FOOD SECURITY IN ASIA
A REPORT FOR POLICYMAKERS

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FOOD SECURITY IN ASIA

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EXECUTIVE SUMMARY

FOOD SECURITY IN ASIA – A REPORT FOR POLICYMAKERS

This report is the outcome of two years of collaborative research on Food Security in Asia funded by the MacArthur Foundation’s Asia Security Initiative. The project aimed to investigate the ways in which food-related policies in the region intersect with local and regional food security dynamics, and analyse the impact on local communities and across the wider region.

The research focused particularly on policy and governance-related challenges in this respect. While food security remains a widely researched subject area, far too often the emphasis is on issues related to food production and availability. The impact of certain policy choices and the unequal distribution of power that often play a greater role in creating and perpetuating hunger and lack of access to food, remain underexplored.

The findings and case studies in this report demonstrate that a lack of adequate and nutritious food in the short term and an absence of any certainty as to where food will come from in the future – a situation of food insecurity faced by hundreds of millions across Asia – is often the outcome of inadequate or insufficient policy planning and poor governance at the local, national and regional levels.

In the above context, the project focused on the following issues:
- Population and Development: Demographic Change, Rural Development and Urbanisation
- Land and Equity: Land Acquisitions and Access to Land
- Freshwater Resources: Climate Change, Aquifer Depletion and Energy Security
- Fisheries and Food Security in Littoral Asia

KEY FINDINGS AND RECOMMENDATIONS

Population and Development: Demographic Change, Rural Development and Urbanisation

Rapid population growth in Asia has brought with it a host of challenges to food security. The unprecedented number of people involved in rural to urban migration throughout Asia is creating ever growing urban areas and mega-cities that demand increasing quantities of food, water and energy. Food consumption patterns continue to shift in favour of higher-valued agricultural products such as meat, dairy, eggs and horticultural products. Consequently, the demand for food as animal feed is also growing, and the competition for land between agricultural urbanisation and industrialisation is escalating. An ageing population in many Asian nations – especially in rural areas – is adding to these pressures on food security.

Recommendations
- A comprehensive understanding of current demographic trends in the region is required for policy makers to develop appropriate food security programs for the future.
- Policymakers need to address the impact of large scale rural-urban migration on rural areas in order to maintain a viable and productive agricultural labour force.
- The impact of expanding cities on agricultural land needs to be considered alongside a rapidly ageing urban population, and a growing middle class given their impact on urban food demand in the future.
- Investment in infrastructure and education in rural areas is needed to boost food production and prevent losses.

Land and Equity: Land Acquisitions and Access to Land

Access to land and tenure security is a key component of self-sufficient and subsistence livelihoods in Asia – especially in rural areas. Yet, in developing countries across Asia, access to land remains weak and millions of small farmers continue to live and work on land without security of tenure. Agrarian reform remains incomplete in many countries, and the situation of women is particularly precarious when it comes to land rights. At the same time, as a case study of land acquisitions in Cambodia reveals, the acquisition of agricultural land by private investors – both domestic and foreign – in the form of large agribusiness enterprises, has served to further undermine the livelihoods and food security of local small farming communities.

Recommendations
- Surety of tenure is vital for rural populations to invest in land and secure livelihoods. As such, developing Asian states must pursue a legal process of fair and equitable recognition of tenure and access to land, adhered to by all stakeholders.
The needs of women farmers should be acknowledged and incorporated into policymaking along fair and equitable lines.

Agrarian reform, including land redistribution and titling, needs to be hastened to ensure forced evictions of rural households are prevented and resettlement and rehabilitation of communities uprooted by developments is enacted in a fair and reasonable manner.

Policymakers and investors need to consider local food security needs when developing land deals as this will ensure long-term viability of the agricultural investment.

**Freshwater Resources: Climate Change, Aquifer Depletion and Energy Security**

Freshwater resources across Asia are under pressure from growing populations and urban expansion. Climate change is affecting the supply of water in the region, for example through changes in precipitation patterns, and more frequent and intense natural disasters such as droughts, floods and cyclones. The over extraction of groundwater in many parts of Asia, including large swaths of India and China, has depleted aquifers in these areas and has become a serious human security concern. In Southeast Asia, excessive damming of the Mekong river for hydroelectricity is having significant impacts on food security in the Mekong Delta region, for example through silt capture and the destruction of fisheries.

**Recommendations**

- Policymakers and donor states need to prioritise climate change adaptation measures, particularly focusing on how severe climate events threaten long-term food security.
- Improvements are needed in the management of the shorter-term consequences of natural disasters on food security.
- Urgent attention needs to be given to the state of aquifers throughout Asia, particularly in India and China, to reduce the probability of severe water stress and food shortages in the near future.
- Measures to protect and restore the quantity and quality of groundwater are needed to ensure the long-term viability of aquifer production.
- The short-term economic and energy gains from hydropower development need to be re-considered in light of the long term negative food security and environmental impacts. Profits from these developments should not be made at the expense of local communities.

**Fisheries and Food Security in Littoral Asia**

Fishing provides food security and livelihoods to millions of Asians. Unfortunately, the state of fisheries across the region is in rapid decline. Inland fisheries continue to suffer under pressure from factors such as over-fishing, environmental degradation, and industrial and urban development. Fisheries in Littoral Asia are also under tremendous pressure as fishing fleets in the region assume unprecedented proportions. Dwindling fish supplies and rising prices of fish threaten to undermine food security, particularly in countries where fish from capture fisheries provide a large proportion of dietary protein per person. Where the writ of the government is already weak, these trends may add to the problems of instability. Moreover, the desire to exploit the region’s wild fish stocks is aggravating a host of maritime sovereignty disputes, e.g. in the South China Sea, and states are more aggressively defending their territorial waters and Exclusive Economic Zones (EEZs) while their fleets are travelling farther afield in search of fish, heightening existing tensions and the potential for maritime conflict.

**Recommendations**

- The region needs to develop improved licensing and monitoring schemes including better enforcement, compliance, stock assessments and cooperation enacted in bilateral and multilateral fishing agreements.
- Reduce by-catch loss through the use of more effective and environmentally sensitive fishing technology and practices.
- Regional bodies to declare additional protected zones to enable fish to spawn and regenerate, and greater focus on fisheries management to then protect stocks.
- Given the reduction in fish stocks, global fishing capacity will need to also be reduced, requiring governments to provide alternative employment and access to food for former fishing communities.
Food security has emerged as one of the most significant and complex challenges of the twenty-first century. Since the mid-2000s, overall global food prices have increased substantially. Policymakers were caught off-guard by the global food price crisis of 2007-2008, when soaring food prices led to riots and protests in over 30 countries around the world. Again, in early 2011, global food prices reached a historic peak, and contributed to fuelling social unrest and instability in a number of countries in the Middle East and North Africa (MENA) region. Escalating food prices are indicative of food systems around the world being challenged by a unique combination of complex and interactive socio-economic, environmental and political issues. The ability of communities and states to meet their food security needs in a sustainable manner depends largely on how they, and the food systems they are embedded within, are able to cope with or respond to this confluence of pressures. Asia is central to meeting the challenge of sustainable food security at the global level. The region has made impressive achievements in reducing poverty and hunger in the past two decades, driven by impressive economic growth and rising incomes over the last few decades. This progress has however been uneven within and across states, and the region remains home to over 60% of undernourished people in the world. In the first instance, food insecurity remains a problem of economic access in Asia as hundreds of millions of Asians continue to live in extreme poverty. Despite such high levels of deprivation and food insecurity, food continues to be wasted in relatively large quantities because of inefficiencies along the entire food supply chain, from farm to fork. At the same time, a number of complex and interactive trends such as population growth, rising incomes, changing food consumption patterns, environmental degradation, climate change, growing competition for natural resources, such as land and freshwater, as well as urbanisation and industrialisation are coming together to exert tremendous pressure on food systems in the region. How governments and other actors in Asia respond to emerging food security challenges at home, has far-reaching consequences for human security and peace and stability of communities and states in Asia and in other parts of the world. Food security needs in all states are far removed from considering the problem of hunger, and in some cases actually contribute to worsening hunger specifically, and human insecurity more broadly. Deliberate policies that benefit elites at the expense of socially weak groups demonstrate how power disparities can have a significant impact on food security. Shifting to a bottom-up approach to food security policies and strategies would help to address the needs of those who are most vulnerable to hunger and malnourishment. This means that policies need to prioritise the food security needs of individuals and communities at the local level, rather than

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AN INTRODUCTION

SHIFTING THE CONCEPT OF FOOD SECURITY

Across Asia, as in other parts of the world, governments continue to interpret food security in terms of food availability and self-sufficiency in staples. These interpretations of food security are limited when compared with the definition provided by the UN Food and Agriculture Organisation (FAO), which states that food security ‘exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.’ Although the FAO definition of food security is more expansive than simple supply and demand logic, it overlooks those issues that play a critical role in defining, controlling and shaping food system activities, processes and outcomes. It does not, for example, draw attention to problems such as: unequal access to productive resources like agricultural land, freshwater resources, forestlands and fisheries; unfair trade policies that disadvantage local farming communities;poor policy planning and implementation; and governance-related problems such as lack of political representation and corruption. Without serious consideration for such issues, food security policies and wider strategies may risk exacerbating existing food insecurity and worsening the living and working conditions of those whom they seek to assist in the first place. Current food security policies in Asia tend to lack a holistic and comprehensive approach, and invariably focus on the economics of food supply and demand, and “the challenge of procuring, and distributing, scarce resources amongst the world’s population.” Consequently, other responses to food insecurity that go beyond such narrow views around how to resolve hunger and malnourishment remain underexplored. For example, ‘forms of protectionism or alternatives to corporation/market models — [have been] largely excluded from consideration.” Moreover, the language of food security is often used by powerful actors to legitimise behaviours that are far removed from considering the problem of hunger, and in some cases actually contribute to worsening hunger specifically, and human insecurity more broadly. Deliberate policies that benefit elites at the expense of socially weak groups demonstrate how power disparities can have a significant impact on food security. Shifting to a bottom-up approach to food security policies and strategies would help to address the needs of those who are most vulnerable to hunger and malnourishment. This means that policies need to prioritise the food security needs of individuals and communities at the local level, rather than
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focusing exclusively on the goal of having sufficient food availability at the national level. Such a bottom-up approach to food security also needs to be holistic – that is, it must encompass all aspects of food systems when considering food security scenarios, policies and outcomes. Here, issues such as access to and control over productive resources, human development, rights, equality, environmental factors and governance all become important considerations in analysing and responding to challenges to food security.

