UNESCO Series on Journalism Education

Getting the Message Across:
A Handbook for Journalists Reporting on Climate Change and Sustainable Development in Asia and the Pacific

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MADE AVAILABLE FOR UNESCO HACKATHON

13-14 OCTOBER 2018,

OFFICIENCE, HO CHI MINH CITY

Getting the Message Across:

A Handbook for Journalists Reporting on Climate Change and Sustainable Development in Asia and the Pacific

Based on UNESCO Climate Change in Africa: A Guidebook for Journalists

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Part One: The essentials

Why climate change matters to every journalist and every media outlet

What's at stake?

The Earth's climate has always changed but because of human activities it is now changing faster than it has for thousands of years.[1] This is what scientists and politicians mean when they talk today of climate change. This climate change is here to stay. It will affect all of our lives and nearly every aspect of society, from our health and food supplies to business and national economies.

In the original Climate Change in Africa guidebook[2], it was noted that climate change threatens to reverse many of the development gains that African nations have made, and this is true for nations in the Asia and the Pacific region as well.[3] It poses threats to food and water security, to political and economic stability, to livelihoods and landscapes. But it also creates opportunities for politicians, business leaders and communities in Asia and the Pacific to act in ways that bring benefits for all. It can create opportunities for new business models and innovations, new routes to sustainable development and new ways for ancient knowledge to have an impact at home and in the wider world.

The injustices of climate change

Climate change is inherently unfair. The countries and communities that are most at risk from its impacts, and are least able to adapt, are those that have contributed least to the problem. If poorer nations pursue economic growth by the same means from which industrialised nations have benefitted – such as by burning coal and clearing forests – they will only add to the climate change problem. Indeed, when the richest nations insist that all nations – including the poorest ones – should act to limit climate change, the poorest nations find themselves in the unenviable position of asking richer nations for help to do so. Depending on the situation, they do not always get the finance and technology they need.

The international negotiations on climate change is vulnerable to brinkmanship, as some countries wield considerable power while others have little to bring to the table other than moral arguments. The more vulnerable nations can do little when industrialised nations fail to act to limit climate change, or even break promises they have made in the past. And when the richer nations provide 'climate finance' in the form of loans not grants, they are in effect asking poorer nations to pay to fix a problem the richer nations created. There is also inequity within countries, as it is the poorest communities that are most vulnerable to climate change. Again, these tend to be the people who have done least to contribute to the problem.

These ethical and moral aspects of climate change have prompted the concept of "climate justice", which civil society organisations have used to call upon governments and others to

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[1] See National Science Foundation, 2013, Earth Is Warmer Today Than During 70 to 80 Percent of the Past 11,300 Years. Press release. (http:// www.nsf.gov/news/news_summ.jsp?cntn_id=127133&org=NSF&from=news)

[2] Climate Change in Africa: A Guidebook for Journalists, M.Shanahan et.al (2013). UNESCO Publishing, Paris.

[3] See AMCEN, 2011, *Addressing Climate Change Challenges in Africa; A Practical Guide Towards Sustainable Development*. http://www.unep.org/roa/amcen/docs/publications/guidebook_CLimateChange.pdf, H. Besada & N. K. Sewankambo. *Climate Change in Africa: Adaptation, Mitigation and Governance Challenges*. Centre for International Governance Innovation http://www.unicef.org/esaro/Climate_Change_in_Africa.pdf and C. Toulmin, 2009, *Climate Change in Africa*. Zed Books, London.

recognise the rights and needs of the climate-vulnerable poor. Climate justice activists call for the equitable distribution of resources to tackle climate change and for climate-vulnerable people to take part in making decisions about how the money gets spent. These ethical conundrums, of how to ensure fair opportunities for all people and how to ensure that nations and people act according to their responsibilities and capabilities, are at the core of the climate change story at local, national and international levels.

Why media coverage matters

Climate change is not going away. It will get worse before it gets better. For people to seize the opportunities and reduce the risks in the Asia Pacific region, everyone will need to know more about climate change. The way the media covers it will affect how well societies deal with the problem. Climate change will become an increasingly important issue for journalists to cover in order to provide open discussion and access to information for a local response to the global issue of climate change.

As climate change takes hold, people will demand information about what is happening and what they and their governments can do about it. Wise and responsive media managers will see that climate change presents an opportunity to grow and better serve these audiences. Three of the media's traditional roles — informing audiences, acting as watchdogs and campaigning on social issues — are especially relevant. Media coverage will also provide a vital link between the science and the service providers upon which much will depend.

For journalists in the region, coverage of climate change means several things. At the local level, it can save lives, formulate plans, change policy and empower people to make informed choices. Through informed reporting, journalists can shine a light on the wealth of activities that people are already undertaking to prepare for climate change. On an international level, it can bring Asia Pacific stories to global audiences and help encourage the rich and powerful countries, their citizens and the companies based there, to act in solidarity with climate vulnerable communities.

What's the story?

Climate change is not just a story: it is the context in which so many other stories will unfold. As such, it is not a subject solely for science or environment reporters to cover. That's why it is essential for all journalists, editors, media owners and journalism educators to understand at least the basics of climate change and realise that there is more to it than carbon dioxide and disasters. Contrary to popular belief, this is an issue full of stories that can sell newspapers and attract new audiences online, in print and on the airwaves. Here is just a small sample of the kinds of stories journalists can tell. These are all real stories that journalists reported on recently in Asia and the Pacific.[4]

- *Indonesia's government considers new regulation on peatlands in order to reduce emission from fires provoked by deforestation*
- *Floods in Bangladesh and Nepal are causing an outbreak of diarrhea, malaria and dengue*
- *The effects of global warming on the sea level is causing concern among the islanders in the*

[4] See the climate change news archive at *Reuters AlertNet* (www.trust.org/?show=alertnetclimate)

Pacific who are reluctant to relocate to less vulnerable places

- *CCTV web is being used in a Thai city as an instrument for flood warning*
- *India's decision to build 'green houses' will cut down the country's carbon footprint, helping to accomplish climate goals*
- *Small -island states substitute diesel for cheaper and cleaner energy*

What's missing from the media coverage of climate change in Asia and the Pacific?

In doing research for this book, the authors asked climate change specialists from academia, civil society organisations and government agencies in Asia and the Pacific what they wanted to see more of in the media's coverage of climate change. The following responses summarise the main areas for improvement and should give journalists ideas for story angles to consider.

- More stories that demonstrate how climate change affects men and women and vulnerable people, such as elderly people, young people and people with disability, in different ways. Indeed, what are the human rights and gender dimensions of covering climate change?
- More success stories highlighting how people are adapting and mitigating climate change, developing solutions and using new technologies that can limit the consequences of climate change
- More coverage of each nation's roles and responsibilities under the UN climate change convention and what governments say and do at the international negotiations
- More coverage of the status of National Adaptation Programmes of Action and the National Adaptation Plans
- More stories that explain the causes, including climate change, of events such as droughts and floods as well as effects on plants and animals
- More stories that explain the human side of climate change and show this is a 'development' and 'people/human rights' issue, just as much as an environmental one that will affect the way our societies evolve in future across all sectors
- More stories about the business and development opportunities that climate change presents
- More stories on climate finance
- More stories on planning and monitoring the implementation of Intended Nationally Determined Contributions
- More stories on legal responsibilities of carbon emitters

Climate Change Tip – Climate Change Media Coverage and Talking to Skeptics

During the past decade, when we discuss climate change, we often see a voice for, and a voice against, global warming caused by humans (anthropogenic climate change). Often, especially on television panel shows, the voice for the affirmative is a climate scientist and the voice for the negative is a politician or someone else who has agency (perhaps a business person from the fossil fuel industry, or an economic think tank). This scenario suggests a 50-50 split in those for and those against anthropogenic climate change.

The reality is, that 97 percent of climate scientists agree that our warming climate is because of human activity. So a fairer representation would be to have 33 people on one side of the TV desk and one person on the other. We know this would be an impossible task for a journalist on broadcast or even print and online media.

So how did climate skeptics get such big coverage? Climate science does not have all the answers. We did not have temperature gauges in the 15th century, let alone 150,000 years ago. Scientists have used "proxy data", such as ice bores in Antarctica and tree rings in ancient forests to determine how global temperatures have changed over millennia. And these are not exact, which is one argument the climate skeptics have jumped on to suggest that global warming is just the normal ebb and flow of the earth's temperature. However, climate scientists have compiled many different proxy data sets from many different regions, and they all point to one direction – up. Our temperatures are rising.

As journalists, we need to be aware of the skeptics' arguments and how to counter them. We need to consider if we are giving the skeptics too much airtime for some of their arguments, which include "It's the sun", "climate change has happened before" and "climate models are unreliable". We need to consider if the debate has gone beyond skepticism and whether we should be concentrating our stories on the voices that are more vulnerable who are perhaps closer to the effects of climate change.

Resources:
1. A summary of global warming and climate change myths and how to counter them:
Skeptical Science at https://www.skepticalscience.com/argument.php

2. An excellent resource on how to talk to climate skeptics. Before you interview someone, find out if they are a skeptic, and have your counter-arguments ready:
How to talk to the Climate Skeptic at https://grist.org/series/skeptics/

How this book can help

This book is primarily for journalists and editors, and for teachers and trainers of journalists. It aims to support journalists with little time or resources to improve their coverage. It is not an encyclopedia – climate change is too big a topic to cover in such a short volume. While this book does not aim to cover everything, it should enable journalists to understand most of the key

concepts, report on climate change effectively for their specific audience and find more information and interviewees.

- Part One presents general knowledge that every journalist needs in order to report on climate change
- Part Two provides greater detail on different aspects of the impacts of climate change in Asia and the Pacific
- Part Three covers ways to limit climate change and adapt to its effects.
- Part Four explains how governments are enacting policies and plans at national, regional and global levels to deal with climate change
- Part Five provides tips and advice to help journalists improve their reporting
- Part Six presents some additional reference material and sources of information

Climate change in quotes

"The Asia Pacific region, while experiencing impressive economic growth is beset by economic, social and ecological imbalances. The region is a frequent victim of climate change-related natural disasters and accounted for about 80 per cent of global casualties in natural disasters during the last 7 years. It is true that there has been a significant growth in emissions in the region, but on per capita terms, developing countries are still far below the levels of emissions in developed countries. The challenge for the region's developing countries is whether they can switch to a less polluting pattern of production while maintaining the growth and development they require."[5]

Noeleen Heyzer
Former Executive Secretary of the United Nations ESCAP

"Throughout Asia and the Pacific, consequences of climate change are already impacting nations and communities across many different sectors. Rising sea levels, intensifying winters, prolonged droughts and increased risk of floods are but some of the impacts of climate change in Asia and the Pacific. In the midst of a changing environmental context, governments strive to achieve and maintain water, food and energy security, while the people adapt day-to-day to preserve their livelihoods, homes and ways of life. As the struggle for access to natural resources intensifies, the need for trans-boundary and regional management of resources will increase."[6]

Masataka Watanabe
Chair of the Asia Pacific Adaptation Network

"To stay off the worst effect of climate change we need a dramatic shift towards low carbon growth. Asia Pacific countries are well positioned to lead this transition considered that carbon markets are now being implemented across the region. The technology center that is a key player in Asian Pacific economies is positioned to be a key player in climate response with ICT solutions able to reduce emissions across six sectors of the global economy."[7]

Christiana Figueres
Executive Secretary of the UNFCCC (2010-2016)

"Climate change is affecting everyone in the world, but we all have different stories about how it is affecting us. In some places it is flood, in some places it is fire, in some places it is losing your home, in some places it is about food and water. We have to realise that we are interconnected and we need to be able to tell those stories and we need to be able to tell

[5] See Noeleen Heyzer's speech at the United Nations Climate Change Talks, 5 October 2011 (http://www.unescap.org/speeches/opening-remarks-united-nations-climate-change-talks)
[6] See Sawhney, P. and M. Perkins (Eds.), 2015, Emerging Climate Change Adaptation Issues in the Asia-Pacific Region, IGES (http://www.gwp.org/globalassets/global/gwp-sas_files/apan/emerging-issues-apan_0_0.pdf)
[7] See Christiana Figueres' message delivered to Climate Security in the Asia-Pacific Region conference in 2013 (http://www.youtube.com/watch?v=UENuPDIlhoM)

those stories of hope."[8]

Julianne Hickey
Director of Caritas Aotearoa New Zealand

"As well as ensuring decisive action to limit global warming, we must also do a lot more to make nations and communities more resilient to the effects of climate change. We know we are all going to have to adapt. But we must make special provision for those who are most vulnerable and have the least resources to cope with the catastrophic consequences we are witnessing all around us."

