



# Climate Change, Migration, and Nontraditional Security Threats in China

Complex Crisis Scenarios and Policy Options for China and the World

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By Michael Werz and Lauren Reed May 2014

Center for American Progress



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# About the Climate Change, Migration, and Conflict series

The intersecting phenomena of climate change, human mobility, and national and international instability pose a unique problem for U.S. foreign policy and global governance in the decades to come. These three factors are already beginning to overlap in ways that undermine traditional understandings of national security and offer ample reason to re-evaluate divisions between diplomacy, defense, and development policy.

This report focusing on China is the fifth in a series of papers from the Center for American Progress examining the implications of the nexus of climate change, migration, and security. Our analyses highlight the overlays of these factors in key regions around the world and suggest ways in which U.S. policy must adapt to meet the challenges they present.

This fourth regional report builds on the foundation provided by our framing paper, “[Climate Change, Migration, and Conflict](#).” Our first regional report focuses on the implications of these trends in [Northwest Africa](#), already one of the most volatile regions in the world. Our second regional report analyzes a similar dynamic in [India and Bangladesh](#), and the third report examines the issue in the [Andean-Amazonian region](#).

This series is linked to the Center for American Progress’ longstanding [Sustainable Security project](#), which argues that our understanding of security must be broadened to address the threats of the coming decades. Indeed, national security, human security, and collective security all have a part to play in achieving a safer and more equitable international environment. Our [Climate, Migration, and Security project](#) discusses and analyzes a series of key regional test cases for this comprehensive approach.

We are especially grateful to the policy planning department in the German Federal Foreign Office for their support of this line of work at the Center for American Progress.

## Editorial note

The Chinese articles cited in this paper originated from mainstream media outlets or peer-reviewed journals. Chinese publishing protocols and norms vary from American standards, which results in fewer citations for the average Chinese article compared to U.S. standards. These differences make it harder to verify the sources of some authors, but we are confident that the official sources of data we examined in this report, such as the National Bureau of Statistics of China, use acceptable standards in their data collection. These standards are disclosed in the notes of our report.

In addition, the primary sources cited in this paper were examined for accuracy and, based on this examination, we are confident that the figures cited here are reliable insofar as they report acceptable margins of error resulting from the nature of data collection.

# Introduction and summary

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## A changing Pacific region

Climate change, migration, and sociopolitical conflicts associated with China’s epic economic transformation over the past 35 years are coming to a head in this second decade of the 21st century. These interlaced dynamics are causing internal upheaval and regional instability in and around China, which could complicate or undermine efforts by the United States and Europe to coax China into full adherence to the post-Cold War international system. The consequences of these complex domestic crises—crises that have the potential to spill over China’s borders—pose challenges for regional security, prosperity, and peace.

The Obama administration clearly understands what is at stake in the region. President Barack Obama, in a speech to the Australian Parliament in November 2011, described the United States as a Pacific nation, promising that his administration “will play a larger and long-term role in shaping this region and its future.”<sup>1</sup> As former Secretary of State Hillary Clinton noted in her *Foreign Policy* article, “America’s Pacific Century,” the United States devoted a vast amount of resources to the Iraq and Afghanistan theaters in the last decade, but the time has come to invest in the Asia-Pacific theater, a region that forecasts show will dominant the economic, political, and security decisions in the 21st century.<sup>2</sup>

More recently, in a programmatic speech on the Pacific pivot, Vice President Joe Biden insisted that the United States and its Pacific allies, especially Latin American countries, embrace a similar geographic outlook on the Pacific in order to secure an important strategic achievement—an increasingly democratic and unified region that “connected economically, strategically, and through common values can make a great contribution to a more prosperous and secure Pacific.”<sup>3</sup>

Taking these new steps to strengthen Asian bilateral security alliances, engage with regional multilateral institutions, expand trade and investment, and advance democracy and human rights is due in large part to the underlying environmental,

demographic, and nontraditional security problems that China is increasingly experiencing—all of them large factors in whether the Asia-Pacific region experiences regional stability and prosperity or encounters an economic slowdown, regional conflict, public dissent, and widespread humanitarian crises.

These are Chinese internal issues that are not easily influenced by the traditional diplomatic and development tools in the hands of policymakers outside of China. The country and its ruling Communist Party face serious problems that threaten its potential for sustained leadership—domestically, regionally, and internationally. The internal challenges of rapid urbanization, political corruption, labor scarcity, local governments' soaring debt, housing inflation, massive pollution, and a graying population loom large in China's path to sustained economic development and becoming a key regional stakeholder.

## China and the United States—pivots of the Pacific Rim

The Pacific Rim is a primary center of global economic activity. The region exhibits incredible diversity—the economic depth of Hong Kong, Taiwan, and Singapore; the technological expertise of Japan, South Korea, and the United States; the natural resources of Australia, Colombia, Canada, Mexico, the Philippines, Russia, and the United States; the human resources of China and Indonesia; as well as the agricultural productivity of Australia, Chile, New Zealand, and others. A few data points illustrate the scope of this region's prevalence: The 21 members of the Asia-Pacific Economic Cooperation forum account for approximately 39 percent of the world's population, approximately 55 percent of world's gross domestic product, or GDP, and about 44 percent of world trade.<sup>4</sup>

The United States and China will increasingly serve as the key pivot points of the Pacific Rim, meaning the two nations will be both strategic partners and competitors, which in turn will require a stable bilateral relationship in order to be constructive. Yet these ties have been strained in recent years as China assertively pushes territorial claims against its neighbors, including two U.S. treaty allies—the Philippines and Japan, but also South Korea and Taiwan—while complaining that the

recent U.S. rebalance in the region seems to be the beginning of a de facto containment strategy against it.

Exacerbating these conflicts are the climate change, migration, and ensuing internal conflicts within China that are the subject of this report. Considering these developments, the United States and its European partners will have to adapt defense and development policies to this new environment while coping with domestic budget cuts. Getting this right is crucial if the United States is to remain the primary Pacific power while Europe must get a handle on its continuing fiscal crisis, which threatens funding for international involvement and the formulation of forward-looking global engagement strategies.

China, of course, must also adapt to its new role as a pivotal power along the Pacific Rim—a role that increasingly means dealing with the challenges of climate change, migration, and conflict within its own borders and working with its neighbors constructively, not confrontationally. The main pages of this report examine those challenges and offer ways for the United States, Europe, and China's neighbors to constructively influence China's decisions.

Moreover, public outcry against polluting factories and power plants in their backyards alongside the stress from internal migratory movements and the fallout from land seizures for infrastructure development only exacerbate the many environmental, social, and economic challenges China faces. This nexus of climate change, migration, and insecurity could potentially undermine the political legitimacy of the ruling party, curb economic growth, and threaten the government's ability to provide basic public services. The government's capacity to offer reliable public goods such as electrical power provision, flood control, and drought relief are inextricably linked with the regime's legitimacy, with major implications for domestic security.

The leaders in Beijing know the threats they face. There are top-level policies in place that attempt to address carbon emissions and energy inefficiencies, combat pollution and resource scarcity, rebalance migration and the rural-urban socioeconomic divide, and improve overall social welfare. However, the implementation of these policies are fragmented across free-standing, separate bureaucracies, without linkage to other climate security policies with which they interact. If the central government does not adopt climate security policies that are implemented at all levels of government—provincial and local as well—then the country's economic and political future is at stake.

China's regional influence and the Asia-Pacific region's safety and prosperity are dependent on addressing the intersecting consequences of climate change, migration, and social instability in China. Already, pressures from migration-driven urban sprawl, pollution, and rising energy demand within China are leading some Chinese policymakers to champion a "going out" strategy to diversify the nation's sources of energy, with ramifications in the South China Sea, East Sea, and beyond. And efforts to develop more hydroelectric energy and cope with rising water demand within China means that China's neighbors in South and Southeast Asia may well see less and less water flowing from the Himalayan Mountains into their nations.

Both of these sets of possible conflict along China's borders are real and growing. In this report, we examine in detail these climate change, migration, and insecurity trends at the national level within China and at different climate migration hotspots within the country, as well as their impact on domestic and regional policies. We then examine the implications for policymakers in the United States and China.

Briefly, however, our findings indicate that China's leadership is making progress on its own terms in addressing individual aspects of the climate change and migration challenges it has encountered, yet the lack of a comprehensive strategy means the country simply cannot tackle the array of problems it now faces. This in turn means that we can expect serious crises in the five climate migration hotspots we identify in this report, leading to serious political and economic complications for China, its neighbors, and the world.

But the complex crisis scenarios we map out in this report also offer possible solutions that China's leadership as well as policymakers in the United States, Europe, and around the Pacific Rim should consider. Crisis and conflict is not inevitable due to the foreseeable impact of climate change in China if policy collaboration can be promoted and then taken seriously. Bilateral and multilateral institutions and protocols focused on climate change are in place as starting points. We suggest further strengthening of these cooperative and collaborative ties in the final pages of this report—steps that will not be easy to negotiate either within China or between China and other nations but steps that simply must be taken to preserve the peace and prosperity enjoyed by Pacific Rim nations since the end of the Cold War.

# Climate change, environmental degradation, and migration

In China—as in other regions that we have analyzed in this series<sup>5</sup>—the parallel progression of rapid economic development and climate change undermines traditional rural order, creates vast new and heavily polluted metropolitan areas, and causes widespread social dislocation. This upheaval to everyday livelihoods in China due to environmental degradation and deteriorating social conditions then feeds on itself as people are forced or inclined to move to cope with these varying pressures.

These pressures are interlinked, but we begin this report by first examining the pressures of climate change. Concurrent with China’s historical economic growth is its massive increase in greenhouse gas emissions that affects China’s territory, climate, environment, and population.<sup>6</sup> In 2007, China surpassed the United States as the largest contributor to carbon emissions, catapulting it onto the main stage of international climate negotiations and requiring tough decisions at home.<sup>7</sup> The rise in global temperatures and changing precipitation patterns caused by climate change have had a profound impact on freshwater availability from China’s lakes and streams and the hydrology cycle that is necessary for agricultural and industrial production and human consumption.<sup>8</sup> These changes brought by climate change pose an enormous climate security risk that threatens national well-being for decades to come.

Climate change is not just affecting food security and water security in China. It also has implications for the nation’s internal migration flows and urbanization. China has experienced tremendous internal migration since the early 1980s due to labor-market demands along the eastern coast during its rapid industrialization, yet current research shows that internal migration is no longer solely driven by labor but also by environmental changes such as food insecurity, sea-level rise in coastal areas, and more extreme weather events. Among the consequences of climate change in China are water stress, increased droughts, flooding, increased coastal erosion and saltwater inundation, glacial melt, and shifting agricultural zones that affect drinking water and food supplies.

All of these consequences create new patterns of climate migration. Specific challenges vary from region to region within China, but the main issues involve water supplies, food security, glacial melting, desertification, extreme weather, rising temperatures, pollution, infrastructure damage, and sea-level rise. Each of these challenges will be examined briefly before we unpack them in more detail in the five regional hotspots we analyze in this report.

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## Water supplies

The United Nations and World Bank define water stress as annual per capita water availability of 2,000 cubic meters or less and water scarcity as 1,000 cubic meters or less. The Hai River Basin, which flows through Beijing, is only at 343 cubic meters.<sup>9</sup> To accommodate water demands, deeper water wells have been dug. But this has led to saltwater intrusion in coastal areas. Similar problems afflict other areas of China.

In addition, farmers are subject to de facto water rationing due to water scarcity. They are required to pay infrastructure and pumping fees along with the water they use for agricultural purposes, such that in northern China the published water price is 0.1 yuan to 0.15 yuan per cubic meter, while the effective price is 3 yuan per cubic meter.<sup>10</sup> The result is farmers have difficulty irrigating their crops and meeting food demand, endangering Chinese agricultural production and rural livelihoods.

In addition, the movement of people to China's western and central regions with greater water availability has the potential to aggravate existing ethnic tensions between Han Chinese and ethnic minorities such as Tibetans and Uighurs.

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## Food security

Fluctuations in water supplies are affecting Chinese agricultural production, which result in inconsistent yields.<sup>11</sup> These fluctuations impact international commodity markets as decreased domestic production in China limits agricultural exports and increases domestic and international prices as China boosts its food imports. Within China, increasing demand by its emerging middle class contributes to rising costs—to the detriment of those that cannot afford it.

The consequences are increasingly evident on a global scale, too. Over the past decade and a half, the World Bank's global food price index has more than doubled. As we have discussed in an earlier report, the impact is particularly dire for Northern Africa, where food security is already precarious.<sup>12</sup>

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## Glacial melting

Substantial portions of China's western glaciers are projected to diminish by more than 27 percent within the next three decades, resulting in an increased water discharge of 20 percent to 30 percent per year. The Yellow River and Yangtze River regions are likely to experience mass flooding followed by droughts as the consequences of flooding, then sharply reduced river flow takes its toll on the soil.<sup>13</sup>

The shrinking Himalayan glaciers and other water resources means that ensuring fresh water to meet people's drinking, agricultural, and general usage needs will intensify over time.<sup>14</sup> Between 2003 and 2009 alone, the glaciers lost more than 170 gigatons of water, resulting in massive floods. Currently, the glaciers are thinning almost three-quarters of one meter per year.<sup>15</sup>

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## Desertification

Decreased precipitation and declining runoff in the upper reaches of the Pearl River, Yangtze River, and Yellow River regions will lead to faster desertification. This process puts roughly 200 million people at risk that are living in already arid and semi-arid areas of China.<sup>16</sup> This is already a massive problem in the Beijing region, where the water shortage is more pressing than in the Middle East.<sup>17</sup>

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## Severe weather

The frequency and severity of storm surges, floods, droughts, typhoons, tsunamis, and other extreme weather events such as heat waves will increase within and beyond coastal areas. The consequences are already devastating: An average of 2,000 Chinese have lost their lives every year to extreme weather since the 1990s.<sup>18</sup> In 2012 alone, 430 million Chinese were affected by natural disasters, leading to direct losses of 309.6 billion yuan.<sup>19</sup> Over the past decade, economic losses due to natural disasters have been estimated at 200 billion

yuan to 300 billion yuan annually, averaging 3 percent to 6 percent of GDP, and the impact is likely to grow.<sup>20</sup>

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## Increased temperatures

Rising temperatures will generate long-term harm to crops and boost the array of agricultural pests as well as provide a better environment for diseases such as malaria and dengue. An additional concern is possible shifts in the geographic range of the H5N1 virus as birds' migration patterns change.<sup>21</sup>

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## Pollution

Industrial production, inefficient energy production, and the insatiable appetite of the Chinese public for motor vehicles have made China home to some of the most polluted cities in the world. Pollution is contributing to more than 3 million deaths, and Chinese will lose an aggregate 2.5 billion years of life expectancy due to air pollution.<sup>22</sup>

The consequences are evident across urban China. In October 2013, Harbin, a northeastern provincial capital of 11 million, was essentially closed for business as smog catalyzed gridlocked traffic, suspended primary and secondary school classes, and shut down airport and public bus routes.<sup>23</sup> In Beijing, particulate matter measuring 2.5 micrometers in diameter or smaller were found at the level of 1,000 micrograms per cubic meter—the same level as London during its most polluted days in the 20th century.<sup>24</sup>

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## Water and energy infrastructure damage

In 2012, flooding caused damage to 38 large- and medium-sized reservoirs, 1,327 small reservoirs, 12,041 kilometers of embankments, 1,219 kilometers of dikes, 204 million irrigation facilities, 806 hydrological stations, 44,000 electromechanical wells, 7,948 electromechanical pumping stations, and 720 hydropower stations—resulting in direct economic losses of 46.8 billion yuan.<sup>25</sup>

Climate change also poses an increased likelihood of floods, droughts, mudslides, and geological disasters affecting China's largest hydro-engineering projects by

adversely affecting reservoir management, dam safety, power generation, shipping, and the surrounding environment. Among these hydro-engineering goliaths are the Three Gorges Dam on the Yangtze River and the South-North Water Transfer Project, which diverts water from the Yangtze River, Yellow River, and Hai River to northern China.<sup>26</sup>

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## Sea-level rise

The sea level of China's coastlines has been rising at a rate of 2.7 millimeters per year on average for the past 30 years—higher than the global average.<sup>27</sup> This increase boosts the probability of flooding and exacerbates the risk of saltwater intrusion into water tables along coastal areas.

