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## How climate change is pushing the boundaries of security and foreign policy

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### Summary

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- Climate change is just one component of the larger problem of direct man-made environmental change.
- That said, climate change alone is likely to cause international legal disputes, disrupt access to vital resources, and damage critical infrastructure.
- Maritime boundaries are particularly susceptible to re-evaluation as a result of climate change.
- As a result of uncertainties over maritime boundaries, it is possible that there will be an increase in hostilities related to borders.

### Introduction

Although climate change has been a foreign policy issue since well before the Kyoto Protocol, it is only recently that the international community has acknowledged that it is a security issue as well. It is making up for lost time. In March and April 2007 alone:

- The UN Security Council debated 'climate change';<sup>1</sup>
- Legislation was introduced in the US asking for a National Intelligence Estimate on the security implications of 'global warming';<sup>2</sup>
- An influential panel of retired US generals and admirals released a study entitled *National Security and the Threat of Climate Change*. Among their findings: 'Projected climate change poses a serious threat to America's national security ... Climate change acts as a threat multiplier for instability in some of the most volatile regions of the world ... Projected climate change will add to tensions even in stable regions of the world.'<sup>3</sup>

As awareness of the security implications increases, and negotiations gear up to find a way forward in a post-2012 world, climate change-related issues are becoming a larger part of international relations. There is a growing understanding that, among other things, the international legal system, access to essential resources and the integrity of critical infrastructure are all at risk. As global problems, they will need global solutions. However, there are roadblocks to finding effective answers. For example, partly as the result of a long-standing trust deficit, many leaders in the developing world are suspicious when the West pushes for global emission cuts. Some see it as hypocritical, and a way to impede growing economies. Also, some partners in the West are less willing than others to look at solutions. A large part of both of these problems has to do with the terminology currently in use, which is often confused or inaccurate, and is in urgent need of clarification. One core confusion revolves around using the term 'climate change', when what is really meant is the larger issue of environmental change.

### *Climate change versus environmental change*

To understand the real threats to global security and the challenge to policy-makers, it is not enough just to look at climate change. Climate change is only one component of the larger problem of direct, man-made environmental change. As a species, humans often

make direct and major alterations to the environment. In fact, irrigation (which substantially changed regional environments) made possible what we think of as early civilization. In the more recent past, massive population increases have had a dramatic effect on global sustainability. At the turn of the 20th century, there were around 1.65 billion people on the planet. At the turn of the 21st, there were around 6 billion.<sup>4</sup> The result is more groundwater pumped up, more forests cut, more urban sprawl, more developments in flood plains, etc. – and, ultimately, a changed environment.

As humans push the boundaries of the carrying capacity of the planet, a smaller degree of environmental variation has larger implications. This means that climate change may significantly exacerbate existing problems, but if there were no climate change, those problems would still exist. For example, the social, economic and security crisis in the United States created by Hurricane Katrina in August 2005 was caused in large measure by problems with levee design and implementation on the part of the US Army Corps of Engineers, poor town planning, a failure of emergency services and a breakdown in the chain of command.<sup>5</sup> There is no question that this naturally dynamic coastal region was also going through a period of man-made environmental change, but much of that change was more direct than the sort caused by climate change. It included large-scale subsidence (in one area of New Orleans by about a metre in three decades) probably caused, at least in part, by the draining of wetlands, the extraction of groundwater and inappropriately designed waterways.<sup>6</sup>

Katrina can be used to show how poor regulations, planning and emergency response can aggravate the environmental disasters that will almost certainly increase as a result of climate change, but one cannot say that the tragedy in New Orleans was caused by climate change alone. Curbing climate change without addressing the way city planning and disaster management are done will not stop other 'Katrinas' (though it may keep the number from significantly accelerating). By broadly labelling most environmental change-related security issues as being the result of 'global warming' or 'climate change', Congress, the UN and others are inadvertently limiting the range of possible responses, and potentially adding further confusion to an already complex problem. Essentially they are saying that cutting emissions is the magic wand that will make most of our problems go away. Unfortunately, that is simply not the case. It is critical to accurately assess the specific causes of specific problems.

That said, it *is* possible to parse out threats that

are directly linked to climate change – ones that can only be mitigated by acknowledging, and ideally trying to counter, its effects. Some of these climate change-specific threats are the subject of this briefing paper, but it is vital to remember that even if they are resolved, there is a whole other suite of environmental dangers, like those that caused the disaster on the US Gulf Coast, that will need other solutions.

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## Climate change, security and foreign policy

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As a result of a warming climate, certain planetary readjustments are already well under way and, owing to the inertia in the climate system, are likely to continue until at least the end of the century, regardless of what is done to mitigate emissions. They include rising sea levels, rising average global temperature, changing precipitation patterns and melting glaciers and sea ice.<sup>7</sup> Apart from compounding existing problems, each impact also produces its own set of destabilizing elements. They often fall into one of three categories:

- Triggering legal disputes (both at the domestic and international level);
- Changing the degree of access to vital resources such as water, fossil fuels, food and arable land;
- Impact on infrastructure.