Voreqe Bainimarama
Prime Minister of Fiji in an address to the UN General Assembly on 21 September 2017

"Climate change is real. It is happening right now, it is the most urgent threat facing our entire species and we need to work collectively together and stop procrastinating."
Leonardo DiCaprio,
Public Figure, Actor, Founder of the Leonardo DiCaprio Foundation, and United Nations Messenger of Peace on Climate Change

Ten things every journalist should know about climate change and sustainable development

[8] See K. Hutt, 2017. Pacific voices, culture key to climate change adaptation, say journalists, Asia Pacific Report, 29 August 2017 (https://www.asiapacificreport.nz/2017/08/29/pacific-voices-culture-key-to-climate-change-adaptation-say-journalists/)

This section introduces concepts that every journalist should know about climate change. There are more details about each of these topics later in the book.

How we know what we know about the climate?

Scientists use weather stations, balloons, satellites and other instruments that measure the properties of our climate and atmosphere to create a picture of the current situation. This includes measuring temperature on land and the surface of the sea, the concentration of carbon dioxide in the atmosphere, the intensity of storms, the density of forests and the sources of greenhouse gas emissions. To get a picture of our past climate they need to use different methods. One way is to study the rings that form in tree trunks with each year's growth. Their size and other properties reveal something – but not everything – about the local climate in the year that each ring grew. Another approach is to drill out long cores of ice and examine the contents of the small air bubbles within the ice. The bubbles contain a sample of the air and scientists can use its properties to estimate the temperature, precipitation, concentration of greenhouse gases and amount of forest fires at the time the ice formed. They have analysed gas trapped in ice cores to understand how our climate has changed over hundreds of thousands of years. To get a picture of our future climate, scientists use computer models that draw upon thousands of pieces of information about the current and past climates to make projections about what will happen if greenhouse gas emissions continue to rise.

The difference between climate and weather

Weather is what we experience from day to day. Climate refers to the average condition a place experiences over many years. Climate variability refers to natural changes through which the conditions differ from the long-term average. This can include periodic changes in rainfall linked to monsoons or to the natural events called "El Niño" and "La Niña" through which ocean currents affect rainfall. Climate change, by contrast, refers to long-term (decades or longer) trends such as the increase in the global average temperature over the past century. It also includes long-term changes in climate variability such as changes to the number and scale of droughts, floods and other extreme events. When scientists and policymakers talk about "climate change" today they tend to mean the portion of climate change that human activities cause, or, "anthropogenic" climate change.

How human activities affect the climate

Some gases such as carbon dioxide and methane can trap heat in the Earth's atmosphere, through a phenomenon scientists call the greenhouse effect. Many human activities emit these greenhouse gases. When we burn fossil fuels such as coal and oil to produce electricity or drive cars, or when we clear forests to grow crops more of these emissions reach the atmosphere. Ever since the start of the Industrial Revolution in the mid-18th century, these gases have increased in concentration. At the same time the Earth has experienced a gradual warming. This global warming is the cause of the climate change that scientists say we need to understand and limit. Part 2 of this book covers the greenhouse effect in more detail.

Impacts of climate change

The immediate impacts of rising temperatures include rising sea levels, less predictable weather and more extreme events such as droughts, floods and storms happening more often. The changing temperature and rainfall patterns can produce additional effects on water supplies, crops, animals and their pests and pollinators, and on organisms that cause disease. They can also have physical impacts on infrastructure, and all of these impacts can combine

to create additional social, economic and political impacts. While it is difficult to prove that any single event is the result of climate change, many climatic trends and events that have been observed already are consistent with scientific predictions.

Mitigation and adaptation

The two main strategies for reducing the threat climate change poses are mitigation and adaptation. Mitigation refers to any activities that reduce the overall concentration of greenhouse gases in the atmosphere. This includes efforts to switch from fossil fuels to renewable energy sources such as wind and solar, or to improve energy efficiency. It also includes efforts to plant trees and protect forests, or to farm land in ways that prevent greenhouse gases from entering the atmosphere. Adaptation refers to activities that make people, ecosystems and infrastructure less vulnerable to the impacts of climate change. This includes things like the building up of defences (both human-made or natural) to protect coastal areas from rising seas, switching to drought or flood resistant crop varieties, and improving systems to warn of heatwaves, disease outbreaks, droughts and floods.

Use climate change story-telling to contribute to REDD+

REDD+ is "reducing emissions from deforestation and degradation" by offering incentives to developing countries to reduce emissions from clearing lands, including mangroves. 55 percent of the world's mangroves are housed in Asia and the Pacific region and sadly, more than 48 percent of the global total loss of mangroves from 2000-2012 happened in Indonesia alone, with Malaysia, Papau New Guinea and Myanmar also contributing, so REDD+ and deforestation is a critical issue for the region. Journalists can use story-telling from communities who live near mangroves to inform their countries' nationally determined contributions on CO_2 emission reductions[9].

The Intergovernmental Panel on Climate Change and UNFCCC

The main scientific authority on climate change is the Intergovernmental Panel on Climate Change (IPCC), which the UN set up in 1988. The IPCC gathers thousands of scientists to review the global body of knowledge about climate change and summarise it in reports that policymakers can use. Every few years the IPCC produces an Assessment Report. Before the IPCC published these, scientists first review them and then governments review and endorse them. The 5th and latest assessment report was released in 2014 and it was agreed that the warming of the climate was unequivocal and that the human influence on this rapid change was clear.[10]

The UN Framework Convention on Climate Change

The UN Framework Convention on Climate Change (UNFCCC) is an international treaty that nearly 200 governments adopted in 1992 with the aim of preventing dangerous climate change. The signatories come together on a regular basis to review progress and negotiate new action during the Conference of Parties (COP). Through this treaty, COP3 produced the Kyoto Protocol, the agreement that required some industrialised countries to reduce their emissions of greenhouse gases. At the COP21 in December 2015, the Paris Agreement[11] produced and brought about unprecedented cooperation for governments to reduce greenhouse gas emissions.

[9] Hamilton, S. E., & Friess, D. A. (2018). Global carbon stocks and potential emissions due to mangrove deforestation from 2000 to 2012. Nature Climate Change

[10] See https://www.ipcc.ch/report/ar5/

[11] See http://unfccc.int/paris_agreement/items/9485.php

Paris Agreement

The Paris Agreement[12] builds upon the UNFCCC and for the first time brings 178 nations[13] into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort. The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change. To reach these ambitious goals, appropriate financial flows, a new technology framework and an enhanced capacity building framework will be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives.

Sustainable Development Goals – No One Left Behind

Heads of State, Government leaders, UN High Level Representatives and civil society met in September 2015 at the 70th Session of the United Nations General Assembly, and adopted the Sustainable Development Goals (SDGs). These 17 Goals represent a universal, ambitious, sustainable development agenda, an agenda of the people, by the people and for the people. At its core, is a pledge to leave no one behind. "Underpinning the renewed focus on inclusion and social justice is the realization that the benefits of social and economic progress have not been equitably shared".[14]

[12] See Summary of the Paris Agreement. Available at http://bigpicture.unfccc.int/#content-the-paris-agreemen

[13] When the Paris Agreement first entered into force on 4 November 2016, 55 countries ratified the agreement. As of June 2018, 178 out of 197 Parties to the Convention have ratified the agreement.

[14] See *Leaving no one behind: the imperative of inclusive development in the Report on the World Social Situation (2016). Available at* http://www.un.org/esa/socdev/rwss/2016/full-report.pdf

Figure 1: Chhattisgarh Irrigation Development Project in India. Photo credit: Asian Development Bank

Vulnerability and resilience

There are many kinds of vulnerability. Low-lying coastal countries and small islands face risks very distinct from those that landlocked or mountainous nations face. Small countries whose economies depend on few sectors are vulnerable in ways which bigger countries with large populations of poor citizens are not, and vice versa. Organisations that have tried to make sense of these differences include non-profit organisation DARA and the Climate Vulnerable Forum. They developed the Climate Vulnerability Monitor[15] to assess and track changes to the vulnerability of 184 countries. This index considers each country's exposure to extreme weather events and other climatic risks, its sensitivity to environmental change, dependence on environmental goods and services, and its economic, technical and political capacity to adapt to climate change.

Within countries, the picture becomes even more complex, as the vulnerability of individuals and communities varies greatly, as does the extent to which different businesses, economies, ecosystems and infrastructure are vulnerable. At all scales, vulnerability is linked to wealth and power: often it is the poorest and most marginalised of people who are most vulnerable. That said, rich people and wealthy countries are not immune to the effects of

[15] See Climate Vulnerability Report 2010. Available at http://daraint.org/climate-vulnerability-monitor

climate change. Across all groups, the very old and the very young are most at risk from any health-related impacts of climate change, and, in general, women are more vulnerable than men. Mortality rates during extreme weather events are often greater for women than they are for men, as women face many social, economic and other barriers that limit their capacity to protect themselves. The same groups of people most vulnerable to climate change impacts tend also to be the ones least able to adapt.

When storms or floods hit cities, it is generally the urban poor that are hit hardest in terms of deaths and injuries. Most houses in informal settlements are poorly built and thus more likely to collapse when hit by storms or floods. Many informal settlements develop on dangerous sites such as floodplains or unstable slopes because housing on safer sites is too expensive. As a result, large sections of the urban population are very vulnerable to any increases in the frequency or intensity of storms, floods, landslides or heat waves, droughts, and to increased risk of disease, constraints on water supplies or rises in food prices.

Many factors affect resilience, the ability to deal with disturbances and return to normality soon after. They include diversity (as when farmers grow many kinds of crop, or when economies do not depend largely on a single sector), adaptability (as in flexible governance, capacity to respond fast to change), strong reserves (finances, food, knowledge and biodiversity, such as seed banks), and strong social capital (such as leadership and social networks).

Climate Change Story: Asia's coming energy challenges

The energy landscape in Asia will face major changes in the coming years. The region comprises extremely diverse countries with vast differences in their levels and patterns of energy consumption and production. Furthermore, according to the National Bureau of Asian Research, energy demand in Asia will continue to grow and consequently there will be higher carbon emissions, turning the region into a key player regarding climate change goals.[16]Among the most damaged countries are Nepal, where hydropower energy is at risk due to increased flooding, landslides and sedimentation[17] and Cambodia, where the effects of climate change will hamper hydropower performance.[18]

[16] See M. Izham, C. Gillispie et al., 2016. Asia's Energy Security amid Global Market Change. NBR Special Report #63, December 2016. (http://www.nbr.org/publications/specialreport/pdf/Free/052217/SR63_AsiasEnergySecurity_December2016.pdf)

[17] See R. Bhushal, 2015. Nepal's hydropower output falling due to climate change, developers claim. The Third Pole, 20 July 2015. (http://www.fao.org/docrep/ARTICLE/WFC/XII/1022-B1. HTM).