The Yangtze River Delta is especially vulnerable because of its many low-lying quarters and massive population. But so, too, are the coastal urban population centers in central and southern Liaoning, Beijing-Tianjin-Hebei, Shandong Peninsula, and the Pearl River Delta. Flooding due to extreme weather is a main threat for these areas as low-lying cities risk being submerged. Specifically, Shanghai's sea level rose an average of 115 millimeters over the past 30 years, Tianjin's rose an average of 196 millimeters, and Liaoning's, Shandong's, and Zhejiang's rose an average around 100 millimeters over the same period. Storm surges for all of these urban regions in 2008 caused 19.2 billion yuan in losses.<sup>28</sup>

Subsidence, the downward settlement of the ground's surface, is also occurring at a rapid rate. Subsidence decreases the buffer against flooding, saltwater intrusion, and sea-level rise, so the more subsidence, the more sea-level rise and extreme weather; 9.6 percent of Shanghai's Binhai area and peripheral island soil had become saline-alkali soil with high pH, a poor soil structure, and low infiltration capacity. Dalian's fresh groundwater supply became threatened when the water table exceeded sea level by 5 meters to 25 meters, resulting in saltwater intrusion of 28,816 square kilometers.<sup>29</sup>

Harbors, piers, and shipyards also are incurring more and more costs due to salt incursion, soil salinization, coastal erosion, and flooding. Coastal erosion in particular can affect beaches, piers, revetment dams, and shelterbelts. Due to subsidence and sea-level rise, the pier at the Old Tianjin Port is 1 meter below the highest recorded high tide; in 1992, a typhoon hit the area and caused damage of 400 million yuan to the dock, bus system, warehouses, and shipyards.<sup>30</sup>

Chinese experts predict 6.9 percent of Guangdong’s coast to be submerged by 2040, and 4.2 percent to be eroded; at the same time, beach, mangrove, sea grass, and wetland ecosystems will experience losses.<sup>31</sup> Fujian’s sea-level rise was incredibility high in October 2010 due to Typhoon Megi. This typhoon affected more than 600,000 people and caused economic losses of more than 2.6 million yuan.<sup>32</sup>

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## The pressures of climate on migration

All these climate indicators enforce a key argument of our analysis: China’s social and economic development is being shaped by increasing climate and environmental pressures—ones that are caused in part by massive migration and in turn cause climate migration. The future of the country’s economic growth and modernization will depend in no small part on how these challenges are addressed and to what degree greater transparency and citizen participation will be allowed. Before discussing the policy decisions facing China’s leaders, a deeper look into the nation’s migration patterns is warranted.

# Human mobility in China

The effects of climate change are intensified by China's internal migration and the massive expansion of its urban population. Prior to economic liberalization, which began under Chinese Communist Party leader Deng Xiaoping in 1978, migration in China was heavily restricted under the hukou household registration system. The modern version of the system dates back to 1958, when any movement between localities required government approval, which was rarely given to ordinary citizens. The Chinese government severely restricted migration of poor peasants to urban areas with higher living standards and greater opportunities.<sup>33</sup>

Designed to establish a Soviet-style system of economic modernization, the system focused on boosting heavy industry and an agricultural surplus in part by preventing a rural exodus.<sup>34</sup> The result was a de facto segregation of the rural and urban populations as well as social, economic, and political fragmentation. Under the hukou system in the Maoist era from 1949 to 1978, some 700 million to 800 million peasants were denied the opportunity to legally settle in cities and obtain access to basic welfare and other social services.<sup>35</sup>

Subsequent rapid industrialization, which began in the 1980s, created a substantial demand for labor, bringing rural western farmers in droves to become laborers in eastern coastal industrial hubs. But these rural migrant workers were not granted urban hukous, which would allow them to settle in urban areas and gain access to resources such as health care and legal representation. Rather, they were categorized as “temporary contract workers.”<sup>36</sup> This practice expanded throughout the following decades.

Today, rural migrant workers form the backbone of China's manufacturing sector and low-end services sector. Between 1985 and 1990, eastward interprovincial migration reached over 11 million, climbing to more than 33 million by the 21st century—with the metropolitan areas of Guangdong, Shanghai, and Beijing ranking as the top three destinations. In 2009, the last year for which complete data are available, the number of rural-to-urban migrants reached a staggering 150 million.<sup>37</sup>

Climate migrants are increasingly forming a larger portion of China's migrant population. The West China Development Office reports that from 1983 to 2005, China had about 2.6 million environmentally displaced persons.<sup>38</sup> Increasing awareness of the problems in regions affected by climate vulnerability due to lack of natural resources or vulnerability to natural disasters have brought about the government's effort to conduct environmentally driven resettlement. With the goal of preventing unexpected instability due to environmental contingencies, these efforts sometimes provoke discontent in communities forced to resettle. The national goal is to resettle 1.5 million people by 2020, and scholars project that by 2050, about 10 million people mostly from western China will need to be resettled.<sup>39</sup>

The widespread construction of water reservoirs—a need in part related to climate change—also is displacing a significant portion of the population. China today has 85,412 reservoirs and reservoir pools with a capacity to hold 6,345 billion cubic meters. In building these reservoirs, 2,288 million people were relocated, amounting to 10 percent of the country's farmers.<sup>40</sup> While policies issued in 2006 mandate commensurate compensation and resettlement for all water reservoir migrants, resettled families often encounter hardship in their resettled communities due to lack of educational opportunities for children, work opportunities for parents, and insufficient living amenities as compared to their previous homes.

## Defining climate migrants

No universally accepted concepts, much less legal categories, exist to describe or define climate migrants. There is agreement, however, that factors such as drought, flooding, severe weather, and environmental degradation can cause human mobility in large numbers that are certain to increase in the near future.

Among the labels ascribed to these people besides climate migrants are climate refugees, environmental refugees, environmental migrants, environmentally displaced persons, environmentally induced migrants, forced-climate migrants, and anticipatory refugees. The category of “climate refugees” was first used by the U.N. Environmental Program in 1985, and is often the term of choice in literature and policy debates. In our reports, we chose not to use the terms climate refugees and environmental refugees because of the many legal and political implications that are generally reserved for political refugees defined under the 1951 Refugee Convention. We share the concerns expressed by many working in this field that considering those who have been forced to move due to climate change as refugees would add so many people to that category that the resources intended for political refugees would be quickly depleted.

In addition, climate migrants often have a higher degree of negotiation room than refugees, particularly in the case of slow-onset climate change, where these migrants may have time to plan their relocation. Thus, we believe that the term “climate migrant” better recognizes the complexity of migration decisions in this situation.

While no internationally accepted definition for persons moving for environmental reasons exists to date, the International Organization for Migration, or IOM, an intergovernmental organization with more than 130 member nations, put forward a working definition of “environmental migrants” in its 94th

Council Session, a definition that also appears in the *World Migration Report 2008* and various other publications. This definition encompasses, but is not limited to, climate migrants. It recognizes that:

- Environmental migrants are not only those displaced by extreme environmental events but also those whose migration is triggered by deteriorating environmental conditions.
- Environmentally induced movement can take place within as well as across international borders and can be both short and long term.
- Population movements triggered by environmental factors can be forced as well as a matter of choice.
- All persons moving for environmental reasons are protected by international human rights law. In addition, persons displaced within their country due to natural or human-made disasters are covered by provisions laid out in the IOM’s “Guiding Principles on Internal Displacement.”

In this document, the IOM underscores that governments have a primary responsibility to protect and assist their internally displaced populations. Should a government not live up to this responsibility, the international community has a right to become engaged.

We think that, for the purposes of strategic and policy planning, using the term “climate migrants” does not require a delineated set of descriptive conditions. Given that all the available parameters—rising temperatures, increasing mobility, global demographic growth, sustained instability, and massive gaps in governance—are creating conditions in which climate change, migration, and conflict will increasingly intersect, there is reason enough to worry and to engage in a policy conversation.



# The challenge of urbanization

Rural-to-urban migration is changing the political, economic, and social dynamics of China, posing risks to stability and influencing policymaking domestically and in the region. The growth of China's cities has far surpassed estimates from the 1990s and early 2000s, which were assuming urbanization to reach 50 percent by 2020.<sup>41</sup> This threshold was crossed in 2011, and the latest report of the National Board of Statistics estimates a 52.6 percent urbanization rate for 2012.<sup>42</sup>

Chinese social scientists predict that the urbanization rate will reach 60 percent by 2020, still falling short of most developed economies, which have urbanization rates of 80 percent or more.<sup>43</sup> If these predictions for 2020 hold true and the widely accepted projection of China's total population reaching 1.45 billion by 2020 is accurate, this would imply that between 2005 and 2020, the number of rural residents migrating to urban areas would amount to 308 million.<sup>44</sup> The impact of those shifts cannot be overestimated, and any exacerbating factor—such as climate change—will play a substantial role in shaping China's future.

In urban areas, social instability is often exacerbated by the lack of health care for migrants. Since the hukou system restricts access to health and other social services, workers theoretically have to return to their hometowns to receive health care.<sup>45</sup> This outdated system increases the spread of infectious diseases in urban areas. Rural migrants fare worse on maternal and infant health indicators, have a higher risk of contracting sexually transmitted diseases, and have considerably less knowledge on health issues in general.<sup>46</sup>

Financial and economic crises can exacerbate already unstable urban environments. During the 2008 to 2009 global financial crisis, 23 million rural migrant workers lost their jobs, triggering mass labor protests—some of which turned violent.<sup>47</sup> For analysts within and outside China, it is clear that the hukou system needs reform, as the current system is unsustainable economically and destabilizing socially. In addition, climate distress is not limited to the urban poor. Air quality in particular has decreased so much that some foreigners and wealthy Chinese

are leaving the country, while foreign companies are reconsidering investments due to the difficulties in finding qualified employees.<sup>48</sup>

These shifts in the patterns of China's labor market are being discussed as the "end of the demographic dividend."<sup>49</sup> In 2003 and 2004, labor shortages were already causing disruptions in the Pearl River Delta, and in 2009, Shenzhen alone accounted for a shortfall of 120,000 workers, mostly blamed on low salaries not overcoming opportunity costs for prospective workers, poor working conditions, and lack of legal protections. In addition, the hukou system still places major constraints on workers, as they cannot receive health care, pensions, housing, and education for their children when they migrate.<sup>50</sup>

The National Bureau of Statistics identifies two notable rural-to-urban migration trends in its 2010 report:<sup>51</sup>

- **Structural changes:** Skills, education, and average monthly salary have all increased with construction jobs paying the best and service and manufacturing sectors at the bottom. Wages grew fastest in western China, closing the income gap with the coastal regions.
- **Geographical shifts:** The number of workers in eastern China—90.76 million—decreased by almost 9 percent, and the numbers in central and western China increased by over 30 percent, totaling more than 100 million. This led to a reduction of the migrant worker population in the Yangtze River Delta and Pearl River Delta by 2.4 and 7.6 percentage points, respectively, within one year.

Several seemingly contradictory trends raise the prospect of instability among China's large migrant populations. On the one hand, workers still put in very long hours, over half do not sign labor contracts, and wages are often withheld. On the other hand, greater prosperity and increased education attainment might result in greater political activity and more outspoken concerns among a group of people that is larger than the population of any European country.

Many of these workers are from western and central China, about 40 percent are female, and more than two-thirds are unmarried.<sup>52</sup> Even more interestingly, a quarter of these migrants have never farmed before in their life, alluding to a stark change in Chinese peasant traditions. Working conditions are unsafe for many, labor contracts are often absent, and about half of these migrants spend their free time on the Internet.<sup>53</sup>

The Chinese government's concern about these restive migrant populations is reflected in the recommendations of the recent report by the Household Survey Office meant to address some grievances.<sup>54</sup> The report recommends that the government:

- Allow for migrant workers to have residential permits in cities.
- Increase the number and quality of job-skills-training programs.
- Consider migrant workers' housing needs in city planning efforts.
- Strengthen the legal protection of migrant workers.
- Improve workers' access to social security and insurance.
- Resolve education issues for migrant workers' children.
- Improve migrant workers' access to psychological counseling.

Clearly there is high-level recognition that national stability is contingent upon the migrant population's ability to integrate into the urban social structure.



# Social instability and domestic security risks

Because the social consequences of climate change are disconnected from its origin—anthropogenic emissions of harmful greenhouse gases in the atmosphere over a long period of time—public demonstrations in China seldom revolve around climate change specifically. But oftentimes the largest industrial polluters are also transgressors of more tangible environmental offenses—and it is these direct offenses that have been the focus of many protests and social unrest in the country.

Not only have pollution and environmental degradation become areas of great concern, but they also constitute a rare issue over which Chinese citizens can express their grievances, even though political repercussions and secrecy are still problems. Other large sources of social instability are migrant worker protests related to labor issues or clashes with locals. Given that climate change may affect these different groups in unpredictable ways in the future, the interplay of environmental, agricultural, and labor grievances with climate security issues creates the potential for volatile outcomes.

One major intersection of climate, environmental, and migration grievances is the growing number of cases where ecological vulnerability intensified by climate change has forced whole villages to relocate. While few large mass incidents have been reported in connection with environmentally displaced persons, or EDPs, local governments struggle to manage the formal petitions of EDPs for some kind of redress. Experts only expect the number of cases and the potential for social instability to increase in the future, as more people will be forced to relocate due to ecological vulnerability. Still, environmental activism and mass incidents in migrant communities rank high as sources of social instability and public contention.

Environmental degradation has become a matter of such great concern that related protests have taken preventive as well as reactive forms, as proven by increasing opposition against the construction of new factories by companies known to flout environmental regulations. In 2007, about 20,000 Chinese demonstrated in Xiamen against a petrochemical plant, expressing concern about adverse envi-

ronmental effects and reduced property values.<sup>55</sup> In August 2011, about 12,000 people demonstrated against a government decision to establish a chemical plant in Dalian, Liaoning province.<sup>56</sup> Similar conflicts take place in the countryside where environmental damage caused by heavy polluting and lax regulations has adversely affected the livelihood of rural farmers by depleting crops, endangering livestock, and fueling major health concerns.

Rural and migrant communities are a source of domestic instability as well. As Geoff Crothall of Hong Kong's China Labor Bulletin said:

*“There is a lot of pent up anger and frustration among ordinary people—not just migrant workers. There are many towns ... which are still very much [divided between] locals and outsiders. Migrant workers are still doing the lowest paid, dirtiest jobs and suffer discrimination on a daily basis. That’s going to cause resentment and anger to build up.”<sup>57</sup>*

Minor confrontations often spill over into much larger protests, proving the high degree of volatility in China's public sphere. Since the Arab Spring's beginnings in Tunisia with one act of protest from a single street vendor, the Chinese government has shown heightened concern over such mass incidents, and has taken extreme measures to suppress any similar uprisings, such as the thwarted “Jasmine Revolution” by pro-democracy protests in more than a dozen cities in China in February 2011.

These environmental and migrant worker protests should be analyzed in the context of China's overall state of dissent. Chinese researcher Cai Yongshun found that from 1994 to 2008, “mass incidents”—protests of 100 or more people—had increased by 16 percent, protests with 500 or more increased by 7 percent, and protests of over 1,000 increased by 2.2 percent.<sup>58</sup> With 74,000 mass incidents in 2004 that involved a total of approximately 3.76 million protesters, it is no wonder that in 2005, then-Public Security Minister Zhou Yongkang remarked, “Mass incidents have become a major problem for social stability ... their scale is constantly expanding.”<sup>59</sup>

Most recently, Professor Sun Liping at Tsinghua University documented 180,000 mass incidents in 2010 alone.<sup>60</sup> With protests on the rise, and the increasing convergence of environmental, climate, and social welfare issues, it may only be a short while before different groups of disenfranchised protesters come together to express their demands over the confluence of climate security issues.

# Climate, migration, and insecurity hotspots

In this section of the report, we focus on several climate migration hotspots in China, selected because they are regions under environmental stress and are expected to be affected disproportionately by climate change, and where human mobility, forced or otherwise, has the potential to exacerbate or generate social tensions. These hotspots are:

- The greater Beijing region
- The Yangtze River Delta region
- The Pearl River Delta region
- The Xinjiang region
- The Chongqing region

The greater Beijing region, the Yangtze River Delta region, and the Pearl River Delta region are all major migration hubs threatened by sea-level rise and storm surges due to their location along the coastline. Coastal zones, of which these three are the largest, host 42 percent of China's population and 51 percent of its GDP, and show varying degrees of vulnerability to climate change. Recent studies show that 30 percent of coastal zones are highly vulnerable or very highly vulnerable to sea-level rise and 90 percent are moderately vulnerable or worse.<sup>61</sup>

The Chongqing region and Xinjiang region are affected by different interactions between climate and migration issues than the coastal areas. Both are home to a large number of environmentally displaced persons due to forced relocation out of ecological vulnerable regions in addition to migrants looking for new economic opportunities. Diverse ethnicities live alongside Han Chinese, the dominant ethnicity, which combined with government policies, environmental factors, and resource scarcity have created a powder keg of ethnic tensions and sometimes even violence and brutality.

