, constrained economic growth due to reduced dependence on cheap coal will present an additional burden on these countries. South Africa in this regard is a vocal voice that challenges the fairness and equitability of the current system and demands improved governance in climate institutions and decision-making bodies.

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[28] L. Tyrer, 'Rough Road: South Africa's path on the steep and rocky road to Copenhagen', *Engineering News*, (20-26 February 2009), p. 16.

Due to the fact that many large developing countries have made recent voluntary emissions pledges under the Copenhagen Accord, it is necessary to share best practice in terms of appropriate policy reforms to encourage climate mitigation (such as fiscal and regulatory measurements, punitive measures, subsidies, taxes, public awareness and stimulating public debate on individual behavioural change.

However it is important to note that not every country has the same energy profile. Unlike most developed and many developing countries, Brazil's energy sector contributes little to the country's greenhouse gas emissions, with low emissions intensity for electricity generation due to the extensive use of hydropower. Three-quarters of its emissions result from deforestation and unsustainable land use as agricultural frontiers expand mainly in the Amazon region for large soybean plantations and cattle rearing.[29] Brazil's emissions from raising cattle are also substantial. Overall, energy emissions per person are relatively low (1.8 percent in 2004).[30] Indonesia also has a similar emissions profile to Brazil. It is among the top three greenhouse gas emitters in the world due to deforestation, peatland degradation, and forest fires.[31] Emissions resulting from deforestation and forest fires are five times those from non-forestry emissions.[32] Large tracts of Indonesian forests have been cleared for palm oil plantations. Some researchers estimate that the emissions from LULUCF, notably deforestation, account for 83 percent of the yearly emissions of greenhouse gases in Indonesia, and 34 percent of global LULUCF emissions. Indonesia's emissions from its energy and industrial sectors are relatively small, but are growing very rapidly. Current emissions from the energy sector account for 9 percent of the country's total emissions. But these emissions from industry, power generation, and the transport sector are growing very rapidly in the wake of industrialisation and economic growth.

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[29] In climate change policy jargon this is referred to as 'land use, land use change and forestry' (LULUCF). Deforestation contributes to climate change when forests are burnt or cleared for new agricultural land (mainly for large soybean plantations and cattle rearing). Carbon that was previously held in the soil is released back into the atmosphere as carbon dioxide and methane.

[30] However Brazil's industrial emissions are relatively carbon intensive: its main contributing sectors are iron and steel, cement, aluminium, chemical, petrochemical, pulp and paper and transportation, all of which are heavily reliant on fossil fuels.

[31] Trees absorb carbon dioxide as they grow. The United Nations estimates that deforestation accounts for about a fifth of all greenhouse gases from human activities.

[32] Annual emissions in Indonesia from energy, agriculture and waste all together are around 451 million tons of carbon dioxide equivalent (MtCO2e). Yet land-use change and forestry alone is estimated to release about 2,563 MtCO2e,mostly from deforestation.

Developing country co-operation on adaptation

Adaptation refers to the various means used to address the vulnerability of developing countries to climatic changes and its associated effects, both in the present and the future. It must be noted, particularly for the least developed countries, that a country's vulnerability depends not only on climate variability itself, but also on its government's ability to increase efficiency in the usage of natural resources and energy supplies. Financial, technical and institutional support and capacity-building are often needed to assist poor nations to switch to more sustainable development pathways**.** While cost estimates are rudimentary and subject to uncertainty in the cases of individual countries, even the most conservative figures estimate a loss of 0–3 percent of global gross domestic product (GDP) annually by the time the temperature has risen 2–3 degrees Celsius.[33]

Developing countries, particularly the least developed countries and small island developing states, are the most vulnerable to these impacts and most of them are already facing climate-related stresses, such as an increase in water scarcity and vector-borne diseases; an increase in the frequency and intensity of extreme weather conditions; unpredictability in rainfall; and a decrease in crop yields. Developing countries have been ill-prepared and slow to develop effective 'early warning' systems and response measures to the impacts of climate change. As a result, countries will need to build the capacity of their national and regional governments to address these climate risks, by among other things, ensuring better water management, promoting agricultural development and developing more effective disaster management and early warning systems. Sharing knowledge on best practice adaptation strategies can be crucial for urban planning and the construction of climate-resilient infrastructure. Early warning mechanisms are also essential. Effective adaptation of the kind required is costly and involves not only significant investment in research, awareness-raising and capacity-building, but practical measures such as the 'climate-proofing' of infrastructure projects.