RECOGNISING POVERTY AND INEQUALITY AS DRIVERS OF FOOD INSECURITY AND VIOLENCE

As the Human Security Unit of the UN Office for the Coordination of Humanitarian Affairs (UNOCHA) points out, “Food insecurity is inherently interlinked with political security, socio-economic development, human rights and the environment.” When food prices increase sharply and suddenly, they cause hunger and malnourishment in the short term, and also lead to “potentially longer-term reversals in poverty reduction and human development by cutting back on healthcare and education in order to maintain immediate staple food consumption.” Poverty is the main cause of hunger, and the two have a mutually reinforcing relationship.

The scale of poverty in Asia makes the region’s populations particularly vulnerable to sudden and sharp increase in food prices, as the poor spend as much as 70% of their household incomes on purchasing food. Although some countries do have social safety nets in place to protect poor and vulnerable sections of their populations from food price hikes, these often suffer from substantial inefficiencies and wastage due to problems of weak institutional and infrastructural capacity, poor management practices and corruption.

Across the region, smallholders – who produce the vast majority of Asia’s food – continue to lack stable and secure access to the land they live and work on, and suffer from livelihood insecurity. Without the surety of benefitting from long-term sustainable use and management of renewable resources like arable land, rivers, lakes and forestlands, there is often insufficient incentive for small farming households and communities to invest in such practices that would otherwise lead to positive outcomes for the environment and agricultural productivity.

In the absence of clear land titles and tenure security, smallholders are increasingly vulnerable to illegal or forced land acquisitions, often facilitated by corrupt government officials and state agencies. In countries like China, India, Cambodia, the Philippines and Indonesia, such deals have widely resulted in small farming households and indigenous communities being forced off their lands without adequate compensation or rehabilitation. A large portion of such land acquisitions are for the production of biofuel crops such as maize, sugarcane and palm oil, often benefitting industrial scale agri-business at the expense of smallholders.

When combined with serious levels of poverty and malnourishment, weak governance, widespread socio-economic inequalities, lack of social justice and phenomena such as rising food prices, illegal or forced land evictions have the ability to trigger violent protests, demonstrations and riots. Both China and India, together with many other countries like Cambodia, Indonesia and the Philippines have been experiencing a rising number of protests by civil society and local communities against forced land acquisitions, often characterised by violence and destruction.

CLIMATE CHANGE, ENVIRONMENTAL STRESS AND FOOD SECURITY IN ASIA

The impacts of climate change, such as rising sea levels, higher temperatures, changing precipitation patterns and more frequent and intense droughts and floods, all stand to seriously undermine agriculture and food production in the region, with potentially devastating consequences for livelihoods, food security and wider human security.

Climate change is expected to have particularly harmful impacts for agriculture in Asia. The phenomenon is already making itself felt through occurrences such as changes in precipitation patterns and more frequent and intense
extreme weather events like droughts, cyclones and floods. It will also affect the availability and quality of natural renewable resources essential for food production, such as freshwater resources, soil and fisheries. Climate change impacts therefore not only threaten food production and availability, but also the livelihoods of hundreds of millions of small farmers in the region. At the same time, as climate change is expected to further push up food prices in the coming decades, it will also most significantly affect those who are the poorest and most marginalised communities in Asia.

According to the UN International Panel on Climate Change (UNPCC), by 2050, over a billion people across Asia will suffer from reduced freshwater availability.

In South Asia, for example, the annual runoff in major rivers such as the Brahmaputra and the Indus is expected to fall by 14% and 27% respectively, with devastating consequences for agriculture and food security downstream. Rainfall patterns in parts of Asia such as South and Southeast Asia are already experiencing disruptions, including the monsoons – the lifeblood of agriculture in these sub-regions – that are likely to become more intense due to increases in surface air temperatures. As more rainfall occurs over fewer days, the risk of flooding particularly in the densely-populated mega-delta areas of South and Southeast Asia is expected to increase. As droughts get prolonged, the risk of losing crops to hotter temperatures and inadequate rainfall will also rise. In China, for example, up to 5 million hectares of sown area was lost to drought and floods every year between 2000 and 2007. Severe droughts in China every year since 2009 have continued this pattern. Rising sea levels are already affecting agriculture in coastal regions and delta areas, such as the Mekong delta region in Vietnam, the coastal plains of China during the dry season and the Ganges-Brahmaputra delta in South Asia. As coastlines retreat under rising sea levels, freshwater resources will be affected by saltwater intrusion, damaging inland fisheries and the livelihoods of fishing communities across the region.

As temperatures increase, agricultural productivity in Asia will also be threatened by variations in soil quality (e.g. moisture and nutrient content), and by pest and disease-related events. Most at risk are those parts of Asia that are seasonally dry and tropical regions, where it is anticipated that even slight increases in temperature (1°C–2°C) would result in drops in crops yields for rice, wheat and maize.

In parts of East, South and Southeast Asia, signs of such declines or stagnation in yield growth rates are already visible. In addition to climate change, Asia’s capacity to produce food is suffering from other harmful environmental impacts. In many countries, the unsustainable use of precious renewable natural resources like arable land, freshwater, fisheries and forestlands have contributed to serious and widespread environmental degradation, putting food systems under great stress. The Green Revolution cut cereal production in Asia double, bringing food security to millions and contributing to economic growth and development. Yet, evidence shows that the Green Revolution ‘increased inequality, worsened absolute poverty, and resulted in environmental degradation.’

According the Global Assessment of Soil Degradation (GLASOD), 18% of Asia’s land is degraded. In South and Southeast Asia, almost 75% of all agricultural land is severely affected by wind or water erosion, and chemical pollution. In China, where soil degradation affects 37% of land, experts estimate degradation could cause up to 40% losses in crop production in the north-east over the next five decades unless efforts are made to curb this trend.

The excessive use of agro-chemicals for both fertiliser and pesticides in Asia has become a serious problem in many countries, where use has shot up significantly in the past few decades. This has had severe consequences for soil structure and nutrient balance, which in turn affects productivity. Aquifers, rivers and lakes across the region have also been contaminated from runoff containing nutrients and toxic heavy metals, while saltwater intrusion has caused degradation of agricultural land in coastal areas.

Asia relies heavily on irrigation for agricultural production, and half of the world’s total irrigated cropland is in China, South Asia and Southeast Asia. However, over extraction of groundwater and other poor irrigation practices have resulted in widespread water logging and salinisation of irrigated areas in these parts. Many parts of the region are now also water stressed or water scarce, particularly large parts of China and India. Water tables in these parts have been declining at alarming rates, and major river systems in the region are also under tremendous pressure and suffering from reduced flows.

In the above-detailed context, the vulnerability of developing countries in Asia to the complex, multifaceted and interactive forces shaping food system activities and outcomes is stark. The following sections of the report explore some of these forces in detail, and their impact on food security in developing countries in Asia, and offer specific recommendations for policymakers in this respect.
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POPULATION AND DEVELOPMENT: DEMOGRAPHIC CHANGE, RURAL DEVELOPMENT AND URBANISATION

At a glance:

- Rapid demographic change is occurring in Asia with an ageing population and a growing middle class creating increased demand for food.
- Rural/Urban migration is changing the face of Asia, expanding urban areas and populations, placing new pressures on food supply and productivity.
- Lack of policy co-ordination and focus on rural infrastructure investment has left many rural areas in Asia seriously challenged in meeting the food security demands of rural and urban populations.

DEMOGRAPHIC CHANGE AND URBANISATION IN ASIA AN OVERVIEW

The Asia Pacific region 'encompasses an extraordinary crush of humanity'. It includes six of the world’s most populous countries – China, India, Indonesia, Pakistan, Bangladesh and Japan. Since 1950, the region’s population has grown from approximately 1.3 billion to 3.87 billion today – roughly 55% of the world’s total. For much of human history, demographic patterns in the Asia-Pacific region remained fairly stable. However, in the second half of the twentieth century, this picture has given way to the biggest demographic upheaval in human history, something that is still running its course.

Population change has been driven by dramatic improvements in health, producing significant declines in mortality. Life expectancy has more than doubled in many parts of the Asia-Pacific over the last 40 years to more than 71 today, and is expected to reach 75 within 20 years. There has also been a trend towards an ageing population throughout the region. Before 2000, young people always outnumbered old people; now, the aged sector is the fastest growing group, and by 2050 in many parts of Asia, people aged over 65 may well outnumber those aged under 15. In Japan, 25% of the population is 65 years or older and within 20 years this section will comprise more than 30% of all people in Japan. Rural areas are particularly affected, and today those aged over 65 make up 40% of Japan's rural population and, importantly, 60% of the farming population. China may well follow this model over the next 50 years. By 2030, it is estimated that 16% of China’s population will be over 65 and by 2050, China will have 350 million people aged over 65.

Accompanying the increase in ageing population throughout Asia, and of equal importance, has been the dramatic increase in rural-urban migration. Currently throughout the region there are taking place some of the greatest rural to urban migration flows in recorded history. In China, massive population movements out of rural areas, encouraged by the Chinese central government in an effort to aid China’s rapid economic growth, constitute the largest flow of labour out of agriculture the world has ever seen. In China, 150 million people have moved from rural to urban areas the last two decades and another 300 million are predicted to do so over the next 20-30 years. Such population movement has consequences for every social, economic and political issue in the region.