In addition, each region has unique challenges to face in its future:

- **The greater Beijing region** is rife with environmental challenges. With an unhealthy air quality index of 196,<sup>62</sup> extreme water scarcity, sea-level rise by the Yellow River Delta projected to rise 0.7 meters to 0.9 meters by 2050,<sup>63</sup> and the continued plague of acid rain, Beijing's capacity for its population of 20.18 million is already under significant stress. Desertification and vigorous sandstorms also are major problems, which the government tries to mitigate with a massive tree-planting program north of the metropolitan area. In addition, the city is a regional hub for migration.<sup>64</sup>
- **The Yangtze River Delta region**, with the mega-city of Shanghai at its center, has been sensitive to the effects of climate change, particularly sea-level rise. By 2030, the sea level is predicted to rise 360 millimeters to 380 millimeters around Shanghai and 320 millimeters to 340 millimeters in the coastal areas in Jiangsu province. Urbanization has stressed the Yangtze River Delta region by intensifying water pollution, acid rain, soil pollution, and solid waste accumulation.<sup>65</sup> Migration rates within the Yangtze River Delta are high; Shanghai brings in a net migration percentage of 100 percent to 350 percent of its population and the surrounding cities of Suzhou, Hangzhou, and Ningbo bring in 50 percent to 100 percent of their total populations.<sup>66</sup>
- **The Pearl River Delta region**, encompassing major metropolitan areas including Hong Kong, Shenzhen, Guangzhou, and Macau, has faced substantial soil pollution as a result of surrounding urbanization. Twenty-eight percent of soil in the delta region has been affected by heavy metal pollution, yielding one out of five vegetables that were contaminated with arsenic.<sup>67</sup> The Pearl River Delta must also endure air pollution, soil erosion, and sea-level rises predicted to reach 30 centimeters—1 foot—by 2030.<sup>68</sup> Migration in the Pearl River Delta is extraordinarily high, with its major cities attracting large numbers of migrants.<sup>69</sup>
- **The Xinjiang region** in northwestern China has transformed into one of the unhealthiest regions in China due to its level of environmental damage. Air and water pollution, desertification, and general degradation led to Xinjiang being rated as the fifth-worst environment out of 30 regions by the Chinese Academy of Sciences.<sup>70</sup> In tandem with these stresses, Xinjiang faces persistent unrest as a result of its heavy influx of Han Chinese migrants who clash with the local population of Uighur Muslims. Currently, Han Chinese migrants occupy 40 percent of the region, which used to be 80 percent Uighur.<sup>71</sup>

- **The Chongqing region** in central China, an industrial mega-city located on the middle banks of the Yangtze River, is also under heavy environmental and migratory stress. Chongqing had the highest level of airborne sulfur dioxide among 23 large cities in China, and currently is the largest progenitor of organic water pollution in the Yangtze River Basin upstream from the Three Gorges Dam. Chongqing experiences concentrated migratory traffic, as 20 percent of the city's registered population passes through as floating migrants.<sup>72</sup>

We turn now to each of these regions to examine in more detail the consequences of climate change and migration on instability.



A Chinese paramilitary police officer stands guard as Tiananmen Gate is shrouded by a haze of pollution in Beijing.

THE ASSOCIATED PRESS/VINCENT THIAN

# The greater Beijing region

Beijing is the cultural, education, and political hub of China. Located on the northeastern edge of the North China Plain, Beijing's climate has historically been that of a semi-humid continental monsoon climate, with hot and rainy summers and cold and dry winters. But the region's scarce precipitation, lack of adequate water sources, and location in a dust bowl surrounded by mountains has resulted in heavy smog, frequent dust storms, and water scarcity.

The size of Beijing is as expansive as its legacy: its total area is 16,400 square kilometers, encompassing 182 townships, 14 districts, and 2 counties.<sup>73</sup> While Shanghai is larger by population, Beijing still boasts a population of 20.2 million people, about a 30 percent increase over the past 10 years.<sup>74</sup> In 2011, the greater Beijing region had a total GDP of 1.6 trillion yuan, with 13.6 billion yuan from agriculture, 375.3 billion yuan from manufacturing, and 1.2 trillion yuan from the services sector.<sup>75</sup>

In the Beijing region, city planners are struggling to integrate new migrants.<sup>76</sup> The urban environment is very fluid, with many migrants moving more than once. About 41 percent report to have moved within Beijing two to four times, and 31 percent moved five or more times. This has social repercussions; a 2008 study documented that about 10 percent of the 300,000 first-grade children of labor migrants in the capital did not enter school at the appropriate time, missing out on opportunities and potentially becoming a risk for the city's safety and stability.<sup>77</sup> With more than 10 million migrant children attending school in Beijing alone in second-rate schools just for migrants, these concerns are not unfounded. Former Chinese Premier Wen Jiabao implicitly acknowledged this dilemma when he stated, "under the same blue sky, migrant workers' children should be able to bathe in the sun rays of public spending" (同在一片蓝天下, 公共财政的阳光要能沐浴到农民工子女身上).<sup>78</sup>

Resentment of immigrants is high among the native Beijing population, and for many immigrants, this resentment comes in the form of direct discrimination.



A few years ago, Liu Weidong, a sociologist at the Beijing Academy of Social Sciences, conducted a survey on migrant workers' rights. He discovered that 38 percent of respondents said they had been discriminated against and 20 percent of non-self-employed workers said they had had wages withheld. Of those who felt discriminated against, almost 60 percent said it was mostly from local residents.<sup>79</sup>

The social tensions between locals and migrants run the risk of boiling over into mass incidents in Beijing. For example, on May 3, 2013, a 22-year-old migrant woman from Anhui, Yuan Liya, fell to her death from the top of the Jingwen shopping mall in Beijing's Muxiyuan district.<sup>80</sup> Police declared the cause of death to be suicide, but rumors online that she was raped and killed sparked protests.<sup>81</sup> Most sources reported that hundreds of protesters faced down riot police.<sup>82</sup> The protesters were quelled and dispersed by the afternoon.<sup>83</sup> With more migrants flooding toward Beijing despite such social discrimination, the lack of legal protections and a viable social safety net threatens the social stability of the region.





Low water levels are seen in the Chongqing section of the Yangtze River in Chongqing, China.

THE ASSOCIATED PRESS/EYEPRESS

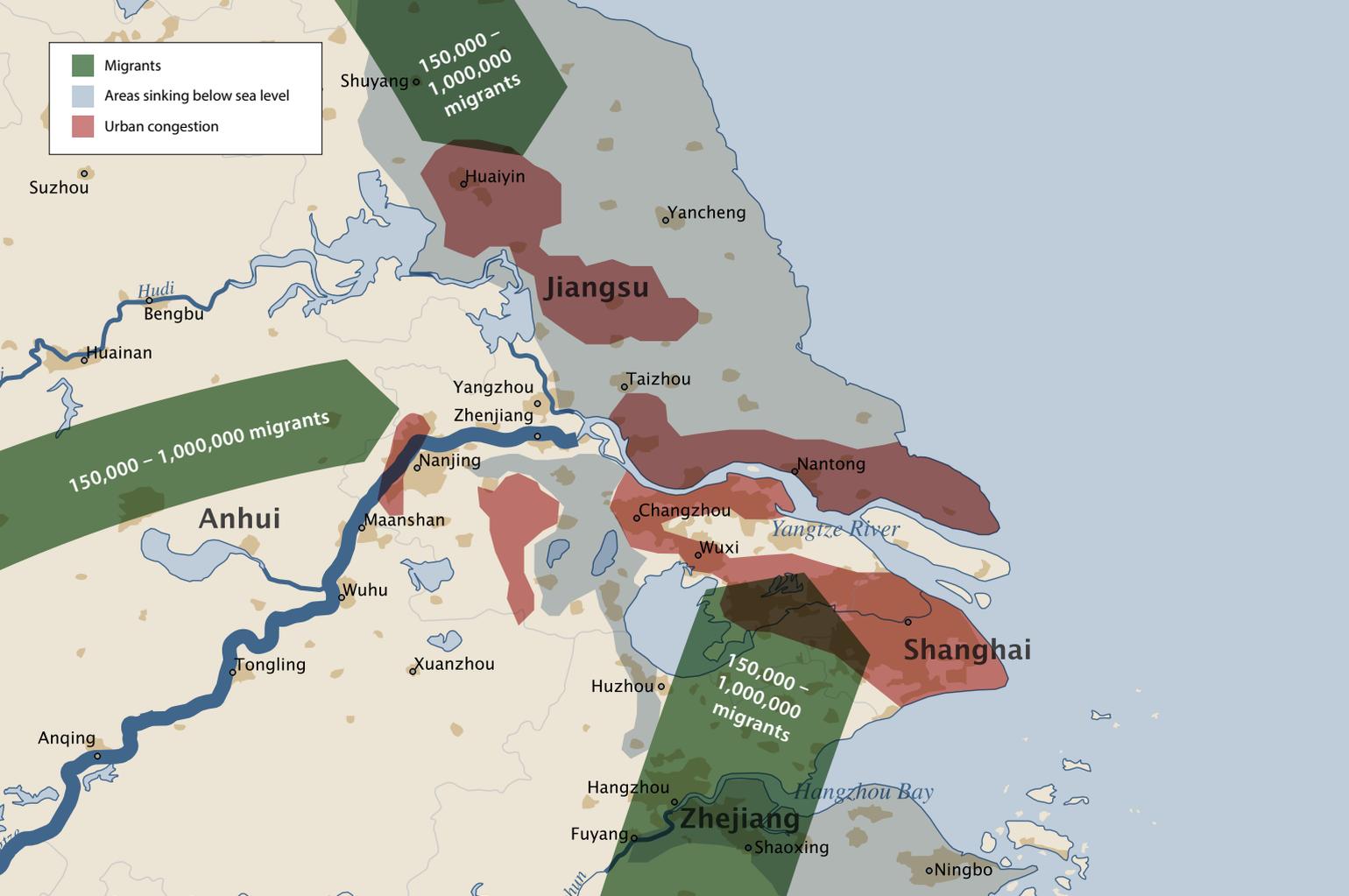
# The Yangtze River Delta region

Consisting of Zhejiang and Jiangsu provinces and the Shanghai Municipality, the extensive Yangtze River Delta is home to more than 105 million people. It is the most urbanized area in the country, with the highest population density and astonishing growth rates. Between 1997 and 2005, the region averaged over 13 percent annual growth,<sup>84</sup> and in 2010, it accounted for over 20 percent of national GDP.<sup>85</sup> The rapid and massive growth of the region can be partly attributed to the opening of the Pudong “new area” in 1990 and the construction of the Suzhou development zone in 1992.<sup>86</sup>

Pudong is Shanghai’s financial center and home of the Shanghai Stock Exchange, while the Suzhou development zone northwest of Shanghai is designated for industrial and high-tech development, with billions of dollars’ worth of output every year. More recently, some of the production has been moved inland due to rising labor costs in the Shanghai region and a growing shipping and services industry in the area that began to outpace manufacturing.

Shanghai is the fourth-largest metropolitan area in the world, with more than 23 million inhabitants and a diverse economy, making it a magnet for internal migrants. In addition, Zhejiang and Jiangsu provinces, which border Shanghai to the north and south, have adopted business-friendly models for structural reform and urban development strategies that focus on establishing large metropolitan centers,<sup>87</sup> such as Nanjing, Suzhou, Wuxi, and Xuzhou. These cities have a total of 30 million inhabitants; Nanjing, a city of 8 million, has an annual growth rate of close to 3 percent, and Suzhou at 10 million has a growth rate of 4 percent.<sup>88</sup>

Rapid urbanization, internal migratory flows, and environmental degradation bring severe challenges to the Yangtze River Delta region. Because of its marine subtropical climate, consisting of hot and humid summers, cool and dry winters, and warm springs and falls, the region is susceptible to typhoons and floods.<sup>89</sup> Moreover, fast urbanization, economic growth, and the production boom have increased carbon emissions dramatically in recent years. Shanghai has the highest



carbon dioxide emission density in the country, reaching 26.639 tons per square kilometer<sup>90</sup> and sulfur dioxide emissions have increased from 41.25 percent in 2000 to 50.76 percent in 2010.<sup>91</sup>

The high concentration of people has created so-called “urban heat islands,” in which buildings retain the heat accumulated during the daytime, causing an increase in nighttime temperatures by 1 degree to 5 degrees Celsius (1.8 degrees to 9 degrees Fahrenheit). In conjunction with more frequent heat waves throughout the region, these conditions pose adverse health risks for citizens. In addition, the pollution caused by the rapid expansion of the industrial sector has caused a significant acid rain problem, exacerbating the existing environmental challenges.

The geography and the urban environment of the Yangtze River Delta make it likely that some of the region’s environmental damages will be irreversible. Due to rapid industrialization, which requires large volumes of water consumption, the

Lake Tai Basin near Suzhou and its surrounding lakes are draining out, reducing their water storage capacity. Given that this is the third-largest freshwater reservoir in the country, providing water to 30 million residents and covering almost 1,000 square miles, water scarcity and the acceleration of soil erosion present a major challenge.<sup>92</sup> In addition, the available water resources in the Yangtze Delta are also affected by the melting glaciers in the Himalayas, which supply roughly a quarter of the water to the river.

The sustainability of the Yangtze River as a water source for the Yangtze Delta region is called into greater question when considering the impact of two major hydro-engineering projects on its banks further upstream: the Three Gorges Dam and the South-North Water Transfer Project. (See sidebar) While the Three Gorges Dam has already profoundly changed the ecological makeup of the region and forced the migration of millions of people in the Chongqing region, the South-North Water Transfer Project is still underway and has the potential to do even greater damage across a larger area of the country. The project entails a \$62 billion investment by the government to divert more than 44 billion cubic meters of water annually from the Yangtze River to arid regions in northern China by way of three large pipelines.<sup>96</sup> The amount of water to be transferred is equivalent to nearly half the amount of water consumed in California annually.

Following the construction of the controversial Three Gorges Dam—the world’s largest power station, completed in 2012 after 18 years of construction—a steady decrease in sedimentary deposits has been observed in the middle Yangtze River, threatening the environment long term due to a decreasing growth rate of intertidal wetlands.<sup>97</sup> The project forced many local residents into migrating further down the river, as did many other hydroelectric projects along the river.

Further downstream where many migrants end up, the environmental impact also shows. Soil erosion in the lower reaches of the Yangtze River affects the entire delta region.<sup>98</sup> A related issue is the overextraction of groundwater, which results in irreversible land subsidence. In Shanghai, land subsidence reached a level of over 6.5 feet (2.6 meters) while in Suzhou, Wuxi, and Changzhou the soil has sunk over 3 feet (1 meter).<sup>99</sup>

This process increases flood risks. Estimates of economic losses in Shanghai alone are about 290 billion yuan—or more than \$470 million—over the past 40 years. About half was spent restoring areas affected by tidal damage and lesser amounts on restoring flood-damaged areas and improving safety measures. In addition,

## Dams and water reservoirs

Over the course of China's recent history, the government has directed the construction of 85,412 reservoirs and reservoir pools with a total holding capacity of 6.345 trillion cubic meters.<sup>93</sup> This policy has had major ramifications over the years: more than 2.28 billion people have been relocated to make way for these reservoirs, creating a major externality in order to ensure water supply. Recently, policies issued in 2006 have attempted to mitigate the effect of forced migration by dictating the legal amount of land-acquisition compensation and resettlement for these "water reservoir migrants."<sup>94</sup> While the overarching goals of the policies are to achieve poverty reduction and sustainable development at the same time, it has yet to be seen whether people's welfare has markedly improved.

Chinese researchers studying the impact of climate change on large hydro-engineering projects have found that the unanticipated effects of climate change have greatly complicated these massive public works projects. Using the Three Gorges Dam and the South-North Water Transfer Project as case studies, the authors collected empirical evidence that points to an increased likelihood of floods, droughts, mudslides, and geological disasters in the vicinity of these large hydro-engineering projects. This significant increase in natural disasters and extreme weather multiplies the risks associated with these massive projects and can negatively affect reservoir management, dam safety, power generation, shipping, nearby residents' livelihoods, and the surrounding environment.<sup>95</sup>

land subsidence makes seawater intrusion more likely, causing damage to buildings, underground pipes, and road surfaces, as well as lower bridge clearance.

