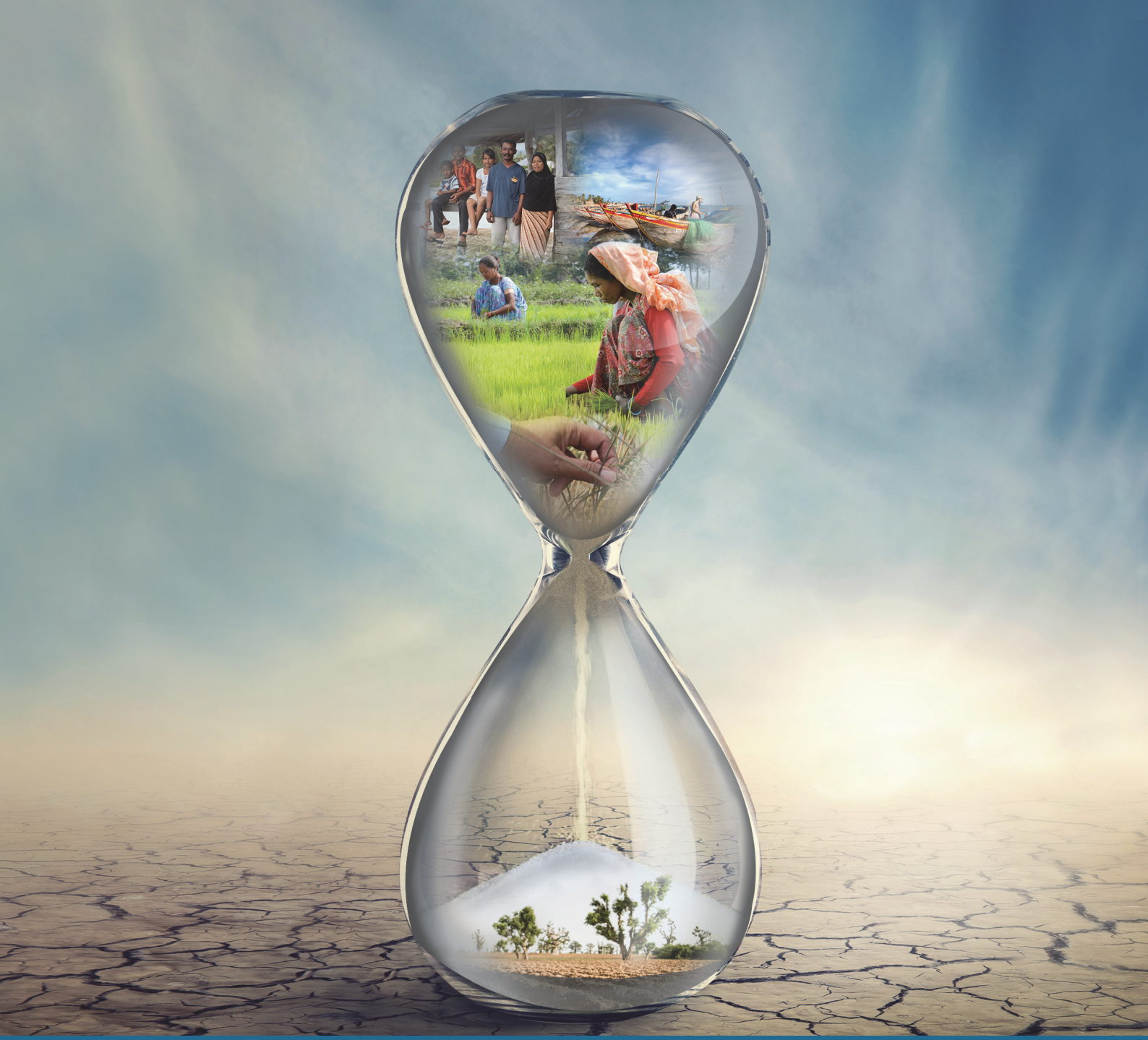
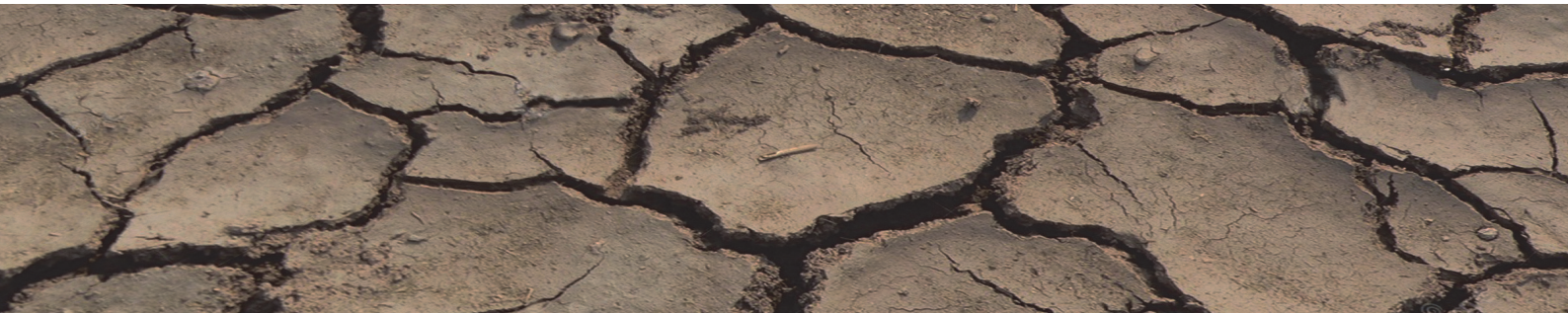


Expert Group Meeting on the Impact of Climate Change on ASEAN Food Security

6–7 June 2013

Organised by the RSIS Centre for Non-Traditional Security (NTS) Studies

Centre For Non-Traditional Security Studies



EXPERT GROUP MEETING ON THE IMPACT OF CLIMATE CHANGE ON ASEAN FOOD SECURITY

ORGANISED BY
THE RSIS CENTRE FOR NON-TRADITIONAL SECURITY (NTS) STUDIES

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This report summarises the proceedings of the Meeting as interpreted by the rapporteurs and editors of the RSIS Centre for NTS Studies. This report adheres to a variation of the Chatham House Rule.