[18] See R. de Ferranti, D. Fullbrook et al., 2016, Switching On: Cambodia's Path to Sustainable Energy. *Mekong Strategic Partners*, March 2016. (https://mekongcitizen.org/wp-content/uploads/2015/11/Switching-On-Cambodias-Path-to-Sustainable-Energy-Security.pdf)

Gender dimensions of climate change

Climate change is a global phenomenon; as such, all people are vulnerable to its impacts. And, yet, one major demographic in particular disproportionately bears the brunt of shifting weather patterns: women. The fact that the world's women must suffer the consequences of a warming planet more acutely than their husbands, brothers and fathers is made all the more ironic by the fact that women have repeatedly found themselves at the margins of the political decision-making process. And, yet, while an increasing number of stories highlight the human costs of climate change, few recognize the inherent gender dynamic present when discussing the causes, impacts and response to global warming.

In the strictest sense, there is an argument to be made that climate change has claimed the lives of more women than men. A 2006 London School of Economics paper studied 4,605 natural disasters in 141 countries and found that, particularly in countries with a high level of discrimination against women – say, not being able to move freely without a male escort – casualties were higher among women than among men.[19] With the number of weather-related natural disasters having quadrupled in the past two decades,[20] a pattern that is only predicted to exacerbate in the future – our changing climate is set to further endanger women's lives.

But the threat climate change poses to women is hardly limited to natural disasters. Often constrained by laws and cultural norms that limit their economic opportunities, many women in developing countries depend upon agriculture. Indeed, women produce roughly 60 per cent of the world's food and in Asia the number of women that have a role on agriculture of livestock system is very high.[21] Even within the already challenging sector of subsistence agriculture, women face additional obstacles like land ownership restrictions (women own approximately one per cent of the world's land[22]) which allow for very few women to gain financial control over any productive land upon which they may farm.

What does climate change mean for women in agriculture? Desertification in arid regions forces women and girls to spend more time to travel further to collect scarce resources such as water and firewood – leaving less time for education or other means of generating income. Lower crop yields due to drought or flood lead to emptier pockets after the harvest, and emptier plates for children. And with rising temperatures driving up the risk of certain diseases, women, as the primary family caregivers in many communities, must devote time to sick family members that they would otherwise spend in their fields, on other work or studies.

[19] See E. Neumayer and T. Plumper, 2006. The Gendered Nature of Natural Disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981-2002. London School of Economics. (http://www.lse.ac.uk/geographyAndEnvironment/whosWho/profiles/neumayer/pdf/ Disastersarticle.pdf)

[20] As reported in a November 2007 Reuters story 'Disasters quadruple over last 20 years: Oxfam'(http://www.reuters.com/article/2007/11/25/us- britain-climate-oxfam-idUSL2518480220071125)

[21] See the Asian Development Bank, 2013. Gender Equality and Food Security. Women's Empowerment as a Tool against Hunger. FAO and The World Bank (http://www.fao.org/wairdocs/ar259e/ar259e.pdf)

[22] See R. Lefton, 2013. Gender Equality and Women's Empowerment Are Key to Addressing Global Poverty. Centre for American Progress. (http:// www.americanprogress.org/issues/poverty/news/2013/03/11/56097/gender-equality-and-womens-empowerment-are-key-to-addressing- global-poverty/)

As climate change worsens in developing countries, threatening in particular the livelihoods of families heavily dependent on subsistence agriculture, women around the world can expect to face even greater hurdles in achieving sufficient education, greater economic opportunities and gender equality.

This gender imbalance on the local level is mirrored on the global scale, as evidenced by the dominance of men across the international decision-making process. One need look no further than to the heavily skewed gender composition of the major summits on climate change. There has yet to be a conference of parties to the UN Framework Convention on Climate Change (UNFCCC) at which at least one-third of negotiators were women, or at which women comprised at least one-fifth of delegation heads.[23]

Women are also underrepresented in the world's leading body of climate-change researchers — the Intergovernmental Panel on Climate Change (IPCC) — whose reports inform the UNFCCC negotiations. There has been some improvement in terms of gender balance in the composition of the IPCC's senior management that includes the IPCC chair, three vice-chairs, eight working group co-chairs and vice-chair. There are currently eight women serving in the panel's senior management from five women in 2007.[24]

The implications of women's absence from these two leading bodies of climate change researchers and responders are profound. Women represent over half the global population, and not only does their disempowerment prevent us from understanding the true extent to which climate change is disrupting the way of life for our most at-risk communities, it also perpetuates the antiquated narrative that women are mere victims rather than agents of change. Indeed, from growing drought-tolerant crops in Kenya[25] to drawing upon indigenous knowledge to protecting farmlands against monsoons in India,[26] women around the world are demonstrating that adapting to and mitigating climate change is possible.

This institutional exclusion is slowly decreasing. In 2012, the nearly 200 governments at the UN climate change talks agreed to promote gender equality in the negotiations.[27] Still, this decision is non-binding, and only "encourages" equal representation of genders in future negotiations. The UNFCCC also launched the "Lima work programme on gender" in a climate summit in Lima, Peru in 2014 which made gender consideration a standing agenda item.[28] On December 12, 2015, Parties to the UNFCCC agreed on the landmark Paris Agreement which highlighted that "climate change is a common concern of humankind' that must consider gender equality and the empowerment of women. Furthermore, the Sustainable Development Goals (Goal 13) adopted in 2015 and came into effect in January 2016 also included targets that focus on raising capacities for effective climate change-related planning

[23] See M. Shanahan, 2013. Missing women hold key to sluggish climate talks, published online by Responding to Climate Change (http://www. rtcc.org/2013/04/10/missing-women-hold-key-to-sluggish-un-climate-talks/)

[24] **See http://www.ipcc.ch/organization/bureaumembers.shtml**

[25] See I. Esipisu, 2013. Kenyan MPs to champion rural women's influence on climate policy. Thomson Reuters Foundation (http://www.trust.org/ item/20130610132743-oypdg/)

[26] See S. Paul, 2012. Inequality deepens climate challenge for India's women farmers. Thomson Reuters Foundation. (www.trust.org/ item/20121030094100-ik53r/)

[27] See UNFCCC website on Gender and Climate Change (http://unfccc.int/gender_and_climate_change/items/7516.php)

[28] **See https://cop23.unfccc.int/fr/node/381**

and management for women, youth and marginalized communities[29].

Climate Change Story: Renewable energy and women

Shifting to renewable energy is one way of mitigating climate change. It can also play an important role in improving the health and wealth of women in poor or rural communities. Women and children are disproportionately exposed to indoor air pollution from burning wood and coal inside as cooking and heating fuels. According to the World Health Organization: "Women exposed to heavy indoor smoke are three times as likely to suffer from chronic obstructive pulmonary disease (e.g. chronic bronchitis) than women who use cleaner fuels".[30] Granting rural communities access to and control over clean and renewable energy sources is crucial to protecting them against harmful diseases and providing an opportunity for them to manage their own economic futures. Ensuring sustainable fuel for cooking and heating homes is an example of the Sustainable Development Goals numbers 5, 7 and 13 working together for positive human development.

[29] **See http://indicators.report/goals/goal-13/**

[30] World Health Organization, 2011. Indoor air pollution and health. Fact sheet 292 (http://www.who.int/mediacentre/factsheets/fs292/en/).

Part Two:
The problem in-depth

Why is the climate changing?

Greenhouse Gases, the Greenhouse Effect and Global Warming

The Earth receives energy from the sun in the form of ultraviolet rays (light) and releases some of this energy back into space as infrared rays (heat). Gases can absorb some of this outbound energy and re-emit it as heat. These gases – which include, carbon dioxide, methane, nitrous oxide and others – are called 'greenhouse' gases. They act like a blanket that surrounds the Earth and keeps it warmer than it would otherwise be, just as the glass panes of a greenhouse allow the sun's energy to enter but prevent some of the heat from escaping. Without this natural process, known as the greenhouse effect, our planet would be on average about 30 degrees Celsius cooler[31], so a naturally occurring greenhouse effect is essential. But too much of an effect will create problems. Human activities over recent generations have artificially raised the concentration of greenhouse gases in the atmosphere and scientists conclude that this is why the planet has warmed in recent history. But, because greenhouse gases can last in the atmosphere for a long time, even if all emissions worldwide stopped today, the climate would continue to change.

The greenhouse effect is not a new discovery. Joseph Fourier discovered it in 1824, John Tyndall experimented on it in 1858, and Svante Arrhenius quantified it in 1896. Since then scientists have provided growing evidence not only that the concentration of greenhouse gases in the atmosphere has increased, but also that this increase threatens to cause dangerous climate change. Measurements from Antarctic ice cores show that for about 10,000 years before the Industrial Revolution, the concentration of carbon dioxide in the atmosphere was about 280 parts per million (ppm) by volume. Since then it has risen rapidly in 2013 to the concentration of 400 ppm, a threshold that last occurred over three million years ago. Then, the world on average was 3-4 degrees Celsius warmer than it is today and sea levels were much higher.

What emits greenhouse gases? Whose emissions are they?

Major sources of greenhouse gas emissions from human activities include power generation (about 25 per cent of all emissions), transport, industrial activities, deforestation and agriculture. Countries have historically varied greatly (and continue to today) in the type, source and amount of greenhouse gases they emit. The biggest emitter overall today is China, but its large population means that emissions per person (per capita) are lower than in many other countries. Historically the United States has emitted more greenhouse gases than any other country and today its per capita emissions are still among the highest worldwide, 100-200 times greater than per capita emissions in most nations in Asia and the Pacific. The question of who is responsible for climate change becomes complicated when consumer demand in one country increases emissions in another.

[31] **See *Greenhouse gases: Refining the role of carbon dioxide*. Available at https://www.giss.nasa.gov/research/briefs/ma_01/**

Climate Change Story: Emissions in Asia and the Pacific[32]
Emissions in the region are high in both absolute and per capita terms. Many Asian countries are included in the top 20 emitting countries by total fossil-fuel CO_2 emissions such as People's Republic of China, India, Japan, Islamic Republic of Iran, Republic of Korea, Indonesia, Australia, Turkey and Thailand.

There are 21 countries in Asia and the Pacific with annual CO_2 emissions in excess of 10 million metric tons of carbon. Sixteen countries have per capita CO_2 emissions higher than the global average (1.4 metric ton of carbon per year): Brunei Darussalam (5.95), Australia (4.17), Kazakhstan (3.9), Turkmenistan (3.52), Palau (3.37), Republic of Korea (3.2), Taiwan (3.08), Singapore (2.79) and others. Based on 2014 per capita emission rates, only four nations in Asia and the Pacific for which data are available have per capita emission rates less than 0.1 metric ton of carbon per person per year.

What else affects the global climate?
Greenhouse gases are not the only things to affect the temperature of the atmosphere and the Earth. The sun's rays vary in strength. Periodic events called El Niño and La Niña alter the circulation of warmer and cooler water in ocean currents, leading to changes in climatic patterns across large regions. Clouds reflect sunlight back into space and, in doing so, reduce the amount of energy that reaches the Earth. Additionally, when volcanoes erupt they produce tiny particles that also reflect light energy in this way. Conversely, particles of black carbon or soot absorb heat. Transport fuels and burning forests and vegetation produce these particles, which scientists think have a warming effect about two-thirds as strong as that of carbon dioxide.

How much heat?
Global warming is just that – global. It refers to the worldwide average increase in temperature above a long-term average. The global average temperature rose by about 0.85 degrees between 1880 and 2012, and the rate of warming has accelerated over the past 50 years, according to the Intergovernmental Panel on Climate Change.[33] Global averages mask big differences in warming between regions. In general there is more warming over land than the oceans and more warming at the poles than in the tropics. Global warming does not increase at a constant rate. From year to year the global average temperature can increase or decrease, but over decades the warming trend is clear. The reasons for these variations include the fact that much of the excess heat that greenhouse gases trap moves into the oceans, including into deep waters.

How much more heat?
Climate sensitivity is the term scientists use to explain how much the temperature will change

[32] See Boden, T.A., G. Marland, and R.J. Andres, 2014. Global, Regional, and National Fossil-Fuel CO_2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, United States (http://cdiac.ornl.gov/trends/emis/overview_2014.html).