An examination of how just two elements, sea-level rise and the melting of sea ice and glaciers in the Arctic, can result in a wide range of legal, resource and infrastructure issues gives an idea of the complexity of the impacts.

### *Arctic melt, sea-level rise and legal disputes*

Climate change is going to cause a redrawing of the physical map of the planet. As has happened during countless past climatic shifts, some areas will flood, others will emerge from their shroud of ice, and previously non-navigable sea lanes will open up. The difference this time is that this is an era of international law, in which political boundaries are closely and rigidly tied to physical ones. This is especially true when it comes to maritime borders which, legally, are often determined by coastlines. As climate change contributes to the retreat, advance and, in the extreme case of low-lying islands, complete disappearance of coastlines, might maritime boundaries shift?

If so, a host of global political, economic and security issues would emerge. The ownership of

strategic sea lanes might come into dispute. Remote island-based military installations – and the right to locate them in those regions – could be lost. Nations could find that their offshore resources are now in international waters. Debates between neighbours over tiny rocks anchoring vast maritime claims could intensify. Only around 160 of the potential 365 or so maritime boundaries worldwide have been agreed.<sup>8</sup>

The UN Convention on the Law of the Sea (UNCLOS), which came into force in 1994, attempts to create norms for determining boundaries,<sup>9</sup> and the International Tribunal for the Law of the Sea (ITLOS) is designed to be a forum for resolving disputes.<sup>10</sup> While UNCLOS was ratified by over 150 countries, the United States was not one of them, and this slightly hobbled its effectiveness. Nevertheless, UNCLOS is now the standard in international maritime law. So it is unfortunate that many of the assumptions of geographical and hydrological stability on which UNCLOS is based might be compromised by climate change. UNCLOS freezes coastlines and borders at a specific point in time – until challenged or revised. That leaves many grey areas when physical boundaries dramatically shift and change as a result of flooding, etc. Why and by whom challenges are made (and whether or not rulings are abided by) could result in foreign policy and security concerns trumping a standardized application of international law. Not long ago, the norm for determining maritime boundaries in Europe was the ‘cannon shot’ rule, in which a state was given the maritime area that could be covered by a cannon shot from its shore (this is the origin of the three-mile limit).<sup>11</sup> The clear implication was that, if you could defend it, you could have it. It is possible that, in a chaotic future of geographical change, the same principle will be increasingly true again.

To gain a better understanding of the potential implications of climate change for maritime borders, it is worth looking at four scenarios. While the specific cases must be considered hypothetical, each of the examples demonstrates that the legal uncertainties caused by climate change could lead to increasing foreign policy and security problems.

### *Shifting borders between neighbours: the United States and Cuba*

Many of the world’s coastal nations, including the UK, China, the US, and others, will find that sea-level rises cause a dramatic retreat inland of their coastlines. As mentioned above, in many cases a country’s maritime boundary is determined by its coastline. Generally speaking, a state is entitled to an exclusive economic zone of 200 miles off its coast, unless its zone butts up against the zone of another country, in which case

they usually split the difference. For example, if two nations are separated by 100 kilometres of ocean they will often agree to set their maritime border 50 km from each shore. This is the case, for example, with the Cuba–US border. The border was agreed by a bilateral treaty in 1977 that is renewed every two years. At the time, account was taken of every rock and small island in the region in order to negotiate an agreement. The problem with the agreement reached is that the US shoreline that is used as a base measurement is down in the Florida Keys, an extremely low-lying region, while Cuba itself is relatively mountainous and not as likely to lose ground to rising sea levels.

So, leaving the Bahamas aside, the hypothetical question is, if the Florida coastline retreats up towards the middle of the state, and Cuba stays more or less as it is, should the border be moved to reflect the new midpoint? That would put the entrance to the Gulf of Mexico in Cuban waters and, while southern Florida would be submerged, it would still be an impediment to shipping, meaning traffic would have to loop down through Cuban waters.

Given that the boundary is confirmed bilaterally every two years, there might be a case under international law for Cuba or the United States to seek a renegotiation on the grounds that reality has changed as a result of sea-level rise. But it is likely to be international politics and security concerns, rather than international law, that will determine whether the boundary changes or not. The same principle applies to other regions of the world. Political tensions are already at play in the South China Sea, where a slight rise in sea levels could submerge one or two critical offshore islands and be used as a pretext for future boundary disputes.