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Executive Summary

Climate change is one of the most pressing issues affecting ASEAN food security. The Intergovernmental Panel on Climate Change (IPCC) projects that temperatures will rise between 1.5 to 3 degrees Celsius by 2100 given foreseeable levels of greenhouse gas (GHG) emissions.

Higher temperatures have significant ramifications for food production, through: (1) continuous impacts – such as changes in yield due to temperature increase, shifting season lengths, and increased salinity in coastal areas; (2) discontinuous impacts – such as increases in harvest failure due to extreme weather- and climate-related events, pests, and disease outbreaks; and (3) permanent impacts – such as the loss of land due to inundation as a result of sea-level rise.

Existing studies highlight several ways in which such impacts might affect Southeast Asia. As a result of higher temperatures, the region will likely experience more extreme and intense heat and rainfall events. It is also projected that sea level will rise at accelerating rates compared to past decades, resulting in increasing inundation of agricultural land. Impacts of climate change such as ocean acidification and warming water temperatures are already affecting fish catches in coral and pelagic areas and threatening the livelihood of fishing communities. These impacts are set to become more pronounced.

On land, climatic changes are having a myriad of second- and third-order effects on agriculture such as making rainfall patterns and dry periods less predictable and affecting rivers fed by upstream ice and snowmelt. More directly, simple increases in temperatures can affect the germination and gestation processes of key crops, and potentially undermine the food production growth levels that the region requires.

Addressing these climate change effects on food production will require concerted, informed attention from various stakeholders. To this end, the Expert Group Meeting on the Impact of Climate Change on ASEAN Food Security brought together leading experts in the region on climate change, agriculture and food security, from the private sector, non-governmental organisations (NGOs), academe and think tanks. This Meeting was organised by the Centre for Non-Traditional Security (NTS) Studies at the S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University (NTU), Singapore.

The Meeting fostered targeted dialogue on climate change challenges to regional food systems, and yielded the following policy pointers:

- **There is a need for existing global climate scenarios and projections to be further downscaled to national and local levels.**

Studies on the changes in surface temperature and weather patterns in Southeast Asia reveal significant variations in different areas. For instance, increases in La Niña rainfall have been seen in countries such as Lao PDR, Cambodia, Indonesia and the Philippines, whereas other parts of the region have experienced instances of rainfall declines.

A climate analysis of Vietnam shows that the repercussions of climate change on food production are already evident, and are occurring in different ways throughout the country. Changes in temperature and rainfall patterns have led to increased frequency of extreme weather and occurrence of soil erosion in some areas. For example, the cold spell that occurred from December 2007 to January 2008 destroyed at least 80,000 hectares of rice and vegetables. Such changes threaten Vietnam's status as one of the leading producers and exporters of agricultural commodities.

The variation in the climate impacts in the region suggests the need to scale efforts down to national and local levels in order to better understand their effects on key producing areas and specific crops. However, currently, leading climate change projections largely concern global, regional or otherwise systems-level scales. Regional actors will thus need to build their capacities to understand local climate conditions and their potential impacts. In this regard, existing climate change projections and models can serve as the foundation for increased collaboration between various actors in R&D and for more effective information exchange – both of which have room for significant improvement. Joint projects spearheaded by leading research institutions in the region, more robust interactions between state and local governments and the attraction of resources from beyond the region can all help bolster Southeast Asia's climate change preparedness and response capacities.

As such efforts progress, existing projections and models can be used as a starting point for integrating mitigation and adaptation strategies into food systems planning. Local communities and smallholders in particular must be brought into these processes, both to share their experiences on the changing climate and to help drive appropriate response measures.

- **Cooperation and collaboration between the public and private sector can spur climate-smart strategies for key sectors of the regional food system.**

The effects of climate change are already evident in key sectors of the regional food system, in particular the region's marine ecosystems and its rice and vegetable production systems. These effects threaten the livelihoods of agricultural producers while raising the spectre of caloric deficits and malnutrition among populations.

The degradation of marine ecosystems and phenomena such as coral bleaching, thus far a result of modest water temperature increases over short durations, have affected fish stocks and catches. These events will likely become more pronounced with rising temperatures. Moreover, sea-level rise has led to saltwater intrusion and erosion in coastal zones. This has made conditions for fisheries less predictable, and has disproportionately impacted small-scale operators.

Temperature increases and higher frequency of natural disasters have also adversely affected rice production. Specifically, heat stresses impact gestation periods and can cause pollen sterility that results in lower yields. Similarly, vegetable production has been affected by higher temperatures, changing precipitation patterns and saltwater intrusion in the region. As with marine ecosystem changes, such crop impacts can disrupt local and national economies, stress the social fabric of communities and in acute cases create impediments to food access.

The threats posed by climate change to various sectors of the ASEAN food supply system could motivate collaboration by stakeholders along different parts of the supply chain. These actors have incentives to bring their respective strengths to bear in tackling climate challenges to existing and future food systems. The private sector has the necessary resources for R&D and the development of new technologies (e.g., drought-resistant or salinity-tolerant rice strains). The public sector has a record of supporting these strategic developments, and it possesses the institutions and systems to make such technologies accessible for farmers. Like other climate change responses, local knowledge is important in the development and deployment of new technologies to ensure that they are appropriate for the unique circumstances of given locations.

The challenges relating to these collaborative processes are to (1) ensure that private-sector investments can be financially viable in the longer term; (2) provide the support and insurance systems to food-producing actors that will encourage the adoption of climate-smart methods and inputs; and (3) create robust public-private partnerships that are inclusive of multiple – and at times competing – interests, and are resilient to disputes where they arise.

- **The effects of climate change on food security accelerate the need to build resilient supply and value chains at regional, national and sub-national levels.**

Climate change has impacts on total food availability in the region and its respective member countries. Changes in the availability of food also have implications for world prices and the region's capacity to obtain food from the global market. The International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) by the Asian Development Bank (ADB) shows that prices of key crops increase sharply when bio-physical impacts of climate change are factored in. The model projects that, by 2050, rice prices may increase by 29–37 per cent, wheat prices by 81–102 per cent, corn prices by 58–97 per cent and soybean prices by 14–49 per cent.