[33] See T. Stocker et al. (eds.), 2013. Climate Change 2013: The Physical Science Basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers. (http://www.climatechange2013.org/images/uploads/WGI_AR5_SPM_ brochure.pdf).

because of the factors that affect the climate system. One of the main ways to understand climate sensitivity is to ask how much the temperature will rise if the concentration of the greenhouse gas carbon dioxide doubles to 560 parts per million (ppm) from 280 ppm, the level it was before the Industrial Revolution. On current trends, this will happen between 2050 and 2070. Scientists differ in their estimates of how much the world will warm as a result. The Fifth Assessment Report of the IPCC said in 2013 that this figure was "likely to be in the range 2°C to 4.5°C with a best estimate of about 3°C, and is very unlikely to be less than 1.5°C".[34]

Three critical ways global warming creates problems

Rising temperatures have three significant effects that create problems

Erratic precipitation

Where, when and how much rain falls, can affect people's health and livelihoods and too much or too little precipitation can have devastating effects. Until recently, rain and snow fell in fairly regular patterns that determined, among other things, when farmers planted and harvested crops. But as the oceans and atmosphere have warmed, both the amount of water evaporating and the amount of moisture the air can hold have increased. As a result, we can predict more overall rainfall as the planet continues to warm.

But what's true for one region may be just the opposite for another, leading to more extreme and less predictable precipitation. Most scientific rainfall models predict that high latitude countries, as well as tropical East Africa, will receive more precipitation, while the Amazon Basin, Mediterranean and North Africa, Central America, the Southern Andes and parts of Australia are likely to receive less. Complex climate phenomena such as the South Asian and West African monsoons are proving harder to model and for many tropical and subtropical countries, scientists have less confidence in their predictions.

Extreme events

Heat waves, tropical cyclones, extreme rainfall, floods, wildfires and droughts are all examples of natural disasters that may or may not become more common as our climate changes. In 2011, the IPCC) produced a special report on such events.[35] It noted that while there is evidence that some extremes have changed since the 1950s, scientists are unsure how much these changes reflect a new reality for different regions and extremes (see Climate Change Tip: Attribution, or "is it climate change?"). That said, climate scientists do predict that climate change will lead to more extreme weather events.

Extreme rainfall raises the risk of soil erosion, landslides and flooding, which can threaten agricultural productivity and infrastructure, posing serious threats to people's economic and physical security. Floods can also contaminate water supplies and increase the likelihood of

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[34] See T. Stocker et al. (eds.), 2013, Climate Change 2013. The Physical Science Basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers. (http://www.climatechange2013.org/images/uploads/WGI_AR5_SPM_ brochure.pdf).

[35] See C.B. Field, et al., 2011. *Managing the risks of extreme events and disasters to advance climate change adaptation*. Special report of the Intergovernmental Panel on Climate Change. (http://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf).

water-borne disease, such as cholera. By contrast, too little rainfall can lead to droughts, which can devastate crops and livestock, deplete food supplies and increase the risk of wildfires.

Rising seas

Several factors affect sea levels and climate change contributes in two key ways. First, higher atmospheric temperatures lead to higher ocean temperatures and as water warms, its molecules expand, and increases its total volume. Second, rising temperatures also cause glaciers and ice sheets to melt, adding to the total amount of water in the world's oceans. In July 2013, the World Meteorological Organization reported that that global average sea level rise during the decade 2001-2010 was 3 mm per year, almost double the observed 20th century trend of 1.6 mm per year.[36] Rising seas increase the risk of coastal erosion and floods, which can cause immediate physical damage and injury, threaten health with water-borne diseases, and contaminate drinking water and agricultural land with salt. Small islands and low-lying areas of coastal countries are especially at risk, but this problem is ubiquitous; one in ten people on Earth — some 634 million— live fewer than 10 meters above sea level.[37] In Asia, cities like Bangkok, Dhaka, Guangzhou, Ho Chi Minh City, Kolkata, Manila, Mumbai, Shanghai and Yangon are highly vulnerable to rising sea levels, floods and other impacts of climate change.[38]

Climate Change Tip: Attribution, or "is it climate change?

It is difficult to prove scientifically that any single event is the result of climate change. Journalists can therefore rarely say for sure whether human activities have made a specific drought or flood or major storm more likely, or whether the event is just part of a natural pattern. However, many extreme events that have occurred already are consistent with what scientists predict climate change will bring, so journalists can always explain individual events in terms of what scientists say about the changing likelihood of such events. As science advances, it may become easier for scientists to demonstrate whether individual events are linked to climate change. Several attribution studies from the University of Melbourne on the mass bleaching of corals on the Great Barrier Reef found out that warm sea temperatures were 175 times more likely because of climate change.[39]

[36] See World Meteorological Organization, 2013. *The Global Climate 2001-2010, A Decade of Climate Extremes* (http://library.wmo.int/pmb_ged/ wmo_1119_en.pdf) and the associated press release (http://www.wmo.int/pages/mediacentre/press_releases/pr_976_en.html).

[37] See G. McGranahan, 2007. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. *Environment and Urbanization* 19. Pp. 17-37. (http://eau.sagepub.com/content/19/1/17.full.pdf+html)

[38] See Asian Development Bank, 2015. Asia's Booming Cities Most at Risk from Climate Change. Asian Development Bank, 6 May 2015. (https://www.adb.org/news/features/asias-booming-cities-most-risk-climate-change)

[39] See G. Readfearn., 2016. Was that climate change? Scientists are faster at linking extreme weather to warming. The Guardian, 14 September 2016. (https://www.theguardian.com/environment/planet-oz/2016/sep/15/was-that-climate-change-scientists-are-getting-faster-at-linking-extreme-weather-to-warming).

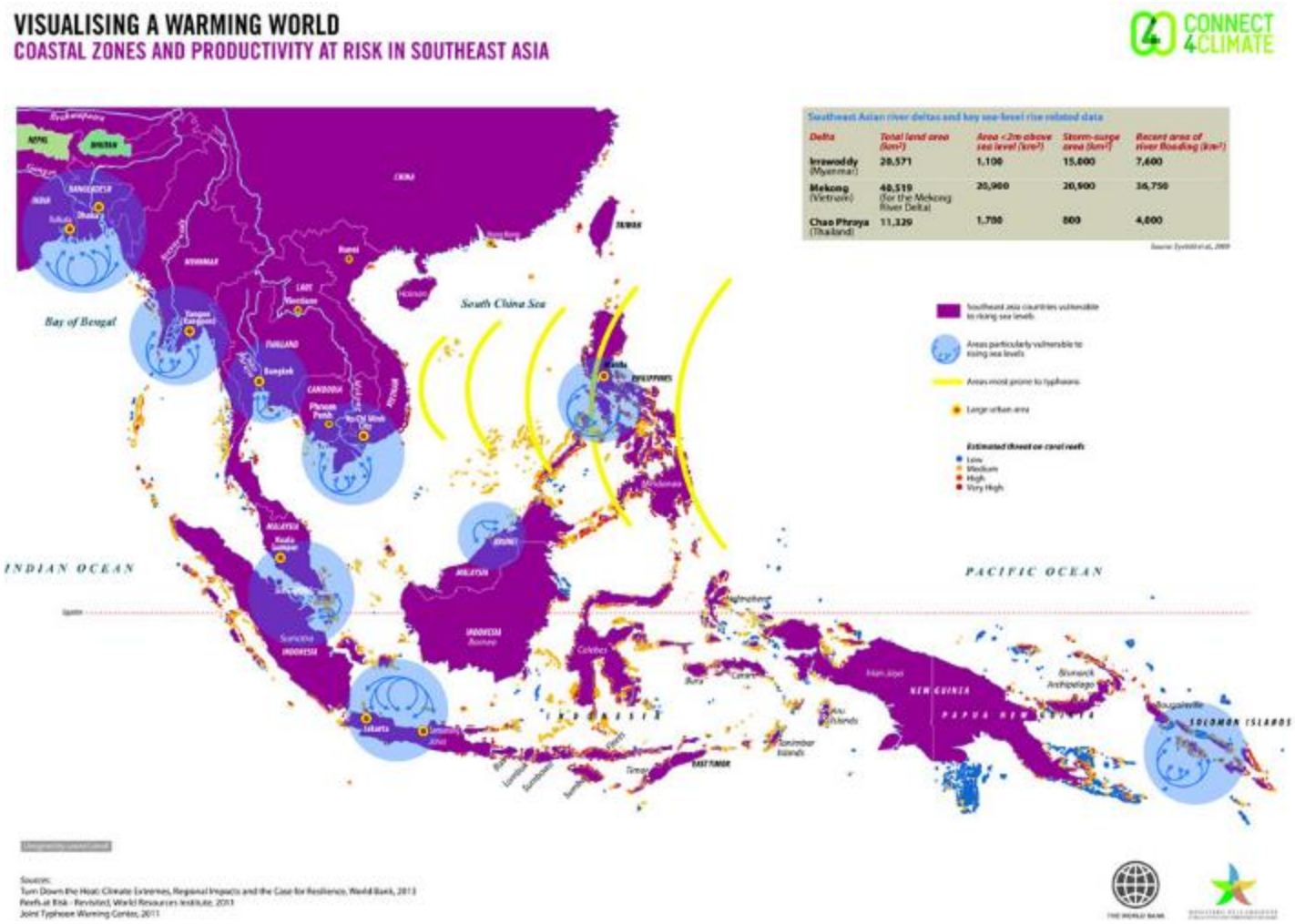

Figure 2: Visualising a Warming World: Coastal Zones and Productivity at Risk in Southeast Asia. Credit: Laura Canali & Connect4Climate, 2013

What climate change means for agriculture and food security

Rising temperatures and the extreme events, such as droughts and floods, are likely to threaten crops and livestock across the region. Climate change can have indirect effects too by affecting the pollinators, pests, weeds and parasites. Together, these changes have already been linked to rising food prices, reduced food security and increased malnutrition — three trends that show little signs of slowing. According to the IPCC, the changes in cereal crop production show an increasing stress on resources induced by climate change in many Asian countries.[40]

Figure 3: Decentralised Rural Infrastructure and Livelihoods Project in Nepal. Credit: Asian Development Bank.

Climate Change Story: Vanuatu Develops Drought-Resistant Crops in Response to Climate Change[41]

Sweet potato is a stable food for over 70 percent of the Vanuatu population, most from rural areas, where they depend on traditional agriculture to provide for their dietary needs and income. Mr. Pakoa Leo, an agricultural expert and Coordinator of the Vanuatu Coastal Adaptation Project (VCAP) said "there are new challenges as a result of climate change and as a result some of the crops of sweet potato are not as resistant." According to Leo, more extreme temperature and precipitation can prevent crops from growing and extreme events, especially floods and droughts, can harm

[40] See IPCC, 2007. Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability. Agriculture and Food Security (www.ipcc.ch/publications_and_data/ar4/wg2/en/ch10s10-4-1.html).

[41] See original story at https://www.huffingtonpost.com/entry/vanuatu-develop-drought-resistant-crops-in-response_us_58dd9bd5e4b0efcf4c66a744

crops and reduce yields. He and his fellow experts from the Ministry of Agriculture in Vanuatu have been cross breeding over 50 varieties of sweet potato to see which will survive through prolonged droughts. The crossbreeding has led to successfully identifying preferred varieties by farmers which can survive drought conditions.