One of the results of this migration has been the rapid growth of towns and cities throughout the region and the emergence of megacities. In 2000 in China, for example, there were only 3 cities with populations of 10 million or more. By 2010, there were six such cities and by 2020, there will be 13. The rapid influx of newcomers to many cities throughout the region has placed a severe strain on many basic services, including housing, education and health and welfare provision – as well as the provision of adequate and reliable food supplies.

Today, it is estimated that there are more than 600 million people living in slums and squatter settlements throughout Asia, and the number can be expected to double within 20 years. Slum dwellers make up about 37% of the population of China, 55% in India and 84% in Bangladesh. Slums are fast becoming a dominant form of urban land use marked by poor sanitation, lack of fresh water and waste disposal making them vulnerable to the spread of disease and chronic hunger.

IMPLICATIONS OF DEMOGRAPHIC CHANGE AND URBANISATION TO FOOD SECURITY IN ASIA

The rapidly growing population of Asia has obvious implications for food security on supply and demand. China in particular, with approximately 22% of the world’s population and less than 7% of the world’s arable land, will see its grain consumption increase to around 50 million tonnes a year, an amount which is expected to overwhelm existing supply markets. India, which will have more people than China by 2025, currently has more undernourished children than the whole of sub-Saharan Africa.
While more mouths to feed require more food, this simple equation is only a small part of the picture. As discussed above, population growth in Asia is also being accompanied by the ageing and rapid urbanising of populations. These trends increase the challenges of a growing population by decreasing the farming labour force, and adding pressures on the natural environment whilst simultaneous change in urban appetites occur – creating higher demand for livestock-based food sources such as meat and dairy products.

Faced by an ageing population, many governments will have to confront a number of important policy challenges related to meeting the needs of the increasing numbers of elderly, and how ageing will impact upon the labour force – especially in rural farming communities. The ageing of the rural population means that many farmers will be dropping out of the workforce without being replaced. This decrease in productivity creates challenges to food security in both rural and urban areas: rural supply will diminish as local production of food decreases, likely increasing prices as food is bought from other areas. Similarly, urban areas will need to find new sources of supply – possibly leading to an increase in imports. This has implications not only for the state requiring new sources of food, but for the region as price keeps pace with demand.

In addition to the challenges to food security brought about by an ageing population, rural-urban migration will also reduce and substantially modify the workforce engaged in subsistence agriculture. A recent report estimates that 100 million farmers will move from rural areas to China’s already crowded cities over the coming decade, in line with the central government’s aim of increasing China’s urban population to 52% in 2015 and 65% in 2030. The challenges that this exodus of farmers from rural areas brings to the overarching food security dynamics of Asia are unprecedented and difficult to assess.

As men migrate to cities in search of jobs and better incomes, increasingly women are the heads of rural households in Asia. They play a key role in agricultural production and contribute significantly to rural economies. Unfortunately, despite their importance, rural women remain largely neglected as small farmers and economic actors in their own right in most developing Asian countries. They face huge inequalities with respect to access to education, land rights, control over productive resources, financial and marketing support and services etc., severely hindering their ability to increase farm productivity and household incomes, contributing to rural food insecurity.

In urban areas, the influx of migrants to the many cities of Asia brings with it increased pressures on food security. Increasing urbanisation throughout the region, with a greater concentration of people in megacities, is seeing substantial shifts in consumption patterns towards higher valued agricultural products (HVAPs) such as meat, eggs and dairy, horticultural crops and processed foods. Not only has demand increased for these products, but so has the expectation of the growing urban population that these products should be readily available in markets.
The pressure on agricultural land in Asia to produce greater quantities of grain for the protein demands of the increasingly affluent requires serious consideration for how this demand is met and managed. For example, between 1972 and 2002, the average supply of fish per person in Asia increased from 7 kg to 17 kg; meat from 8 kg to 27 kg; milk from 16 kg to 35 kg; fruit from 18 kg to 45 kg and vegetables from 41 kg to 137 kg. HVAPs such as horticultural crops are water intensive, and the production of animal products additionally requires food grains as feed. Estimates vary, but for 1 kg of animal protein, between 3-6 kg of grain is required. This means that not only is the overall demand for food in Asia rising strongly, but that demand for more grain and water-intensive food crops is also expected to continue to increase in coming years and decades.

Even slums, although not demanding the same amount of food as more wealthy urban areas due to the poverty involved, have a significant impact on food supply and demand. Whereas the rural poor are usually involved in small-scale agriculture, and able to provide themselves with enough food for subsistence, slum-dwellers and the urban poor must rely on meagre incomes for subsistence. This makes them extremely vulnerable to economic shocks such as financial downturns, unemployment and especially food price spikes such as those that have occurred in the past several years. Steep increases in food prices create real poverty and hunger as vulnerable households are forced to pay greater percentages of their income to meet their basic needs.

The rapid urbanisation of Asia over the past few decades has also brought about physical pressures on the environment. The growth of towns and cities has encroached on former agricultural land, as has major development and infrastructure projects such as irrigation schemes and dams. Urbanisation redirects water flows, hampering the replenishment of groundwater. More food must be supplied with less, putting greater strain on the production areas that are already struggling to keep up with demand.

Over the next few decades, there seems little doubt that demographic forces will provide a major challenge to food security. Continuing population growth, even if it slows somewhat, declining rural agricultural populations, limited agricultural land, rapidly growing cities and ageing populations will – together with soaring food prices – combine to create a growing food crisis. All these trends will impact on food resources and in some cases may increase the risk of famine and conflict.

RURAL DEVELOPMENT IN ASIA: CHALLENGES TO FOOD SECURITY

Despite having significant levels of rural-urban migration in recent decades, most developing countries in Asia continue to have considerable and growing rural populations. Yet, rural development remains far from adequate, even in China and India where there has been astounding economic growth and development during this period. Poverty remains a largely rural phenomenon in Asia, and agriculture remains the single-most important source of livelihoods for the rural poor. In South and Southeast Asia in particular, they make up the overwhelming majority of national poverty headcounts. Following the impressive agricultural achievements of the Green Revolution years, public investment in agriculture suffered considerably in comparison to investment in other sectors such as industry and services. In many countries, rural employment generation slowed down, failing to keep pace with rural population growth and contributing to declining rural economies. As agricultural productivity decelerated, farm incomes stagnated or fell, pushing up poverty and general misery in rural areas.

Agriculture has on the whole been neglected in most Asian countries in the past two decades in terms of public investment in infrastructure, research and development. The agricultural production base in the region has endured great stress in the last few decades from overexploitation, degradation from industrial agricultural practices, and overall unsustainable use and management for agricultural as well as urban and industrial purposes.

In India, farm sector employment grew at an excruciatingly slow rate of 0.2% in 1993-1994 and 1999-2000. As agricultural productivity slowed down due to lack of investment, a combination of these and other factors such as low farm-gate prices, inadequate credit and extension services, insufficient storage, lack of risk insurance, climbing input costs, and erratic weather served to leave small farmers with insurmountable debts, seriously undermining their livelihoods. Agriculture remains heavily reliant on rainfall and unsustainable groundwater extraction across parts of Asia, and the lack of adequate and efficient irrigation infrastructure is a major hurdle towards the goal of raising agricultural productivity. The expansion of surface irrigation is a key imperative, particularly as precipitation patterns become increasingly erratic as a result of climate change. Unfortunately, irrigation expansion has been taking place at very slow rates throughout developing Asia, and small farmers continue to be at the mercy of uncertain weather conditions.
At the same time, existing irrigation infrastructure in many countries is dilapidated and badly in need of restoration or repair, contributing to inefficient use of water for irrigation. Rural communities also continue to lack adequate schools, healthcare facilities, sanitation, clean drinking water, electricity, transport and communications infrastructure. Overall rural development is essential for agricultural growth and development, poverty reduction and improvements in rural living standards. Without adequate education and training, for example, farmers lack the capacity “to make best use of the available resources, and have found it more difficult to get trade or extension services.”43 Lack of access to healthcare, sanitation and clean drinking water has profound implications for the quality of life in rural areas, and directly affects food security and other aspects of human security.

POLICY RECOMMENDATIONS
- It is critical for policymakers to fully appreciate current demographic trends and their implications for the future, with particular reference to social and economic development and food security throughout the region and beyond.
- Food security programs need to be developed within the framework of current population trends, with special reference not only to population growth but also to falling fertility and mortality, increasing life expectancy and the rapid ageing of populations, as well as the major transfers of people from rural to urban areas.
- Policymakers need to address the transformations that large scale rural-urban migration is producing. Programs need to be developed to empower and support rural populations so as to maintain a viable and productive agricultural labour force.
- Consideration should also be given to the impact that growing cities and development projects are having by encroaching upon agricultural land throughout much of the region.
- Within cities, consideration should be given to the fact that rapidly ageing populations and a growing middle class will impact upon food demand as the next few decades will most likely see further changes in consumption patterns.
- Investment in rural areas is needed to boost food production and prevent losses. Investment in irrigation, transport and storage infrastructure, as well as in education, financial support schemes such as microcredit and other lending services for small farmers are required on a wider scale in order to help small farmers make informed decisions and prevent them from falling into vicious cycles of debt.
LAND AND EQUITY: LAND ACQUISITIONS AND ACCESS TO LAND

At a glance:

- Tenure security and access to land is critical for rural food security, as it provides for livelihood security and encourages on-farm investment by farmers.
- The role of women in agriculture in Asia is often neglected in policymaking, and in practice, women often lack equal land rights with men.
- Agricultural land deals geared towards meeting the food security needs of investors tend to undermine the food security of local communities.
- A wider debate on the meaning and context of food security is needed in light of foreign investment in agriculture and land deals.