### *Dramatically eroded exclusive economic zones: coastal states*

Those sorts of changes to maritime zones based on changing coastlines might also affect a country's ability to exploit offshore resources. One of the most widely quoted examples of this is the case of Bangladesh. The United Nations Environment Programme (UNEP), University of Dacca, World Bank and others have published a map that shows the potential impact of a 1.5-metre sea-level rise on Bangladesh. According to digital terrain modelling techniques, 17 million people (15% of the population) and 22,000 square km (16% of the total land area) will be affected.<sup>12</sup> However, the map is not without its problems, according to geographer Dr Robert Bradnock, visiting senior research fellow at King's College London, because it was arrived at simply by superimposing sea-level rise over elevation. It did not

take into account the effects of siltation, plate tectonics and other determining factors. Some areas of the coastline, according to Dr Bradnock, are actually expanding.<sup>13</sup>

This serves to underline the point that all the specific scenarios presented here are very much hypothetical, and are being used as examples only because they are often mentioned in the context of problems that will be caused by climate change. The problems of potentially shifting borders will definitely have to be addressed, though not necessarily in the locations mentioned here. With climate systems, the situation is always more layered than it seems. For example, rising sea levels may not flood Bangladesh, but, according to the UN International Panel on Climate Change (IPCC), storm surges and cyclones in the Bay of Bengal are predicted to increase in intensity, causing flooding of their own. Also, the area is hugely geomorphically dynamic even without climate change. Those two factors of environmental change alone have the potential further to exacerbate the two major international issues that climate change in Bangladesh might aggravate: increasingly desperate environmental refugees pushing towards India and, of specific interest here, tensions over maritime boundaries in the Bay of Bengal.

The coastline of Bangladesh is particularly difficult to define. One hydrologist has called it 'kilometres of liquid mud'.<sup>14</sup> What in other countries would be considered serious flooding happens in Bangladesh almost every year, with water levels rising by between 13 centimetres and 2 metres. Usually, it takes an inundation of over 50% of the country for a flood to be considered 'heavy'.<sup>15</sup> With such a literally fluid coastline, determining a maritime boundary becomes very complex – especially as Bangladesh shares the arc of the Bay of Bengal with India to the west and Burma (Myanmar) to the east. The result is that while Bangladesh has quite a long coastline (however determined), its maritime claim is shaped like a triangle, squeezed on both sides by its neighbours as it extends further out to sea. The Bay itself is suspected of containing considerable hydrocarbon deposits, making offshore maritime claims particularly valuable. If Bangladesh's coastline were to retreat dramatically, in theory its maritime border would retreat commensurately, potentially completely squeezing it out of zones that are rich in hydrocarbons. Already Bangladesh is complaining of encroachment by its neighbours.<sup>16</sup>

There is a way for Bangladesh to safeguard its maritime claims against the impact of climate change. Under UNCLOS, a country can claim the waters up to 200 nautical miles off its coastline as its exclusive economic zone. If it is on a continental shelf, the shelf

itself, submerged or not, can be used to establish a permanent claim regardless of a retreating coastline. If such a claim were submitted by Bangladesh and accepted, its access to offshore resources would be assured and a poor and overpopulated country could have a near guarantee of at least some future income. There are various schools of thought as to why Bangladesh has not done this – all of them involving politics. Bangladesh and India accuse each other of stalling; at least one Indian commentator attributes the stasis to Bangladesh being a client state of China and China wanting to use its proxies to hinder India.<sup>17</sup> But if Bangladesh does not get its claim in by May 2009, the deadline set by UNCLOS, it risks losing its continental shelf claim, leaving it vulnerable to having its maritime border determined by a shifting coastline.

### *Threats to sovereignty: small island states*

By 2100, according to the IPCC's Third Assessment Report, sea levels are predicted to rise by between 9 and 88 cm, much of that as a result of thermal expansion as the oceans heat up. Again, the impact will not be uniform and will depend quite a bit on regional hydrography. But the difference, to put it in the words of one climate scientist, is 'between bad and very bad'.<sup>18</sup> Sea-level rise is slower to take effect than air surface temperature rise, and also takes longer to stabilize. The oceans' thermal inertia is predicted to cause levels to rise long after the general climate stabilizes or even cools. As a result, one of the more significant long-term physical impacts of climate change, no matter what is done to mitigate and adapt to it, will be rising sea levels.

As sea levels rise, coastlines will retreat and low-lying islands may become uninhabitable. Long before the islands disappear completely, inhabitants may have to be evacuated as salt water infiltrates groundwater, killing vegetation and animals and leaving those without desalination plants also without fresh water. There is a lot of uncertainty about how quickly this is happening, as protective barrier coral reefs seem to be trying to grow to keep pace with rising waters. But as water temperatures increase, the coral, which is temperature-sensitive, may die off. Already some islands have had to be abandoned.<sup>19</sup> It is very likely that eventually at least one entire nation will have to be completely resettled. The one mentioned most often is Tuvalu in the South Pacific, which will be used as the example in this section; but it must be stressed that this is not a prediction, merely a hypothetical scenario for investigating the likely geopolitical implications of a challenge to sovereignty based on a changing environment. There are other nations at risk as well.