The impact of climate change on agriculture and food security differ depending on the location. Droughts are especially relevant in Central Asia where they have led to negative consequences on cereal crops affecting the availability of world's cereal supplies. Furthermore, high temperatures and low rainfall together have reduced wheat production in countries like Australia and Kazakhstan.[42]

In Southeast Asia, there could be a reduction of around 50 per cent in the most favorable and high-yielding wheat zones as a consequence of heat stress caused from an increase on CO_2 emissions. The areas located in Bangladesh and along the Mekong Delta River will be extremely vulnerable to the sea level rise, which will have profound effects on rice growing zones.[43]

Climate Change Story: Tea Production in India[44]
Although climate change has distressed every tea-producer country, a representative example can be observed in the state of Assam as it is one of the world's largest tea-growing regions. The temperature increase (estimated in 1.3 °C) and a reduction of the rainfall (20 cm per year) together are rendering it difficult to sustain the tea industry due to the effect of warmer temperatures and changing rain patterns that result in crop losses, higher production costs and potential risks to human health.

How climate change can affect human health

The World Health Organization (WHO) estimates that, between 2030 and 2050, climate change is expected to cause 250,000 additional deaths per year.[45] In the Asia and Pacific region where people are potentially more vulnerable than in other areas, rising temperatures and extreme weather events also pose longer term threats as well as the immediate dangers that heat waves, floods and storms can cause, especially.

The WHO notes that the threats to people include:

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[42] See IFPRI, 2012. Global Food Policy Report. International Food Policy Research Institute. (www.ifpri.org/file/23918/download)

[43] Hijioka, Y., E. Lin, et al., 2014. Asia. In: Climate Change 2014: Impacts, Adaptation and Vulnerability. Part B: Regional Aspects. *Contribution of Working Group II to the Fifth Assessment Report on the IPCC* (Barros, V. R., C. B. Field, D. J. Dokken, M. D. Mastrandrea, K. J. Mach, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, and L. L. White (eds.)). Cambridge University Press, Cambridge, United Kingdom and NY, pp. 1327-1370. (www.ipcc.ch/pdf/assessment-report/ar5/wq2/WGIIAR5-Chap24_FINAL.pdf)

[44] See S. Cousins, 2015. Climate change causing a headache for Assam tea growers in India. New Scientist, 12 June 2015. (www.newscientist.com/article/dn27714-climate-change-causing-a-headache-for-assam-tea-growers-in-india/)

[45] See the World Health Organization's fact sheet on climate change and health, updated in July 2017. (http://www.who.int/mediacentre/ factsheets/fs266/en/)

- **Hunger and malnutrition:** As the climate so heavily influences agriculture, changes that reduce yields can threaten food security. For instance, in the Pacific island of Niue, a cyclone in 1990 reversed the food trade during two years[46]
- **Water-borne diseases:** Climatic conditions strongly affect water-borne diseases such as cholera, which cholera thrives during periods of increased rainfall. If these conditions intensify with climate change as projected, scientists expect to see more outbreaks, particularly in areas with poor sanitation or where flooding has occurred
- **Vector-borne diseases:** Climate change's impact on diseases such as malaria is not yet clear. Warmer temperatures may affect the life cycle of mosquitoes in ways that facilitate their transmission of diseases. In too hot and dry a climate, though, mosquitos cannot survive. Other diseases such as dengue fever – caused by a virus that mosquitoes transmit to people – are projected to increase in prevalence

[46] See K. Uji, 2012. The health impacts of climate change in Asia-Pacific. UNDP, Asia-Pacific Human Development Report Background Papers Series 2012/16 (www.asia-pacific.undp.org/content/dam/rbap/docs/Research%20&%20Publications/human_development/aphdr-2012-tbp/RBAP-HDR-2012-APHDR-TBP-16.pdf)

What is climate change going to cost?

The economics of climate change is a new field, and one that is complicated by the difficulty of saying for sure if a specific event is due to climate change or natural variation. Estimates of what climate change will cost vary greatly – but are all big, running to hundreds of billions of dollars per year. Experts tend to agree with the 2007 Stern Review on the Economics of Climate Change, which said the costs of doing nothing would be much higher.[47] The costs of climate change will include:[48]

- Direct damage to infrastructure and crops from extreme weather events such as floods, storms and droughts. Since 1980, the economic damages of weather-related disasters around the world has totaled over an estimated US$1 trillion[49]
- Loss of lives
- Costs of tackling health problems such as disease outbreaks and the injuries people sustain in extreme events
- Loss of ecosystem services – such as crop pollination by insects
- Costs of mitigating climate change and moving towards low-carbon economies
- Costs of adapting agriculture, health and other sectors to the impacts of climate change

Climate Change Story: Counting the costs of climate change in Indonesia[50]
When most of a country's wealth relies on nature, shifts in natural systems can ravage the nation's economy. Indonesia is a case in point. Its geographic constitution and its dependence on natural resources leave the country highly vulnerable to the impacts of climate change. In fact, research by USAID, the United States Agency for International Development suggests the cost of climate change is 1.4 per cent of Indonesian economy as measured through the gross domestic product or GDP. This will cover involving three major areas of impact: agriculture, health and sea level rise. It is recommended that policies and activities designed to tackle climate change are implemented immediately to lessen the future impacts.

In 2015, a World Bank report projected that climate change could reduce 6 percent of the GDP across Asia by 2050. Farmers and poor households will be among the most affected due to the importance of agriculture within the region. According to the World Bank, under a scenario implying high emissions, changes in raining patterns are estimated to reduce crop yields globally by up to 10 per cent by 2030 and up to nearly 35 per cent by 2080.[51] [52]

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[47] N. Stern, 2006. *Stern Review on the Economics of Climate Change*. HM Treasury, London. (http://www.hm-treasury.gov.uk/stern_review_report. htm)

[48] C.B. Field, et al., 2011. *Managing the risks of extreme events and disasters to advance climate change adaptation*. Special report of the Intergovernmental Panel on Climate Change. (http://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf).

[49] Munich Re, 2013. North America most affected by increase in weather-related natural catastrophes. Press release, 17 October 2013. (http:// www.munichre.com/en/media_relations/press_releases/2012/2012_10_17_press_release.aspx).

[50] J. E. Hecht, 2016. Policy Brief. Indonesia: Costs of Climate Change 2050. Prepared by US AID and ATLAS. (http://www.climatelinks.org/sites/default/files/asset/document/Indonesia%20Costs%20of%20CC%202050%20Policy%20Brief.pdf)

[51] World Bank, 2016. ''High and Dry: Climate Change, Water and the Economy''. World Bank, Washington D. C. (https://worldbank.org/en/topic/water/publication/high-and-dry-climate-change-water-and-the-economy)

[52] World Bank, 2016. Bangladesh: Building resilience to Climate Change. Projects and Operations, World Bank (http://www.worldbank.org/en/results/2016/10/07/bangladesh-building-resilience-to-climate-change). Also see World

- In Indonesia's capital city Jakarta, the 2007 flood caused financial losses that amounted to for US$900 million
- Bangladesh, one of the most exposed countries to climate change, has suffered an outsized impact of devastating storms such as the 2009 Cyclone Aila, which caused US$270 million in damages
- The Philippines, which is also listed as a very vulnerable country to weather-related events, has experienced severe damage and losses due to climate change (for instance, Typhoon Haiyan accounted for US$12.9 billion in losses)

Climate Change Story: The costs of climate change in Kiribati[53]

Kiribati is one of the Pacific islands that is projected to become uninhabitable in the future years as a result of the consequences of climate change. Its geography combined with the storms are threatening the population and their livelihood. There are estimated annual damages that amount to approximately $8 million-$16 million only in the capital, Tarawa. Moreover, sea level rise can disturb socioeconomic activities such as shoreline erosion, biosphere damage and lack of supplies and migration of local communities.

Bank, 2014. Philippines: Climate Change a Fundamental Threat to Development. World Bank, 23 May 2014 (http://www.worldbank.org/en/news/press-release/2014/05/23/climate-change-a-fundamenta-threat-to-development-world-bank)

[53] R. C. Asuncion and M. Lee, 2017. Impacts of Sea Level Rise on Economic Growth in Developing Asia. Economic Working Papers Series No. 507, Asian Development Bank, January 2017 (https://www.adb.org/sites/default/files/publication/222066.ewp-507.pdf)

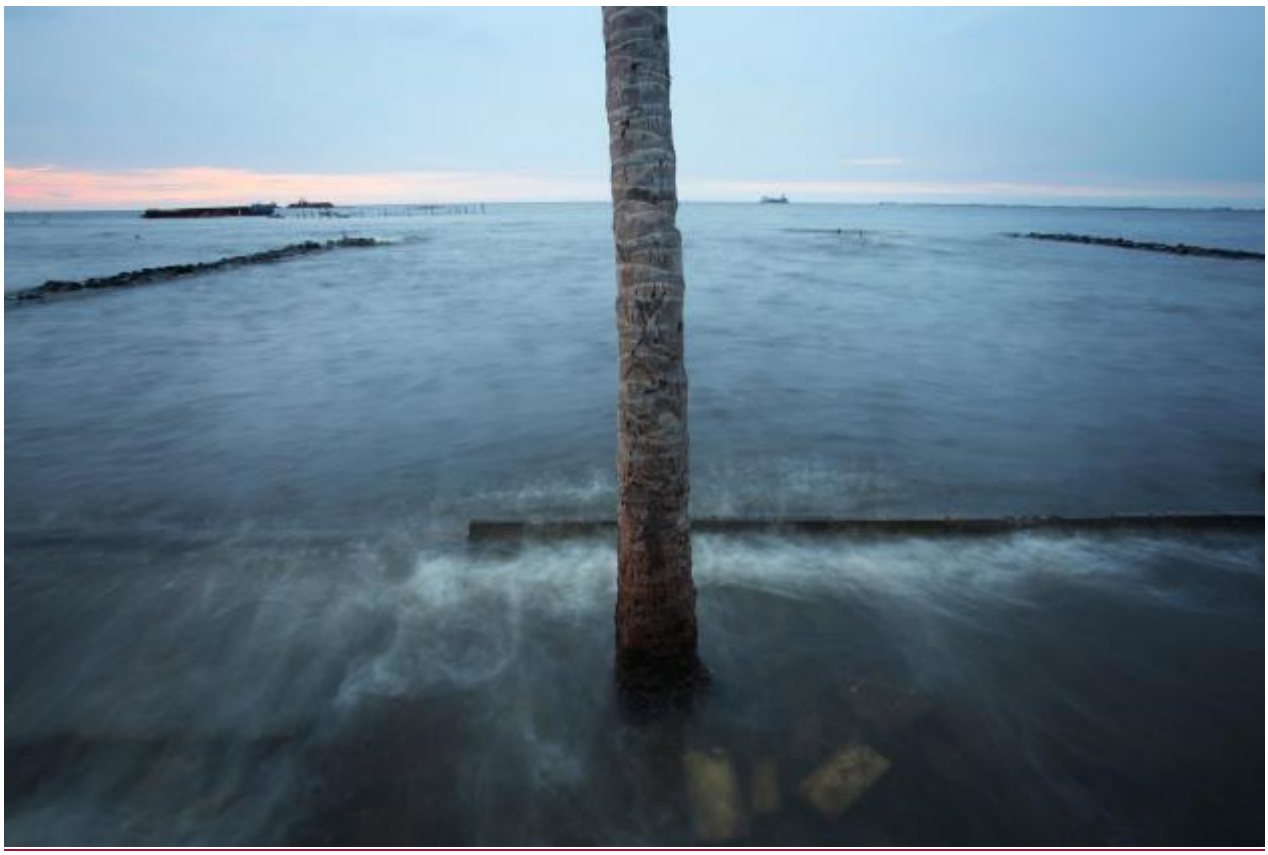

Figure 4 Jakarta, The Sinking City: Waves engulf a tree on the north coast of Jakarta. 40% of the city is now below sea-level and with rising sea-levels more and more areas of the city are flooding, Credit: Sean Gallagher

Costs of adapting to climate change

As reported by the World Bank, the Southeast Asia and Pacific region bears the highest adaptation costs measured in total annual costs of adaptation for all sectors from 2010 to 205;: in the wetter scenario it reaches US$37.6 billion whereas in the drier scenario it reaches US$35.2 billion.[54] Past trends can give us an insight into what projected costs will look like, but changing conditions and external factors will inevitably drive experts to update their findings. What we do know is that climate change has already cost the world trillions of dollars, not to mention the environmental damage and lives lost.