ACCESS TO LAND

According to the FAO, tenure insecurity is one of the largest impediments to raising agricultural productivity. When farmers have the security of tenure, they can reasonably expect to use the land to its best advantage in accordance with the right, reap a timely and fair return...[it] enables the holder to make management decisions on how land-based resources will be used for immediate household needs and long-term sustainable investment."44 Land tenure status, type of access and security of rights are 'key incentives for poor rural people to undertake long-term investments and to adopt environmental protection measures, which are often key to enhancing and securing their livelihoods and food security.'45 This in turn leads to agricultural and overall economic growth, and has a poverty reducing impact.46

In many developing countries in Asia, small and marginalised farmers including women lack adequate access to land and tenure security. Land redistribution and titling remains incomplete or inadequate in many countries, causing deep insecurities around livelihoods and hampering the ability of agricultural households and communities to sustain their traditional way of life. In Cambodia, for example, a majority of small farmers lack titles to lands they have traditionally lived and worked on. In China, land documentation also remains incomplete, and despite having the same land rights as men, rural Chinese women continue to have their names largely excluded from land use certificates.47 This effectively leaves them without a legal claim to their land, despite the fact that there are more women working in the fields in China today than men.48

According to IFAD, enhancing women’s access to "agricultural resources and inputs could increase production on women’s farms by 20-30 per cent, reducing the number of hungry people in the world by 100-150 million."49 Without adequate land titles and land use certificates, small farmers also face the risk of being unfairly pushed off the land they have lived and worked on, sometimes for generations. According to a 2011 survey of 1,791 farmers in 17 of China’s provinces, there has been a steady increase in land acquisitions in rural China since 2005, and in an overwhelming majority of cases, there was no compensation to the farmer despite promises having been made to this effect. Where compensation was given, it was far below the actual value of the land in question.50

Such land acquisitions where small farmers are forced from their lands illegally or without adequate compensation have become a relatively prominent phenomenon. At the same time, landlessness has increased and farm sizes continue to shrink across the region.51 In many Asian countries, governments have been actively encouraging domestic private investment and FDI in agriculture. Such investment is viewed as a means to boost economic growth, develop much-needed rural and agricultural infrastructure, provide enhanced livelihood opportunities for local communities and raise incomes.

Although domestic private agribusinesses are also significant players, the acquisition of agricultural land by foreign actors has become increasingly prominent in South and Southeast Asia. Governments grant long-term leases or concessions to foreign interests, sometimes in partnership with local entities. Concerns around such so-called ‘land grabs’ have grown in recent years, particularly as most deals are taking place in poor countries with weak state institutions, inadequate enforcement of land laws, and where wide sections of the population suffer from food insecurity. Moreover, some of these land deals are reported to be for purposes of growing biofuel feed crops, and many for export of production back to the investors’ domestic markets.52
FOOD SECURITY IN ASIA

A case study for this project examined the nature and impact of such land deals on local smallholder communities in Cambodia. State capacity in Cambodia is weak and ingrained corruption is a serious impediment to agrarian reform. Security of land tenure remains precarious and many agrarian communities live in poverty and are vulnerable to hunger. The findings of the case study are presented below.

THE VIABILITY OF LAND DEAL INVESTMENTS AS A FOOD SECURITY STRATEGY IN CAMBODIA

In the last five years, as many as 3.9 million hectares of land in Cambodia is estimated to have been granted by the Cambodian government to commercial interests. This is 22% of the country’s total area and equivalent to the FAO’s estimate of total arable land in Cambodia. On one hand, Cambodia is an ideal prospective target for foreign investors in agriculture: It is a largely agrarian country with fertile lands but with an agricultural sector plagued by low productivity and lack of investment. There is considerable opportunity to increase for both local and international consumption by raising the productivity of existing farmlands. The government offers investors an almost ideal neoliberal—unfettered—investment environment with few taxes, no requirements for local content, employment or re-investment, and freedom to repatriate all production and profits out of the country. On the other hand, it is unsurprising that land concessions on such a scale and with so few local benefits are contentious, subject to violent resistance, targets of opprobrium and at risk of sabotage. The Cambodian government has been quick to grant land concessions with little or no effort to prevent the dispossession of the rural poor relying on those lands. This has led to forced evictions generating two forms of insecurity. One is civil strife in the form of violent conflict over land, either by citizens in retaliation for forced eviction, or by the state (or private contractor) security forces in enforcement of land grant awards.

The other is wider human insecurity, in the form of worsening poverty, hunger and exclusion (including from healthcare, education and livelihoods) arising from dispossession, displacement, confiscation of livelihoods. The argument in favour of land deal investments insists that such investment will bring employment, infrastructure, productivity and economic growth—and thus food security—to local communities in particular and the host country in general. Despite this seemingly logical rationale, the case study of Cambodia revealed that land deal investments are not a viable strategy for enhancing food security either for Cambodia or the investor’s country of origin, for a number of reasons.

First, the use of the language of ‘food security’ to justify land deals is contradictory to the actual practice of such deals. This especially true when hunger is one of the forms of human insecurity generated by land deal practices such as these. This calls into question the legitimacy of the strategy in the name of ‘food security.’

Second, the strategy is one predicated upon conflict. Successful land deals are based on an assumption that proves to be erroneous: that land is vacant and unused. When land is not vacant, the acquisition pits current tenants against investors. As a result, conflict is effectively an inherent characteristic of such land deal practices in Cambodia. This also presents a profound challenge to the viability of land deals. The potential for violence undermines the ability for such projects to either address local problems of hunger and poverty, or assure reliable sources of food staples for export.

Third, Cambodia’s agricultural political economy poses a high-risk environment for investors and their projects. Weak state institutional capacity, corruption, poor law enforcement and contested land rights all combine with infrastructure deficits to contribute to a difficult investment setting. The high-risk environment further decreases the likelihood of such land deals being a viable strategy to deliver food security outcomes for either investors or hosts over the long-term.

Fourth, the generation of conflict and undermining of the human security of affected communities is deeply limiting for projects’ long-term success. In some cases, affected communities take matters into their own hands, protesting and responding to forced evictions with force. In other cases, evictees move quietly but their relocation creates tumours of worsened poverty and despair on the periphery of projects—and amongst the populations that investors are assuming will form their seasonal workforces.
At a local level, such situations can lead to antagonistic environments for investors, including threats of sabotage against projects. At an international level, such situations have led to stalling Cambodian sugar exports to Europe and paused World Bank donor aid funds flowing to the country. Enlightened self-interest argues that these are not viable situations for investors—as well as being far from viable for the damaged local communities.

Altogether, the case study indicates that land deals are highly unlikely to be a viable food security strategy—either in terms of securing reliable food supplies for the future or addressing the problem of hunger—for investors, host states or affected communities.

**EXPLORING ALTERNATIVE STRATEGIES FOR FOOD SECURITY**

FDI in agriculture in developing countries such as Cambodia, but also neighbours including Laos, Myanmar, the Philippines, Indonesia and others in the region, has the potential to improve local food security and livelihoods, while working towards surplus production that could be exported to investor countries. This depends however on such investment being embedded within a cooperative, rather than competitive or conflict-based framework. Such an approach would prioritise local food security by first helping to boost productivity through rural development and improved livelihoods, and generating surplus production for export in a sustainable and just manner.

In principle, both food security in terms of reliable future food supplies for investors and poverty reduction and alleviation of hunger for developing country poor could be achieved simultaneously. The financial resources of investors have the ability to deliver much-needed inputs and infrastructure (e.g. irrigation, transport, storage, knowledge and skills training etc.) to help resolve the problem of under-productivity of agriculture in less-developed countries like Cambodia.

The political and economic power of investors could also be utilised to address perhaps two of the most crippling paucities facing smallholder farmers in such host country environments. First is the confidence to invest in their own land, through guarantees that it will not be arbitrarily confiscated by the government (for allocation to other actors). Second is guaranteed access to markets for their produce, especially including the investors’ profitable domestic markets. Together, these latter actions provide the incentive and surety for developing country farmers to maximise their productivity, which the technical contributions of investors may then facilitate.

Such an approach offers the possibility of a path out of poverty and food insecurity for the local agrarian poor, while providing investors with a more viable means of securing food supplies for domestic consumption.

Thus, alternatives to land deals as they are currently manifested are possible. Lessons may be learned from other examples of agricultural development and food security strategies that have delivered successful outcomes and avoided the pathologies of land deals such as those discussed above. The case of Vietnam’s successful smallholder-centric agricultural development strategy has been examined for this purpose. Vietnam’s rice industry turned from a situation of net food importation in the late 1980s to net exportation by the early 1990s. At the same time, the country went from having a high percentage of the population vulnerable to hunger, to the vast majority of the population having access to both subsistence food and, albeit often small, income for additional needs. Since then, Vietnam has grown to become the world’s second largest rice exporter.

The Vietnamese case is interesting because of the change in government policies in the late 1980s that led to its success. The single-most important policy change was the granting of secure land-use rights to smallholder farmers. Other crucial factors included opening farmers’ access to markets, large-scale investment in irrigation infrastructure and the provision of inputs and dissemination of know-how. The success of this strategy was twofold. First, it resulted in the production of considerable surpluses by smallholder farmers that were then available for wider domestic consumption and for export. The latter generated substantial and reliable foreign exchange returns for the government, as rice trade remained largely government-controlled.

Second, the strategy ensured at least a modest income for the vast majority of agrarian families. As a result, there were dramatic improvements in Vietnam’s overall food security since most families had adequate land for subsistence and at least a modest income. Vietnam reduced poverty between 1985 and 1995 from 40% of the population to 20%, and by 2000 it was down to around 11%. This is important because although Vietnam’s success was built on public domestic—not private foreign—investment, it shows that alternative strategies are possible, given appropriate policy and investment structures.
Lessons may also be learned by assessment of the actual opportunities for investment and potential for improving productivity in the developing country case studies—like Cambodia—examined. The paucities in Cambodia’s agricultural sector are easy to identify and apart from the lack of land tenure security and access to markets identified earlier, include lack of effective irrigation that would enable the majority of existing smallholder farmers to grow multiple crops per year. This could rapidly increase productivity and food availability— including the generation of surpluses for export. These observations confirm the potential for alternative investment strategies—as an alternative to land deals—that can contribute to meeting desired food availability objectives for the investor, but also to reducing problems of hunger for Cambodia’s rural poor. Such strategies offer the potential for truly successful food security programs.