Yet the most dramatic environmental challenges for the entire Yangtze River Delta arise from continuing coastline erosion. The existing floodwalls in Shanghai are built to withstand a 1 in 500 occurrence—a flood that is statistically likely to happen only once every 500 years. Yet this level will become insufficient in the future as more frequent floods and natural disasters such as typhoons are expected to erode the floodwalls. Currently, Shanghai experiences a severe flood every 5.5 years and a catastrophic flood every 16.6 years. This is a daunting problem for a metropolitan area of more than 23 million inhabitants.<sup>100</sup> The potential inundation of Shanghai could cause a mass migration, shifting migratory trends and increasing resource pressures in other areas.





A flooded dock is seen in Foshan City in south China's Guangdong province.

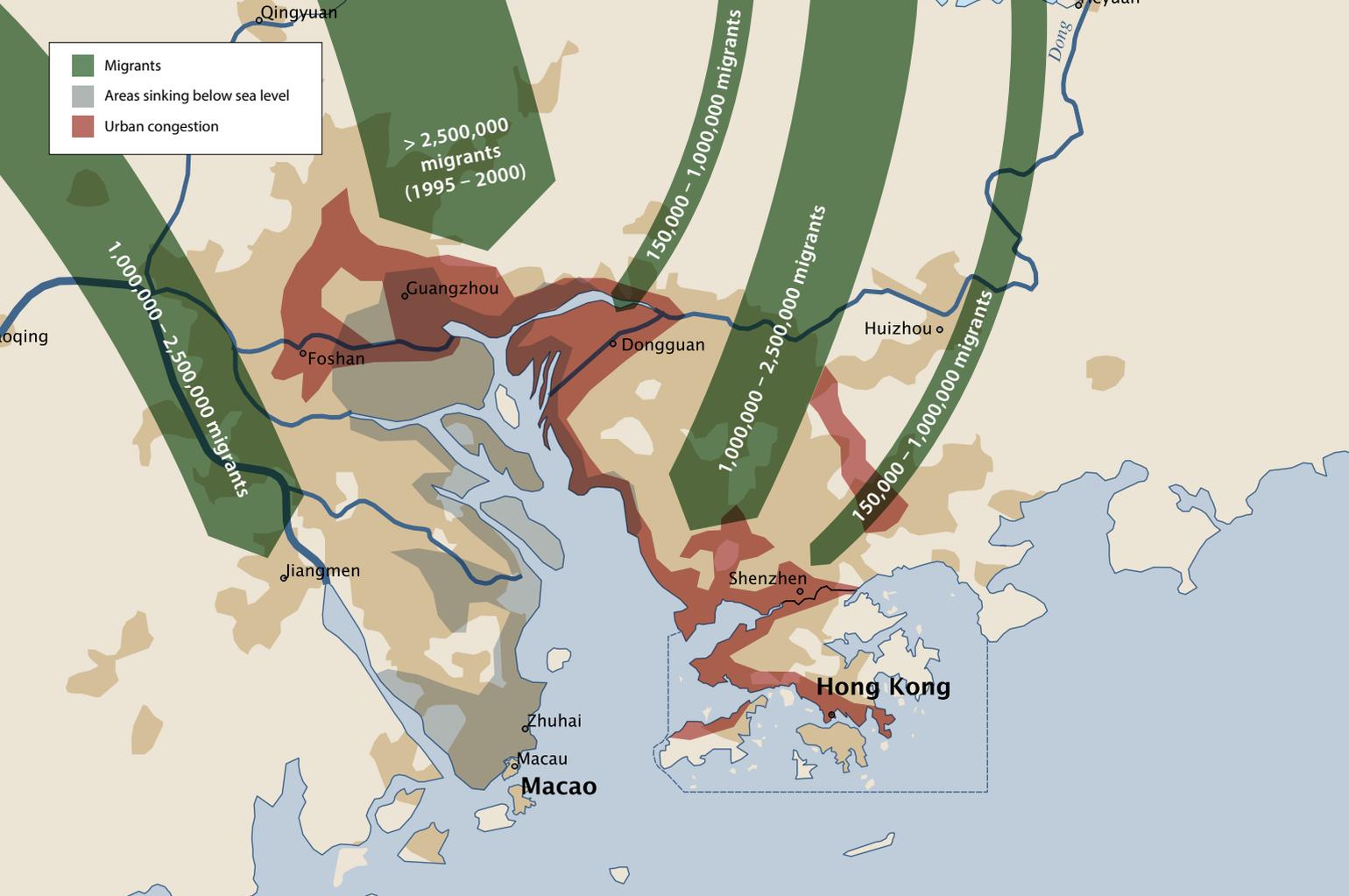
THE ASSOCIATED PRESS/XINHUA, ZHUANG JIN

# The Pearl River Delta region

Today, the Pearl River Delta, with its major metropolises of Hong Kong, Shenzhen, Guangzhou, and Macau, is home to an estimated 120 million people, making it one of the world's mega-regions of endless cities with Shenzhen as a global high-tech manufacturing hub.<sup>101</sup> Only three decades ago, this city of more than 10 million was a small, frontier fishing village. Today, it is a cosmopolitan economic center, known for “Shenzhen speed” and “Shenzhen efficacy,” terms that refer to the short amount of time it took for urbanization and the high productivity and efficiency in its development.<sup>102</sup> Between 1979 and 1999, Shenzhen's GDP grew from 196 million yuan (\$31 million) to 143.6 billion yuan (\$23.4 billion), making for a 30 percent annual growth rate over two decades.<sup>103</sup>

Migrants accompanied this capital inflow to Shenzhen to meet exploding labor demand. In the two decades after 1979, the city's labor migrant community grew from 1,500 to 4 million, an average annual growth rate of 46 percent.<sup>104</sup> Migrant labor became the backbone of Shenzhen's economy by reducing costs and increasing productivity. Today, the Pearl River Delta economy accounts for an estimated 10 percent of China's gross national product<sup>105</sup> and starting a few years ago, the region became the world's largest manufacturer of electrical and electronic goods, watches and clocks, toys, garments and textiles, plastic products, and other goods. About one-third of all Chinese exports originate in the region and one-quarter of all foreign direct investment is directed toward the delta.<sup>106</sup> The Pearl River Delta by itself it accounts for the fourth-largest economy in Asia behind Japan, South Korea, and India.

Urbanization has also meant greater exposure to the consequences of climate change due to increased environmental stress. Since 1979, nearly two-thirds—63.6 percent—of all agricultural land in the Pearl River Delta has been developed and the population density is one of the highest in the world.<sup>107</sup> As a consequence, demand for water in coastal areas has increased dramatically and groundwater is being extracted so rapidly that the water table is falling, making the territory more vulnerable to flooding from storm surges. Salinity has also decreased water quality. According to Canfei He and Lei Yang at the Lincoln



Institute of Land Policy, marine hazards have resulted in direct economic losses of 15.43 billion yuan—\$2.5 billion—and 73 deaths.<sup>108</sup>

The Pearl River Delta presents a unique case for the nexus of climate change, migration patterns, and security concerns through its catastrophic potential. According to a recent study by the global reinsurance giant Swiss Re on disaster risks to 616 urban mega-centers, the Pearl River Delta ranks first among all the cataloged metropolitan areas in the absolute number of people poised to be affected by typhoon-related storms, storm surges, and river floods.<sup>109</sup> Out of its total population of more than 42 million people, 17.2 million are likely to be affected by storms, 5.3 million by storm surges, and 12 million by river floods.<sup>110</sup> In total, 81 percent of its population faces severe risk from environmental hazards.

The economic burden this would impose on the mega-cities of Shenzhen, Hong Kong, and Guangzhou is evident in the Pearl River Delta topping the

charts of total number of working days lost per year to storm surges.<sup>111</sup> Not only are costs imposed by storm surges, but also the foregone dollars earned for individuals and companies due to weather puts the problem into perspective. Considering the wage riots sparked in 2010 and 2011 by uncompensated time due to storm surges, such a tangible effect on the livelihoods of Pearl River Delta denizens could derail the fragile economic and social balance between migrants and locals in the region—and cause ripple effects throughout the Chinese economy.

With such a large percentage of people put at risk by environmental hazards, internal migratory flows are likely to contribute to tensions. Hong Kong, Shenzhen, and Guangzhou, all positioned directly along the river, have population densities of up to 130,000 per square kilometer.<sup>112</sup> Disasters thus have enormous potential to ignite massive currents of migration along the delta, which is dependent on cheap migrant labor.

There is little doubt that climate change will exacerbate the rate of coastal erosion and has the potential to create crises. The sea level is predicted to substantially increase, which would likely cause inundations that will affect more than 2,000 square kilometers—770 square miles—of coastline and force more than 1 million people to relocate.<sup>113</sup> Should the sea level increase by 1 meter—3 feet—the sea will consume major parts of the densely populated Chinese coast. Such a scenario could become reality by 2030.<sup>114</sup> In the short term, the increase of water salinity will cause soil erosion and soften the foundations of buildings while sedimentation will damage buried pipes and semi-buried tanks as well as dam structures and pump equipment.<sup>115</sup>

Concerns about coastal erosion are more than justified since the region is facing an intensification of typhoons. During more than 20 storm surges over the past five decades, water levels have been at least 1.5 meters—5 feet—above normal.<sup>116</sup> Such a rise in sea level would render current flood control infrastructure such as dykes and levees ineffective. The Hong Kong Observatory has documented that the return period of intense rainstorms with more than 10 centimeters (4 inches) of rainfall per hour has shortened from 37 years to 19 years over the past century and that the intensity of short-term heavy rainfall has increased from 11 centimeters (4.5 inches) to above 14 centimeters (5.5 inches) within the two decades.<sup>117</sup>

In addition, the changing nature of flooding renders current defensive systems inefficient. Typhoon Chanthu in July 2010 brought more than 15 centimeters—6 inches—of rain per hour, overwhelming the flood-containment systems and trap-

ping 3,000 people in rural areas, killing three in the flash floods. Extreme storms pose a considerable economic burden as well. Between 2000 and 2007, typhoons in the Shenzhen area caused substantial economic losses and disrupted essential shipping operations.<sup>118</sup>

The current governance structure makes comprehensive strategies difficult to implement. Hong Kong is autonomous with its own government while respective municipal governments administrate the surrounding regions of the Pearl River Delta. Even though the Shenzhen River has high flood risk due to rapid urbanization<sup>119</sup> and governments agreed to officially work together to address this problem in 1995, lack of transparency meant that the findings are not available to the public.

Other environmental factors exacerbate the situation. Increasing temperatures and resulting heat waves are expected to increase the likelihood of heat-related deaths by four to seven times the present numbers.<sup>120</sup> Higher temperatures will also provide favorable conditions for mosquitoes, increasing the risk of diseases such as malaria and dengue fever.

As in other Chinese climate migration hotspots, the situation in the Pearl River Delta is being complicated by the massive influx of migrants and continuing challenges of integrating large numbers of people into the receiving communities. Studies document the extent of these challenges. In 2009, close to 50 million non-permanent residents lived in the nine cities of the Pearl River Delta region.<sup>121</sup> In 2008, migrant workers only earned a little more than half the average local wage; the mega-city of Shenzhen was near the low end with 38 percent. Since urban workers are unwilling to ameliorate the labor shortage because salaries are too low, it might be possible that in the future both labor shortages and an increase in unemployed urban laborers will be seen at the same time.<sup>122</sup>

Public anger and disgruntlement can occur in an instant. These flashpoints can take the form of spontaneous violence in one locality in reaction to an event on the ground, such as a riot that erupts on the street in response to a cruel assault of a migrant worker or an ethnic minority, or it can take the form of Internet rumors and news that spark online outrage or small protests in pockets of the country. The risk of these types of protests doing severe damage in Shenzhen is greater than in other places due to the confluence of people, media, property, and power.

Local authorities are fully aware of this fact and thus capitulate to protester demands in large cities much more readily than in rural areas, where there is less to lose if things go awry. In nearby Zhejiang province, for example, workers came out in droves to protest the lack of compensation for lead poisoning. To assuage them, the local authorities offered each protester 2,000 yuan (\$309 at the time). This did not appease the workers, and the government ended up offering 8,000 yuan to the workers, albeit only the ones with “proper work permits.”<sup>123</sup>

Conflict over wages has already resulted in social volatility in the Pearl River Delta. In May 2011, a 19-year-old migrant young man confronted his boss for not paying him his contractual wages, which ended in the young man getting beat up by his boss and policemen. This sparked a riot of hundreds of Sichuan migrant workers who violently took to the streets and demanded better treatment.<sup>124</sup> The level of social disruption fueled by protests of this scale could be detrimental to the long-term stability of the Pearl River Delta.



An Uighur ethnic minority man prays next to his commercial stall near the Grand Bazaar Market in Urumqi, China.

THE ASSOCIATED PRESS/ELIZABETH DALZIEL

# The Xinjiang region

The Xinjiang region—officially the Xinjiang Uighur Autonomous Region—in northwestern China borders eight neighboring countries, including Russia, Afghanistan, Pakistan, and India. The strategic importance, its remote location, and a history of ethnic conflict between Han Chinese and Uighur Muslims who both make up 40 percent of the 22 million inhabitants make Xinjiang a test case for diversity management.

While ethnic tension has existed for some time, the 1990s marked a turning point in local Uighur-Han relations. In April 1990, Uighur rebels allegedly led by Zeydin Yusuf and the Islamic Party of East Turkistan planned a series of synchronized attacks on government buildings all across the Kashgar area, the westernmost part of the province bordering Tajikistan and Kyrgyzstan.<sup>125</sup> Tensions between Uighurs and Han Chinese have been particularly explosive recently, as 100 people have died in ongoing clashes since June 2013.<sup>126</sup>

The conflict is fueled at least in part by economic disparities due to the lack of urban development and the persistence of an agricultural economy; Han Chinese migrants that move into the region use existing economic control mechanisms to sideline local populations. Preferential policies exist for Han migrants, for example, to attract outside investment the Xinjiang government claimed large tracts of land for cotton cultivation, which largely benefitted Han migrants.<sup>127</sup> Overall, the influx of many Han immigrants has led many Uighurs to believe, not wrongly, that the central and local government prioritize economic growth over the protection of the Uighur people and their way of life.

But grievances are not purely economic or ethnic, and they stand to be exacerbated by the impacts of climate change and environmental degradation. Increased cotton cultivation in Xinjiang carried the added detriment of significantly harming the environment. According to a 1998 report from China's Department of Environmental Protection, "desertification has progressed in 53 of the 87 districts of Xinjiang," resulting in the drying of lakes around the Tarim Basin, the southern



region of the province.<sup>128</sup> Moreover, a 1996 report from the Chinese Academy of Social Sciences noted that cotton cultivation was prone to market risks and yielded less profitability than grain, making it a poor choice for Xinjiang farmers in the first place. Aside from this economic impracticality, the failed attempt to modernize the region only exacerbated ethnic tensions due to disproportionate economic benefits and increased competition over disappearing resources.

Northern Xinjiang is semi-arid and faces a decreasing amount of grassland as a result of desertification, which in turn was caused by poor agricultural practices. Xinjiang's growth has, like many other provinces' growth, put a significant strain on the water supply. Southern Xinjiang is an arid region, and its water shortages were intensified by the government's attempt to divert the flow of the Tarim River for agricultural expansion.

Due to internal migration and high fertility rates, the growing population of Xinjiang places more demand on food, which accelerates the conversion of forest and grasslands for agricultural use. Government policies implemented to meet food demands have resulted in damaging environmental practices that have dried up lakes and accelerated desertification. Extensive deforestation, water diversion, and groundwater pumping have led to an increase in soil erosion and overdrafting of water resources by at least 112 percent.<sup>129</sup>

These factors also do not bode well for crops. Areas that undergo extensive deforestation face frequent windstorms that destroy crops, block transportation vessels, and harm human health.<sup>130</sup> Climate change continues to aggravate these problems, threatening the livelihoods of rural villages and potentially deepening existing ethnic tensions.