If such price increases transpire, ASEAN member countries will be affected in several ways. Price increases will create direct food security concerns for import-dependent countries such as Indonesia, the Philippines and Singapore. At the same time, net exporters of food commodities such as Thailand and Vietnam may opt to impose export restrictions to bring stability to their domestic markets.

Such market volatility and price increases are far from inevitable, however, and actors throughout food value chains can help create food systems that are more robust. For example, downstream players in the supply chain such as processors, wholesalers and retailers could play a crucial role in facilitating long-term investments to reduce the impact of climate change on food security. These groups can drive improvements in post-harvest practices and facilities to take into account changing climatic conditions, to manage perishability as well as to benefit from increased yields.

At the regional level, there is an opportunity to strengthen partnership capacities within ASEAN and to use existing frameworks for evidence-based interventions. As the region moves towards enhanced economic integration, there is a need for it to recognise the link between food security and climate change, and to incorporate such understanding into concrete action plans. Similarly, national planning efforts should take into consideration regional weather-related events and potential external shocks from major trading partners. For instance, the changes in the consumption patterns of China, India and Japan could impact food markets that Southeast Asia depends on, while storms and droughts concurrently impact its regional food sources.

Building a resilient supply and value chain necessarily involves integrating the capacities and expertise of various stakeholders. The public sector is well placed to strengthen the adaptive capacity of farmers and downstream actors and provide them with the necessary information about the effects of climate change. Private-sector actors could take the lead in raising awareness and understanding of climate adaptation among suppliers, producers and retailers and other key players along food value chains.

Conclusion

Climate change presents an encompassing range of food security challenges. It affects a myriad of systems and trends: from major production areas to smallholder farms; from land-use allocations to energy strategies; from habitats of fisheries to transportation infrastructure. Given its formidable scope, there is a need to develop more coherent analysis about the ways that climate is affecting – and will likely affect in the future – specific parts of Southeast Asia's food value chains. Such analysis must then be used to improve the knowledge capacities of key regional stakeholders and lead to tangible strategies for adapting to the uncertainty that climate change brings to the food sector. At present, studies and cases of best practices on adaptation and mitigation strategies exist but are often not widely known and disseminated. There is thus a need to increase awareness with regard to existing climate-smart approaches and to upscale such efforts. Best practices need to be disseminated to the national and local levels, a process that can be effective only when it engages a range of stakeholders.

Current trends and future projections on the impacts of climate change imply that isolated adaptation and mitigation efforts are no longer enough to ensure food security in Southeast Asia. Instead, adaptation and mitigation strategies should be incorporated into food systems planning at multiple levels. This approach entails multisectoral involvement that will not only facilitate increased cooperation in R&D but also its application into relevant climate response policies. At the same time, the need to heighten awareness of the effects of climate change on food production calls for a bottom-up approach wherein local knowledge is incorporated into adaptation and mitigation strategies.

Ultimately, involvement of stakeholders from the regional, national and local levels is crucial, as are interventions that foster partnerships between the public and private sector. Such collaboration is often messy, needs buy-in from multiple parties and runs counter to entrenched modes of operation. Nonetheless, there is no viable alternative to such shifts in Southeast Asia, and the ability of the region to evolve its food systems in light of climate change will be a key indicator of its future progress.

A version of this Executive Summary was published as an NTS Issues Brief (No. IS13-04) in September 2013.

Session 1: Climate Change Scenarios and Southeast Asia

This session provided a critical overview of various climate change scenarios and identified which among them are most likely to apply to the ASEAN region and its member countries. The impacts of climate change on key agricultural production areas in member countries were also briefly discussed. The session saw calls for governments to collaborate with the private sector and civil society when implementing mitigation and adaptation initiatives.

Effects of climate change on food production

Climate change is one of the most pressing issues affecting ASEAN food security. As a result of higher temperatures, the region will likely experience more extreme and intense heat and rainfall events. It is also projected that sea levels will increase at accelerating rates compared to past decades. Such sea-level rise may impact tens of millions of people in the region, particularly those in low-lying, coastal cities, and lead to increased inundation of agricultural land. Other impacts of climate change such as ocean acidification and warming water temperatures are already affecting fish catches in coral and pelagic areas and threatening the livelihood of fishing communities. These impacts are set to become more pronounced.

On land, climatic changes are having a myriad of second- and third-order effects on agriculture such as making rainfall patterns and dry periods less predictable and affecting rivers fed by upstream ice and snowmelt. In more direct terms, simple increases in temperatures can affect the germination and gestation processes of key crops, and potentially undermine the food production growth levels that the region requires.

Vietnam provides a useful case for illuminating such effects. Between 1951 and 2000, the typhoons that visited the country during the La Niña season became more intense and the occurrence of extreme weather events such as flash floods, droughts and storms became more frequent. As a result of such trends, salinity penetration is expected to increase steadily. Rising average temperatures and erratic rainfall patterns have also affected the production of key agricultural commodities such as rice, corn and vegetables. As such, if not effectively addressed, climate change could significantly reduce corn and rice outputs in Vietnam during the coming decades.

Such production declines could lead to rising dependence on imports at the same time as a decline in export volumes. For rice, the region's most important staple, some projections see climate change accounting for production losses of roughly 3 million tonnes by 2030. If this were to occur, some Southeast Asian states could see their rice exports reduce significantly, and the region's importing countries could find it more difficult to procure affordable and high quality rice. Other staples and high-value agricultural products face similar challenges. Hence, it is crucial for the region to develop climate adaptation and mitigation strategies for the agriculture sector. The first step in constructing such strategies is to develop robust knowledge on regional climate effects, which is very much a work in progress.

Climate change scenarios and implications for Southeast Asia

The effects of climate change vary over time and this variability is affected by human activities. Climate change projections attempt to capture this fluidity by creating scenarios based on specified levels of greenhouse gas (GHG) emissions. The emissions levels in turn reflect demographic, socioeconomic and technological changes. Evidence across scenarios suggests that increasing temperatures and wide-ranging climatic impacts are in the offing.