**POLICY RECOMMENDATIONS**

- **Surety of tenure is important for rural populations in order to encourage investment in land and secure livelihoods.** Developing Asian states must pursue a legal process of fair and equitable recognition of tenure and access to land and ensure that the law is adhered to by all stakeholders including elites.
- **The needs of women farmers need to be acknowledged and incorporated into policymaking.** Policies that disadvantage women when it comes to access to financial and marketing support services, skills and knowledge training, extension services, property rights and control over ownership and use of resources, need to be redesigned along fair and equitable lines.
- **Agrarian reform, including land redistribution and titling, needs to be speeded up and completed on an urgent basis.** Forced evictions of rural households and communities must be prevented, and governments need to ensure that the resettlement and rehabilitation of communities uprooted for developmental purposes is carried out on a fair and equitable basis.
- **Policymakers and investors need to recognise that agricultural land deals that do not take into account local food security needs and concerns are unlikely to be viable in the long-term.** As they are currently practiced, such land deals remain ill-equipped to deliver the desired outcomes for investors, and also stand to adversely affect local communities involved.
- **Policymakers should consider very carefully whether to continue land deal practices or to place a moratorium on them until further research may be undertaken to explore alternative best-practice agricultural investment models like those proposed above.** This would assist host countries to ensure that such investments are in the interest of local communities and their food security, and also assist investing countries to develop suitable policies for regulating the behaviour of their investing enterprises acting overseas.
- **A deeper debate is required over what ‘food security’ means when there are competing interests involved.** There needs to be a more detailed and comprehensive discussion around how international actors perceive food security objectives at the local, regional and global levels, and what accounts as legitimate food security activity on behalf of different actors (e.g. communities, states, private companies etc.).
FOOD SECURITY IN ASIA

FRESHWATER RESOURCES: CLIMATE CHANGE, AQUIFER DEPLETION AND ENERGY SECURITY

At a glance:
- Competition for the precious and often scarce commodity of freshwater is fierce in Asia. As urban development and industry demand increasing amounts of freshwater, agricultural and potable needs are faced with serious shortages.
- Climate change is already having an impact on food security in Asia and the trends of sea-level rise, and increased and more intense flooding, drought and other severe climatic events will increase in coming decades.
- Aquifer depletion is a critical issue that requires immediate attention and action, particularly in parts of China and India, to avoid severe food and water shortages.
- Hydropower development is increasing the risks to food security throughout Asia by hampering the natural flow of silt.
- Hydropower projects are destroying fish stocks in many Asian rivers, further threatening food security and livelihoods in the long-term.

There are four critical linkages between food and freshwater: climate change and its effects on droughts, floods and sea-level rise; aquifer depletion and its complex interaction with urbanisation; energy security, specifically in relation to hydropower projects; and the availability and viability of river fish for subsistence and livelihoods. In combination, these four major issues are leading to deep insecurities surrounding food and water, and if not addressed swiftly and with forethought, are likely to create even greater risks to Asian food security in the immediate future.

CLIMATE CHANGE
Climate change is already having a significant impact on the supply and availability of food in Asia. Sea-level rise is impinging on highly fertile crop-growing land, especially in the mega-deltas of Asia. For example, rising sea-levels and salinity are affecting rice producing areas in the Mekong delta which is home to nearly 20 million people and produces a surplus of rice that is exported throughout the region. The Ganges delta is also witnessing significant impacts from sea-level rise, affecting food production and the livelihoods of millions living in and around the delta. Encroaching salinity is an increasing problem in all the deltas of Asia, affecting food security by destroying crops or decreasing yields, as well as saline water destroying freshwater supplies in shallow aquifers.

High impact coasts (that are exposed to regular breaking waves) are most at risk and the sea is reclaiming land in these low-lying areas rapidly. Sea walls are costly and the size and number of vulnerable coastlines needing protection is massive. Natural barriers like mangrove forests are the best defence, and there are growing moves to protect these natural defences. However, development and human habitation often stand at odds to these protective measures. Whatever the current impacts, credible scientific reports forecast an increase in sea-levels over the coming decades.

How rapid and how widespread the impacts will be is difficult to predict – but it is unlikely that sea-level rise will slow in the foreseeable future. Extreme climatic events have been a recurring theme in Asia throughout history. Monsoons and typhoons regularly sweep through the region, creating havoc and are often accompanied by a significant death toll. Severe weather events can have a negative impact on the food supply chain by destroying crops and livestock, as well as critical infrastructure. In Asia, climate change is making severe climatic events such as storms, floods and droughts more intense and frequent.

China has faced a series of severe droughts over the past decade, and droughts experienced in the period of 2009-2012 were some of the worst in the country’s recorded history. Many crops failed as a result, and water was trucked in from other regions just to meet household needs. Cloud seeding has been used in an effort to get rain to fall on affected crops, but with little effect. These climactic trends have played a role in the reduced levels of water in the Mekong River, which flows out of Yunnan. Similar patterns of drought have also been occurring in India. On the Asian sub-continent, the monsoon has been arriving later, prolonging the dry season and putting pressure on food security whilst precipitating social unrest. The drought of 2009 occurred after low levels of monsoonal rain, causing India to import sugar, which in turn negatively impacted prices globally.
Flooding is a regular part of life in Asia, but the changing climate is increasing the intensity of flooding throughout the region. In 2011, typhoons Nelgae, Nesat and tropical storm Nock Ten battered Southeast Asia, destroying at least 10% of Thailand’s massive rice crop as well as severely impacting food supply in Laos, Vietnam, Cambodia, Southern China, the Philippines and Pakistan. Ironically, one year on, Thailand faced the prospects of a serious drought due to a lack of sufficient rainfall, exemplifying the disruption that a changing climate is having on food security. Alarmingly, this pattern of flooding and drought may be the ‘new normal’ for many parts of Asia.

At the local level, the impact of such severe weather events is devastating, as witnessed in the aftermath of Nock Ten and the severe flooding of the Mekong in September – November 2011. In Laos, those living along the XeBeng Fai river, a tributary of the Mekong river, suffered almost total losses to crops in the wet season of 2011. Many were relying on government hand-outs of rice and had no rice seed to plant for the following season. In addition, all livestock that could not be brought to high ground were washed away in the flood.

The sudden onset and severity of the flooding meant that many were unable to evacuate their animals. Villagers reported that losses also included food such as frogs and ducks, species usually able to survive floods.

In Cambodia, the situation was similar although for a different reason. In the areas along the Tonle Sap River, the main river between Cambodia’s Tonle Sap (Great Lake) and the Mekong, the flooding had been severe but also lasted much longer than usual. Although the rice paddies in the region are usually inundated each year, rice crops are destroyed if they remain submerged for too long.

Throughout the region, and indeed the country, thousands of square kilometres of rice paddies were destroyed. In some places, as far as the eye could see, instead of green rice stalks, there were only dead clumps of unharvested rice or paddies still full of water, months after the water levels should have receded. The hardship faced by those living in these areas was evident, and was shared by hundreds of thousands of others across the region.
AQUIFER DEPLETION AND URBANISATION

A second significant issue linking food and water security is aquifer depletion. 73% of water consumed globally for agriculture is used in Asia and the rapid urbanisation that has been taking place throughout the region only adds to the increasing thirst for water.60 Large cities place increasing demands on crop production due to rapidly expanding urban populations and the changing, protein intensive diets of the developing middle classes. It is estimated that between 500 to 4,000 litres of water is required to grow one kilogram of wheat, but up to 10,000 litres to produce one kilogram of grain-fed beef.61 The most populous and rapidly urbanising countries in the region, China and India, face the most significant risks as aquifers near large cities are being drained at unsustainable rates, due to the ever-increasing demands of residents and industry.

The North China Plain, for example, contains 65% of China’s agricultural land and is crucial to the food security of the world’s most populous country. This dry region relies on groundwater for 70% of its total water supply and as a result of the policy of growing two harvests a year – including wheat in the winter when there is very little rain – the North China Plain aquifer system has witnessed reductions in the water table of up to 40 metres in many areas.62 By 2015, it is estimated that 100 million people will be living in the areas directly over this immense aquifer system, increasing the reliance on groundwater and associated risks as the resource becomes increasingly scarce.

The water problems in China’s north are indicative of the country’s overall challenges regarding water. China has 20% of the world’s population but only a 5-7% of global freshwater resources, raising a physical barrier to limit China’s runaway growth of the past decades. China has relied on its rivers and lakes as dumping sites for the pollution created by years of rapid industrialisation and as a result, 90% of groundwater in China is polluted, 60% seriously so.63 This situation leaves Chinese policymakers in a conundrum.

If China does not immediately slow the rate of aquifer depletion, which would involve reducing agricultural output, it is estimated that within a decade, water tables will deplete, leading to a collapse in agricultural output anyhow.64 Slowing production now is however an extremely difficult task, given that the requirement in China for larger quantities of grain is building due to the pressures on the demand side, as discussed earlier. China’s foreign reserves would allow it to purchase its food supply deficit on the international commodities market, but this would reverse a long-standing policy of food self-sufficiency as well as serving to drive up the global price of food with regional and global consequences.