Climate finance

Much of the money needed for climate change adaptation and mitigation will have to come from public and private sources in industrialised countries. This is a principle with which all parties to UN Framework Convention on Climate Change (UNFCCC) have agreed upon. The UNFCCC has set up four funds: The Least Developed Countries Fund, the Special Climate Change Fund, the Adaptation Fund and the Green Climate Fund.

The Global Environment Facility, the World Bank, European Commission and other donors also have a number of other climate funds, such as the World Bank's Carbon Finance Unit, which uses money from governments and companies in Organisation for Economic Cooperation and

[54] S. Margulis and U. Narain, 2010. *The costs to developing countries of adapting to climate change: new methods and estimates – the global report of the economics study*. Washington DC. (http://www.siteresources.worldbank.org/INTCC/Resources/Executivesummary.pdf)

Development (OECD) countries to pay for project-based greenhouse gas emission reductions in non-OECD countries. The World Bank's Climate Investment Funds are made up of four funding windows to help developing countries pilot low-emissions and climate-resilient development[55]

- The Pilot Programme for Climate Resilience, with US$1.2 billion pledged as of 2016, includes projects in Bangladesh, Bhutan, Cambodia, Kyrgyz Republic, Nepal, the Philippines, Tajikistan and the Pacific Region (Papua New Guinea, Samoa and Tonga)
- The Forest Investment Programme, with US$758 million pledged as of 2016, includes projects in Bangladesh, Cambodia, Lao People's Democratic Republic and Nepal
- The Clean Technology Fund, with US$5.8 billion pledged as of 2016, includes projects in India, Indonesia, Kazakhstan, the Philippines, Thailand, Turkey and Vietnam
- The Programme for Scaling up Renewable Energy in Low Income Countries, with US$839 million pledged as of 2016, includes projects in Bangladesh, Cambodia, Kiribati, Mongolia, Nepal and the Pacific Region (Solomon Islands and Vanuatu)

The private sector also plays a role in climate finance — through investments in renewable energy projects and planting trees, for instance. So far, however, finance from all of these sources is just a small fraction of what will be needed.

FinTech and climate change

There is an emerging financial technology which could assist with the financing of climate change. During May 2017 at the COP23 in Bonn, the UNFCCC discussed how new financial technology, such as crypto-currency and Blockchain, could revolutionise the way climate change is financed. A Blockchain is basically a distributed database that continuously updates and verifies transactions through a series of computers. When 51 percent of computers agree that a transaction is correct, they add this block of data and it becomes part of the "ledger", which can be publically seen by the network of members. This new "fintech", according to the UNFCCC could contribute to greater stakeholder involvement and transparency in helping to bring trust and innovative solutions in the fight against climate change.[56] The fintech revolution could bring about improved carbon emission trading, help facilitate, clean energy trading, assist with crowdfunding and peer to peer transactions in support of climate actions, better track greenhouse gas emissions and because of the blockchain ledger, avoid double counting.

Climate Change Story: Fintech and Solar Energy
Power Ledger, a blockhain company in Perth, Western Australia, is already using this fintech to promote solar energy trading. The technology enables consumers to sell surplus renewable energy generated from both residential and commercial developments connected to existing electricity distribution networks or with microgrids.

[55] See https://www.climateinvestmentfunds.org/cif/
[56] See http://newsroom.unfccc.int/climate-action/how-blockchain-technology-could-boost-climate-action/

Climate change and conflict

While the physical and economic impacts of climate change are (at least, relatively) well-documented, experts are still grappling with the political. Until recently, few academics, government officials, development workers or journalists thought to link rising sea levels, shifting weather patterns and environmental degradation with security, despite the strong evidence that conflict over natural resources can fuel violence and war.

Figure 5: One of the flood victims in Bangladesh shows the ground of his hut that is yet unlivable. Credit: Amio James Ascension

In recent years, few countries in Asia and the Pacific have been immune to climate-driven resource pressures. Erratic rainfall has contributed to communal conflict across the Indian subcontinent.[57] In the Tibetan Plateau in particular, the main source of water for the area, climate change is increasing tension and conflict among the neighboring countries.[58] A 2009 UNEP report stated that "the potential consequences of climate change for water availability, food security, prevalence of disease, coastal boundaries, and population distribution may aggravate existing tensions and generate new conflicts".[59]

[57] G. Wischnath and H. Buhaug, 2014. Rice or riots: On food production and conflict severity across India. Political Geography, Volume 43, November 2014. Pages 6-15, Science Direct. (http://www.sciencedirect.com/science/article/pii/S0962629814000602)

[58] A. Khan Lone, 2015. How Can Climate Change Trigger Conflict in South Asia? Foreign Policy, 20 November 2015 (http://www.foreignpolicy.com/2015/11/20/how-can-climate-change-trigger-conflict-in-south-asia/)

[59] UNEP, 2009, From Conflict to Peacebuilding: The Role of Natural Resources and the Environment. UN Environment Programme, Nairobi, Kenya, 44 pp. (http://postconflict.unep.ch/publications/pcdmb_policy_01.pdf)

Figure 6: 'The 3 Rivers: Asia's Threatened Headwaters' from Tibetan Plateau: A young man walks up a plank near Tsyaring Lake, the official source of China's second mightiest waterway, the Yellow River. Temperatures are rising on the Tibetan Plateau twice as fast as anywhere else in Asia, causing concern in scientific circles as to how this will affect the sources of some of Asia's most important rivers. Credit: Sean Gallagher

In 2013, the journal *Science* published several studies on the correlation between climate and conflict. These findings showed that years of low rainfall had increased domestic violence and ethnic conflict in South Asia, probably due to the high reliance of the region on agriculture.[60] Future scenarios pose a high threat of intensifying conflicts as patterns of rainfall are changing among the region. Climate change is best thought of as a "threat multiplier" – not necessarily a catalyst of conflict, but rather an accelerator.

[60] M. Burke, S. Hsiang and E. Miguel, 2013. Weather and Violence. The New York Times. Gray Matter. 20 August 2013 (http://www.nytimes.com/2013/09/01/opinion/sunday/weather-and-violence.htm)

Climate change and migration

Though there is disagreement about the terminology – some use politically -loaded terms such as "climate refugees"- the concept of climate migration has been loosely defined as the forced displacement of individuals or groups by sudden or gradual changes in their environment that adversely affect living conditions.

The factors behind climate migration are numerous and diverse: these "sudden or gradual changes" can include rising sea levels eroding the land beneath coastal communities, the desertification of farmland, or the major damage and flooding that a tropical cyclone can inflict. Water scarcity, too, represents a major threat to human development and security that is certain to exacerbate as temperatures rise. Within Asia Pacific region, agriculture consumes 80 per cent of the resources. The Asian Development Bank estimates that up to 3.4 billion people could be living in water-stressed areas by 2050.[61]

Research shows that most migrants who move to avoid environmental problems do so for relatively short distances and durations and that the poorest and most vulnerable people are the least likely to move.[62] While some governments see migration as a problem and something to discourage, for the migrants themselves movement is a form of adaptation to climate change. Climate migration can be short-term or long-term; an annual movement to cope with yearly flooding, or a sudden response to a natural disaster that has wiped out an entire town. As with many trends, it is impossible to assign total causation for the migration of peoples to climate change; many other social, political, and cultural factors are always involved.

Throughout much of Asia, climate migration is driving urbanisation, one of the defining features of Asia's shifting demographics. According to the UN, by 2050, Asia's urban population will jump from 1.9 billion to 3.3 billion people.[63] While urbanization can propel economic growth, an explosive growth in urban populations can place a strain on cities' limited resources, and further exacerbate existing stresses. For instance, South Asia's fast-growing cities have a large part of its population living in slums, which lack appropriate infrastructure and resources to face natural disasters or consequences of climate change. Furthermore, the ongoing crowding of slums, many of which are low-lying and thus themselves prone to flooding is in turn likely to increase vulnerabilities to malnutrition, poor sanitation, air pollution and disease.

[61] See Asian Development Bank, 2016. Asian Water Development Outlook 2016. Strengthening Water Security in Asia and the Pacific. ADB, The Philippines. (http://www.adb.org/sites/default/files/publication/189411/awdo-2016.pdf)
[62] See IIED, 2009. Radical shift needed to end alarmism over climate-related migration. Press release, 24 June 2009 (http://www.iied.org/radical-shift-needed-end-alarmism-over-climate-related-migration)
[63] United Nations, 2011. Africa and Asia to lead urban population growth in the next four decades. UN Press Release, 4 April 2011 (http://esa.un.org/unup/pdf/WUP2011_Press-Release.pdf)

Climate Change Story: Where migration and conflict meet

In many countries in Asia and the Pacific, the nexus between climate and international security can be clearly presumed. As the effects of climate change set in, escalating migration from Bangladesh into India has been continuously growing. As the rising sea levels and floods remain affecting the region, Bangladeshis will face not only the threats of droughts, flooding and coastal erosion but the increasing number of unauthorized Bangladeshis in the Indian region will probably escalate tensions and conflicts such as the clashes in Assam and West Bengal. Therefore, the political and social implications of an increase in the number of migrants need to be considered.[64]

Climate Change Story: Water problems

Seven of the world's major rivers, including the Mekong, Irrawaddy, Indus, Ganges, Brahmaputra, Yangtze and Yellow River, are fed by the glaciers in the Himalayas and the Tibetan Plateau, which supplies water to roughly 40 percent of the global population.[65] Yet dry season flows appear to be gradually falling as glaciers recede due to rising temperatures and water supplies becomes unstable. This scenario arises concerns about how the issue will develop in the future, especially as the effects of climate change become more severe each year. Potential conflicts result from actions taken in safeguarding previous water resources coupled with border-related issues could have deep consequences for the whole region.

[64] See A. Bhattacharyya and M. Werz, 2012. Climate Change, Migration and Conflict in South Asia. Rising Tensions and Policy Options across the Subcontinent. Center for American Progress. (http://www.cdn.americanprogress.org/wp-content/uploads/2012/11/ClimateMigrationSubContinentReport_small.pdf)

[65] See A. Blondel, 2012. Climate Change Fuelling Resource-Based Conflicts in the Asia-Pacific. Asia-Pacific Human Development Report (http://www.uncclearn.org/sites/default/files/inventory/undp304.pdf)