Higher temperatures and changing weather conditions have significant ramifications for food production, through (1) continuous impacts – such as changes in yield due to temperature increase, shifting season lengths, and increased salinity in coastal areas; (2) discontinuous impacts – such as increases in harvest failure due to extreme weather- and climate-related events, pests, and disease outbreaks; and (3) permanent impacts – such as the loss of land as a result of sea-level rise.

Criticisms of the climate change scenarios

Despite progress and growing overall awareness, there is still looming uncertainty and areas of disagreement among experts with regard to the climate change scenarios and projections. For instance, there is uncertainty and debate about the most appropriate temperature increase projections to work from, as well as how such increases will affect other climatic systems.

A more fundamental problem for the food sector, however, is that current climate projections focus largely on macro-level climate impacts. There is a need to downscale climate change scenarios to smaller geographical areas and to dynamics directly tied to the food sector. For instance, general circulation models (GCMs) often do not speak to vulnerability and impact assessments, targeted risk analysis, and food systems issues. Rather, they relate to global climate trends and are difficult to downscale to regional, national and local levels due to the lack of information and data.

Existing climate models also sometimes fail to incorporate local knowledge and inputs from relevant stakeholders. Multistakeholder inputs are essential for accurately downscaling climate projections. To this end, consultations and dialogue with stakeholders – particularly at local community levels – can help identify best practices in the area of adaptation and mitigation.

Discussion

Existing climate change scenarios can serve as a foundation for creating relevant food policies and adaptation and mitigation strategies. They can also serve as a common point of reference for increased collaboration and cooperation on information sharing and R&D within the region. Ultimately, however, downscaling climate change scenarios and projections to national and local levels requires countries in Southeast Asia to build capacity, which in turn suggests that technical assistance may be needed in some cases. Existing climate scenarios and models can help identify areas for intervention, but the actual policy formulation necessitates moving beyond these models to understand climate impacts – and what the appropriate responding actions might be – at more localised levels. Tapping into and sharing local knowledge and adaptation and mitigation practices would strengthen the validity and applicability of the scenarios and models.

On the whole, the effects of climate change in Southeast Asia are such that isolated adaptation and mitigation efforts will prove insufficient. Instead, there is a need for climate-smart approaches that mainstream climate responses into agricultural and food systems planning. This is not an easy task, and will require cooperation and collaboration across government ministries, between national, provincial and community governments, and between research, private-sector and policymaking communities. Such collaboration is often messy, needs buy-in from multiple parties and runs counter to entrenched modes of operation. Nonetheless, there is no viable alternative to such shifts in Southeast Asia, and the ability of the region to evolve its food systems in light of climate change will be a key indicator of its future progress.

Session 2: Climate Change and the ASEAN Food Security System

This session took a sectored approach to examining the effects of climate change on the regional food system. Fisheries and the rice and vegetable sectors face common threats from fragile environments and shifting climate conditions. The session discussed these issues along with the analytical and policy approaches most apt for promoting food security in an era of climate change.

Climate change, marine ecosystems and the communities that depend on them

Marine environments have relevance that extends beyond coastlines and affects millions of people in Southeast Asia. Changes in marine environments can impact lands inward from coastlines as fishing communities experience outmigration towards farmland and cities. Shifts in wild fisheries as fish populations move to more hospitable waters can have geopolitical winners and losers both within and outside the region. Deterioration of aquatic habitats can render previously valuable marine systems of little use. In each case, change often occurs more rapidly than can be satisfactorily adapted to. Exploring these challenges therefore necessitates looking to both the physical and social manifestations of climate change in regional marine environments.

When considering physical climate impacts on marine environments, temperature is the starting point. Acute bleaching events in the Coral Triangle (Indonesia, Malaysia, Papua New Guinea, the Philippines, the Solomon Islands and Timor-Leste) in recent years have affected fish stocks through altering and destroying key habitats. Coral bleaching has occurred with 1 degree Celsius water temperature increases over a one-week period; making climate scenarios of a 2 degree permanent warming particularly disquieting.

Beyond temperature, there are a number of more indirect impacts of a warmer climate that are affecting marine productivity. Sea-level rise affects coral (by increasing the distance between these organisms and the sun's energy) and leads to saltwater intrusion and erosion challenges in coastal zones. Erosion and coastal sedimentation have their own set of implications that are making conditions less predictable. Storms are becoming more powerful, originating in new locations and proceeding along unfamiliar pathways. Oceans are becoming 'less basic' (a phenomenon often described as ocean acidification), impacting a range of aquatic organisms. Mangroves, which protect coastlines and offer habitats, are being stressed by storms, salinity and sea-level changes.

The social implications of these and other changes for marine environments are formidable. Storms are affecting communities outside traditional typhoon belts, and these communities are often poorly equipped to deal with them. Moreover, while knowledge of such climate impacts is growing throughout the region, it remains difficult to assess or predict climate impacts on small spatial scales. Fish migrate as a response to warming temperatures, largely to deeper waters, which makes it more difficult for fisherfolk to access them. These difficulties also mean that smaller-scale municipal fisherfolk may lose access as only corporate trawler efforts continue to be economically viable. This may in turn result in the socioeconomic or political disenfranchisement of fishing communities, growing deprivation, outmigration, food insecurity and even insurrection and instability.

However, there are some positive signs of adaptation to these challenges. In multiple areas throughout the region, past fish kills – which were monetarily disastrous and had negative effects on local food security – have spurred innovative pre-emptive responses that have enjoyed some success. Such local and individualised efforts need to be shared, supported and upscaled for the region to successfully face its maritime climate challenges.

Rice, the regional staple under threat

Rice has political, economic and nutritional importance to Southeast Asia. A significant percentage of total global exports of rice originate in the region. Beyond the well-known exports of Thailand and Vietnam, Cambodian rice production has increased significantly and Myanmar's is set to do the same. Indonesia and the Philippines, meanwhile, are traditionally the largest importers in the region and have been among the highest globally. Given its importance, threats to rice from climate change require policy responses that are substantial and evidence-based.