The core foreign policy question is, can a nation exist without a physical state? If Tuvalu goes under

the sea or is abandoned, will it lose its seat in the UN? Will its current maritime exclusive economic zone revert to international waters? Will it lose its lucrative .tv internet suffix? Article 1 of the Montevideo Convention on Rights and Duties of States sets out that the following qualifications are necessary for the existence of a state: a permanent population; a defined territory; a government; and the capacity to enter into relations with other states.<sup>20</sup> This definition itself raises a host of questions. The last two qualifications are relatively easy to maintain, even in exile, assuming other states will continue to recognize the dislocated nation as a state. The first two, a defined territory and a permanent population, are issues that are currently being tackled by other countries: for example, in the South China Sea, China has stationed military outposts on partially submerged atolls and is using that 'permanent presence' to claim the surrounding defined, though contested, area.<sup>21</sup>

Similarly, if Tuvalu goes under, could it tether a ship to its old island (or dump enough sea breaks to form a new island on top of the old island), keep a few people resident there and then administer the territory – and its attendant exclusive economic zone – through a government in exile in another country?<sup>22</sup> Under international law, nations cannot stake claims based on artificially maintained islands, but in an era of sea walls, artificial beaches and other constructs to ward off rising seas, what constitutes 'artificial'? For the people affected, such a solution could provide badly needed revenue through access to resource rights (fishing, undersea mining, offshore oil and gas, etc.), a voice in international fora and the right to return if the seas eventually recede. The precedents set by agreed solutions (if accepted) could directly affect the security of nations such as the UK and the US, which stand to lose the right to stage from geostrategic bases. For example, the low-lying UK territory of Diego Garcia in the Indian Ocean Chagos archipelago that is used as a base by the US is at threat from rising seas. If Diego Garcia is lost to the sea, will the UK also lose exclusive access to that crucial tract of ocean and, in the process, lose a valuable bargaining chip with the United States?

Legally speaking, a country's ocean territory is determined by its land territory; or, hydrologically speaking, the land dominates the sea. Normally oceanic territory is defined according to baselines submitted by the national governments. Unless those baselines are challenged, they stand. Herein lies the intersection between the negotiations of foreign policy and the blunt force of security concerns.

If a nation cannot claim ownership over a tract of ocean, then it is usually preferable, from its point of view, for the expanse of water to be recognized as international waters. This leaves the prospects for

countries such as Tuvalu rather dim unless they find stronger protector states to defend them both diplomatically and, if necessary, militarily. The cannon shot rule by proxy, so to speak.

### *New transportation routes: the Northwest Passage*

A classic example of the 'if it's not exclusively mine, it should at least be open to everyone' approach to the seas can be found in the Arctic. Planetary warming will not be uniform over the entire globe. Broadly speaking, the changes in temperature will be relatively small over the oceans, as the oceans themselves can absorb a lot of heat. In the Arctic, however, the changes will be much larger. One reason for this is that ice, being light-coloured, reflects sunlight. As the ice starts to melt, less of this ultraviolet light will be reflected back into space and more solar radiation will remain at the surface. The result is a positive feedback mechanism that accelerates the warming of the area. Other possible such mechanisms include the warming of the waters themselves, contributing to faster melting at the ice edge, and the lowered elevation of the ice pack as it melts, also resulting in an increased rate of melt (a mountain, for example, tends to be colder at the peak than the base).

As a result, in a world where the global mean temperature increases by over three degrees Celsius, for example, there will perhaps be a one- or two-degree increase over the ocean, while in the Arctic the rise might be seven or eight degrees, and the melt in consequence surprisingly rapid. The Arctic melt is already being observed. Sea ice is melting earlier in the spring and freezing later in the autumn, and its thickness is decreasing. The Hadley Centre for Climate Prediction and Research predicts that by 2080, and possibly much sooner, the entire Arctic may be ice-free in the summer.<sup>23</sup>

One of the many geopolitical results of this melting ice is that shipping routes through the Arctic will become more viable. Russia is already making increasing use of its territorial Northeast Passage.<sup>24</sup> Travelling between Asia and Europe through the Northwest Passage, which is mostly in Canada but might also include the waters of the United States, Denmark and other nations, is days faster, and would be much cheaper, than the current route through the Panama Canal. For example, the distance from London to Tokyo via Panama is approximately 23,000 km. Through the Suez Canal it is approximately 21,000 km. Through northern Canada, it is approximately 16,000 km.<sup>25</sup>

However, it is already evident that the opportunities this new route opens up will increase tension between states. While Canada claims that much of the Northwest Passage is part of its internal

waters (a claim with a sound legal basis according to UNCLOS<sup>26</sup>), the United States claims that the route is actually an international strait, open to free passage for all (the US is rather generous in its declarations of international straits, including in its list, for example, a tiny strip of water in the Falklands that is only occasionally used for local supply boats<sup>27</sup>).