India uses more than a quarter of the total global groundwater extraction – 85% of the country uses groundwater for drinking and 60-65% of agriculture in India relies on groundwater for irrigation.65 India’s rapidly growing population, expected to overtake China in the mid-2020s, will continue to require growth in its water resources, and demand is expected to double by 2030.66 Throughout the country, many aquifers are facing rapid depletion, but the north-western regions are facing the most serious decline, particularly the Upper Ganges aquifer and Indus River plains aquifer systems. These aquifers are being depleted at rates faster than they are being renewed, and in many places depletion has reached a critical level. In the state of Delhi alone, with a population of 17 million, groundwater extraction is at 138% of replenishment levels, far beyond what is sustainable and estimates are that 40% of water supply is lost mostly due to poor infrastructure.

In order to cope with water shortages, many villages must dig ever deeper, chasing the receding water table. Apart from the challenges and economic costs involved in digging deeper wells, there are other less quantifiable costs such as fluorosis, a disease caused by an excess of fluoride in the body which can disfigure and cripple. Millions in India suffer from fluorosis as a result of poor quality drinking water, hampering their ability to provide for themselves and their families.67 Potable water requirements must compete with extraction demands of industry and development, including mining, quarrying and construction, as well as pollution into aquifers by pesticides and fertilisers from agriculture, and pollution from chemical production and other industries.

Furthermore, development in urban areas often diverts or encumbers natural aquifer recharge systems, hampering the crucial replenishment of groundwater.

As aquifers are steadily depleted throughout the region, reliance on the increasingly sporadic and unreliable precipitation and monsoons increases – creating even greater risks for food security in Asia. A key reason why India is so heavily reliant on groundwater resources for irrigation is because 90% of its rainfall takes place in the summer monsoon season.68 As monsoon patterns become increasingly erratic, the implications for agriculture in the country raise serious concerns around food security and livelihoods.
The looming groundwater crisis in Asia stands to destabilise an already fragile regional food system, and may be one of the most serious tests to food security in Asia in the coming decades. How Asia will produce more food with significantly less water is a challenge of enormous proportions. There is growing awareness of the issue at a policy level, but given the consequences of significant aquifer depletion in the region, greater urgency needs to be given to shift the focus from developing groundwater to managing it.

It is crucial that the governments of China and India take immediate steps to implement water management measures including water saving techniques and environmental protections from pollutants. In this case, technical knowledge at the local level is an important requirement, as is education. Policies in China are advancing along these lines, but there remain significant questions as to how production can be increased with less water. Policy in India remains far behind the rapidity of depletion and if radical steps to decrease water usage and wastage are not implemented soon, India is likely to suffer a food and water crises on a grand scale in the coming years.

**FOOD SECURITY, ENERGY SECURITY AND HYDROPOWER DAMS**

Another significant issue related to the food-water security nexus is energy security. Growing populations and economies require ever-increasing amounts of energy to fuel economic growth and modern prosperity. Although hydropower presents energy-hungry states in Asia a possible way to meet their growing energy requirements, the reality of hydropower projects and their impacts on local communities within and across borders is complex and problematic and is putting at risk millions of subsistence livelihoods throughout the region. Research conducted for this study found that hydropower dams have a negative effect on food security through two main channels. Firstly, dams have significant negative consequences for agriculture due to the large quantities of silt withheld behind dam walls. The second major impact is the destruction of fish stocks which will be examined in the following section.

Silt is a vital part of the natural flow and annual flooding of rivers. In the case of the Mekong, massive quantities of silt flow from the Tibetan plateau, down through the south-western regions of China’s Yunnan province, and into the lower part of the river. The many tributaries also feed silt into the Mekong in the lower basin, and all this ends up in the vast Mekong delta in southern Vietnam. The silt is both the reason for the delta’s existence and the reason for its high fertility.

The huge quantity of silt flowing down the Mekong is what has created the delta over millennia, and it is also the natural fertiliser that has been the source of surplus food production in this highly fertile region. Due to the massive Chinese dam project, known as the Lancang Cascade, on the Chinese controlled headwaters of the Mekong, an extraordinary amount of silt is being captured behind the series of dams currently either in operation or under construction. The capture of silt from hydropower projects has a double impact on crop production: Replacing the benefits of the silt as a fertiliser is costly and for some impoverished farmers, not an option. Additionally, the withholding of silt also affects apparent sea-level rise at the delta due to the fact that silt is what naturally creates deltas. This also increases salinity in the delta as well as increasing the vulnerability of those living there to floods and storms.
On the tributaries of the Mekong, scores of dams have either been built or are under construction. Laos, for example, aims to be the ‘battery of Southeast Asia’, by building scores of hydropower projects on its many rivers, including the Mekong itself. The silt withheld in the many dams already built is adding to the pressures brought about by the Lancang Cascade. On the lower Mekong mainstream, several dams are in the advanced stages of planning and up to 11 hydropower projects are on the drawing board. If all of these are built, the lower Mekong would turn into a large holding pond for hydroelectricity production, creating further and severe impacts that accompany silt withholding, not to mention the deleterious effects on fish stocks, as discussed in the next section.

A further negative impact of dams to food security is the impact on riverside gardens. Villagers have adapted their crop growing habits to the clearly delineated wet and dry seasons, planting riverside gardens in the highly fertile banks of the Mekong’s rivers during the low season. The dramatic changes experienced as a result of the rapid dam building in the Mekong basin have fundamentally changed the flow of the river, meaning that gardens planted in the low season are now regularly washed away overnight due to the sudden water releases from the upstream dams.

INLAND FISHERIES AND HYDROPOWER DAMS: ENERGY SECURITY VERSUS FOOD SECURITY

According to the FAO, inland fisheries in Asia are under threat from changes in water quality and quantity from factors such as ‘irresponsible fishing practices, habitat loss and degradation, water abstraction, drainage of wetlands, dam construction and pollution (including eutrophication)’. Of these issues, the most pressing but often misunderstood threat to fish in Asia is the negative impacts brought about by the construction of hydropower projects.

The experience of the Mekong River which flows from its headwaters on the Tibetan Plateau to the Mekong delta in southern Vietnam is a case in point. The Mekong’s fisheries are a remarkable natural resource that provides fish for tens of millions of people living in the Mekong River Basin. The Mekong is home to over 1500 different fish species that often migrate hundreds of kilometres along the river and its tributaries to breed. The fishery is the most valuable inland fishery in the world, with an estimated worth of up to US$ 3 billion.
Today, the fisheries of the Mekong are in peril. There are scores of dams on the tributaries of the Mekong in Laos, Cambodia and Vietnam. The negative impacts to fisheries caused by the Hinboun river dam, on a tributary of the Mekong in Laos, is indicative of the impact large dams can have on fisheries. Apart from regular inundation of rice crops from the larger floods created by the dam, fisheries have declined by as much as 85%. Evidence suggests the same thing is occurring in the XeBeng Fai River following the construction of the Nam Thuen 2 (NT2) dam, and similar reports of fisheries depletion or destruction have been made all throughout the basin after dams have blocked tributaries.

On the mainstream, the two proposed Lower Mekong Basin (LMB) mainstream dams that are in the most advanced stages of planning are the Don Sahong and the Xayaburi. The proposed location of the Don Sahong dam is near the Khone Falls in the southernmost regions of Laos, just a few kilometres from the Cambodian border, where it is set to block a vital part of the Mekong for fish migration.

A technical paper released by the MRC in 2002 warned of the serious implications of blocking the migration routes of fish on the mainstream. A more recent report gives a clear indication as to the extent of damage to fisheries caused by this one dam, demonstrating that fish unable to migrate through this vital passage because of the dam would not be able feed or breed – devastating the fisheries around the Tonle Sap in the Lower Basin, fisheries crucial for the food security of millions.

Two fish passes are proposed as part of the project, yet no evidence is given as to the appropriateness of their design. In fact, the ‘steps’ on the fish ladders proposed are 37cm high – 7cm higher than what is recommended for strong upstream swimming salmonoid species (not present in the Mekong), and 24cm higher than the dominant cyprinid in the Mekong – not known for its abilities to swim up waterfalls.

There are no fish passes that currently work on the Mekong or any of its tributaries. Essentially, any dam built on the Mekong mainstream with expectations that a fish pass will be successful would be ‘highly risky and experimental at best; reckless and irresponsible at worst.’ A technical report written for the MRC sums up the situation well: ‘On the mainstream, the choice therefore remains: fish or dams.’

The Don Sahong and the Xayaburi dams are just two of 11 planned hydropower projects on the lower Mekong mainstream. The devastation to fisheries on the Mekong from the construction of all of these dams would be immense. According to the scientific literature, the Tonle Sap and the Delta, both heavily populated with migratory fish, would have their fisheries severely impacted, affecting the most productive inland fishery in the world. A 2012 paper presenting finding on the non-traditional security impacts of hydropower projects on the Mekong explores the risks to human security if the Mekong’s fisheries fail: ‘Calls to replace the 2-3 million tons of annual wild fisheries caught on the Mekong with aquaculture do not recognise the value of the fisheries in terms of subsistence. A large majority of the tens of millions of people who rely on the Mekong fisheries as their main source of protein are poor subsistence farmers and fishers. The idea that the bulk of these people could raise the capital to build fish farms, covering the significant cost of inputs in the production of cultured fish, let alone quickly and inexpensively gain the technical skills required, is unrealistic.’