The nature of the climatic threats to rice is increasingly well-understood in the context of temperature increases and natural disasters. Heat stresses can impact gestation periods, cause pollen sterility and decrease overall yields. Deltas – which are major regional rice suppliers – can suffer from salinity increases as a result of storms and typhoons. In other areas of climate impact there is less agreement, particularly when different emissions scenarios are considered, and considering that different geographies respond to climate stresses in different ways.

Still, there are some response methods that are showing positive results in the region. Maps such as those employed by the International Rice Research Institute (IRRI) can find areas where rice is vulnerable to day- and/or night-time heat stress and act as guides for deploying heat-resistant strains. Similarly, there are salinity-tolerant rice strains that are more resilient to the effects of sea-level rise and saltwater intrusion during major storm events. New strains, many of which are not genetically modified, can be brought to bear from existing seed-banks, and breeding efforts to respond to changing contexts can be increased.

What is shown by the rice sector then is that there are vulnerabilities in the region that need to be assessed on small and specific spatial and temporal scales, and these individual areas likewise require targeted adaptation strategies.

Food does not equal nutrition: The importance of vegetables

Having 'enough' food is not equivalent to food security – nutritional content matters. Malnutrition is Southeast Asia's 'hidden hunger', and a cause of a range of social ills. At the most critical levels, mothers die during childbirth as a result of insufficient nutrients and children die due to Vitamin A and iron deficiencies. These deficiencies also affect cognitive ability, work performance and quality of life. Malnutrition also exacerbates the effects of diarrhoeal diseases, organ dysfunction and other health risks found most often in areas of low development. Such diseases in turn have a negative impact on appetite and nutrient absorption. In pockets of Southeast Asia, such problems remain a daily concern.

Vegetables are part of the solution. Mortality and underweight instances decrease when children eat at least 200g of vegetables per day. Vegetables are high in nutritional value, and are relatively easy to grow in different environments. Many indigenous vegetables have health benefits stemming from having higher nutrient values than commercial varieties. Moreover, higher vegetable consumption can help mitigate the more contemporary problems of obesity, diabetes and non-communicable diseases that are increasing as the region urbanises and consumes more processed and energy-dense foods.

Similar to fish and rice, vegetables are also under threat from climate change. Higher temperatures, changing precipitation patterns and saltwater intrusion are all impacting vegetable growth in the region, and these challenges are set to become more pronounced. Efforts to combat such changes are at a fledgling stage but promising. There is potential to expand a gene bank to collect and create varieties that are more resistant to climate effects such as flooding, drought and salinity. There is also room to enhance regional cooperation to promote robust vegetable yields. AVRDC-The World Vegetable Center, a network for vegetable production, collaboration and R&D, could serve as a means to this end, but it is not very climate-oriented at present. This could improve, and the growing presence of climate change in regional food discourses and policy circles is a positive trend towards this objective.

Discussion

There is room for debate on how much climate information is needed to formulate effective responses. Climate change always acts in conjunction with other variables to cause impacts, which makes specifying the role of climate change difficult and at times impossible. One school of thought is that an appropriate policy response to such uncertainty is to assemble multiple climate models, focus upon their veracity and attempt to improve them through progressive scientific enquiry. Others suggest that there is an immediate need for policy action, and that recognising overall trends should provide adequate guidance for forming responsive policies. While these approaches are not necessarily mutually exclusive, they do highlight the at-times contentious nature of climate response prioritisation.

There are a number of convergences among the climate challenges and opportunities faced in the fishery, rice and vegetable sectors of the region. They all must respond to shifting demand patterns – such as lower per capita consumption of rice, higher demand for fish (including from fish farms) and the desire for different vegetables in various locations – at the same time that climate change is making production less predictable. Each sector also needs to bring to bear new technologies and existing indigenous knowledge to face climate shifts. There are pervasive challenges in all cases to harmonise the combined efforts of these sectors towards a more food-secure regional future. Climate change makes these challenges more formidable, but can also act as a potential catalyst for greater regional food systems integration that recognises the relative strengths and capacities of different actors and locations.

Session 3: Climate Change and ASEAN Agricultural Trade

The impact of climate change is expected to affect extra- as well as intra-ASEAN trade in agricultural products. ASEAN countries are major producers of agricultural products such as rice, fish, fruits and fresh vegetables while depending on other regions for some key food imports. This session examined how climate change might affect the production, processing, safety and transportation of food. The presenters provided insights into potential policy implications and suggested appropriate mitigation measures.

Impact of climate change on intra-regional trade

Climate change has impacts on total food availability in the region and its respective member countries. Changes in the availability of food also have implications for world prices and the region's capacity to obtain food from the global market. The International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) by the Asian Development Bank (ADB) shows that prices of key crops increase sharply when bio-physical impacts of climate change are factored in. The model projects that, by 2050, rice prices may increase by 29–37 per cent, wheat prices by 81–102 per cent, corn prices by 58–97 per cent and soybean prices by 14–49 per cent. Moreover, these changes are coming at a time in which external forces – including those relating to expansive neighbouring markets in India and China – are impacting Southeast Asia's food trade calculations.

Southeast Asia is home to the world's major rice and shrimp exporting countries (Thailand and Vietnam), major rice importers (Indonesia, the Philippines) and countries that remain highly agrarian (Lao PDR, Myanmar and Cambodia). In the event of a sharp increase in world prices of key food commodities, Thailand and Vietnam could impose export restrictions to bring stability to their domestic markets, as was the case in 2008. However, it remains unclear whether trade restrictions could be reasonably implemented by exporting countries in times of price instability while also managing the food security concerns of import-reliant neighbours such as Indonesia and the Philippines. What may be more effective in terms of dealing with the inevitable market volatility and price increases are efforts by actors throughout the food value chain to mitigate these risks by engaging in climate adaptation efforts.

Building resilient supply and value chains through climate adaptation

Climate adaptation at the farm level is necessary but not sufficient to tackle the wide array of problems that arise along the global food supply chains. The technical expertise, market power and actionable knowledge of downstream actors such as processors, wholesalers and retailers play a seminal role in facilitating the long-term co-investment needed to thwart climate change impacts on food security. For instance, post-harvest practices and facilities will have to take into account changing climatic conditions to manage perishability and benefit from increased yields.