As a result, southern Xinjiang faces extensive erosion of water quality especially in the Tarim Basin, which accounts for more than half of the freshwater supply in the region. Inefficient irrigation systems established over the past 50 years and government subsidies on water results in a 60 percent loss of water and act as a deterrent for the local population to adopt less wasteful practices.<sup>131</sup> In 1967, the lower part of the Tarim River dried out when the Daxihaizi Reservoir was built for storing water for irrigation.<sup>132</sup> Half a decade later, the lake Lop Nor dried out.<sup>133</sup> Today, the water quality is so low that the Tarim Basin can no longer be classified as a freshwater source due to its high salinity levels.

Both reduced water quality and the eventual disappearance of water from the lowlands are unsustainable and threaten the livelihood of regional populations. Even now, the increased frequency of sandstorms from desertification and the salinity of water quality result in adverse health effects in downstream areas, such as increased respiratory and eye diseases and waterborne gastrointestinal diseases.<sup>134</sup>

If conditions become so dire that local populations have to migrate, they may face the same cultural and economic costs as the Uighur village of Deryabuyi in southern Xinjiang. Deryabuyi has a population of 1,300, a 40 percent literacy rate and an average per capita income of 1,034 yuan (\$120).<sup>135</sup> Fifty years ago, the region had seven natural lakes in its vicinity that were surrounded by grassland—they have all disappeared and water sources have become scarce since because of diversion from the Keriya River to Keriya, a nearby city that is developing into

an agricultural hub. Local government officials estimate that Deryabuyi will not survive the next three or four decades and have undertaken efforts to compel remaining citizens to leave.<sup>136</sup>

Climate migration in the Xinjiang region is being acknowledged within China and discussed under the title of “economic resettlement.” In 2008, a committee of experts released the report titled “Research on the State of Xinjiang’s Ecological Migrants,” outlining observations on the management of Xinjiang’s ecological resettlement projects, focusing on the smallest minority groups that are affected in the southern Talmud Desert region and the Altai Mountain region of northern Xinjiang. The authors describe the resettlement of these communities as lacking dedicated funding and beset by challenges due to the decreasing number good locations for resettlement as well as resettlement program mismanagement.<sup>137</sup>

Given that minorities are overrepresented in the agricultural sector, climate-driven environmental changes often result in migration toward the coastal mega-cities as a final option in search of labor. In larger cities, these migrants face even greater challenges than other laborers because many firms will not hire Muslims.<sup>138</sup>

At the same time, local competition for resources and employment has heightened ethnic tensions between Uighurs and Han Chinese—and this dynamic could spread eastward if other regions are similarly impacted by climate change. In 2009, the city of Urumqi saw riots that killed more than 200 people. Xinjiang as a whole continues to experience ethnic conflict, with recent bombings and skirmishes in Hotan and Kashgar in 2012.<sup>139</sup> Interestingly, the major areas of conflict—with the exception of the capital Urumqi—are located in southern Xinjiang, the area that faces more severe climate problems than the north. It is therefore likely that ethnic tensions will continue to worsen due to the erosion of rural livelihoods from unsustainable environmental practices and the continuation of educational and economic disparities between the Uighur and the Han in urban centers.





A crane towers over a building under construction in Chongqing in southwestern China.

THE ASSOCIATED PRESS/ELIZABETH DALZIEL

# The Chongqing region

In 1997, the city of Chongqing was separated from the Sichuan province and made into a provincial-level municipality under the control of the central government, making Chongqing the most populous and most industrialized province in Western China.<sup>140</sup> Today, the municipality of Chongqing—slightly smaller than South Carolina—has almost 30 million inhabitants after years of heavy government investment. This funding transformed it from a transport hub into the uncontested economic center of the upstream Yangtze basin with a strong focus on IT technologies.

Chongqing is also the beneficiary of high revenues that allowed it to pay for the costs that arose with the ambitious and controversial Three Gorges Dam.<sup>141</sup> The region is still strong in manufacturing, including automobiles, natural gas, chemicals, weapons, instruments, and agricultural products.<sup>142</sup> This is because many industrial bases were built during World War II and again in the 1960s during the so-called “Third Front” period, during which China scattered its industries around the country to make it more difficult for the United States or the Soviet Union to strike China’s manufacturing base. In recent years, consumer-oriented manufacturing of durable goods grew exponentially. Between 1997 and 2007, the automobile and motorcycle industries expanded fourfold<sup>143</sup> and the city of Chongqing saw a tenfold increase in population during the same period.<sup>144</sup>

Chongqing is a keystone in China’s reorientation toward an economic model based upon domestic demand rather than the export-dominated strategy of the coastal cities. Hence, exports only make up less than 8 percent of Chongqing’s GDP whereas domestic consumption and investment accounted for more than half.<sup>145</sup> In 2008, during the global economic downturn, China’s GDP grew at a slower pace at 9 percent whereas Chongqing’s GDP grew more rapidly.<sup>146</sup> The city is also known for policies that improve public welfare and security but limit civil liberties. In addition, state-owned enterprises contribute between 15 percent and 20 percent of their profits to the government, which in turn invests the revenue in infrastructure and social programs.<sup>147</sup> These policies also attempted to alleviate the



urban-rural divide. In 2011, Chongqing spent \$15 billion building public housing for poor families and issued more than 3 million hukou permits to rural migrant workers, granting them access to health care, education, and social security.<sup>148</sup>

As a result of rapid industrialization, Chongqing faces a number of environmental problems. Average mean temperatures in the southwest region have increased one-tenth of a degree per decade over the past 50 years,<sup>149</sup> with most of the warming occurring in the mid-1990s. Even though Chongqing has seen a cooling trend in summers, the number of hot days increased slightly at a rate of 0.32 days per decade.<sup>150</sup>

But the most pressing environmental problem that plagues Chongqing is its poor air quality.<sup>151</sup> In the city of almost 30 million, one-third of all crops are damaged by acid rain and cancer-causing pollutants are six times above safe quantities.<sup>152</sup>

An additional concern in Chongqing and southwestern China in general is drought. Although Chongqing did not bear the brunt of the damages from recent events, the mega-city has felt the effects. In 2006, Chongqing faced the most severe drought in a century. And in July 2011, a drought that affected southwestern China left 12.6 million people without adequate drinking water and affected 14 million hectares of farmland.<sup>153</sup> The droughts in this period were so severe that hydroelectric dams were forced to close.

This is not a new development. Between 2004 and 2007, droughts caused damage at an estimated cost of \$8 billion in economic losses per year. In April 2009, a 1 in 50 year drought occurred and lasted a year. Rainfall during this period was reduced to 70 percent, a shortage so severe that the water storage facilities in the affected provinces proved to be inadequate. In 2012, the region was yet again affected by another severe drought, leaving 7.8 million people and 4.6 million livestock without adequate drinking water.<sup>154</sup>

The Chongqing region demonstrates how the interaction of climate change, environmental pressures, urbanization, and migration has the potential to become almost impossible to manage. Large infrastructure projects meant to address some of the issues outlined above have sometimes intensified these exact challenges. The Three Gorges Dam, several hundred miles downstream from Chongqing city is the world's largest producer of hydroelectric power in terms of installed capacity. Yet the construction of the dam at an estimated \$26 billion and its environmental impact has raised legitimate concerns about how the installation is altering the ecology of an entire region. Concerns of increased pollution into the reservoir resulted in the tightening of pollution limits and enforcement in 2002. Since then, the State Council Three Gorges Project Construction Committee has devoted \$5 billion to building sewage treatment plants and garbage disposal centers.<sup>155</sup>

Furthermore, between 2008 and 2011, the State Environmental Protection Agency spent \$3.3 billion on 460 projects to improve the water quality in the Yangtze River. Whether these efforts will make a significant improvement in water quality has yet to be seen, given that in 2006 alone, nearly 30 billion tons of sewage was dumped into the Yangtze River.<sup>156</sup> Two years later, environmental authorities were battling a bloom of blue-green algae along a 25-kilometer—15 mile—stretch of the Xiangxi River, a tributary of the Yangtze River, which was caused by a buildup of pollutants from phosphor mines and chemical plants.

Another serious concern is frequent landslides—an issue that had been discussed intensely during the planning phase of the dam. Heavy rainfall and high waters in the reservoir have weakened surrounding slopes and caused erosion on up to 80 percent of the affected land area, which translates into an estimated 40 million tons of sediment into the Yangtze every year.<sup>157</sup> In response, the central government has spent \$2 billion to stabilize landslide zones, and authorities have relocated 1.2 million people, with another 4 million projected to be driven out of their homes within the next 10 to 15 years<sup>158</sup> at a cost of \$22 billion.

Current research that examines the social effects estimates that the 89 water reservoir and hydropower projects initiated before 1999 forced the migration of 5.1 million Chinese, a third of whom lived below the poverty line.<sup>159</sup> A review of the regional effects by Chen Guojie, director of the China Academy of Sciences Chengdu Land Disaster and Environmental Studies Institute, states that a total of 1.2 million Chinese were resettled for the Three Gorges Dam in Sichuan province only. The effects on rural farmers were equally devastating: The Second Bank Power Plant submerged 29,545 mu (1970 hectares, 4,868 acres) of arable land, the Baozhu Temple Power Plant submerged 31,148 mu (2,077 hectares, 5,132 acres), and the Baobugou Power Plant submerged 44,220 mu (2948 hectares, 7285 acres).<sup>160</sup>

With their farmland submerged and their livelihood gone, farmers were expected to make a new life in another village, farming different crops and dealing with different environmental and business factors. Though the environmental migrants are usually given compensation for the loss of property and land—in the form of monetary payment, a new house, or land—the majority of migrants are dissatisfied with the compensation package, and many petition local authorities for more.

Even if the compensation may be commensurate with their property loss, oftentimes the town's families relocate to require higher living and farming expenses, and the new settlers are given little to no support to learn everything they need to know to successfully farm their new land. With few farming options, migrating to find nonagricultural work becomes the fallback for many environmental migrants, complicating the migration picture even further.

Due to the incredible pushback from rural residents forced to relocate in the Three Gorges Dam and other projects, local government officials are conducting the South-North Water Transfer project with an eye toward mitigating resettlement issues. With the central government traditionally evaluating local officials on their ability to maintain social stability and prevent mass incidents, tolerance for widespread public discontent is steadily diminishing.

Still, forced environmental migration continues, with 330,000 people relocated in 2012 for the expansion of the project's middle route.<sup>161</sup> Peng Chengbo, vice director of the Hubei Reservoir Immigration Bureau, explained that more than one-third of the forced migrants would experience lower living standards.<sup>162</sup> Thousands of migrants are fighting back, taking actions such as petitioning the government, barricading highways, vandalizing government buildings, and even beating government officials.

The regional and national party representatives were well aware of the potential conflict that could occur given the massive resettlement process and unexpected environmental impact following the completion of the dam. This year, a Communist Party journal reported on the state of the Three Gorges Dam resettlement plans. The post-settlement plans commenced in 2011 under the Chongqing government's populist slogan of "Moving Out, Stable Settlement, Becoming Wealthy Step-by-Step"—an indicator of concern regarding the rural migrants that have been affected by the legacy of the Three Gorges Dam. Even though the author admits that 49 percent of the Chongqing Reservoir area is an ecologically unstable habitat due to steep mountains, desertification, and erosion, the overall tone—as is common in government literature—is designed to deflect public criticism but also to help signal budgetary needs to party and government elites. Such financial assistance is a dire necessity in Chongqing, given that the region encompasses 15 migrant districts, 9 of which are national-level poverty areas.<sup>163</sup>

A recent survey of new migrants in Chongqing documents that in comparison to their older counterparts, new migrants are more integrated in city life. This means that they are more prone to stand for their interests. New migrants pay attention to government policies, interact with city residents, and participate in community events to a greater degree than their predecessors. At the same time, more than a third of migrant workers in Chongqing do not want to officially change their hukou status to the city, indicating that they value the land associated with their rural heritage more than the lifestyle offered by the city.<sup>164</sup>

The volatility of all the interacting factors of climate change, environmental degradation, mandated migration, and lack of social cohesion in Chongqing is reflected in the central government's attention to this region. The incremental warming and plague of drought will be exacerbated by Chongqing's rapid growth rate, which will perhaps force more drastic mandates for rural migration into Chongqing's urban center. The divisiveness fostered by the hukou system will pose a problem for mitigating conflict, but Chongqing migrants are already beginning to integrate into the legal system and adapt to urban life under current climate and demographic trends and the region's manic growth rate.

# Domestic consequences of the nexus of climate, migration, and security

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## A fragmented policy response

The Chinese central government is acutely aware of the challenges that resource scarcity, energy demand, environmental degradation and pollution, climate change, migration, and urbanization present. This is reflected in the latest communiqué approved in November 2013 at the Third Plenum of the 18th Central Committee of the Chinese Communist Party. The Central Committee unveiled a number of high-level policies aimed at environmental and demographic issues:

- **Hukou registration system reform.** Future policies will relax restrictions over rural residents moving to more urban towns and small- and medium-sized cities. Requirements for establishing residency in mega-cities will be “reasonable.” Basic urban public services will be made available for all permanent urban residents regardless of hukou status, and the affordable housing system and the social security network will be extended for the first time to rural residents.<sup>165</sup>
- **Environmental protection reform.** A number of environmental reforms were passed. One lifts economic performance assessments for local governments of ecologically fragile or poverty-stricken areas to reduce perverse incentives to mismanage the environment for GDP gain. Another reform will see that natural resources and ecological habitats are registered by ownership and supervised to ensure protection. The communiqué also mandates the establishment of a monitoring and warning system to track the loading capacity of river, ocean, and land resources to ensure sustainable use. Lastly, natural resources will be priced to reflect market supply and demand as well as the cost of environment damage and rehabilitation of extracting the resources.<sup>166</sup>

- **Pollution control reform.** The Chinese Environmental Protection Agency will increase its monitoring and control of air pollutants and water effluent.<sup>167</sup>
- **Petition system reform.** Legal authorities must respond to and then end cases within the legal system, meaning they must re-examine cases where people are not satisfied rather than letting them continue with indefinite resolution.<sup>168</sup>
- **Rural property rights reform.** Farmers now have the right to possess, use, benefit from and transfer their contracted land; they will also be able to use their land ownership as collateral, or to become a shareholder in industrial agricultural operations.<sup>169</sup>
- **One-child policy reform.** Instead of the former policy where couples could have two children if both of them were only children, now couples will be able to have two children if only one of them is an only child. This will help maintain the total population around 1.5 billion.<sup>170</sup>

The new policies are small but important steps to begin to address issues in the climate-migration-security nexus, but questions about the capacity of the Chinese Communist Party to implement them remain. Policies are fragmented and compartmentalized under different state bureaucracies so reforms may not be effective when deployed in tandem. Local officials are evaluated on a number of quantitative metrics, only one of which is implementation of environmental-protection and energy-efficiency policies.

Officials also use their discretionary authority to implement these national policies in ways that also address local business and political legitimacy interests.<sup>171</sup> For instance, informal incentives such as assurances of secure long-term operations, access to local financing, and preferential treatment for future projects are incentives that local officials have used to get private enterprises to abide limits on greenhouse gas emissions.<sup>172</sup>

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## Middle-income trap

Then there's the so-called middle-income trap. China is facing a slowdown in economic growth that may prevent it from moving up the education and production value chain to emerge as a high-income economy. In 2012, the Conference Board forecasted China's growth to be 5.5 percent from 2014 to 2018, and 3.9

percent from 2019 to 2025.<sup>173</sup> A leading economist, Barry Eichengreen, calculated that fast-growing economies experience growth slowdowns averaging 3.6 percent between successive seven-year periods. In 2013, he identified China as an economy ripe for this slowdown, concluding that “It is implausible that total factor productivity in China will continue to grow between now and 2030 at anything approaching the six plus per cent annual rate achieved in the last ten years.”<sup>174</sup>

China is even more at risk for this type of slowdown because it is a country with both high investment rates and undervalued exchange rates.<sup>175</sup>

The Chinese government can reverse these trends by investing in education, spurring domestic consumption of goods and services, and increasing high-tech exports relative to total exports.<sup>176</sup> Still, investment-led growth is often relied upon in the short term to increase economic growth, which distorts the economy and exacerbates pollution, climate change, and rural-to-urban migration. This potentially undermines the fragmented attempts to sustain healthy levels of GDP growth and increase the population’s standard of living.

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## China’s 12th Five-Year Plan

Still, the 12th Five-Year Plan covering the years from 2011 to 2015 outlines several energy and environmental measures that the government is working on implementing. Instead of primarily focusing on economic development in the vein of previous five-year plans, the 12th Five-Year Plan prioritizes more sustainable economic development toward creating a more consumer-driven society, and—even more importantly—emphasizes the need to manage natural resources more responsibly.