Developing country co-operation to further improve projections and predictions of climate change data

Co-operation in the development of more substantial climate data and analysis capabilities is essential to project climate variability and to analyse its potential impact on vulnerable sectors such as water, agriculture and infrastructure. Data collection and analysis can be done at a national level with the assistance of international partners – for example in the construction of meteorological

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[33] J. Llewellyn, *The Business of Climate Change: Challenges and Opportunities*. (Lehman Brothers, February 2007), available online: http://www.lehman.com/press/pdf_2007/TheBusinessOfClimateChange.pdf (accessed 31 March 2011).

stations and in training of human resources, or at an international level through co-operation on the provision of scientific data and climate information.

According to the Council for Scientific and Industrial Research (CSIR) South Africa, Australia is the only country in the southern hemisphere to have developed a coupled global climate model: that is, a model that can be used to predict global climate change.[34] Australia is therefore also country to have contributed such predictions to the Assessment Report 4 (AR4) of the IPCC and been part of the broader debate on climate variability in the southern hemisphere. All other countries in the geographical South depend on the North to provide them with global climate change predictions.

According to Dr Engelbrecht of the CSIR's atmospheric modeling unit:

> Through the creation of a Southern Axis of model development, with active development initiatives in Brazil, South Africa and Australia as anchor points, various modeling groups can share progress and plans. Several other southern hemisphere countries may eventually become niche contributors. The enhanced southern hemisphere model development effort will benefit the study of southern hemisphere circulation dynamics in general, and will also induce improvements in international model codes.[35]

The other area in which collaboration has huge potential is within the forestry sector. Brazil, home to one of the greatest ecosystems and forests of the planet, has established a multi-agency program to combat the deforestation of the Amazon using a satellite monitoring system. From 2005-2007 this resulted in a 52 percent reduction of the rate of deforestation.[36] Brazil has also adopted a National Plan for the Prevention and Combat of Deforestation which aims

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[34] The study of global climate change relies heavily on the projections of coupled ocean-atmosphere global circulation models. More active involvement by southern hemisphere oceanographers, climatologists, terrestrial ecologists and modellers in coupled model development is critically needed, in order to improve the simulations of southern hemisphere circulation dynamics.

[35] Interview with Dr Francois Engelbrecht, Council for Scientific and Industrial Research (CSIR) South Africa, Atmospheric Modeling Unit, Natural Resources and Environment Project, 31 August 2009.

[36] This forms part of a speech 'Climate Change as a Global Challenge' delivered by the Director-General of the Department of the Environment and Special Themes of the Ministry of External Relation, Minister Machado, Embassy of Brazil in London (August 2007).

to reduce deforestation in the Amazon region by 70 percent by 2017.[37] These lessons could be useful for those, such as Indonesia and the countries of the Congo Basin, that find it challenging to monitor deforestation.

Developing country co-operation on technology transfer

Developing countries can also co-operate on technology transfer. This aims to accelerate the demonstration, development and deployment of low-emission energy technologies, including: renewable energy sources; smart grid systems and energy storage; refurbishment of power generating facilities and cogeneration; the use of high efficiency energy supply technologies (such as fuel cells); sustainable mobility and low-emission transport vehicles; carbon capture and storage; geothermal; and nuclear energy.

As an example, carbon capture and sequestration technologies have been designed to reduce emissions from coal-fired power stations by capturing CO_2 and storing it instead of releasing it into the atmosphere. This technology offers huge mitigation potential for countries that are fossil-fuel reliant (not for extending the life cycle of fossil fuels, but as a transitional step towards renewables and nuclear energy). There are leading technologies that have been produced in this regard, including in Australia, and that offer huge potential in other coal-reliant societies. However, these technologies are extremely expensive and have yet to be implemented on a large-scale as further investigation is needed to ensure their safety and efficacy, as well as to identify potential site locations and suitability, safety, costing and feasibility.

Coal efficient technology is another option for countries like South Africa and Australia, whose electricity demand is increasing annually – each having to make strategic decisions about the renewal or replacement of old or mothballed coal fired stations. While there is increasing pressure for non-fossil fuels, abundant reserves and low cost make coal the preferred source for the foreseeable future. The challenge is to enhance efficiency and environmental acceptability through clean coal technologies. According to the CSIR South Africa, a process called integrated gasification combined cycle (IGCC) could be applied. It would be more efficient, reduce water consumption and could co-produce liquid and gaseous fuels and chemicals.