Applying adaptive measures at critical points of food value chains requires collective approaches to assessing climate change impacts and adaptation options. One way to highlight potential disruptions to food value chains is to integrate climate adaptation and disaster risk reduction strategies. In order to underscore the broad implications of climate change on the economic and social fronts, climate-related extremes can be registered as 'shocks' in value chains and trade systems so that the policy implications from the disruption to food supply, assets and livelihoods may be made more apparent.

Mitigating climate change at the regional and national levels

ASEAN food supply chains are complex and often informal which makes targeted interventions difficult at the regional level. Nevertheless, there is potential to strengthen partnership capacities within ASEAN by exploring economic groupings and sub-regional economic corridors, taking stock of vulnerability assessments for the region's major agricultural crops and marine products, and considering ways to provide support to existing regional frameworks. Given regional efforts towards economic integration in ASEAN, it would also be fitting to acknowledge the linkages between food security and climate change in the ASEAN Economic Community (AEC) Blueprint.

In working towards improved coordination, documentation and analyses of climate impacts across the region, the use of common interdisciplinary impact assessment frameworks can be useful. Frameworks that are being tested by the Food and Agriculture Organization of the UN (FAO) include the Thailand InteGrated Economy and Resource (TIGER) Model; Assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under Climate Change to Strengthen Household Food Security with Livelihoods' Adaptation Approaches (AMICAF) and Modeling System for Agricultural Impacts of Climate Change (MOSAICC) in the Philippines; and the Regional Rice Initiative for Asia. If successful, the frameworks are expected to provide a basis for incorporating field experiences into policies, and translating policies into region-wide evidence-based interventions.

At the national level, buyers in importing countries may find ways to mitigate production volatility by developing longer-term and more stable relationships with food suppliers in exporting countries. National planning efforts should take into consideration factors such as regional weather-related events and potential external shocks from major trading partners such as the ASEAN Plus Six. For instance, changes in the consumption patterns of China, India and Japan could have an impact on food security and regional economic integration. Governments may also secure support for adaptation efforts at the national level by tapping on long-term innovative financing, such as the Green Climate Fund.

The experience of the Philippines reveals pathways by which climate change impacts can be mitigated through regional cooperation, including: (1) regional exchange initiatives that facilitate training, sharing of experiences and best practices; (2) cost-effective and climate-proofed infrastructure such as alternative irrigation systems; (3) collaboration with the insurance industry to design insurance for disaster relief and crop loss; (4) increased research on drought-tolerant and flood-resistant crops; and (5) improved logistics through an expansion of the ASEAN roll-on / roll-off (RO-RO) nautical transportation network. These approaches see the Philippines look towards its neighbours, trading partners, ASEAN bodies and private-sector actors to improve its own food security. Further measures such as these on behalf of multiple ASEAN players can combine to be greater than the sum of their parts, and lead to more robust food security for the region.

Mitigating climate change through public-private partnerships

The key factors affecting food value chains in Southeast Asia are crop vulnerability; the plight of small producers, including low income, poor housing, impediments to market access and other development deficits; supply chain logistics and finance; and the role of institutions.

Given the wide range of players involved in these value chains, the public sector could strengthen the resilience of food systems by (1) providing a research support platform to share knowledge about crop and site-specific impacts and adaptation strategies; (2) improving physical infrastructure for irrigation, transportation and marketing; and (3) offering businesses and farmers more equitable access to financial instruments such as start-up investments and micro-financing to implement collective adaptation measures.

Beyond the public sector, the threats posed by climate change could serve as a catalyst for collaboration among stakeholders in different sectors and along different parts of the supply chain. These actors have incentives to bring their respective strengths to bear in tackling climate challenges to existing and future food systems. The private sector has the necessary resources to lead in R&D and the development of new technologies (e.g., drought-resistant or salinity-tolerant rice strains). The public sector has a record of supporting these strategic developments, and it possesses the institutions and systems to make such technologies accessible for farmers. Like other climate change responses, local knowledge is important in the development and deployment of new technologies to ensure that they are appropriate for the unique circumstances of given locations.

The challenges relating to these collaborative processes are to (1) ensure that private-sector investments can be financially viable in the longer term; (2) provide the support and insurance systems to food-producing actors that will encourage the adoption of climate-smart methods and inputs; and (3) create robust public-private partnerships that are inclusive of multiple – and at times competing – interests, and are resilient to disputes where they arise.

Discussion

Climate adaptation, improved logistics and land and labour productivity, as well as government policies that provide an enabling environment for private businesses, could play a key role in addressing declining production and in encouraging agricultural investment. Examples of such approaches include land consolidation policies, farm mechanisation, micro-services schemes for smallholders, improved road and shipping networks, and the simplification of customs and logistics regulations. Lessons may be drawn from Japan's rapid industrialisation between the 1940s and 1960s. Despite a significant shift from agriculture to manufacturing, Japan was able to continue to meet a large percentage of its rice demand domestically.

Nonetheless, one could argue that the agricultural sector may become less profitable with rural-urban migration and the risks of climate change, and hence it may make less economic sense for producers to increase production and investment in agriculture. Some countries have disproved this hypothesis, specifically, the US and Australia, which in spite of rural-urban migration, drove productivity through increased farm efficiency. Should there be a decline in regional production, however, an increase in imports would be required to sustain the supply of food. Such a scenario reinforces the importance of improving logistics and transportation networks, particularly in Lao PDR, Cambodia and Myanmar and the highlands of Vietnam where such networks are less developed.

The increased risks of climate change for agricultural producers could be partially underwritten by insurance. Producers may be encouraged to continue farming or increase their investments if risk mitigation instruments such as insurance derivatives are available. For instance, India partners with Tokio Marine Insurance to provide indemnity for droughts that occur during the monsoon season with payment levels linked to the severity of the drought. For similar schemes to be drawn up in ASEAN, the insurance industry would require information on food production in ASEAN, among which are climate risks to production and logistics. In addition, there would need to be a regional consensus to focus on a small number of key commodities. Apart from providing support to producers, if crop or climate insurance is used in conjunction with the introduction of new farming technologies, it may also help to change the behaviour and practices of farmers.