During the most recent Canadian general election campaign, Stephen Harper, who subsequently became Prime Minister in February 2007, set out his C\$5.3 billion plan for defending Arctic sovereignty in an era of climate change. It included stationing armed ice-breakers, building a military/civilian deep-water docking facility and establishing underwater listening posts to monitor northern waters for foreign submarines and ships.<sup>28</sup> The Canadian military even (not so subtly) renamed the passage Canadian Internal Waters. The main target of all that activity seems to be the United States. While the route remained non-navigable (or at least unprofitable), this was largely a technical debate. Now, according to the report by the US admirals and generals, 'A warming Arctic holds great implications for military operations' – though, tellingly, in the report's entire section on the Arctic they do not once mention Canada.<sup>29</sup>

To be declared an international strait, the route must have been historically regularly used by international traffic. Obviously, until recent melting and improvement in shipbuilding technologies, that was not possible, as the nineteenth-century Franklin expedition and others fatally proved. The first single-season crossing of the Canadian Arctic by ship did not happen until 1944, when a Royal Canadian Mounted Police schooner made the trip to assert Canadian sovereignty and control of the region. The US Coast Guard sent some ships of its own through in 1957, but the US was still sensitive enough to Canadian claims that when the SS *Manhattan*, a reinforced US tanker designed to test the financial viability of the route, went through in 1969, it was accompanied by a Canadian icebreaker. (As a result of this trip and other research at the time, the route was declared unprofitable and the Alaska pipeline was built.)

By 1985 the United States was taking a much more strident position. In order to bolster its claim, it started changing the nature of its traffic in the area. While it had long been assumed that both the United States and Russia had been sending submarines under Canada's Arctic sea ice, visible surface vessels – overt challenges to Canada's territorial claims – were largely off limits. Then, in 1985, the United States sent the *Polar Sea* icebreaker through without asking permission. Canada objected. The result was that in 1988 the United States and Canada signed the Arctic Cooperation Agreement, which stated that the US

would ask permission before sending icebreakers through the passage but that, when so asked, Canada would give permission.<sup>30</sup> The agreement did not last. Over the summer of 2005 it was reported that a US military submarine probably passed through the region on its way to a photo-opportunity at the North Pole, where crew members played a quick game of American football for the cameras.<sup>31</sup>

Legally, Canada's claim is strong.<sup>32</sup> But the changing conditions caused by climate change create a legal uncertainty and give an opening in which international politics can outflank international law. Declaring the soon to be navigable waters an international strait is in the interest of every nation except Canada, and international political support for the Canadian position has been marked by its absence. The United States cannot help but be pleased that several of Canada's neighbours, for example Danish Greenland, are directly challenging some of Canada's other territorial claims.<sup>33</sup> Within Canada there is a lot of support for the government's stand on Canadian sovereignty in the north. But the fact remains that while Canada can lodge as many complaints as it likes with ITLOS or through the media, it is probable that the United States (and possibly other states as well) will become increasingly bold in their transits through the region as they test Canadian resolve. Unless Canada is prepared actually to use its new military investments, or create stronger, targeted, strategic alliances with an ice-capable counterbalance protector state such as Russia, the country's control over the Arctic may be gradually eroded.

This is a clear case where climate change is causing an acrimonious and expensive border dispute, even between two countries that are usually considered allies.

### **Access to vital resources under threat**

In many regions, it will become increasingly difficult to guarantee the necessities of life, in particular water, food and shelter. This can lead to increased regional conflict, massive migration (which often just spreads the problem over a larger area), and more sympathy for extremist ideologies.<sup>34</sup> Where those conditions already exist, climate change can exacerbate the situation. It can also bring instability to currently stable or marginal areas. Here are two ways in which that can happen.

#### **Water**

The massive Himalayan range is home to over 9,000 glaciers, and is one of the largest storehouses of fresh waters outside the polar regions. It provides water directly to Bhutan, Nepal, Afghanistan, Bangladesh, Pakistan, China and India and is the source of three of

the world's largest water systems. One of the *relatively* minor rivers, the Mekong, starts in the Tibetan Plateau and then flows through China, Burma, Laos, Cambodia, Thailand and Vietnam – a total of 4,400 km – to the South China Sea. Along the way, it waters 60 million people. India's sacred Ganges river also starts here, and runs through China and Nepal before reaching India and then flowing on to Bangladesh. These rivers link together close to half the world's increasingly water-starved population. And all are dependent on the countries upstream for their supplies. Very dependent. The Indian water resources minister said in 2002 that 22% of Indians already faced 'absolute water scarcity'.<sup>35</sup> And, according to the Stern Review, 23% of China's population, or around 250 million people, live 'in the western region that depends principally on glacier meltwater. Virtually all glaciers are showing substantial melting in China, where spring stream-flows have advanced by nearly one month since records began.'<sup>36</sup>