Such issues are becoming more important for a number of reasons. First, energy insecurity and deepening environmental degradation have the potential to delegitimize current policymakers as well as the Communist Party at large. The Chinese people are growing increasingly uneasy about the effects of pollution on their lives, and energy security threatens the party’s ability to keep the economy growing.

Second, resource scarcity, pollution, and climate security issues touch upon sensitive areas in China’s political fabric since they highlight the drawbacks of an economic growth strategy traditionally driven by relentless, export- and investment-led GDP growth. In conjunction with massive migratory movements and an urban expansion

of thousands of square miles, which has doubled in the last decade, the longtime strategy of separate urban and rural development is collapsing.<sup>180</sup> Stronger urban centers in historically middle-tier provinces also put stress on the centralized power structure due to competing economic and political interests.

Past plans and programs have included standalone energy-efficiency goals, which local governments and industries worked diligently to implement. The 2007 National Climate Change Program met its ambitious goals to reduce energy intensity by 20 percent between 2006 and 2010, increase renewables in the energy mix to 15 percent by 2020, and increase forest cover to 20 percent of China's land mass by the end of 2010.<sup>181</sup> Many of these energy-efficiency and reduction goals had been folded into the 11th Five-Year Plan, but until the 12th Five-Year Plan, complete restructuring of industrial and energy sectors was left untouched, as well as any mention of combatting climate change.

One major new thrust of the 12th Five-Year Plan is to dramatically increase power capacity and transfer power to high-demand areas. To do so, China will pursue an “all-of-the-above” strategy, reaching from coal development and increasing natural gas imports to building nuclear power plants and investing

## Qinghai-Tibet Railway

Ninety-five percent of desertification and 94 percent of sandification in China occurs in Xinjiang, Inner Mongolia, Tibet, Gansu, and Qinghai—provinces that already have a long history of political unrest due to ethnic tensions, migratory pressures, and environmental vulnerability. These regions could potentially experience greater political unrest if climate change intensifies. Case in point: The thawing and refreezing of permafrost sections of the Qinghai-Tibet Highway and railway due to warmer temperatures has resulted in high maintenance costs and safety concerns. The Chinese military now takes more precautions to protect soldiers and equipment from damage in extreme weather, and contributes more resources to domestic humanitarian response systems and preparation than ever before.<sup>177</sup>

Many Chinese scholars confirm the grave security implications of the thawing permafrost over which half of the Qinghai-Tibet Railway travels—632 kilometers out of 1,138 kilometers.<sup>178</sup>

From the 1970s to the 1990s, the Qinghai permafrost layer warmed 0.1 degrees to 0.3 degrees Celsius annually. Based on estimates predicting an air temperature increase of 2.2 degrees to 2.6 degrees Celsius by 2050, the area of thawed permafrost will increase from 102 square meters to 302 square meters.

This kind of permafrost degradation has a direct impact on the engineering stability of the railway, which could compromise safe operations. In fact, thawing permafrost has already cost the northeast railway and highway to incur major damages that require considerable maintenance. One researcher argues that unlike other vulnerable roads and railways, the Qinghai-Tibet Railway is a key strategic national defense project, not simply a public service for civilian transportation.<sup>179</sup>

in renewable energy sources. Non-fossil energy supply is rapidly expanding, with 230 million kilowatts of hydropower-generating capacity, 12.54 million kilowatts of nuclear power due to 15 new generating units, 47 million kilowatts of wind power connected to the grid, and 3 million kilowatts of photovoltaic power. Admittedly, hydropower is 78 percent of non-fossil energy supply, while wind power is 16 percent, and solar power is 1 percent.<sup>182</sup>

This approach to energy development boasts some positive steps toward mitigating climate change, but it also poses grave problems, such as the massive problems likely to occur with increased hydraulic fracturing in China. (See analysis on page 62) Still, the largest departure from previous five-year plans in the 12th Five-Year Plan is China's acknowledgement of climate change and its first attempt to reduce greenhouse gas emissions. To control these emissions, the central government plans to reduce energy intensity by 16 percent of 2010 levels, reduce CO<sub>2</sub> emissions per unit of GDP by 17 percent of 2010 levels, increase non-fossil fuels in the energy mix to 11.4 percent by 2015, and increase the national forest cover area by one-fourth to 2.5 million hectares.<sup>183</sup>

China's first National Strategy for Climate Change Adaptation in 2012 drills down to attempt to implement these pledges, but the 12th Five-Year Plan's targets have fundamental weaknesses that must be addressed going forward. The problem with these targets is that they are all dynamic targets based on GDP, so if GDP grows, then the targets decrease. What China still has not committed to are absolute values of energy use and CO<sub>2</sub> reductions. China's current strategy continues to be primarily an adaption strategy, not a mitigation strategy.

Jiang Kejun, a fellow at the Energy Research Institute at the National Development and Reform Commission stated that the 13th Five-Year Plan for the next five years of this decade "should ideally" include total energy-consumption targets and defined caps on greenhouse gas emissions, but whether this will happen has yet to be determined.<sup>184</sup> Inaction on the part of the National Development and Reform Commission is inexcusable in light of the fact that China's annual emissions will soon be one-third of the world's total annual emissions.

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## Policy implementation failures and the consequences

Thus far, implementation of these policy initiatives has been difficult. To address, for example, widespread deforestation and subsequent desertification, the government has invested huge amounts of capital in planting trees. The Three-North Shelterbelt Reforestation Program was inaugurated in 1978 and is scheduled to end in 2050. It aims to increase forest coverage from 5 percent to 15 percent.<sup>185</sup> But because the arid and semi-arid areas of northwestern China are unsuitable for such reforestation programs given the severe water shortage in the region, reforestation efforts have only added to the depletion of groundwater sources.<sup>186</sup> (See sidebar) In addition, more than 80 percent of China's efforts involve monoculture planting, using fast-growing but water-inefficient species,<sup>187</sup> resulting in 120,000 hectares of crops being devastated because of pest infestation.

# China's troubled water management policies

A pressing issue for China's climate security is water management. Seen as a matter of public welfare, the government heavily subsidizes water use. This policy provides little incentive for citizens and firms to use water more efficiently since prices are forced below market. The same is true for the largely outdated and inefficient water infrastructure, some of it dating back to Mao Zedong's revolutionary era: More than 20 percent of urban water is lost to leakages, and only 25 percent to 40 percent of agricultural water is used efficiently. In addition, water is heavily polluted due to industrial and agricultural discharges, making much of it unusable. The Chinese government estimates that 40 percent of river sections, 50 percent of lakes, 20 percent of reservoirs, and 60 percent of groundwater wells contain unusable water, resulting in massive regional water shortages.<sup>188</sup>

This problem is so severe that the central government has implemented a number of quick fixes to alleviate the problem. In the long term, the water-scarce north may benefit from the massive South-North Water Transfer Project, scheduled to finish construction in 2050. It would transfer water from the Yangtze River to the Huai, Yellow, and Hai Rivers in northern China. Yet this infrastructure project will mostly benefit urban areas, force the relocation of 330,000 citizens in central China, and might negatively affect future water security in the south. The only sustainable solution lies in decreasing water subsidies, a policy that would be very unpopular and risk a political backlash.

More efficient water practices are needed, however, as changes in temperature and water shortages already have had a negative effect on food security and agricultural production. Seventy-five percent of China's grain production relies on irrigated water, but this source of water may dwindle due to declining river runoff and increasing soil evaporation. Increased incidents of drought and flooding due to weather changes have the potential to devastate farms: a severe drought in 2001 and 2002 led to a drop in crop yields of 50 million tons.<sup>189</sup>

Increases in temperature also heighten crop vulnerability, resulting in considerable economic cost because more pesticides and fertilizer will be needed to ensure a healthy crop yield and satisfy the demands of a growing population. This challenge is further complicated by the reduction of arable land due to economic development, desertification, and deforestation.

The elevation of these issues to the highest levels of government show that water and climate issues are putting China's economic and social development at stake. During the 17th Congress of the Chinese Communist Party, Premier Wen Jiabao stated that China could not risk having less than 120 million hectares of arable land, but at the end of 2009, there was only 121.7 million hectares.<sup>190</sup> Based on the rate of arable land loss from 1997 to 2009, China is predicted to have lost another 10.7 million hectares by the end of 2013, definitively crossing Premier Jiabao's red line.

Grievances over the environment, weather, land, and resources all converge with migration patterns in the hotspots identified in this report—creating massive political challenges that sometimes spill over into conflict. Since the 1990s, China has seen a dramatic increase in public protests against environmental degradation directed at local governments and Chinese corporations. According to the Ministry of Public Security, these incidents have increased fourfold between 1993 and 2000. Since then, statistics for these “mass demonstrations” have not been released. In 2007, the director of China's State Environmental Protection Agency acknowledged that a rising portion of these “mass incidents” is related to environmental concerns. And according to a report compiled by the European Council on Foreign Relations in 2011, 180,000 mass incidents occurred that year, although it is unclear how many were due to environmental concerns.<sup>191</sup>

Environmental protests are usually a result of public complaints over local corruption rather than about climate change directly, so in the short term, climate change is unlikely to directly increase the amount of protests. Still, the gradual local response to increasing environmental pressures as a result of climate burdens will mean that protests will continue and possibly increase.<sup>192</sup> Thus far, the scale of grievances motivated by environmental concerns has been enormous. The *2010 Environmental Statistical Yearbook* records more than 700,000 formal environmental complaints in the country. During the 11th Five-Year Plan, the Ministry of Environmental Protection received 300,000 petitions on environmental matters.<sup>193</sup>

As of now, many of these developments are being addressed separately. But given the need to address climate-related challenges and anticipate future shifts in migratory patterns at the same time, an integrated approach is the best way forward. Human mobility and environmental security are more closely related than ever before. Internal migrants make up a significant number of the Chinese labor force, and shifts in population at the current scale will also change the picture of resource pressures.

Yet Elizabeth Economy at the Council on Foreign Relations rightly points out that China does not have the necessary political mechanisms to address these complex crisis scenarios and that instead “governance by crisis management” is the rule at the local level, not the exception.<sup>194</sup> There are many instances in which local officials give in to demands during mass protests and thus offer short-term solutions. There are a number of prominent recent examples:

- In May 2013, 200 protestors—or 2,000 according to Chinese bloggers—demonstrated against a proposed petrochemical plant in Kunming, the capital of Yunnan province.<sup>195</sup>
- In October 2013, victims of floods in the wake of Typhoon Fitow gathered at the local government headquarters in Yuyao, Zhejiang, in protest of inadequate relief efforts. A large number of riot police were dispatched after a day of clashes with residents.<sup>196</sup>
- In 2012, three major protests occurred along the eastern coast. In Ningbo of Zhejiang province, demonstrators clashed with police during three days of protests over the proposed expansion of a petrochemical plant. These actions resulted in the government announcing the cancellation of the plant—after consultation with investors. In Qidong, near Shanghai, about 1,000 protestors reportedly demonstrated against a proposed water discharge plant that locals complained would pollute the water supply. In Shifang, a town in Sichuan province hit hard by the 2008 earthquake, the municipal government suspended the construction of a metals factory after bloody street protests of a few thousand.
- In 2011, Dalian, the second-largest city in Liaoning province, officials decided to shut down a chemical plant after 12,000 protestors took to the streets.<sup>197</sup>

An important ingredient in managing the implementation of environmental, climate, social, and labor policies within China is public participation. Currently, there are very few options for citizens to be part of policymaking. In terms of environmental policymaking, Chinese citizens “can take part in reviewing environmental impact assessments for proposed large projects in their neighborhoods,” but there are considerable limitations to the participation process. As Elizabeth Economy notes, “Only a small percentage of projects are subjected to compulsory public participation; the timing and duration of engaging the public is short; the method of selecting those who can participate is often biased; and the amount of information actually disclosed is often quite limited in an effort to prevent social unrest.”<sup>198</sup>

Many observers agree that environmental, pollution, climate, and migration issues have an even more significant impact on Chinese domestic policy and will lead to a more visible and energetic public debate. For the first time, the Chinese government needs to actively manage public opinion and be more transparent about environmental degradation and pollution issues given public demand and the high profile of the issue in Chinese media. The debate has been driven partly by successful bloggers that have shaped the conversation and generated considerable impact, especially among younger Chinese. As a result, the government is pressed to provide greater clarity and environmental information to the public. Last October, for example, the government decided to launch an air quality warning system in Beijing and Tianjin as well as in the surrounding areas.<sup>201</sup>

## Comparative public awareness on climate change in the United States and China

The Pew Research Center, BBC World Service, World Public Opinion, and the World Bank conducted various global surveys between 2006 and 2009 on climate change issues.<sup>199</sup> Highlights from the surveys include:

- Two-thirds of both Chinese and American respondents thought rich and poor countries alike should address climate change.
- Four-fifths of Chinese believed climate change will significantly influence the likelihood of natural disasters, rainfall

and water resources, and food insecurity. Americans did not believe the effects would be as great or as negative.

- Seventy percent of Chinese supported urgent actions to limit greenhouse gas emissions—a slightly higher proportion than the Americans surveyed.
- Ninety percent of Chinese thought the central government should place a high priority on climate change, while only 50 percent of Americans held this view.<sup>200</sup>

Still, there is a lack of existing political mechanisms to publicly debate government policies. One recent setback was the censorship of the popular Hong Kong-based environmental and climate security website, [Chinadialogue.net](http://Chinadialogue.net). Strict secret regulations as well as an unclear hierarchy of contradictory national and regional regulations can hold new initiatives back.

The central government acknowledges that climate change, energy security, water scarcity, environmental degradation, and pollution could hamstring the country's sustained economic development, but the promise to create an "ecological civilization" through this next round of reforms remains hollow without a comprehensive plan to address issues in the climate-migration-security nexus across the nation's entire policymaking and policy-implementing bureaucratic apparatus—from the central government down to provincial and local governments.

No new reforms brought an overarching and coordinated effort to manage evolving policy interactions and unpredictable climate and demographic contingencies. The risk of a humanitarian crisis interacting with other environmental and climate stressors will only continue to grow without coordinated efforts between various bureaucracies in policy design and implementation.

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## Predicting the success of China's 2012 climate change policy

China faces challenges in implementing its climate change policy put forth in 2012. In order for China to succeed in achieving both current and future climate change policies, it will need the following policy elements:

- Top-level leadership support and interagency coordination
- Design of compliance incentives and enforcement
- Better monitoring and measurement of greenhouse gas emissions

Central government officials have sent strong signals that these priorities are to be taken seriously. First, the energy-savings and emissions-reduction policy (节能减排) is a "National Policy" (国策), a title reserved for only the most important policies—there are only 17 current National Policies designated by the central government.<sup>210</sup> Two important high-level bodies have been formed to support these policies: the State Council climate change leading small group, led by Premier Li Keqiang, two State Council vice chairs, and 20 ministerial heads. The National Development and Reform Commission also established a climate change

## Female migrant workers “vote” with their feet

China has experienced more than 30 years of rural-to-urban migration. Analysts now refer to a “new generation of migrant workers” driving current migratory trends. These workers are defined as being born after the 1980s and enjoying better opportunities than their predecessors, but they are also demanding more from their employers and society. Female migrants now account for 41 percent of the new generation, compared to 27 percent of the previous generation of migrant workers, and will only grow in number.<sup>202</sup>

With more women migrating, China’s traditionally female agricultural sector is drastically changing, with far-reaching implications. These new female migrants to the cities are playing a larger role than ever before in dictating the future of Chinese society and global production networks.