This phenomenon was observed first-hand in interviews with farmers along the XeBeng Fai river during fieldwork investigating the food security impacts of the NT2 dam in central Laos. Although the Nam Thuen Power Company (NTPC) set up a micro-lending facility to help farmers establish their own fish farms, without the required technical knowledge and due to the on-going costs of inputs, the bulk of these schemes failed and many farmers now face a burden of debt and the need to sell assets such as buffalo in order to repay that debt – the result being an increase in both poverty and hunger.
The dismal failure to replace the fisheries losses on the XeBeng Fai is a strong warning for any who believe that replacing capture fisheries in Southeast Asia with aquaculture is inexpensive, effective or simple to implement. A recent study revealed that if all the dams planned for the entire Mekong River Basin are built, the loss of protein through drops in fisheries output will result in significant increases in the requirement for pasture land and water inputs in order to produce other sources of protein to fill the deficit. Cambodia and Laos are particularly vulnerable because such large percentages of their respective populations rely on fish as their primary source of protein. Agricultural land would be required to produce animal feed for cattle and poultry needed to replace the lost protein. This in turn would require much greater inputs of water for irrigation. Agricultural land would also need to be converted to pasture land in order to provide room for the alternative protein sources. This increased requirement for land and water comes in the context of the other issues discussed within the broader context of this report including growing populations and dietary changes, increased risks from severe climatic events, pressure on water tables, the destruction of riverside gardens from dam construction and, especially in countries like Cambodia and Laos, poor rights over land tenure. The negative impacts to food security from the unchecked construction of dams in the Mekong River Basin will consequently be long-term and wide-ranging.

Furthermore, fisheries are more than just a means of subsistence; they also provide jobs for many. Fishers are ‘overrepresented in poor and vulnerable Lower-Mekong Basin communities which would be affected by fisheries losses.’ Fishing not only puts food on the table, but it also provides employment. Money gained from selling excess catch including value-added fisheries products is used to buy household items and meet other expenses such as rice and fuel:

Any level of fisheries losses in the LMB would have a double negative impact on food security by taking away both the primary source of protein and the economic means to replace the losses. A serious loss to fisheries, as is expected with the full or partial LMB mainstream hydropower projects, would be devastating in terms of food security.

The case of the Mekong is not an isolated one. River systems and inland fisheries throughout Asia are being devastated by hydropower projects and the externalities that they create. Throughout all of South, Southeast and East Asia, rapid dam development is occurring and wherever dams are proposed, protests – sometimes violent – have followed. Of particular note is Myanmar, which is increasingly opening up to outside investment and is currently being targeted as the new hydropower hot-spot. Protests erupted last year over plans to construct the controversial Myitsone Dam that would have negatively impacted Myanmar’s Irrawaddy delta, the source of the majority of the country’s rice crop. The government cancelled its plans in response to public and international pressure – much to the chagrin of the Chinese construction company involved. Similar protests have occurred in India in response to the dams in the Narmada River Valley.

The most obvious example, and one with the greatest effect in terms of social and environmental impacts caused by a hydropower project, is the massive Three Gorges Dam in China. The raft of problems associated with it, including silt capture, fisheries destruction, pollution and the forced removal of millions of villagers from their homes, reflects the extent to which hydropower projects impinge on wide-ranging issues that are vital to the safety and security of local communities. A report by the World Commission on Dams released over a decade ago revealed that China alone has 22,000 large dams. At the time, India was third on the list behind the US and since then, the construction of dams in Asia has continued at a rampant pace. The thirst for energy from hydropower is creating poverty, hunger and environmental destruction on a vast scale and has serious consequences for the livelihoods and food security of local communities. The real food security disaster from dams is more often than not slow and silent – resulting in chronic hunger, increased poverty, and migration. Although these negative impacts have been widely researched and are well known, there is insufficient recognition of this at the policy level. Lack of adequate political representation in many developing countries in Asia means the majority of those most affected by dam construction have little or no say in the matter. It is vital, therefore, that policymakers are not only aware of the situation of severe food insecurity as a result of hydropower construction, but that they also act on behalf of their citizens to protect their most basic needs. In the absence of such policy action, developing countries in the region face worsening hunger, the widespread destruction of livelihoods and increased rural-urban migration, as well as the prospect of political violence and instability.
POLICY RECOMMENDATIONS

– Climate change adaptation measures must be given priority by Asian policymakers and donor states. Specifically, the most vulnerable populations need to be considered in the context of how severe climate events threaten both lives and livelihoods with a focus on long-term food-security planning.
– Improvements must be made to disaster management at the local, national and international levels to deal with the shorter-term consequence to food security from natural disasters.
– Urgent attention needs to be given to the state of aquifers throughout Asia, and particularly in India and China, the two most populous countries in the world. Overall improvements to the management of water and investment in water infrastructure is vital if large populations in both rural and urban areas throughout Asia are not to face severe water stress and food shortages in the near future.
– Measures to protect and restore the quantity and quality of groundwater are needed to ensure the long-term viability of aquifer production.
– Due to the severity of the potential consequences, the precautionary principle needs to be applied with respect to further hydropower development throughout Asia. Long-term food security and environmental consideration must be prioritised over the short-term economic and energy gains of hydropower projects.
– Policymakers must ensure that profit-centred hydropower companies and elites are not financially benefitting from hydropower projects at the expense of the livelihoods and food security of millions of poor and vulnerable people.
FISHERIES AND FOOD SECURITY IN LITTORAL ASIA

At a glance:

- Without the long-term viability of fisheries, the food security of millions of Asians is in jeopardy.
- Fisheries throughout Asia are at risk from a multitude of factors including pollution, over-fishing, development and climate-change.
- Fisheries losses are interacting with territorial claims to increase inter-state tensions in the region.
- Urgent policy and action is required to protect fisheries and halt the large declines already being witnessed.

THE STATE OF FISHERIES AND FISH STOCKS IN ASIA

The world’s fisheries are in a far more parlous state than is generally recognised and acknowledged by policymakers the world over. Unless measures are taken to more effectively manage and preserve wild fish stocks, increasing competition over fish and other marine living resources may heighten interstate tensions in Asia and fuel food insecurity, particularly in weaker developing states. ‘Fish wars’ are not entirely inconceivable, but a more likely outcome is that declining fish stocks will contribute to political and social instability in the developing world, complicating efforts to ensure adequate and affordable supplies of food for those most in need.

Globally, stability in per capita fish consumption obscures the reality that the overall level of demand for fish has grown substantially since the late 1960s, while capture fisheries production has levelled off after showing strong increases in the second half of the twentieth century. As a result, many fish species are at risk, with 28% of stocks now overexploited, depleted or recovering from depletion, and a further 52% at full exploitation. Some leading scientists believe that if current trends continue, all fish stocks could collapse by mid-century – making this the “last century of wild seafood.” These trends are unlikely to be reversed without strong and immediate remedial action by governments of which there is yet little sign.

As mentioned earlier, fish is the main source of protein for over a billion people in Asia, and crucial to livelihoods in the region’s littoral and inland waters. Fish and fishing activities support more people in Asia than in any other part of the world.

Over half the global ocean fish catch and two-thirds of the inland fisheries catch are taken in Asian waters, and Asia produces nearly 90% of the world’s aquaculture products. Around 85% of the world’s fishers and fish farmers are Asian, and three-quarters of all fishing vessels (powered and unpowered) are in Asia. Unsustainably then, six of the top ten capture fishing nations are Asian. The most fished region of the world is the Northwest Pacific Ocean where the major fishing powers of East Asia compete for its ever-dwindling resources. Asia has already lost half its caught fish stocks and the depletion of fish species is a major concern in the Northwest Pacific, which provides nearly a third of the world’s marine harvest.

Unfortunately, the Pacific is showing signs of environmental degradation from coastal pollution, overfishing and unsustainable exploitation of other forms of living marine resources:

 ‘Water quality and habitat quality and quantity have been reduced in most coastal areas, decreasing in turn the productivity of the coastal environment for many fish species. Coastal development, increasing coastal populations and other land-based activities...have all contributed to pollution and siltation of the coastal waters.’

Unsustainable practices such as the highly lucrative shark-fin trade where sharks are caught, their fins removed, and the rest of the animal is discarded, add to fisheries losses, and many sharks species are now threatened or endangered.
The live reef fish trade is another such practice where fish are stunned by explosions or cyanide and then shipped to the aquariums of rich collectors throughout Asia and the rest of the world.

Furthermore, human activities in Asia are threatening the state of its coral reefs – a crucial part of the food chain for all life in the ocean – and the majority are in dire straits, with overfishing, reef poisoning (such as cyanide from the live reef fish trade), reef-blasting, sedimentation, pollution and coastal development all combining to threaten the long-term viability of coral reefs.

In Southeast Asia, for example, 88% of all reefs are threatened by human activity, with nearly 50% under high or very high threat. Compounding these risks is the threat of warming oceans and seas from climate change, which has already caused massive coral diebacks across the region. The destruction of the coral reefs of Asia threatens the lives and livelihoods of millions not only due to the direct food insecurity that comes about from fisheries losses, but also from the loss of other benefits that coral reefs provide such as employment, tourism and shoreline protection. The situation in Southeast Asia has been summarised succinctly, described as a complex, negative feedback cycle...whereby rapid population growth paralleled by fewer economic opportunities...increases the number of people living in the coastal zone dependant on fishery resources and thus the number of fishers. Increased fishing pressure results in fish population declines and stock collapses and increased resource competition between fishers and scales of fishing operation (e.g., small vs. commercial). The result is reduced income and food security...

Asia’s fisheries are thus at a critical point. Continuing the ‘business as usual’ model of large fishing fleets over-fishing the dwindling resources of Asia’s vast littoral waters will lead to greater risks to regional food security.

Even with improved fish management and the rationalisation of fishing fleets, it is clear that the era of cheap and abundant fish is over. Without a serious attempt to preserve remaining wild fish stocks, the fishing industry could soon go into precipitate decline. If current trends continue, the pressure of overfishing and pollution are only likely to hasten the speed at which fisheries are declining, potentially spiking tensions in the highly competitive littoral waters of Asia.

FISHERIES IN LITTORAL ASIA: INCREASING PRESSURE IN AN ALREADY TENSE REGION

The ability of governments in Asia to feed their people will have a major bearing on global food security because of the region’s size, population and geostrategic importance. Fish is seldom considered to be a strategic commodity despite its obvious importance as a primary source of protein for billions. The unwillingness to accept that fish is a strategic commodity – just as much as gold, oil, rice or wheat—stems from a false perception that fish is an inexhaustible natural resource.