Session 4: Pathways Forward – Downscaling Global Climate Change Scenarios

According to Robert Zoellick, former World Bank president, 'environmental change is akin to a silent tsunami that brings adverse impacts for food security'. Food security challenges are part of the region's day-to-day affairs. Hence, there is a need to explore current food and climate projections, model potential scenarios and calibrate policies accordingly.

The interconnectedness of intra- and extra-regional food systems also shows the pervasiveness of climate change effects. Climate affects crops in various areas across time and is intertwined with other complexities involving trade-production relationships, regional and global food system shifts and pervasive hunger. This is evident in the case of Vietnam wherein the repercussions of climate change are seen in the production of several key agricultural crops. At the same time, a significant number of people still lack food and their condition is further worsened by their unpreparedness for intense typhoons and other natural calamities. Likewise in Lao PDR, Cambodia, Indonesia and the Philippines, there has been a variable increase in La Niña rainfall with attendant impacts on crop yields and losses of arable land. These events and trends have ripple effects that run through regional food systems.

There remains a need to raise awareness of the impacts of climate change on food security and to share information on adaptation and mitigation strategies in the region. To achieve this, it is crucial to have well-crafted communications strategies able to disseminate the information from the national to the local levels. These strategies will only be effective, however, if useful information is fed into them. This requires downscaling climate change information, which is a prerequisite for constructing climate-smart food policies.

Downscaling needs also extend to carrying out initiatives, and local communities and smallholders must be integrated into the processes of formulating and implementing mitigation and adaptation strategies. Engaging these players in dialogue and consultation can lead to the incorporation of local knowledge into applicable practices. Such goals provide both needs and opportunities for enhanced public-private sector collaboration. R&D (e.g., the development of new, more climate-resilient rice strains) is one for the most promising areas for collaboration, and is an area of strength for the private sector. The public sector could play a complementary role by using its institutions and systems to bring any innovations arising from such collaborations to farmers. Together, actors in these sectors can help secure the regional food future.

Resilient supply and value chains at the regional, national and sub-national levels

Extra- and intra-ASEAN trade of agricultural commodities are affected by the impacts of climate change, but also provide potential avenues for resilience. Changes in the supply of food also have implications for world prices and the region's capacity to obtain food from the global market. Since Southeast Asia is made up of net food importers and exporters, the effects of price increases will be diverse and will impact their food security. However, this presents an opportunity for collaboration at the regional level as it moves towards enhanced economic integration.

The ASEAN Secretariat can play an important role in strengthening partnership capacities and the dissemination of evidence-based interventions. Its existing capacity-building mechanisms – such as the executive forums for local government officials, private sector and civil society – can serve as an instrument for creating awareness and recognising the areas for interventions.

Similarly, the creation of a regional coordinating body to facilitate the extension of information and R&D knowledge to the various stakeholders can help in the building of resilient supply and value chains. This coordinating body can help promote understanding of the link between food security and climate change, and the need for concrete action plans to address this issue. It can also serve as a broker between the public and private sectors in translating climate change scenarios and projections to evidence-based policies and interventions.

At the same time, both the public and the private sector are crucial actors in the development of resilient supply and value chains. The public sector is well-placed to strengthen the adaptive capacity of farmers and downstream actors and provide them with the necessary information about the effects of climate change. On the other hand, the private sector could influence the understanding of climate adaptation among suppliers, producers and retailers and other players along food value chains.

The research community could serve as a bridge among these various actors by communicating in policy language to facilitate the translation of research into policy action. In Southeast Asia, however, any policy action in the food sector faces a particular challenge. Governments are expected to intervene in agriculture at the same time as they are expected to remove impediments to freer trade. This is not the paradox that it may appear to be. Rather, it is possible to have food policies that both encourage resilience and foster regional integration and concomitant progress. If pursued successfully, such policies can be the tide that raises all boats.





RSIS

Paul Mitchell

RSIS



Participants of the Expert Group Meeting on the Impact of Climate Change on ASEAN Food Security

Front row: *Prof. Laura T. David, Dr Mercy A. Sombilla, Dr Rolando Dy, Prof. Nguyen Huu Ninh, Assoc. Prof. Mely Caballero-Anthony, Prof. Paul Teng, Dr Ponciano S. Intal, Jr, Dr Venkatachalam Anbumozhi, Prof. Felino P. Lansigan, Ms Sanchita Basu Das*

Second row: *Ms Belinda Chng, Ms Cynthia V. de Guia, Ms Rafaela Jane P. Delfino, Ms Gina Aljecera, Ms Marinelle Espino, Prof. Kazuhiko Kobayashi, Prof. Rizaldi Boer, Mr William H. Martirez, Dr Chanagun Chitmanat, Ms Amalia Agustina, Dr J. Jackson Ewing, Dr Robert J. Holmer, Mr Paul Mitchell, Ms Margareth Sembiring, Ms Maria Carmencita S. Morales, Dr Reiner Wassmann*

Programme

Day 1
6 June 2013 (Thursday)
Crowne Plaza
Manila, Philippines

09:00 **Welcome Remarks**

Associate Professor Mely Caballero-Anthony
Head
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S. Rajaratnam School of International Studies
(RSIS)
Nanyang Technological University (NTU);
and Secretary-General
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Singapore

09:10 **Meeting Background, Format and Objectives; Introductions**
Framing the issues: Linking climate change effects to the food security ecosystem in Southeast Asia and beyond

Professor Paul Teng
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Singapore

10:20 **Session One: Climate Change Scenarios Affecting ASEAN and Ex-ASEAN Sources of ASEAN Food**

Moderator

Dr J. Jackson Ewing
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Professor Rizaldi Boer
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Questions:

- From the results of studies on climate change, what climate change scenarios are most likely to affect ASEAN as a region or specific countries in 2020 and 2050? (A climate change scenario may be ambient temperature rise, increased frequency and volume of precipitation, sea-level rise, etc.)
- From the results of studies on climate change, what climate change scenarios in 2020 and 2050 are most likely to affect the countries outside ASEAN which constitute major sources of agricultural products, in particular, the US for corn and soybean; Brazil for soybean and meat; and Australia for wheat?
- What climate change scenarios need to be considered in estimating impact on key food production areas in 2020 and 2050?