In fact, the more educated rural women are the more likely they are to migrate. Whereas agricultural workers overall receive an average of 8.2 years of education, the new generation of migrant workers averages 9.8 years of education—meaning they have finished middle school and some high school.<sup>203</sup>

What’s more, 30 percent of the new generation of migrant workers has undergone job-skills training compared to 14 percent of agricultural workers.<sup>204</sup> While pressures exist to bring in extra income for their families and provide better educational opportunities for their brothers or their children, women are gaining much more independence as a result of their decisions to migrate.<sup>205</sup>

Migrant women are also redefining marriage norms in China. Although many women leave home single, they do not return that way. The majority of migrant women are engaging in major life milestones during their time of migration, such as dating, marriage, having children, and ensuring their children receive an “urban” education, even though it may be in second-rate illegal schools that crop up on the outskirts of cities.<sup>206</sup>

But discrepancies exist among different types of urban employment. Women who find work in the service sector stay in these urban jobs longer than women who find employment in factories.<sup>207</sup> Although single women are more likely to migrate, married women make up a significant portion of the urban population because urban employment offers opportunities for rural and urban women to realize family goals, such as offering the best education and lifestyle possible for their children. Married women prioritize earning money to provide for their children’s college education, which they perceive as a necessary step toward obtaining an urban hukou for themselves and their families.<sup>208</sup>

Such opportunities are also accompanied by risk. Female migrants in particular face discrimination, harassment, and professional competition from rural and urban men, resulting in greater job instability and fewer prospects of career advancement. Human trafficking and forced sex work are also rampant issues that affect rural and migrant women significantly more than their male counterparts. The lack of access to health care due to the hukou system is also a problem, especially when considering the fact that women often work overtime under unhealthy conditions in order to keep their jobs. Studies have shown that female migrants have a higher suicide rate for these reasons.<sup>209</sup>

In many ways, rural and migrant women still have less educational and employment opportunities and encounter more threats to pursuing their goals than their male counterparts. Still, China’s new census data unequivocally illustrate the improvement of women migrants’ opportunities as compared to their predecessors. With post-financial crisis labor shortages continuing to dominate labor markets, female migrants will increasingly vote with their feet and contribute to global production networks on their own terms. As consumers, they play a key role in China’s new push for domestic consumption. China’s development and social stability in large part relies upon the government’s investment in education, hukou reform, and social welfare for this and the next generation of female rural and migrant workers.

department to support domestic policy and China's participation in international climate change negotiations.<sup>211</sup>

In addition to leadership support and interagency coordination, policies that are designed to align the interests of local governments and state-owned enterprises with national policy goals are more likely to be implemented than those that do not. This includes policies for which there are credible enforcement mechanisms and formal incentives that frame policies in light of expanding production and improving competitiveness, but can crack down on underperformers.

Indicators for these incentives and enforcement mechanisms are clear in the 2012 climate change policy. In the 36-page document,<sup>212</sup> for every mention of punitive measures, such as “raising the entry threshold for certain industries and strictly limiting new projects in industries with high energy consumption, high pollutant emissions, or excess capacity” there are at least two mentions of earmarked funds subsidizing projects for “technological upgrading,” “improved management mechanisms,” or “promotion of energy-saving products.” The framing of the policy in terms of local economic development and firm competitiveness are evident in the use of language such as “optimizing and upgrading,” transformation of traditional industries,” “guiding sound development of industries,” and “optimizing the energy structure.” Through creative framing and attempts to align incentives for state-owned enterprises and local cadres alongside credible enforcement, the 2012 climate change policies are designed to overcome typical implementation challenges.

Lastly, a critical technical issue of enforcing any policy that deals with curbing greenhouse gas emissions is the ability to accurately measure the problem by implementing regular or constant monitoring systems that make fraudulent reporting difficult. In the late 2000s, many improvements were made to the monitoring systems for energy efficiency. Criminal sanctions exist for officials that misreport data and the National Bureau of Statistics now publishes monthly data to boost transparency. These high-level monitoring and reporting systems are a critical step in pushing the policies forward so that the central government can hold provinces and industries accountable for greenhouse gas emissions.



# Climate change, migration, and China’s strategic policy in the Asia-Pacific region

Given the complex crisis scenarios China faces in the converging challenges of climate change, environmental degradation, internal mobility, and resulting security challenges, the intensifying policy focus on energy security as well as economic and social development will influence the government’s foreign policy. Several dynamics are likely and could result in greater regional stress and potential conflict. Such a scenario is especially probable should energy security issues fuel China’s “going out” strategy of procuring new sources of foreign or offshore oil.

In the past, this assertive “going out” strategy has fueled China and other countries’ intransigence in regional maritime disputes, such as the South China Sea or the East China Sea disputes. As a result, China’s energy consumption will most likely continue to jeopardize the already fragile relationships between disputant states involved in maritime conflicts. In addition, the need to ensure domestic freshwater resources may lead to tensions with neighbors on international waterways that originate in China, such as the Mekong River. Should China adopt these types of regional strategies in response to climate change and migration issues, it will aggravate existing conflict with neighboring countries.

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## Dangerous currents: Regional water conflict

As noted in the U.S. National Intelligence Council’s Global Trends 2030 report, the state of China’s international shared river basins may lead to increased regional conflict, instability, or economic depression. China shares 19 international river basins with 14 countries at almost every land border, for a total shared basin area of 3,200,000 square kilometers—one-third of its total land area.<sup>213</sup> While China is not dependent upon others for water resources, many other states are dependent upon China. China’s outflows are more than 40 times as much as its inflows.<sup>214</sup> As such, “Chinese water users have little intrinsic

interest in considering the effect of their use on their counterparts in neighboring countries ... the attention of China's river managers to cross-border issues is adequately consumed by interprovincial disputes."<sup>215</sup>

Indeed, China has strategically kept silent on its policy on international river basins, with no clear statements on the issue from top leadership. China voted against the U.N. Convention on the Law of Non-Navigational Uses of International Watercourses, and its negative vote sent a strong signal of the importance of sovereignty over resources within its borders to ensure the security of its own citizens.<sup>216</sup> In February 2013, China's new State Council approved \$635 billion of water infrastructure projects to increase hydropower and improve water resource management in areas prone to scarce drinking water, droughts, and flooding.<sup>217</sup> China is following the path of least resistance in order to continue domestic economic development.

But climate change poses significant risks. The diminishing glacial ice reserves in the Qinghai-Tibet Plateau will continue to impact the water flow of the Brahmaputra-Ganges-Indus and Mekong river systems—affecting the livelihood of millions in China's immediate neighborhood. It also has the potential to destabilize neighboring regions with their own challenges related to high population density, climate change, migration, and conflict.

We have described these trends in a recent report on India and Bangladesh.<sup>218</sup> One major water management issue that continues to plague the two countries is flooding from the unruly monsoons in the Ganges-Brahmaputra-Meghna Basin in regions of high absolute poverty.<sup>219</sup> Given the history of border disputes between India and China, this could be yet another challenge to an already difficult bilateral relationship. The Tibetan Plateau, located between the Himalayan ranges in the south, the Altyn Tagh and Kunlun range in the north, and the Hindu Kush and Pamir ranges in the west, sources major river systems not only in China but also in South Asia. The glaciers in the plateau account for 70 percent of summer flow in the Ganges and 50 percent to 60 percent of the flow in other major rivers such as the Brahmaputra and Yangtze Rivers. The Chinese Academy of Sciences has estimated that the glaciers on this plateau have decreased by 7 percent annually,<sup>220</sup> causing floods and mudflows that have forced the relocation of villages and small cities.

The importance of the Himalayan region for Asian water security cannot be understated. The Himalayas contain more than 46,000 glaciers, with a third of the world's soil carbon stored in the permafrost region of the plateau, which is extremely susceptible to global warming.<sup>221</sup> The thawing of the permafrost on the Tibetan Plateau can potentially release 60 billion to 190 billion tons of carbon locked up in permafrost, a process that would substantially accelerate global warming.<sup>222</sup>

Other consequences include lowering of the water table, loss of soil moisture content, drying of swamps, extinction of native plant species, and desertification. Future projects by the Chinese government to develop this region, such as the Qinghai-Tibet Railway and the expansion of mining operations, are likely to exacerbate the effects of climate change. Comprehensive studies of the terrain do not exist and the hydrology of the rivers in relationship with the Himalayan glacier is not well understood. Joint research is lacking between India and China mainly because China owns the headwater region, it has no incentive to sign more substantive water-sharing agreements with India. The same is true for China and its southeastern neighbors, as the glaciers from the Tibetan Plateau also feed into the Mekong River.

### The Yaluzangbu/Brahmaputra River Basin

The current Sino-Indian water dispute regarding rivers from the Tibetan Plateau in China that become part of the Brahmaputra and the resulting concerns about water scarcity and pollution is an important test case on which to judge whether two of Asia's large powers will be able to manage conflicting interests and avoid a rivalry that destabilizes the entire region. Domestic success and experiences in managing such resource conflicts within China may also determine the Communist Party's regional strategy in a case of transboundary water sharing along the Yarlung-Zangbo-Brahmaputra corridor.<sup>223</sup>

In April 2012, Indian Prime Minister Manmohan Singh stated that with almost a fifth of the world's population and only 4 percent of its usable water resources, India finds itself in a challenging situation. He further noted, "rapid economic growth and urbanization are widening the demand-supply gap. Climate change could further aggravate the availability of water in the country as it threatens the water cycle."<sup>224</sup> Indian demand for the waters of the Himalayas is in no doubt.

Chinese central and local leadership are much too preoccupied with China's domestic water management to be overly concerned about India's water scarcity issues. As the upstream party, China has de facto control over the source of the Yarlung and has not been constrained so far in its development of the river. Instead, it has managed to maintain diplomatic ties over the basin without actually committing to any agreements that would limit its behavior. In 2002, the two countries entered into a memorandum of understanding regarding the Yarlung-Zangbo-Brahmaputra River Basin with provisions for information sharing, and in 2006, an Expert-Level Mechanism was established to discuss cooperation on more substantive transborder issues such as emergency management. Four Expert-Level Mechanism meetings have been held so far,<sup>225</sup> but little substantive collaboration has emerged from the efforts due to China's intransigence and India's lack of bargaining power.

At the same time, avenues of cooperation exist in the bilateral relationship. China and India join forces when it comes to opposing demands from Western countries, as evidenced by their 2009 five-year agreement to jointly fight climate change and negotiate international climate deals using common positions—an agreement made prior to the U.N. climate change summit in Copenhagen that same year.<sup>226</sup> Yet the joint argument that developing countries should not be required to set and meet hard targets for reducing greenhouse gases, as developed countries should, will only hold for so long. For that reason, current Indian-Chinese cooperation on climate-driven complex crisis scenarios should become a template for how the two neighbors could work together bilaterally and in the region. Indian Minister for Environment and Forests Jairam Ramesh explicitly made this point two years ago.<sup>227</sup>

Joint interests do not end here: The impact of natural disasters or large-scale displacement of people due to extreme weather events also has the potential to dramatically effect both countries' energy security. Eighty percent of China's oil imports and 65 percent of India's oil imports are shipped through the Indian Ocean, and if supply lanes or port infrastructure are negatively affected by climate-driven disasters, the economic prosperity of the Asia-pacific regional could be severely at risk. Again, this challenge could result in either greater cooperation or a potentially dangerous rivalry. Indian Navy Chief Admiral Sureesh Mehta recently expressed concern that Chinese naval forces could "take control over the world energy jugular."<sup>228</sup>

## The Mekong River Basin

China contributes 16 percent of the volume of the Mekong River, which flows into the Southeast Asian nations of Laos, Thailand, Vietnam, and Cambodia. Increasing water scarcity due to climate change will force China to meet its freshwater resource needs using any means necessary. This may aggravate existing conflict with the Southeast Asian nations, which would like to see China limit its damming and diversion of the Mekong so they can also utilize the freshwater resources for irrigation, fishing, and transportation.<sup>229</sup> Some neighboring countries also blame Chinese dams for the Mekong River Delta's increasing salinization problem, which jeopardizes the economic livelihood of downstream communities in Cambodia and elsewhere.<sup>230</sup>

Cambodia and the region at large have much reason to be concerned, as over 21 percent of the basin is eroding, only 31 percent of its original forests are intact, and in some areas, fish catch has decreased by 50 percent.<sup>231</sup> With population in the region rising, people who rely on the Mekong for their livelihood will face challenges—and there are many of them—more than 1 million people in Cambodia depend on fishing for their livelihoods and 70 percent of rural households in Laos earn income from fishing.<sup>232</sup>

In light of these problems, in the 1990s, China and Burma became “dialogue partners” of the Mekong River Commission, a multilateral regional organization dedicated to the sustainable management of water and related resources in the Mekong River Basin.<sup>233</sup> In 2002, China signed an agreement to provide hydrological data about the Lancang-Mekong River, to which it has complied.<sup>234</sup> In 2008, this agreement was renewed.<sup>235</sup> Even though Mekong transboundary water-sharing negotiations are taking place between China and Association of Southeast Asian Nations, or ASEAN, countries, as a so-called “Riparian Rambo,” China has little incentive to acquiesce to the demands of its less powerful downstream counterparts.<sup>236</sup>

But if China increasingly restricts the downstream flows in its international shared rivers in the future, this would result in poor agricultural yields, destroyed fisheries, and stagnated development of river industries for its lower riparian neighbors in South and Southeast Asia.<sup>237</sup> This, in turn, could lead to social unrest or humanitarian crises that jeopardize long-term regional development and security, and could weaken markets and potential trading partners. In this way, monopolistic approaches to trans-border riparian rights can be viewed like trade barriers—they are likely to hurt all players.

Water is a finite resource and therefore subjected to a different sort of analysis, particularly when supply is constrained by the effects of climate change. This kind of scenario is clearly not in China's long-term economic and political interest—and yet, a lack of regional cooperation could lead to irreversible damage for China's neighbors. Migratory flows, desertification, and increased consumption in urban areas will continue to exacerbate China's domestic water security problem. In light of this, China will continue to prioritize its needs over cooperating with downstream countries. This will be true not only for the Mekong River Basin and the Yaluzangbu/Brahmaputra River Basin, but also for other shared international waterways as well, and it will increase the potential for deeper regional conflict.

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### The risk of an intensified “going out” strategy

Urbanization and migratory movements also augment China's energy demand, which already presents a challenging policy situation. In 2006, imported oil constituted 40 percent of China's total consumption, positioning China as a competitor of other oil-hungry Asian states such as Japan, South Korea, and India.<sup>238</sup> A recently released analysis on the global energy outlook painted an even bleaker picture for 2030. A little less than two decades from today, fossil fuels are projected to account for 80 percent of primary energy consumption, and global demand for oil will exceed 103 million barrels per day. China and India lead the demand and shape the entire 2030 global energy outlook.<sup>239</sup>

The response of Chinese scholars to this report does not inspire confidence in conflict-free management of regional energy demands. Wang Yong of the China National Offshore Oil Corporation and Wan Limin at Department of International Petroleum Economics advocate a strategy in which China continues current efforts to strengthen research and joint development of unconventional resources in order to “guarantee the safe and stable supply of energy.”<sup>240</sup> This implies the development of oil fields abroad, the continued support for oil and gas state-owned enterprises, and further joint ventures that transfer knowledge of developing unconventional resources to Chinese firms.

Similarly, researchers at the China Research Institute of Petroleum Exploration and Development note that Asian countries, China included, receive most of their oil from the Middle East. In 2010, 85 percent of imports came from the Middle East, 8 percent came from Africa, and 4 percent from Central Asia and

Russia. They predict that in the next 10 years, China's demand for oil will only increase. Thus, independent of how successful the government's energy, environment, and climate change policies prove to be, China will continue its policy of "going out" by promoting diversification of oil imports and strengthening extraction technologies in order to "take a commanding position in ensuring national oil supply safety."<sup>241</sup>

This "going out" strategy could play out several ways in the region. Much of it depends not only on the resource needs in China, but also on the public discourse, including nationalist attempts at mobilizing the public using climate and energy security issues as political wedges. For example, with regard to the South China Sea region, scholars like Gong Jianhua, a professor at Guangdong Maritime University, present a hawkish stance on the current South China Sea disputes. Gong argues that China has always supported the position of "shelving sovereignty to promote common development" (搁置主权, 共同开发), yet it has continued to be the recipient of increasing hostility from other countries with sovereignty claims. He claims this hostility comes in the form of disputants continuing to expand their militaries and interference from the United States in dispute resolution efforts.<sup>242</sup>

Gong recommends China pursue its strategic interests through six actions, which appear to be a deepening of current policy. His first recommendation is for China to above all else continue to assert its sovereignty over the South China Sea in every way possible. Following this, he strongly recommends that China encourage neighboring countries to abide by the "Declaration of Behavior for Parties of the South China Sea" (南海各方行为宣言), which does not allow for other nations to form a "Nansha group" (南沙集团) against China or allow for U.S. involvement in negotiations. The rest of his recommendations involve more economic and cultural cooperation among disputant parties, including: the formation of a "South China Sea Development Strategy" to engage in joint economic development strategies; the establishment of a "South China Sea Economic Ring" and "South China Sea Rescue Assistance Base" to separate and protect those countries who would like to jointly develop parts of the sea from those who do not; enhanced cooperation between China and Taiwan over South China Sea issues; and active protection and defense of areas over which China currently has sovereignty, allowing for the adoption of nonpeaceful means to counter acts of aggression.<sup>243</sup> The more intensely the complex crisis scenarios within China play out and affect the country's energy security, the more likely such strategies become.