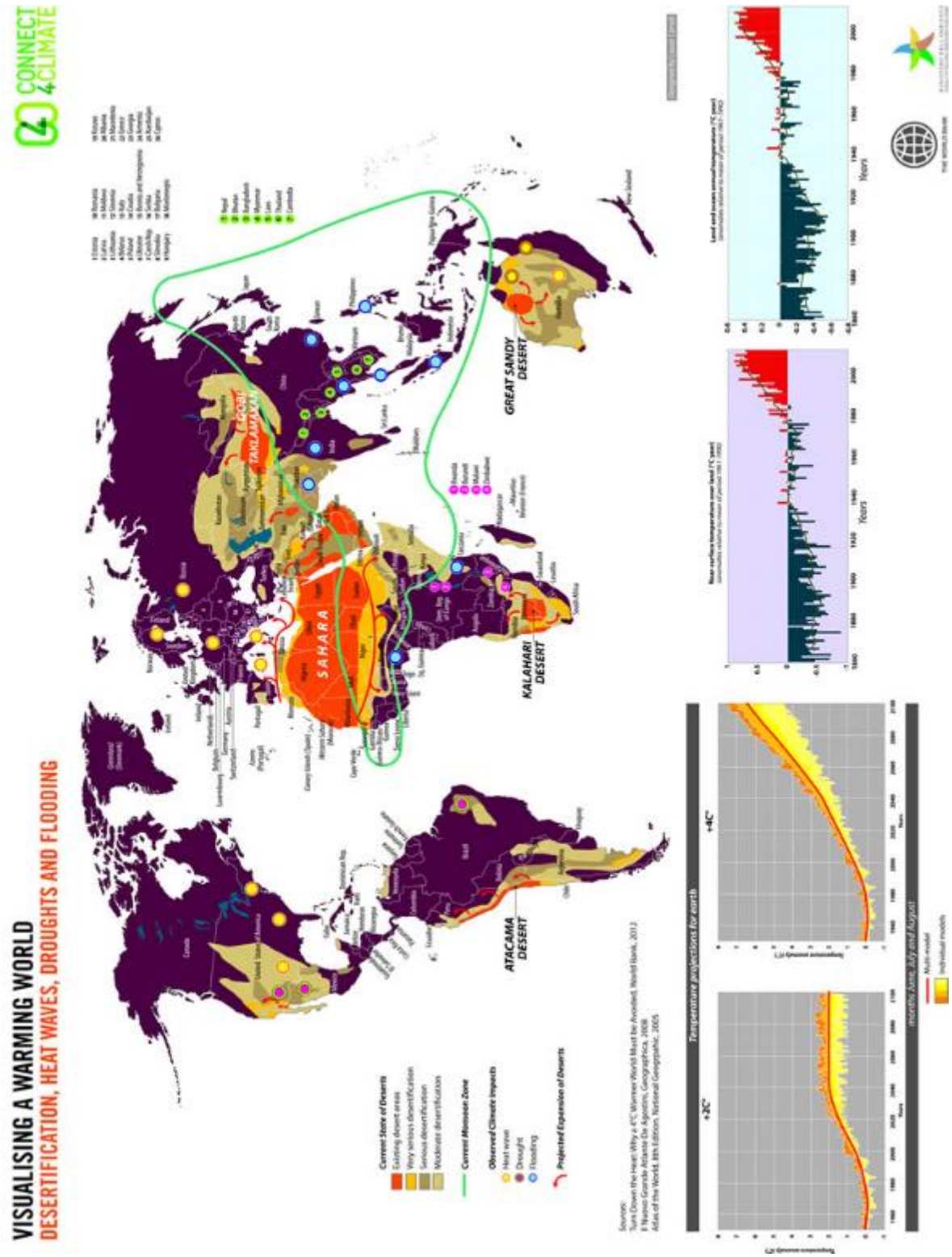

Figure 7: Visualising a Warming World: Desertification, heat waves, droughts and flooding. Credit: Laura Canali & Connect4Climate, 2013

Part Three: Solutions in-depth

How can we limit climate change?

There are different responses to dealing with climate change. Broadly, they are "mitigation" and "adaptation". Efforts to reduce the concentration of greenhouse gases – either by removing them from the atmosphere or stopping them from entering it in the first place — are termed "mitigation". The capacity to do so depends on socioeconomic and environmental circumstances and the availability of information and technology. Mitigation can be done in major sources of greenhouse gases such as in the energy, forestry and agriculture sectors, and a wide variety of policies and instruments are available to governments to create incentives for mitigation actions such as REDD+(Reducing Emissions from Deforestation and Forest Degradation); using sustainable renewable energy instead of fossil fuels and efficient consumption of energy.
Adaptation on the other hand is taking measures to anticipate the adverse effects of climate change and acting appropriately to prevent or minimize damages that can be caused by climate change. Early adaptation can save lives and money. Some examples of adaptation include building defences against sea-level rise, using less water, planting more hardy and different crops. Both approaches of mitigation and adaptation are necessary to deal with climate change both at the global and local level.

Mitigation: Steps being taken to plant and protect forests (REDD+)
REDD+ is a global initiative designed to pay developing countries for protecting their forests and reducing emissions of greenhouse gas pollutants, especially CO_2. REDD+ safeguards ensure that appropriate livelihood activities (which could bring economic development) can still be done in REDD+ sites. In the Paris Agreement, forests are featured as key to climate change mitigation, and REDD+ is explicitly recognized as an instrument to contribute to reducing emissions and enhancing carbon sinks. Additionally, previous COP decisions on REDD+ were reaffirmed at the Paris Agreement.[66]

Under a REDD+ scheme, countries could gain credits for reducing emissions. These credits could be sold in international carbon markets and developing countries could be compensated through a fund paid by developed nations. Already many countries are implementing REDD+ projects or preparing to do so. The challenges REDD+ schemes must overcome include:

- Measuring 'reference levels' of how much carbon an area of forest stores
- Calculating how this baseline level would change under a 'business as usual' scenario
- Designing projects that ensure less carbon is lost
- Ensuring laws protect local land rights
- Developing social and environmental safeguards to ensure that REDD+ does not harm indigenous people and local communities for example through conserving biodiversity, forests, soils and water
- Ensuring that preventing deforestation in one place does not encourage it elsewhere (known as leakage)
- Ensuring that those in power and corrupt officials do not capture REDD+ money that

[66] Key decisions relevant for reducing emissions from deforestation and forest degradation in developing countries (REDD+) are available at http://unfccc.int/land_use_and_climate_change/lulucf/items/6917.php

flows to forest nations

Earlier in the decade, there are different ways to measure carbon, and very few forest nations have the resources to make such measurements because it requires historical data, satellite imagery and direct measurement of trees, as well as an international system for reporting and verifying the data in often hard-to-reach locations.

Subsequently, the UNFCCC has agreed to a set of safeguards information system (SIS) to realise the benefits and mitigate the social and environmental risks that could arise from implementing REDD+. Countries undertaking REDD+ are requested to provide information on how these safeguards are being 'addressed and respected'. This may present significant challenges to multiple stakeholders as the relevant information will be gathered from them. Additionally, the REDD+ Web Platform, mandated by the Conference of Parties (COP) in decision 2/CP.13, was established with the purpose of making available such information on the outcomes of activities relating to REDD+, including activities on capacity building, demonstration activities, addressing drivers of deforestation and mobilisation of resources.[67]

In reality, the success of REDD+ needs to involve networks of local communities in determining how plans are interpreted locally and in managing activities such as monitoring and policing. Geographical isolation, language differences and contested rights over land are among the issues that need to be addressed. In some cases this will require significant changes in policy to give indigenous people and local communities a greater voice in governing their forests. UN and World Bank programmes and non-profit organizations around the world are looking at ways to do this.

REDD+ in Asia and the Pacific

Before the Paris Agreement, activities have been organized through other initiatives such as the UN-REDD programme, the World Bank's Forest Carbon Partnership Facility, Forest Investment Programme and Global Environmental Facility. Countries like Bhutan, Cambodia, Fiji, Indonesia, Lao People's Democratic Republic, Nepal, Pakistan, Papua New Guinea, Thailand, Vanuatu and Vietnam are all REDD+ partner countries in one of these programmes. The major recipient of REDD+ finance flows in the region is Indonesia.

Other nations in the region that have initiated REDD+ programmes include Bangladesh, India, Malaysia, Mongolia, Myanmar, the Philippines, Samoa, Solomon Islands and Sri Lanka. According to the Climate Investment Funds Update for 2017,[68] REDD+ projects accounted for 4 per cent of all climate funding to Southeast Asia and the Pacific. This comprised 43 REDD+ projects, for which US$329.8 million has been approved. The Global Environment Facility is the largest funding source for REDD+ projects with USD$369.37 million disbursed to a total of 70 projects.

[67] See http://redd.unfccc.int/

[68] See http://www.climatefundsupdate.org/

Figure 8: Siem Reap Province, Cambodia. Credit: Gardnergp

Climate Change Story: A Case Study in Nepal

Nepal has serious concerns regarding deforestation and forest degradation. Its forest cover has fallen from 60 per cent in the 1960s to 29 per cent in the 1990s and it still has a descending trend. The forest area decreases at an annual rate of 1.7 per cent per year.[69] Nepal has two active projects ongoing, explained by the fact that the country's engagement with the FCPF began in 2008 but Nepal is still in the process of implementing its REDD+ package. Updates about the country's REDD progress are available through website.[70]

Many organizations along with the Government of Nepal have begun programmes to support efforts that aim to reduce emissions from deforestation and degradation and to find opportunities to develop REDD+ mechanisms. The Himalayan Community Carbon Project (HCCP) was developed in 2010 with the purpose of supporting rural communities in Nepal to benefit from international voluntary market for ecosystem services.[71] This programme enables the participation of grassroots stakeholders and communities in managing forests, resulting in direct implications for the climate change scenario and poverty reduction. In addition, WWF Nepal in collaboration with Winrock International has developed a project which aims to conserve the biodiversity, forests, soils and water heads of the Terai and Churia Hill to ensure the integrity of the area through the creation and implementation of early action forest carbon projects.[72]

[69] Ministry of Forest and Soil Conservation Singha Durbar, Nepal, 2009, Nepal Forestry Outlook Study. Asia-Pacific Forestry Sector Outlook Study II. Working Paper Series. Working Paper No. APFSOS II/WP/2009/5. FAO Regional Office for Asia and the Pacific, Bangkok (http://www.fao.org/docrep/014/am250e/am250e00.pdf)

[70] See http://www.forestcarbonpartnership.org/

[71] See http://www.thereddesk.org/countries/nepal

[72] See WWF, 2011. Early Action Forest Carbon Project. To prepare for a REDD+ and have an equitable carbon financing mechanism in place. WWF Nepal (http://thereddesk.org/sites/default/files/eary__action_forest_carbon_project_4.pdf)

Climate-friendly sustainable renewable energy

Using renewable energy instead of fossil fuels

According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007) [73], *"renewable energy is obtained from the continuing or repetitive currents of energy occurring in the natural environment and includes non-carbon technologies such as solar energy, hydropower, wind, tide and waves and geothermal heat, as well as carbon-neutral technologies such as biomass."* These renewable energy supplies are growing in use as a result of greater investment, falling costs, the rising price of fossil fuels and a mounting body of scientific evidence of the threats that climate change poses. In April 2017, UN Environment, the Frankfurt School-UNEP Collaborating Centre and Bloomberg New Energy Finance[74] reported that all investments in renewable energy totaled US$241.6 billion (excluding large hydropower). Investments in renewables capacity had roughly doubled compared to fossil fuel generation. The corresponding new capacity from renewables is equivalent to 55 per cent of all new power, which means that it is capable of preventing the emission of an estimated 1.7 gigatonnes of carbon dioxide.

Solar power is taking off in Asia and the Pacific too. In 2017, India has built the world's largest solar plant which produces a capacity of 648 MW at Tamil Nadu. They also have their own solar panels which are able to self-charge.[75] According to the International Energy Agency, in 2016, new solar photovoltaic (PV) capacity around the world grew by 50 percent reaching over 74 GW, with China accounting for almost half of this expansion. In comparison, for the first time, solar PV additions rose faster even surpassing the net growth in coal.[76] Thailand[77] and the Philippines[78] have also made enormous progress in solar power development. Despite all these developments, numerous barriers, both technical and financial, continue to hamper widespread adoption of renewable energy in Asia and the Pacific. Among the efforts to overcome these barriers is the United Nations Decade of Sustainable Energy for All,[79] which runs from 2014-2024.

[73] See Climate Change 2007. Mitigation of Climate Change, Cambridge University Press (2007).