There is also much scope for collaboration within the renewable energy technology sector. This sector is positioned to become the fifth largest sector in terms of job creation and investment.[38] For instance, German wind farms

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[37] It must be noted that deforestation is not a priority for all other developing countries. While forests make up 57.2% of Brazil's total land, they only make up 21.2% of China's total land, 22.8% of India's, 33.7% of Mexico's and 7.6% of South Africa's: Food and Agriculture Organization, 'Global Forest Resources Assessment 2005', (Rome, 2006) available online: http://www.fao.org/forestry/fra/fra2005/en/ (accessed 31 March 2011).

[38] Tyrer, op. cit. (2009), p. 84.

are estimated to have created 40,000 jobs. It has also been estimated that if South Africa reaches 15 percent generating capacity from renewable energy, it will create 34,000 direct jobs by 2020. While generating 5,700 MW of solar photovoltaic power would create 680 full-time jobs and 8,800 construction jobs.

The world has much to learn from Brazil which has made remarkable headway on the promotion and use of renewables as a component of its energy mix with 38 percent of Brazil's energy supply now generated from renewable sources, particularly hydropower, sugarcane and wood.[39] In 2002, a law was passed to establish a compulsory market for renewable energy. The programme (PROINFA) helps independent power producers feed power from renewables into the national electricity grid including electricity-generating capacity based on biomass, small hydro power plants and wind power. This, coupled with President Lula's incentives to increase the attractiveness of private investment in hydropower-generation, has resulted in 80 percent of Brazil's electricity being generated from hydropower.

Brazil is also an innovator in developing bio-fuels from sugar cane waste, which it believes has great potential to grow and be transferred to others with a similar emissions profile.[40] Its National Ethanol Programme was launched in 1975, and has become the largest commercial application of biomass for producing and using energy in the world. This Programme demonstrates the feasibility of large-scale ethanol production from sugarcane and its use in producing automotive fuels. Today, flex-fuel vehicles in Brazil run on any mixture of gasoline and ethanol, based only on the decision of the consumer at the pump. Fuel-flex vehicle sales represent approximately 80 percent of total cars sold in Brazil today. Ethanol has substituted 40 percent of the petrol used in passenger cars.

Indonesia is also progressing towards expanding its biofuel production, both for domestic use in order to reduce oil consumption, but also for export to Europe. Bioethanol is currently produced using mainly sugar and cassava as feed stocks, whereas biodiesel is developed using crude-palm oil, stearin (the non-edible byproducts of crude-palm oil), Jatropha curcas and other sources. In 2009, biodiesel from oil palm in Indonesia is projected to reach 700 million

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[39] E. La Rovere and A. Pereira, 'Brazil and Climate Change: a country profile', Policy Briefs, Science and Development Network, (14 February 2007), available online: http://www.scidev.net/en/policy-briefs/brazil-climate-change-a-country-profile.html (accessed 31 March 2011).

[40] However, it is important to note that Brazil's bio-fuel industry is not necessary applicable to India or South Africa. Brazil, for example, can support a viable bio-fuel industry without taxpayer subsidies. In contrast, most others countries cannot. According to IISD, bio-fuels require subsidies of between 50-70 cents per litres to replace a litre of fossil fuel, almost as much as the cost of a litre of regular gasoline. Bio-fuels also are water demanding and the use of water to produce energy and not food which is not justifiable in countries like South Africa and India.

litres, or 2 percent of diesel consumption, requiring about 200,000 hectares of oil palm plantations. Demand for biodiesel is expected to increase by 2025, when it reaches 4,700 million litres, or 5 percent of total diesel consumption. This will require 1.4 million hectares of oil palm plantations – about 2.5 times the area of the island of Bali. Jatropha curcas can grow in degraded lands and promises a good potential to reforest degraded areas, while at the same time providing livelihoods to the poor living near degraded areas and reducing the use of petro-diesel. However, the risks of deforestation, and to some extent land use conflicts with biofuels, have not been thoroughly assessed. Historically, oil-palm production in Indonesia has been a major driver of deforestation. Given the similarities of Brazil and Indonesia, there exists large potential for best practice scenarios.