The glaciers are melting at an alarming rate. The Chinese Academy of Science estimates that 7% of China's glaciers are melting annually and that by 2050, up to 64% could be completely gone.<sup>37</sup> The immediate impact is flooding. The Katmandu-based International Centre for Integrated Mountain Studies and UNEP have shown that around fifty lakes in Nepal, Bhutan and China have formed as a result of melting glaciers. They are very unstable and are liable to burst their banks and flash flood, drowning entire communities. The melting is also disrupting hydro projects. The flip side is that once the melt is done, those same regions (and the ones that are downstream) will suffer drought and power shortages.<sup>38</sup>

Sea levels will also affect water supplies as rises will infiltrate freshwater aquifers. All this, combining with other environmental change factors, could contribute to destabilizing the region through aggressive competition over water resources and large-scale migration.

#### **Food**

Climate change has affected not only global food supplies but agriculture-dependent economies. Here the lack of meltwater and rising sea levels are often compounded by erratic rainfall patterns. In 2006, climate conditions and beetles wrecked crops in Australia, Ukraine, Argentina and North America, driving wheat prices to a ten-year high. High corn prices, caused in part by the diversion of crops to ethanol production, triggered riots in Mexico. As India's critical monsoon veers all over the map, and meltwater becomes unreliable, the economic impact has been staggering. Around 21% of India's GDP comes from the rural sector. As of 2001, around 59%

of the workforce was involved in agriculture. That means a huge section of the economy and the country is directly affected by climate change. In 2002, for example, the monsoon failed, causing a seasonal rainfall deficit of 19%. That devastated agriculture and knocked over 3% off India's GDP. The lingering social effect of increased poverty in the already suffering countryside, accompanied by increased migration to the cities, has been compounded by a failure of government to deal with the problem in any substantial way. The issue of farmers committing suicide because of impossible debt is now a regular theme in political debates. And, in 2006, once proudly food-self-sufficient India started importing wheat for the first time in seven years.<sup>39</sup> Given that other countries, such as China, are also likely to face an increasing need for food imports (unless there is a radical revamp of agricultural policies), relying primarily on the global market could be very expensive as demand grows and crops fail. In the end, it is all likely to just make it even harder on poor people in rich countries and on poorer countries already suffering agricultural deficits. That could potentially lead to instability within and between nations, and foreign policy geared to creating preferential relationships with reliable agricultural producers.

### **Sea-level rise and infrastructure**

As around two-thirds of the world's population live near the coast,<sup>40</sup> it is not surprising that some of the planet's most expensive infrastructure is highly vulnerable to sea-level rise, including cities such as Shanghai, Mumbai, London, Washington and Paris. And sea-level rise compounds the effects of storm surges and extreme weather events. While there has been considerable focus on the vulnerability of the developing world, it is worth noting the West is also at extreme risk and, as those populations have higher expectations of their governments, the political after-effects can be strong and lingering (some attribute the Democrats' gain in the mid-term elections as much to anger over the response to Hurricane Katrina as to anger over the Iraq war). There are also long-term destabilizing ripples in terms of internal security implications. The on-going disruption caused by the Katrina refugees is most obvious in Houston, which took in 150,000 evacuees. Within weeks of their arrival, fights started to break out in schools between teens relocated from New Orleans and local youths. In December, one riot at a Houston high school resulted in the arrest of twenty-seven students, fifteen of them from New Orleans.<sup>41</sup> Almost a year after Katrina, the crime rate in Houston was spiking, with a 20%

increase in homicides, and around one out of every five murders involving an evacuee as either a victim or a suspect.<sup>42</sup> Hospital emergency services were stretched by cases of refugees with no health coverage, the incidence of sexually transmitted diseases was up, and disproportionate numbers of evacuees were on anti-depressants. The city's budget was being crushed and Houston Mayor Bill White was clear that 'there is still an emergency'. Steve Radack of the Harris County Commission agreed, saying, 'This is going to create turmoil for many years to come.'<sup>43</sup>

The US is likely to experience more of the same. For example, according to the National Hurricane Center, New York City is the fifth most vulnerable place in the US (the top four areas have all been hit since 2003). The risk area includes coastal New York, New Jersey and Connecticut, an area with a combined population of around twenty million, and an economy of US\$1 trillion with US\$2 trillion in built assets, known as the Metro East Coast, or MEC. It had a little taste of what might be in store during a 1992 Nor'easter when floodwaters poured into tunnels and subway entrances, cutting off sections of the city. The entire New York subway system shorted out (salt water conducts electricity and corrodes wires), LaGuardia Airport was closed down, the Battery Park Tunnel went under two metres of water, the sea level at the southern tip of Manhattan rose by close to three metres, and the PATH link between New Jersey and Manhattan was shut for ten days.<sup>44</sup>