13:00 **Session 2: Which Parts of the ASEAN Food Security System are Likely to be Affected by the Anticipated Climate Change Scenarios in 2020, 2050?**

Moderator

Professor Felino P. Lansigan
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Dr Robert J. Holmer
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Questions:

- For each climate change scenario identified in Session 1, which part of the ASEAN food security system will likely be affected with respect to food availability (production), physical access (transport and logistics support), economic access (food affordability, pricing) and food utilisation (nutritive value of food, food safety, human nutrition)?
- For each climate change scenario, how will major ASEAN food source countries (e.g., US, Brazil, Australia) be affected with respect to production in 2020 and 2050 for specific agricultural products?

15:00 **Session 3: How Will Climate Change Affect Intra-ASEAN Trade in Agricultural Products?**

Moderator

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Mr Aristeo A. Portugal
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Questions:

- Given that ASEAN countries are the major producers of important agricultural products (such as rice, fresh vegetables, fish, black pepper, cashew nuts, etc.), how will climate change scenarios affect the production, processing and food safety of these products?
- What policy implications may potentially arise from the anticipated effects of climate change scenarios on ASEAN production of important agricultural products?
- How will climate change scenarios affect the 'physical access' aspects of ASEAN-produced food products, and what potential policy implications are there?

16:45 ***End of Day One***

Day 2
7 June 2013 (Friday)

09:00 **Session 4A: Moderated Discussion and Recap of Day One**

Moderator

Dr J. Jackson Ewing
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- Identification of unanswered questions; information gaps.
- Potential collaborative network on climate change/food security impact assessment and policy innovation.

10:15 **Session 4B: Open Session – Debating Ways Forward**

Moderator

Professor Paul Teng
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11:50 **Closing Remarks**

Associate Professor Mely Caballero-Anthony
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13:00 ***End of Meeting***

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About the RSIS Centre for Non-Traditional Security (NTS) Studies

The **RSIS Centre for Non-Traditional Security (NTS) Studies** conducts research and produces policy-relevant analyses aimed at furthering awareness and building capacity to address NTS issues and challenges in the Asia-Pacific region and beyond.

To fulfil this mission, the Centre aims to:

- Advance the understanding of NTS issues and challenges in the Asia-Pacific by highlighting gaps in knowledge and policy, and identifying best practices among state and non-state actors in responding to these challenges.

- Provide a platform for scholars and policymakers within and outside Asia to discuss and analyse NTS issues in the region.

- Network with institutions and organisations worldwide to exchange information, insights and experiences in the area of NTS.

- Engage policymakers on the importance of NTS in guiding political responses to NTS emergencies and develop strategies to mitigate the risks to state and human security.

- Contribute to building the institutional capacity of governments, and regional and international organisations to respond to NTS challenges.

Our Research

The key programmes at the **RSIS Centre for NTS Studies** include:

1) Internal and Cross-Border Conflict Programme
   - Dynamics of Internal Conflicts
   - Multi-level and Multilateral Approaches to Internal Conflict
   - Responsibility to Protect (RtoP) in Asia
   - Peacebuilding

2) Climate Change, Environmental Security and Natural Disasters Programme
   - Mitigation and Adaptation Policy Studies
   - The Politics and Diplomacy of Climate Change

3) Energy and Human Security Programme
   - Security and Safety of Energy Infrastructure
   - Stability of Energy Markets
   - Energy Sustainability
   - Nuclear Energy and Security

4) Food Security Programme
   - Regional Cooperation
   - Food Security Indicators
   - Food Production and Human Security

5) Health and Human Security Programme
   - Health and Human Security
   - Global Health Governance
   - Pandemic Preparedness and Global Response Networks

The first three programmes received a boost from the John D. and Catherine T. MacArthur Foundation when the RSIS Centre for NTS Studies was selected as one of three core institutions to lead the MacArthur Asia Security Initiative in 2009.*

Our Output

Policy-relevant Publications

The **RSIS Centre for NTS Studies** produces a range of outputs such as research reports, books, monographs, policy briefs and conference proceedings.

Training

Based in RSIS, which has an excellent record of post-graduate teaching, an international faculty, and an extensive network of policy institutes worldwide, the Centre is well-placed to develop robust research capabilities, conduct training courses and facilitate advanced education on NTS. These are aimed at, but not limited to, academics, analysts, policymakers and non-governmental organisations (NGOs).

Networking and Outreach

The Centre serves as a networking hub for researchers, policy analysts, policymakers, NGOs and media from across Asia and farther afield interested in NTS issues and challenges.

The Centre is the Coordinator of the ASEAN-Canada Research Partnership (2012–2015) supported by the International Development Research Centre (IDRC), Canada. It also serves as the Secretariat of the initiative.

In 2009, the Centre was chosen by the MacArthur Foundation as a lead institution for its three-year Asia Security Initiative (2009–2012), to develop policy research capacity and recommend policies on the critical security challenges facing the Asia-Pacific.

It is also a founding member and the Secretariat of the Consortium of Non-Traditional Security Studies in Asia (NTS-Asia).

More information on our Centre is available at www.rsis.edu.sg/nts

About the S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University

The S. Rajaratnam School of International Studies (RSIS) was inaugurated on 1 January 2007 as an autonomous School within Nanyang Technological University (NTU), upgraded from its previous incarnation as the Institute of Defence and Strategic Studies (IDSS), which was established in 1996.

The School exists to develop a community of scholars and policy analysts at the forefront of Asia-Pacific security studies and international affairs. Its three core functions are research, graduate teaching and networking activities in the Asia-Pacific region. It produces cutting-edge security related research on Asia-Pacific Security, Conflict and Non-Traditional Security, International Political Economy, and Country and Area Studies.

The School's activities are aimed at assisting policymakers to develop comprehensive approaches to strategic thinking on issues related to security and stability in the Asia-Pacific and their implications for Singapore.

For more information about RSIS,
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