Genuine co-operative technology transfer between developing and developed countries is therefore essential: 'Developing countries should unite efforts to build production capabilities with strategies to advance research and development'. Investments need to be targeted to areas of under-funded ICT research, in fields such as agricultural production, environmental management and public health'. One important goal of strengthening the scientific and technology policy in developing countries is the generation of new goods and services that can improve carbon reduction. Stimulating the low carbon technology industry is one way to achieve commercialisation of research and development.[41]

The importance of North-South partnerships cannot be ignored as the developed world's initial experience on promoting energy efficiency can provide valuable background for countries attempting to reform their energy policies.[42] Many technologies based on resource endowments of developing countries, for example biomass and geothermal, do not yet exist or are too expensive. Collaborative research and development between developing and developed country institutions is necessary to address this gap.[43]

There remain substantial economic, social and political hurdles to overcome with the introduction, transfer and dissemination of technology. These include: the lack of technical capacity to utilise introduced technologies; the

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[41] C. Juma, C. Gitta, A. DiSenso and A. Bruce, 'Forging New Technology Alliances: the Role of South South co-operation' *The Co-operation South Journal* (2005), pp. 59-71, available online: http://ssc.undp.org/uploads/media/6Technology.pdf (accessed 31 March 2011).

[42] Ibid. p. 59.

[43] According to Prasad and Kochher, 'India suggests that this may be done by a Venture Capital Fund, located in a multilateral financial institution, with the resulting IPRs being held by the Fund, and worked at concessional cost in developing countries and on commercial basis in developed countries': Prasad and Kochhner, 'Climate change and India – Some major issues and policy implications', Department of Economic Affairs and Ministry of Finance, Government of India, Working Paper No 2/2009-DEA, (March 2009).

lack of appropriate laws and regulations; defective administrative structures and insufficiently developed market conditions.[44] Also, those that own the technology need to be protected by appropriate intellectual property rights.

Conclusion

Climate change is a global challenge that requires the participation of all countries. South Africa faces many challenges in this regard and although it has made progress independently, its efforts can be enhanced and encouraged through collaboration with other like-minded countries.

Energy needs and climate impacts are increasingly contributing to a geo-political realignment that will result in the new political relationships of the 21st century. A new era in climate change multilateral arrangements now exists with the creation of new coalitions and issue-based alliances. This is evident through the co-operatBASIC Group discussions leading up to Copenhagen, as well as through the Asia-Pacific Partnership for Clean Development and Climate and the Forum for Forestry.

These alliances have the potential to provide a platform for information sharing, knowledge and coalition building among policy makers in order to develop a dialogue with research institutions from industrialised countries through recognised forums.

These countries share many similarities: they are all significant contributors of greenhouse gas emissions, both globally and within their regions; they are all vulnerable to the impacts of climate change, although some more than others given their differing socio-economic performance and their ability to buffer the impacts of climate change on sensitive sectors; all have contributed to voluntary national commitments within the Copenhagen Accord (December 2010), with some promising more ambitious commitments than others; and all are political leaders in their respective regions and all are dedicated to obtaining a fair and equitable climate regime post Kyoto. All countries are also pursuing international partners to further their interests on the global stage and protect their interests in their regions.

However, it is also important to realise that despite their common interests as developing nations, countries will act and react to the negotiations primarily from a national standpoint. It would be naïve to expect emerging countries to be driven by anything less than domestic stakeholders, national interests and local realities. Different countries have differing priorities and challenges: for example, South Africa and Australia have high emissions per capita ratio, unlike China and India – while the majority of Brazil's and Indonesia's emissions

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[44] S. Sudo, 'Energy efficiency, technology and climate change: The Japanese experience', in Loh, Stevenson and Tay (eds.) *Climate Change negotiations: Can Asia change the game?,* (Civic Exchange 2008).

do not originate from the energy sector but rather from deforestation, land-use change and land degradation. To understand these dynamics more clearly, it is important to interrogate what informs individual countries' negotiating positions at an international level.

In order to make progress and to advance the global climate agenda, it is perhaps practical to focus on the least contentious issues and to make progress on the 'low-hanging fruit'. This is evident for example in role that Brazil and Indonesia play in forums where they represent their forestry interests.

More contentious issues also exist that cannot be ignored. However, there is major scope for collaboration and shared information on the debate on biofuels for example within Indonesia, Brazil and South Africa. Commercial agriculture has recognised the potential that biofuels like sugar cane and jatropha offer and, as a result they are expanding cultivation in Kwazulu-Natal province and the region. Furthermore, there is scope for co-operation to improve the accuracy and availability of scientific projections and relevant data; collaboration on ways and means to reduce overall carbon emissions in an ambitious southern mitigation proposal and a common position of IBSA on an adaptation agenda for the South.

Each emerging economy should seek to lead in areas where it has competitive advantage and expertise. South Africa, for example, should take the lead on mineral processing, refineries and metal production; China on energy-efficient goods and renewable technologies; India on the services sector; and Brazil on land use and forestry. These developing countries could exchange knowledge and co-operate regarding these sectors. For example, India has adopted efficient super-critical technology in four plants under construction. This technology would be very useful to assist South Africa in moving towards energy efficiency targets in its coal-fired plants.