Much of Manhattan is only about 3 metres above sea level, with critical regional infrastructure, such as airports, even lower-lying. A major climate vulnerability study on the region for the US government's Global Change Research Program found that 'By the end of this century, for two-thirds of [transportation infrastructure] facilities with elevations at or below 10 feet above sea level, flooding may occur at least once every decade.'<sup>45</sup> The report goes on to note that lowest elevation at FDR Drive is 6 feet, LaGuardia Airport 6.8 feet, the Holland Tunnel 7.6 feet, Marine Parkway 8 feet, Port Newark & Elizabeth 9.6 feet, and the entrances to over a dozen subway lines are all below 10 feet.

There are clear security risks involved with the inundation of a major city, or even just a major energy distribution centre or military base (in 1992 Hurricane Andrew did so much damage to Florida's Homestead Airforce base that it never reopened). That sort of vulnerability leaves even the strongest nation open to international pressure, uncontrolled population movement and economic stress.



## Conclusion

Even a far from comprehensive overview of the impacts of two narrow aspects of climate change, melting sea ice and glaciers, and rising sea levels is enough to conclude that there will be severe challenges to the global legal system, a scarcity of vital resources, and increasing threats to critical infrastructure. As a result, serious and complex legal, foreign policy, and security issues will have to be

addressed. Adapting international law to incorporate the effects of climate change can help resolve some of the problems, but it is likely that in some of the most strategic cases a modern form of the 'cannon shot rule', in which those that can best defend the turf get to keep it, will come into play. And again, it is worth remembering that these are just some of the issues raised strictly as a result of climate change. The challenges caused by the larger triggers of environmental change are even more complex.

## Endnotes

- <sup>1</sup> 'First climate debate divides UN', BBC News, 18 April 2007.
- <sup>2</sup> 'Durbin, Hagel: Global Warning poses serious threat to national security', Official Senatorial Website, [durbin.senate.gov/record.cfm?id=271514](http://durbin.senate.gov/record.cfm?id=271514).
- <sup>3</sup> *National Security and the Threat of Climate Change*, The CNA Corporation, Alexandria, VA, 2007, [securityandclimate.cna.org](http://securityandclimate.cna.org).
- <sup>4</sup> 'The world at six billion', United Nations Secretariat, 1999.
- <sup>5</sup> 'Katrina report blames levees; Army Corps of Engineers: "We've had a catastrophic failure"', CBS News, 1 June 2006. 'Report: Criticism of FEMA's Katrina response deserved', [cnn.com](http://cnn.com), 14 April 2006.
- <sup>6</sup> Nick Joliat, 'Delta region: subsidence', *Mission 2010*, Massachusetts Institute of Technology.
- <sup>7</sup> Intergovernmental Panel on Climate Change, *Fourth Assessment Report, 2007*, [www.ipcc.ch](http://www.ipcc.ch).
- <sup>8</sup> 'Climate Change and Borders' workshop, Chatham House, London, 30 June 2006.
- <sup>9</sup> [www.un.org/Depts/los/index.htm](http://www.un.org/Depts/los/index.htm).
- <sup>10</sup> [www.itlos.org](http://www.itlos.org).
- <sup>11</sup> Lawrence Schafer, 'The cannon shot rule', *Legal Aspects of Contemporary Marine Fisheries*, 1997.
- <sup>12</sup> [www.grida.no/climate/vital/33.htm](http://www.grida.no/climate/vital/33.htm).
- <sup>13</sup> Telephone interview with Dr Bradnock, 10 August 2006.
- <sup>14</sup> Private conversation.
- <sup>15</sup> Sonja Butzengeiger and Britta Horstmann, 'Sea-level rise in Bangladesh and the Netherlands: one phenomenon, many consequences', 2004, p. 4, [www.germanwatch.org/klak/fb-ms-e.htm](http://www.germanwatch.org/klak/fb-ms-e.htm).
- <sup>16</sup> Harun ur Rashid, 'Is India taking advantage?', *Daily Star*, 17 May 2006.
- <sup>17</sup> M. D. Nalapat, 'UPA ocean diplomacy undermining Indian interest', *Organiser*, 25 September 2005.
- <sup>18</sup> Private conversation.
- <sup>19</sup> M. Jarraud, Secretary General of the World Meteorological Organization, warned in his opening statement to the World Climate Research Programme workshop, Paris, 6 June 2006, that decisions are already being made to evacuate islanders from some atolls in the Pacific Ocean on account of sea-level rise and variability. The two Kiribati islands of Tebua Tarawa and Abanuea were abandoned in 1999. It has recently been decided to relocate islanders from Papua New Guinea's Carteret Island over a period of one to two years to the larger Bougainville Island. The situation is also extremely critical on the coral atoll nation of Tuvalu. For the full statement, see [http://www.wmo.ch/web/Press/SeaLevelRise\\_V.4.doc](http://www.wmo.ch/web/Press/SeaLevelRise_V.4.doc).
- <sup>20</sup> For the text of the Montevideo Convention, see <http://www.yale.edu/lawweb/avalon/intdip/interam/intam03.htm>.
- <sup>21</sup> 'Climate Change and Borders' workshop.
- <sup>22</sup> One model for doing this might be that of the Tibetan government-in-exile. A large proportion of Tibetans, both inside and outside Tibet, consider their government-in-exile, based in Dharamsala, north India, to be the legitimate government of the people of Tibet.
- <sup>23</sup> Interview with Dr Jeff Ridley, Met Office Hadley Centre for Climate Prediction and Research, 12 April 2006.
- <sup>24</sup> Beth Chalecki, 'Climate change in the Arctic and its implications for US national security', *Oceanic Studies*, Fletcher School of Law and Diplomacy.
- <sup>25</sup> 'The Arctic Grail', CBC News, [www.cbc.ca/news/background/northwest-passage](http://www.cbc.ca/news/background/northwest-passage), accessed 8 August 2006.
- <sup>26</sup> 'Climate Change and Borders' workshop.
- <sup>27</sup> *Annotated Supplement to the Commander's Handbook on the Law of Naval Operations* (Newport, RI: Naval War College, 1997), p. 215.
- <sup>28</sup> Michel Comte, 'Conservative leader Harper asserts Canada's Arctic claims', Agence France-Presse, 22 December 2005.
- <sup>29</sup> *National Security and the Threat of Climate Change*.
- <sup>30</sup> 'The Arctic Grail'.
- <sup>31</sup> Chris Wattie, 'US sub may have toured Canadian Arctic zone', *National Post*, 19 December 2005.
- <sup>32</sup> 'Climate Change and Borders' workshop.