Similar risk factors apply to the East Chinese Sea and continuing maritime disputes that impact Sino-Japanese relations. Climate change impacts have the potential to exacerbate the two countries' dispute over a group of uninhabited islands known as the Senkakus in Japanese and Diaoyu Islands in China. The islands' surrounding waters carry great strategic relevance for shipping lanes, rich fishing grounds, and the potential for oil and other mineral reserves.

In a similar dispute, Japan and China are vying to maximize domestic interests in Russian oil and gas pipeline negotiations, which has caused a deepening of hostility and suspicion. Wang writes that Japan's primary reason for getting involved in the Russian pipeline is the same as its strategy in the Diaoyu/Senkakus dispute, which is to "constrain China in its energy diversification strategy and expand its influence in Northeast Asia" (而日本的参与主要为了达到遏制中国能源的多元化战略以及扩大在东北亚地区的影响力的目的).<sup>244</sup> Another anonymous Chinese author blames the conflict on the Japanese government's "outrageous" position that "ignores the historical truth that clearly shows China's territorial claim takes precedent." This author also mentions the importance of the island for China's maritime interests, particularly the oil resources in surrounding waters.<sup>245</sup>

Such positions are not confined to the scholarly world but resonate in Chinese policy as well. On December 14, 2012, the Chinese Permanent Mission to the United Nations Secretariat filed a partial submission of Chinese sovereignty over East China Sea waters on the outer limits of the continental shelf beyond 200 nautical miles. This submission seeks to expand the scope of national jurisdiction in international waters and has important strategic significance for China. It seems possible that domestic pressures—primarily economic but exacerbated by climate change and the results of migration and urbanization will continue to influence increasingly assertive policy toward territory disputes and negotiations over oil and gas resources with Japan.

Similar risks apply to China's relations with South Korea. Bilateral relations have dramatically improved over the course of 21 years of cooperation. The current strategic partnership includes extensive trade, Korean Peninsula security, and general political and cultural ties. Yet a point of friction in the relationship that could be amplified by climate change and the two countries' need for natural resources is the Suyan Islet, an underwater reef that is located in both countries' overlapping exclusive economic zones. In recent years, there have been scuffles over fishing rights in the area, resulting in loss of life for both parties. Both sides had previously agreed that because the Suyan Islet is completely submerged, there could not be a territorial dispute, and that sovereignty needed to be addressed through bilateral consultations.

Unsurprisingly, this agreement is easily ignored when tensions flare. Chinese scholars comment that in 2011, contrary to these agreements, South Korean President Lee Myung-bak asserted that South Korea will maintain control over the reef and that it has potential to be an important economic activity hub. On December 26, 2011, South Korea announced that it would invest 932 billion won—5.2 billion yuan—to combat Chinese fishing vessels’ illegal activities. If the fishing boats threaten the lives of the South Korean maritime police or interfere with official duties, police are granted the right to fire. South Korea’s statements and actions seem to cause concern among Chinese officials.<sup>246</sup>

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### Climate security risk and uncertainty: Shale gas exploration

China’s energy demand is so great that it needs to harness energy from every source possible—coal, hydropower, nuclear power, renewables, oil, and natural gas. Still, China needs more domestic sources of energy to ensure energy security in the long term. As a result, China has turned to shale gas and hydraulic fracturing—or fracking—technologies as a potential way to harness extra energy domestically. Through fracking, China hopes to produce 6.5 billion cubic meters of shale gas by 2015, and potentially 100 billion cubic meters by 2020, even though it had no output in 2013.<sup>247</sup> These activities have already begun, but with minimal consideration for potential consequences on the environment or internal migration—government regulations do not require earthquake surveys to be included in standard environmental impact assessments.

Initial surveying shows that China has large shale gas reserves, but with the only basins expected to have high yields located in Sichuan and Xinjiang, two of the hotspot regions identified above as at risk for climate-migration-security issues. The year 2013 saw advancements in China’s shale gas industry in China. The Royal Dutch Shell Group began partnering with China National Petroleum Corp. or CNPC, to explore in Sichuan while Hess Corp. is exploring with in Xinjiang with the China National Petroleum Corp.<sup>248</sup> Chevron Corp., Exxon Mobil Corp., and BP Plc are also jointly surveying Chinese basins, while CNPC, Sinopec, and China National Offshore Oil Corp. are hurriedly buying into North American oil and gas companies with expertise in shale gas extraction in a “market-for-know-how” strategy.<sup>249</sup>

The problem is, however, that much of Xinjiang already faces extreme drought and water scarcity, which combined with the high demand of water for fracking will jeopardize the livelihood of local populations and contribute to environmental degradation. As for Sichuan, signs already suggest that fracking may lead to increases in seismic activity. In a region already prone to devastation due to natural disasters, fracking could intensify the plight of millions of local residents already struggling to cope with one major earthquake after another.

In one study by the Earthquake Administration Bureaus of Sichuan and Hebei—a nearby province—more than 2,700 earthquakes of varying strengths occurred after fracking began in a test well in Zigong, Sichuan, an increase from previous trends in that area.<sup>250</sup> Moreover, a U.S. Geological Survey found that wastewater wells—also a necessary part of the fracking process—are correlated with increases in seismicity. After 70,000 deaths and thousands of environmentally displaced persons resulting from the 2008 Sichuan earthquake, there are grave and unpredictable consequences of deploying fracking technologies in Sichuan and Xinjiang.

# Conclusion

Addressing the consequences of climate change, migration, and security in China and the Asia-Pacific region requires action on several fronts simultaneously going beyond the scope of traditional policymaking in China and elsewhere in the world. But there are steps to be taken that, when broken down into smaller, more workable solutions yet linked to an overarching strategy, hold out the promise of success. In this section of the report, we break out those workable solutions while being realistic about what can be achieved—beginning with international climate negotiations.

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## Prospects for international climate change negotiations

China seeks to actively participate in U.N. Framework Convention on Climate Change, or UNFCCC, negotiations under the premise of its role as a developing country with low historical greenhouse gas emissions and low capacity to implement mitigation or adaptation technologies. Chinese scholars tend to focus on historical emissions, and frequently cite that data from 1850 to 2006, when U.S. emissions comprised a total 29 percent of the world’s historical emissions, while China’s only amount to 9 percent over the same period.<sup>251</sup> Predictably, its position did not change for the subsequent UNFCCC meetings at the Doha conference in 2012 or the Warsaw conference in November 2013. China, of course, has domestic reasons to fulfill its international “contributions” to greenhouse gas reductions—namely energy security, economic and social development, technological competitiveness, and anti-pollution campaigns—but there is no incentive for China to comply with a more stringent agreement.

China’s participation in climate change negotiations also is determined by its foreign policy motivations. It seeks to ensure a level playing field between industrialized and emerging societies, unite developing countries behind common policy positions, and improve its image as a responsible global leader. China’s obligations under the UNFCCC track these foreign policy considerations:

- In 1992, China approved the UNFCCC.
- In 2004, based on the UNFCCC and the Kyoto Protocol obligations, China submitted its first international communications on climate change. It advocated the “common but differentiated responsibilities” principle created by the developing country bloc. This principle states that while all countries have a responsibility to mitigate climate change, some have more responsibility than others. The degree of responsibility is based on both capacity to mitigate climate change and historical emissions. China argues that developed countries should set reduction targets for the Kyoto Protocol second commitment period, transfer \$30 billion of funds to developing countries, and engage in technology transfers.<sup>252</sup>
- In the second round of Kyoto obligations to be implemented post-2012, China advocates for developed countries to reduce emissions by 40 percent of 1990 levels, and for those developed countries that have not ratified the Kyoto Protocol to do so.<sup>253</sup> China advocates for developing nations to make “contributions” to reduction targets and to implement Kyoto obligations to the best of their ability without making formal commitments.
- Following the Doha conference in 2012, China maintained that developed countries should follow through with obligations for funding of clean energy technologies and environmental capacity building to developing countries, and arrange for appropriate implementation methods.<sup>254</sup>
- At the Warsaw conference in November 2013, Chinese negotiators led the developing country bloc in the fight to establish the so-called “loss-and-damage” mechanism that was agreed to in principle at the 2011 Doha conference. Loss and damage is largely a financing issue to put in place “institutional arrangements” where developed countries provide funding to developing countries to cope with extreme weather events. The G-77, a U.N. party group that represents more than 130 developing nations including China—view loss and damage as a separate issue altogether from adaptation and mitigation.<sup>255</sup> The United States and other developed countries consider loss and damage a part of adaptation. A compromise put the loss and damage mechanism under an adaptation framework to be reviewed in 2016.<sup>256</sup>

- China and India also pushed back hard on the key requirement of the United States and other developed countries for all member nations to establish a national target for greenhouse gas emissions by the first quarter of 2015.<sup>257</sup> The eventual compromise between the two factions was for developing nations to make flexible “contributions” instead of firm “commitments” to national targets.<sup>258</sup> This lowers the requirements for compliance and threatens to reduce already minimal gains to climate change mitigation.

Given that China has not deviated at all from its national climate policies with the Warsaw Accord, there is little debate about whether it can fulfill its minimal requirements. Because China’s goals are domestically driven, it is not likely to change its position on international negotiations in the near to medium term, unless it can find new ways to cooperate with the United States.

### Implications for the United States

Most Chinese policy experts precede any discussion of U.S.-China comparative climate change policy by acknowledging the U.S. withdrawal from the Kyoto Protocol in 2001.<sup>259</sup> But China’s leaders also realize that there are benefits from maintaining a strong relationship on climate and energy issues because U.S. renewable technology firms, energy policies, and legal frameworks are much more developed than their counterparts in China. China has much to learn in the areas of clean coal, energy markets, fracking, and deepwater drilling technologies.<sup>260</sup>

There are also other potential areas for cooperation between the two largest greenhouse gas emitters that both countries have yet to acknowledge. First, both countries should raise climate, environmental, and migration policies to the level of strategic and security issues in order for them to gain the status and attention necessary to implement policy changes. Second, current U.S.-China climate, energy, environmental, and strategic cooperation mechanisms should be strengthened. Third, new areas of collaboration should be developed under a new climate security umbrella, including:

- Collaborative humanitarian assistance and disaster relief to address climate change-induced extreme weather and natural disasters. Military strategic cooperation surrounding humanitarian assistance would build trust between the two militaries and reduce the potential for misunderstandings and accidents. It is no longer an option to work separately on regional crises, such as in the Myanmar

crisis in 2013 and Pakistan humanitarian efforts following the devastating floods in 2010. Since 1998, China and the United States have had a platform for maritime security cooperation, and both countries' efforts would be more effective if this platform was actively utilized.<sup>261</sup>

- Cross-Pacific partnerships between nongovernmental organizations and scientific educational organizations to promote dialogue and track two collaborations on climate security issues. U.S. and Chinese nongovernmental organizations should work together to educate people on climate change and help pressure local governments to take action.

### Implications for the European Union

The EU currently offers technical assistance to improve China's carbon capture and storage technologies and near-zero emissions coal technologies. But more can be done to promote climate security issues in the Asia-Pacific.<sup>262</sup> Climate and energy security could form the cornerstone of China-EU cooperation moving forward, but current competition in the renewable energy market and so-called "embedded carbon issues"—meaning the amount of carbon emissions contained in products exported from China—are creating roadblocks in the relationship.

Chinese critics note that the EU's strict emissions policies contradict its trade strategy that involves importing goods from carbon-intensive economies. China's adaptation and mitigation policies as well as global climate change have many implications for this relationship. Chinese economists calculate that from 1995 to 2010, embedded carbon in China's net exports to the EU amounted to 3 percent to 8 percent of China's total emissions.<sup>263</sup> Critics call on the EU to take responsibility for this part of China's emissions by giving China funding and technical assistance in the form of technology transfers for clean technologies.

What's more, China is increasingly seen as a competitor for the EU in the renewable energy market, given that China's installed wind power in 2009 was second only to that of the United States, and China's photovoltaic cell production has led the world since 2007.<sup>264</sup> In response to what is viewed as a clear case of dumping, the EU and the United States have both filed anti-dumping cases against China with the World Trade Organization.<sup>265</sup> Anti-dumping cases can continue for years, and can cause major rifts in bilateral relations.

In light of this, both parties should commence consultations and negotiations on the contentious issues relating to emissions policies, embedded carbon, green energy development, and photovoltaic cell production. More can be done in the European Union to promote climate security issues in Asia, but beginning with current areas of contention will pave the way for more collaboration later.

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## The need for a new U.S. climate change agenda for the Pacific

A few developments may be signaling a new era in international climate governance and U.S.-China collaboration. One is the U.S.-China agreement on hydrofluorocarbon emissions restrictions that came out of President Xi and President Obama's June 2013 bilateral meeting in California.<sup>266</sup> President Obama's new climate policy also signals more U.S. commitment to cutting greenhouse gas emissions. Perhaps the most important development is the U.S.-China Climate Change Working Group's advancement of cooperation on these issues in the two nation's annual Strategic and Economic Dialogues. Established in April 2013, this working group made groundbreaking headway at the July 2013 meeting by highlighting five "action initiatives": vehicle emissions, smart grids, carbon capture and storage, utilization and storage, greenhouse gas data collection and management as well as building and industry energy efficiency.<sup>267</sup> Indeed, the World Resources Institute points out several themes that run through the July 2013 bilateral report: enjoying greater benefits by working jointly, implementing domestic action in concert, and beginning a new phase in the bilateral climate change relationship.<sup>268</sup>

Continuing this momentum, in November 2013, U.S. National Security Advisor Susan Rice underlined the need for the United States and China to lead the efforts against climate change and spur a global transition to a low-carbon energy future.<sup>269</sup> She highlighted plans underway, such as partnering with Asian allies to bring new green technologies to market, protecting natural resources and endangered species, and helping communities adapt to the consequences of climate change. Still, more tangible progress must be made in forums such as the UNFCCC negotiations, the U.S.-China Strategic and Economic Dialogue, and other multilateral and bilateral forums to address climate change and the unique intersection of climate, migration, and security issues. Vast improvements can be made if the United States implements the following recommendations:

- Engage in more trust-building, such as working with China, India, and other developing country leaders to conduct joint humanitarian assistance and disaster relief in response to extreme weather and natural disasters, especially in Africa.
- Strategically implement mitigation and adaptation projects as well as technical capacity building in developing countries.
- Conduct collaborative research projects and information sharing with China, India, Bangladesh, and other Asia-Pacific countries vulnerable to climate change.
- Integrate climate change, migration, and humanitarian issues into traditional security bureaucracies.

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## The need for a new China climate change agenda

Climate change, migration, and social stability present enormous hurdles for China at its current stage of economic development as it emerges as a global leader. Without addressing the climate security risks posed by greenhouse gas emissions, migration hotspots, and social stability, China's emergence as a stable world partner and the legitimacy of the Chinese Community Party will be challenged. China's leadership has made some headway in the disparate policy realms of climate change, rural-to-urban migration, urbanization, human security, and resource scarcity, but no overarching policy exists to link them together to mitigate complex crisis scenarios.

With much uncertainty as to the long-term impacts of climate change and migration on social and economic stability, China would do well to adopt a national climate security strategy. If such a policy were proposed and implemented, it would need top leadership support, incentives for industry compliance, credible enforcement by national and local bureaucracies, and better monitoring, measurement, and synthesis of data. While China has shown its capacity to make progress on certain resource, environmental, and security issues, much more interagency coordination, targeted resources, and mechanisms for policy implementation must be in place.

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## The way forward

Yet it is clear after the meager outcomes achieved at the UNFCCC 2013 Warsaw conference that if the United States does not take the first step, China will not. The United States must lead by example and adopt its own national climate security strategy that integrates climate change mitigation and adaptation, migration and human security, disaster relief and maritime coordination, food security, and renewable and new energy technologies. It must also drive international forums to influence other nations, most urgently China, to do the same, and work to build the capacity among developing countries to address their specific climate security challenges.

China's assertive positioning regionally makes it all the more critical that the United States continue its diplomatic and security arrangements in the Asia-Pacific region, with an eye toward potential climate security contingencies that would affect the stability and safety of regional economies, global trade, and financial markets. While China has a large role to play in ensuring regional climate security in the Pacific Century, the United States remains the only Pacific and global leader whose actions will persuade others to do the same.

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