APPENDIX 1

Outside the formal negotiating structures of the UNFCCC, there are a number of informal negotiating forums, or so-called 'near negotiations', which can unblock areas of disagreement in the formal negotiations and bring developed and developing countries together to increase understanding, transparency and to build trust.

Example of these informal issue-based groupings include:

The G20 Major Economies Forum on Energy and Climate Change:

The G20 Summits focus primarily on international economic and financial issues. However, the agenda has broadened to include low-carbon/green growth, as well as wider energy and climate change issues.

The Major Economies Forum (MEF):

The MEF is a US initiative launched in 2009 that intended to enable a dialogue between developed and developing major economies in order to generate the necessary political momentum for a successful outcome at the UNFCCC in Copenhagen, as well as exploring opportunities for concrete initiatives and concerted actions that increase the supply of clean energy while reducing carbon emissions.

The G77 and China Grouping:

The G77 and China, was established in 1964 and now has approximately 136 developing and poor member nations (including the BASIC countries). This group has become a powerful lobby group in negotiation forums, including last year's Copenhagen climate conference. This coalition is based on the principals of climate equity in the division of the remaining carbon budget, differentiated but common responsibilities, financial and technical support from the North to the South. G77 + China's overall greenhouse gas emissions are 40.69 percent of world total, just over that of the G8 which makes up 39.63 percent of world total. In per capita terms from 1950-2000, the G77 + China produced 95.9 tons while the G8 519.5 tons. All G77 members maintain a coherent position on the following: deeper cuts in greenhouse gas emissions in the North; international support of development through additional finance, the adequate transfer of technology and capacity building; and the paying for those having to adapt to the adverse impacts of climate change. A common Southern position on these issues would give the developing world more leverage in the negotiations to encourage 'common but differentiated responsibilities' from that of the historical emitters in the North. An alliance and further commitments by the major emerging

economies would put further pressure on the United States, Canada, Japan, and Australia, and hold other big greenhouse gas emitters to account.

BASIC Group:

This grouping is an informal and temporary coalition of countries – namely Brazil, South Africa, India and China, all of which are members of the G77 and China grouping. BASIC countries account for approximately 30 percent of global emissions. Although joined but common responsibilities (dependant on capabilities) all countries have very different positions given their divergent national interests. There is a growing expectation that the four countries should begin to take on responsibilities commensurate with their growing capabilities. BASIC group seek to provide leadership reputation and catalyze progress in the UN negotiations. BASIC Group met before Copenhagen to discuss their common negotiating position. The group, for example, rejected the draft on the global emission cuts proposed by host country Denmark. They have met twice since Copenhagen (in Delhi and Cape Town) to discuss the way forward. They remain dedicated to their G77 agenda. In Copenhagen, China, India, Brazil and South Africa offered voluntary emissions cuts by 2020.

Indonesia currently plays a bridge-building role in international forums. Indonesia's climate change adviser Agus Purnomo recently said "Our strategy is to take the middle path to ensure all parties reach a consensus on a climate deal". It is for this reason that Indonesia remains an observer to the BASIC Group discussions and has not formally joined the Group. "The four are a group of eminent countries that need to be heard. Their voice is crucial for the success of climate talks." However, "the Indonesian government needs to find out more about the targets and agenda of BASIC", and is cautious in considering joining BASIC since it could make climate change talks even more difficult to reach consensus. The Indonesia government is considering whether the G77 platform is perhaps more appropriate to strengthen its position in climate talks. "Indonesia must be careful because it could benefit China and India in its fighting for their interests against the rich nations." Indonesia has also been actively involved in informal meetings, including the G20 major economies forum on energy and climate change and the group of forest nations known as the F-11.

Mexican Initiative:

As chair and hosts of the COP in 2010, Mexico is leading a process to support the formal UN negotiations. They have used their convening power to set up a 'Contact Group' with around 30-40 developed and developing countries. The first meeting of this 'contact group' format took place in Mexico City in March 2010.

Asia-Pacific Partnership for Clean Development and Climate (APP):

This alliance is an innovative new effort to accelerate the development and deployment of clean energy technologies. APP comprises of government, business and research communities from Australia, Canada, China, India, Japan, Korea, and the United States. These countries co-operate on eight sectors in which all countries have substantial experience. For example, in coal mining, member states generate approximately 65 percent of world primary coal production. They have committed to collectively work towards improving the efficiency of the mining and processing of coal and improving the monitoring and control of coal mine methane gas that can make a significant contribution to emissions reductions.