<sup>33</sup> Anne McIlroy, 'Hans off my island', *Guardian*, 30 Aug. 2005.

<sup>34</sup> *National Security and the Threat of Climate Change*.

<sup>35</sup> Marq de Villiers, *Water: The Fate of our Most Precious Resource* (Toronto: McClelland & Stewart, 2003), pp. 318–20.

<sup>36</sup> Stern Review, *The Economics of Climate Change*, HMSO/Cambridge University Press, 2006, p. 78.

<sup>37</sup> *The Fall of Water*, UNEP, 2005, available at [unep.org/PDF/himalreport.pdf](http://unep.org/PDF/himalreport.pdf).

<sup>38</sup> *Ibid.*

<sup>39</sup> 'India to import wheat', *The Economic Times*, New Delhi, 3 February 2006.

<sup>40</sup> Don Hinrichsen, 'Coasts in Crisis: Coasts and the Population Bomb', American Association for the Advancement of Science, September 1995.

<sup>41</sup> Monica Guzman, 'Westbury high tension explodes into a brawl', *Houston Chronicle*, 8 December 2005.

<sup>42</sup> Nick Miles, 'Crime spike hits Katrina evacuees', BBC News, 15 August 2006.

<sup>43</sup> Arian Campo-Flores, 'Katrina's Latest Damage', *Newsweek*, 13 March 2006.

<sup>44</sup> Christine Van Lenten, 'Storm surge barriers for New York Harbor?', *Science & The City*, The New York Academy of Science, 6 November 2006.

<sup>45</sup> *Climate Change and a Global City: The Potential Consequences of Climate Variability and Change*, Columbia Earth Institute for the US Global Change Research Program, July 2001, [metroeast\\_climate.ciesin.columbia.edu](http://metroeast_climate.ciesin.columbia.edu).

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## Climate change research at Chatham House

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Climate change is no longer an 'environmental protection' issue but one intimately connected with a wider world. Given the scale and urgency of the challenge, many of the decisions critical for global climate security and the effective transition to a low-carbon, high-efficiency economy will take place *outside* the field of climate change. It is the decisions made in the areas of foreign and trade policy, security and geopolitics, energy policy and investment that will have an influence on the global response to climate change.

Chatham House, as a leading international affairs think-tank, can play a unique role in analysing the wider forces that will shape the overall effectiveness of the international response to climate change. One aim of the Energy, Environment and Development Programme (EEDP) at Chatham House is to reframe the debate on climate and to make the connections between climate change and other international issues. The purpose of this briefing paper series is to highlight the analysis being undertaken by EEDP to better understand the linkages. Other papers in the series include:

- Climate change: the leadership challenge (Beverley Darkin)
- Transforming our energy within a generation (Walt Patterson)
- Incentives, risk and decision-making in mitigating climate change (William Blyth)
- Linking trade, investment and climate change policies (Richard Tarasofsky)

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