It does not follow, however, that declining fish stocks are necessarily a strategic security problem for all nations. Rich countries can respond by paying more for fish on international markets or by diversifying consumption towards other food items. Aquaculture can also fill some of the gaps in supply, although this rapidly developing industry brings its own set of problems and challenges such as pollution and ongoing expenses.

The challenge of declining fisheries interacts with security in two main ways. For developing states highly dependent on wild fish to provide a large proportion of their dietary protein, the problem of rising fish prices is not easily overcome and the resultant scarcity may lead to problems such as greater hunger and starvation, migration, piracy and political disturbances. Where the writ of the government is already weak, dwindling fish supplies may add to the problems of instability and serve to exacerbate existing ethnic and sectarian tensions.

Secondly, the desire to exploit and protect the region’s wild fish stocks is aggravating a host of maritime sovereignty disputes in the Western Pacific. Many Asian countries are now more aggressively defending their territorial waters and Exclusive Economic Zones (EEZs) while their fleets are travelling farther afield in search of fish. As fishing fleets grow and venture further into the Pacific, the area of ocean open to international fishing is shrinking; a large percentage of the marine resources of the Western Pacific are either claimed or contested.
As a result, the frequency and seriousness of incidents at sea have steadily increased as foreign trawlers have encroached into other countries’ EEZs and territorial waters. The tensions and incidents at sea stem largely from competing claims of rival claimant states over the waters of the East and South China Seas.

Fishing disputes and competing claims to rich fishing grounds are complicating five major off-shore island disputes in the Western Pacific – the Kuril Islands (Japan and Russia); Tokdo-Takeshima (South Korea and Japan); Senkaku-Diaoyu (Japan and China); the Paracels (Vietnam and China) and the Spratly’s Islands (China, Taiwan, Vietnam, the Philippines, Malaysia and Brunei). The most contentious assertion by far is China’s so-called ‘nine-dash line’ that claims almost the entire South China Sea, skirting the coasts of all the other claimant states.

From the Chinese perspective, there are significant pressures. The seas immediately surrounding the Chinese coast have been severely depleted by the country’s massive fishing fleet, by far the largest in the world at around 288,000 vessels, and this has driven Chinese fisherman further and further afield in search of adequate catches.

It is unsurprising then, that the relatively plentiful features of the South China Sea have acted as an important pull factor for Chinese fisherman in search of a profitable catch. Fisheries in general are a considerable part of the coastal economy of mainland China, which is the world’s leading exporter of fish and fishery products, contributing almost 10% of world exports.

The overall situation is encouraging greater aggression and as a result there is fiercer competition between fishermen from the various claimant states. In recent decades, the number of incidents at sea has been on the increase, accompanied by an increase in the overall negative risk to the regional security environment. Gun battles have broken out between the navies of regional states intent on defending the activities of their national fishing fleets or preventing perceived territorial violations by others.

There is an upward trend in incidents at sea, ranging from the detention of trawlers accused of fishing illegally to more serious confrontations such as that between a Japanese Coast Guard ship and Chinese naval vessel in 2010 which led to a major diplomatic dispute between Beijing and Tokyo. China in particular has been enforcing its claims in the South China Sea, regularly impounding foreign fishing vessels, fining and imprisoning their crews. On several occasions, this has led to significant diplomatic tensions between China, the Philippines and Vietnam, as well as increased political manoeuvring at the various regional and international forums that the claimant states are involved in.

It must be kept in mind that that the South and East China seas are also vital areas for strategic reasons other than fish. The waters of this region are important sea-lanes of communication (SLOCs) between the huge economies of East Asia and their trading partners in Europe, the US and Africa. The SLOCs are also crucial to the continual supply of Middle Eastern and African oil to help meet the ever-growing thirst for more energy in Asia. Furthermore, it is believed that under the many reefs and rocks of the South and East China Seas lie vast quantities of gas and oil. Whoever controls the islands and features will have a strong claim to the resources beneath, and this may explain the propensity of many states to build military outposts on the far-flung rocks of the South China Sea. The shared boundaries and the various claims of Asia’s littoral states over sea-lane security and resources make for a competitive strategic environment.
In terms of actual food security and contribution to economic development, the Philippines and Vietnam are much more dependent on fish than China.39 “Southeast Asians rely more heavily on fish as a primary source of dietary protein than any other people in the world.”94

The result is that the Chinese claims of sovereignty over the fisheries resources and features of the South China Sea, and China’s willingness to enforce this, are having a real impact on food security in both the Philippines and Vietnam.95

The state of fisheries and the strategic competition surrounding them in littoral Asia is reflective of the overall challenges of understanding and dealing with food security issues. Reflecting the siloed nature of research on food, and security more generally, most of the concerns about food and security in the academic literature have focused on the economics of supply and demand and the science of increasing production, monitoring or environmental factors. Food security intersects these issues and, as the examples above demonstrate, overlaps with strategic concerns and policy decisions at a national and regional level.

Better fish management practices are clearly central not only to the problem of fish depletion but also the geopolitical tensions that arise when states fear a loss of a valuable resource to competitors. The key is to find a better balance between the legitimate needs of fishing nations, the important contribution that wild fish makes to the global food market and fishing practices which are sustainable in an era of rising fish consumption. Moreover, claimant states must understand that by pushing their claims in the contested waters of Asia, although they may stand to gain in terms of extended sovereignty, energy and increases in fish supply in the short-term, they have much to lose in the medium to long-term, not only through significant losses to food security from the risk of collapse of the region’s fisheries, but also from the likelihood of increased tensions and the risks of conflict. Policymakers and other actors must be cognisant of the fact that international norms and values need to be abided by to ensure the long-term sustainability of fisheries resources, regional peace and stability and food security and livelihoods for millions of Asians.

The depletion of fish stocks in Asia illustrates three broader points about the connections between food scarcity and security. First, even local and relatively short-term food shortages can generate social and political tensions within states that may become the precursors of more serious conflict. Second, the relationship between food and security is more complex and dynamic than often recognised: food shortages have rarely been a primary cause of major conflict between states; they can, however, contribute to instability and aggravate interstate tensions by stimulating migration flows and resource conflicts. Third, food shortages are generally symptomatic of flawed political and economic systems, policy failures, and a lack of access because of the uneven distribution of food or income inequalities. Elites rarely suffer from hunger even in the poorest countries.

There has been insufficient political commitment and policy coordination to avert what could turn into a full-blown fish crisis in the coming two decades. Without a new approach to managing this critical food resource, the decline in Asian fish stocks will only accelerate, causing widespread political strife and social disruption in fish-dependent communities and states, while aggravating resource tensions.

**POLICY RECOMMENDATIONS**

Essential elements of a strategy to prevent such a crisis must include:

- Improved licensing and monitoring schemes including better enforcement, compliance, stock assessments and cooperation enacted in bilateral and multilateral fishing agreements;
- Reduced by-catch loss through the use of more effective and environmentally sensitive fishing technology and practices;
- The declaration of additional protected zones to enable fish to spawn and regenerate;
- Flaws in the designs of existing management schemes and insufficient budget allocations for the protection of fish stocks in national EEZs and international waters need to be overcome by giving higher priority to fisheries management policies at the national and regional levels.
- It is important to address the ways in which fisheries management schemes are enforced because of the immense areas of ocean that require surveillance and policing.
- Global fishing capacity will need to be reduced significantly, requiring governments to provide alternative employment and access to food for former fishing communities while discouraging newcomers from taking their place.
ENDNOTES


5. Ibid.

6. The absolute nature of the FAO’s definition of food security is also problematic. If ‘all people, at all times’ require the elements within the statement, it is difficult to conceive that food security can ever be achieved. It is not the intent of this report to present a new definitional interpretation of food security, but instead, to forward a much broader perspective of food security as a concept. It is anticipated that this will encourage policy-makers, and other food security actors, to be aware of the importance of the broader issues involved in order to achieve more comprehensive food security at the local and state levels.


9. Ibid.

10. Ibid.


12. Ibid.


18. Ibid.

19. Ibid.


21. Cruz et al., “IPCC, Chapter 10”.


23. UNDP, One Planet to Share, p. 27.


27. Ibid.

28. Ibid.


31. “Beyond scarcity: Power, poverty and the global water crisis”, UNDP Human Development Report 2006. 176:http://bit.ly/SROTo. A country is water stressed when its per capita availability of water reaches 1,700 cubic metres or below. Water scarcity is achieved when per capita availability becomes less than 1,000 cubic metres, and absolute water scarcity is reached when this availability drops to below 500 cubic metres.


34. “Supersized Cities: China’s 13 megalopolises,” (The Economist Intelligence Unit, 2012).


40. While the rural population in Southeast Asia is already declining, South Asia’s rural population growth continues albeit at a gradually decreasing rate; it is expected to start to decline only in 2025. See: “Rural Poverty Report 2011 - New realities, new challenges: new opportunities for tomorrow’s generation,” (Rome: International Fund for Agricultural Development, November 2010). 16.


43. “Sustainable Agriculture and Food Security in Asia and the Pacific”. 77.


46. Ibid. 5.


48. Ibid.


50. Ibid.


53. The expenses for the field research for this case study were separately funded by the Center for International and Regional Studies at the Georgetown University School of Foreign Service in Qatar.


75. Baker, “Dams, power and security in the Mekong”.

76. Ibid.


85. FAO, “World Review of Fisheries”. 13. In fact, seven of the top ten capture fishing nations are Asian, if Russia and its Eastern ports are included.


90. Although there had been unsuccessful plans to reduce the fleet to 192,300 vessels by 2010. See: FAO, “World Review of Fisheries”.34.

91. Ibid. 10.


95. Greg Torode, “Disputed islands are prized catch: First foreign reporter allowed on the Vietnamese island of Ly Son finds fishermen determined to fight Beijing’s control of the Paracel Islands in the South China Sea” South China Morning Post 30 May 2011.