[74] See Global Trends in Renewable Energy Investment 2017 (http://fs-unep-centre.org/publications/global-trends-renewable-energy-investment-2017)

[75] India owns the world's largest solar power plant (20 February 2017). *The Economic Times*. Available at (http://economictimes.indiatimes.com/slideshows/nation-world/india-owns-worlds-largest-solar-power-plant/worlds-largest-power-plant-is-here/slideshow/55704319.cms)

[76] See Renewables 2017. International Energy Agency (https://www.iea.org/publications/renewables2017/#section-1-6)

[77] See Solar Power in Thailand, 2017 (https://www.rvo.nl/sites/default/files/2017/03/FACTSHEET-SOLAR-POWER-IN-THAILAND.pdf)

[78] See Bob Shead, 2017. Solar Power Industry in the Philippines, ASEAN Briefing (https://www.aseanbriefing.com/news/2017/06/27/solar-power-industry-philippines.html)

[79] See United Nations, 2012. UN General Assembly Declares 2014-2024 Decade of Sustainable Energy for All (http://un.org/Nes/Press/docs/2012/ga11333.doc.htm)

Figure 9: Scientists warn that air pollution cuts solar energy output in China. Credit: Sean Gallagher

Hydroelectric power is another important source of renewable energy. In the case of Asia, hydroelectric power helps countries achieve their Paris Agreement commitment to reduce greenhouse gases emissions. Hydropower can be a significant source of low-cost, reliable, renewable energy for local populations and can generate economic benefits for the region. However, they can also have negative impacts on downstream communities and ecosystems, including fisheries and agriculture. For example, the 400-odd existing and planned dams in Bhutan, China, India, Nepal, and Pakistan have and will affect the ecology of the Himalayas. On a larger scale, some of them may also impact downstream conditions in Southeast Asia.[80] To date, China is the largest source of external investment in Southeast Asian hydropower. Chinese play a significant role in dam construction in several ASEAN countries such as Cambodia, Indonesia, Laos, Myanmar, the Philippines and Vietnam.

Climate Change Story: Thailand embraces renewable power

Thailand is the largest producer of solar energy in Southeast Asia. In 2012, Thailand's Ministry of Energy along with the Electricity Generating Authority of the country prepared the Thailand Power Development Plan 2015-2036 (PDP 2015) based on ecology, economy and security of the national power system. The constant pressure of fossil fuels on the economy and the ecology has set renewable energy as a main goal for innovation and sustainable development in the country. The Ministry of Energy harmonizes five plans (PDP 2015, EEDP, AEDP, Natural Gas Supply Plan and the Petroleum Management Plan) to reorganize the country's energy management to perform more effectively.[81] Thailand's solar energy capacity has grown from 1,299 MW in 2014 to over 2,800 MW in 2016, which is higher than the combined output of all

[80] See Indra Overland et al., 2017. Impact_of_Climate_Change_on_ASEAN_International_Affairs_Risk_and_Opportunity_Multiplier (https://www.researchgate.net/publication/320622312)

[81] See Ministry of Energy, 2015. Thailand Power Development Plan 2015-2036 (PDP 2015). Electricity Generating Authority of Thailand (www.egat.co.th/en/images/about-egat/PDP2015_Eng.pdf)

other Southeast Asian countries. It aims to produce 6,000 MW of energy by 2036.[82]

At the moment, the country uses over 3 million liters (792,516) of ethanol per day as transport fuel and the Thai government plans to raise consumption to 11.3 million liters per day by 2036. In 2017, St1, a Finnish energy company, has signed a memorandum of understanding with Ubon Bio Ethanol (a private company whose shareholders are state-owned energy companies) to launch a pilot project producing bioethanol from cassava waste in Ubon Ratchathani, with the aim of setting up a joint venture for ethanol production in Thailand.[83]

Energy efficiency

Another way to limit emissions of greenhouse gases is to use energy more efficiently. McKinsey's study found that increasing energy efficiency in developing countries could lower energy demand by up to 25 per cent by 2020 – a reduction which is equivalent to the size of China's entire energy consumption.[84] Beyond the environmental benefits, these improvements would make energy cheaper to use. According to International Energy Agency[85], the best practice in energy efficiency policy should include a wide range of policy instruments in the following areas:

- Buildings
- Lighting
- Appliances and equipment
- Transport
- Industry
- Cross-sectoral
- Energy utilities

[82] See Solar Power Development in Southeast Asia. Available at https://asian-power.com/regulation/commentary/solar-power-development-in-southeast-asia

[83] St1 signs MOU for cassava ethanol project in Thailand (25 January 2017). *Ethanol Producer Magazine*. Available at http://ethanolproducer.com/articles/14099/st1-signs-mou-for-cassava-ethanol-project-in-thailand

[84] **F**ueling sustainable development: The energy productivity solution (2008). McKinsey Global Institute. Available at http://www.mckinsey.com/insights/energy_resources_materials/fueling_sustainable_development

[85] See https://www.iea.org/topics/energyefficiency/bestpractice/

Figure 10: Solar power project in Thailand. The 73-megawatt Lopburi Solar Farm is one of the largest photovoltaic projects in the world. The Lopburi Solar Farm is integral to Thailand's efforts to generate energy from renewable sources. Credit: Asian Development Bank

Climate Change story: Climate-smart energy in the Philippines

Approximately 512 million people lack access to electricity in developing Asia.[86] As nations in Asia and the Pacific develop, climate change presents an opportunity to fill this energy gap without relying on the fossil fuels that emit greenhouse gases. For this to happen, public and private sector players will need to coordinate their efforts to develop clean-energy supplies.

Projects that employ solar panels or small-scale hydro power to provide schools and villages with power demonstrate what is possible, but the challenge is in scaling up these solutions to meet demands across the continent.

A lack of infrastructure, funding and comprehensive vision all threaten to hinder such efforts. Successful efforts to improve energy efficiency can happen on a larger scale (for example, installing new national power grids), or simply involve replacing light bulbs and appliances in homes. Since 2009, the Philippines has started to install 13 million compact fluorescent lamps (CFLs) to replace incandescent light bulbs in order to gain efficiency and to achieve longer duration.[87]

Across the region, most people rely on traditional fuels such as wood, biomass, or charcoal for

[86] See Energy Access Projections (2017). International Energy Agency. Available at http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessprojections

[87] Cheaper, better lighting (2017). Global CCS Institute. Available at https://hub.globalccsinstitute.com/publications/clean-energy-asia-case-studies-adb-investments-low-carbon-growth/cheaper-better-lighting

cooking.[88] Smoke from these stoves not only threatens public health, but also contributes to climate change as it contains the greenhouse gases carbon dioxide and methane. Clean cook-stoves can dramatically reduce fuel consumption, significantly reduce indoor air pollution, and improve livelihoods.[89]

Unfortunately, work to upgrade developing Asia's energy sector will not be cheap: according to the World Energy Outlook, the additional investment required to achieve universal access to energy in the region is US$ 241 billion (for the period 2010-2030).[90]

Biofuels: Win-win or risky business?

Biofuels are fuels made from living things or their waste products. They include solid biomass such as wood or charcoal; biogas (methane produced from sewage); and liquids such as bioethanol and biodiesel, derived from crops such as maize, sugarcane, soybeans, and jatropha. While biofuels do emit some greenhouse gases when they burn, the plants from which they are created absorb carbon dioxide from the atmosphere as they grow. So they appear to offer a means to provide power in a more climate-friendly way than fossil fuels.

The proponents of biofuel argue that there is ample opportunity to grow traditional food crops and produce biofuels with little conflict. This apparently would allow the region to use unproductive or idle land to grow traditional crops and produce biofuel for profit from this new commodity. However, opponents argue that many biofuels are bad for the climate as the process of growing materials to convert into some biofuels are, ironically, fossil-fuel intensive. Some critics of biofuels claim that they are not in fact compatible with food production. A recent Oxfam report claims that the land now being devoted to biofuel production could have fed up to one billion people.[91] Others warn that investors, keen to profit from the biofuel rush, have leased large areas of land that local communities had lived in and worked upon as their own.[92]

The challenges of mitigation and land-use policies

While there are approaches to mitigate climate change, we are also faced with issues related to economic development and poverty alleviation of developing countries in order to meet the principles of sustainable development goals (SDGs), particularly SDG #1. One of the obvious result of economic development that relies on land-based commodities is the increase in demand for land. Consequently, this may lead to land grabs for new plantations or extension of existing plantation, mining, infrastructural and industrial development. There are several ways in which land use and availability can be limited, for example, biophysical characteristics, the spatial planning, local policies and land ownership. Therefore, it is important to understand that land is a limited natural resource and that in many cases supply is unable to meet the demand and as a result the people who most need access to land use are not able to fully benefit from

[88] See B. Merchant, 2012. Charcoal kills 2 million people and vast swaths of forest every year. Can biofuel stop the carnage? Treehugger.com (http://www.treehugger.com/renewable-energy/africa-cooking-charcoal-kills-millions.html)

[89] See Global Alliance for Clean Cookstoves: Clean cookstoves and climate change. (http://www.cleancookstoves.org/resources/fact-sheets/cookstoves-and-climate-1.pdf)

[90] See International Energy Agency, 2011, World Energy Outlook 2011 – Energy for All: Financing Access for the Poor (www.worldenergyoutlook.org/media/weowebsite/energydevelopment/weo2011_energy_for_all.pdf)

[91] See Oxfam, 2012. Land sold off in last decade could grow enough food to feed a billion people – Oxfam. Press release (http://www.oxfam.org.uk/media-centre/press-releases/2012/10/land-sold-off-in-last-decade-could-grow-enough-food-to-feed-a-billion-people)

[92] See J. Vidal, 2012. Land acquired over past decade could have produced food for a billion people. The Guardian (http://www.guardian.co.uk/global-development/2012/oct/04/land-deals-preventing-food-production)

it.

In many countries, particularly the developing ones, land-use planning is usually top–down, spurious and not well founded on a solid understanding of ecological, economic and social processes. Planners struggle to comprehend the complexity of the situation and are not able to anticipate changes caused by climate change. Together with uncontrolled expansion this has had serious environmental impact on economies and livelihoods. Additionally, policies which do not promote inclusivity of multiple stakeholders laterally or vertically and bad planning exacerbate the situation. Hence, land-use planning and good policies are critically important in managing sustainable landscapes. This inevitably calls for sound planning processes, consistent implementation, regular monitoring and evaluation of policies on land use. All of these need to be inclusive, integrative and transparent in providing and accessing information.

Another challenge is the lack of technical capacity and knowledge to operate complex tools. For example in Indonesia a set of tools and methods to support low-carbon development planning has been produced and applied nationally to maintain and restore environmental services. However, there is a need to make sure that information can be easily interpreted and low carbon development actions are cost effective in the use of funds that could produce intermediate outputs, help scenario development or accommodate scenarios.

Reducing emissions from agriculture

Figure 11: Smallholder Development Project in Lao PDF. Vegetable farmer watering plants at the organic farm in Boung Phao Village, Lao PDR. Credit: Asian Development Bank

According to the UN Food and Agriculture Organization, greenhouse gas emissions resulting from 'Agriculture, Forestry and Other Land Use' (AFOLU) have nearly doubled for the past 50 years, and projections suggest a further increase by 2050.[93] Creative and alternative farming principles and agricultural methods such as agroecology and agroforestry have the potential to reduce emissions of carbon dioxide.

Agroecology

Agroecology is the application of the ecological science to the study, design and management of sustainable agroecosystems. Farmers who practice agroecology draw upon their understanding of both the complex dynamics of their local ecologies and the diverse means of cultivating the landscape for human benefit. Although the agroecological farms are different in nature based on surrounding environments, the concept broadly entails the reintegration of livestock crops, pollinators, trees and water in ways that work resiliently with the landscape; crop rotation and the planting of multiple crops at once (intercropping) rather than one single crop (monoculture). In terms of pest controls and management of soil fertility, there is the reliance on biological methods rather than on chemicals. Not only does agroecology have the potential to revitalize farmland that has been devastated by the impacts of warmer temperatures and more industrial agriculture, agroecology actively fights climate change by capturing carbon from the atmosphere through the maintenance of healthy soil matter and the replanting of trees on deforested lands, and by rejecting carbon

[93] See FAO, 2017. The Future of Food and Agriculture- Trends and Challenges. Food and Agriculture Organization of the United Nations. (http://www.fao.org/3/a-i6881e.pdf)

intensive fertilizers and other toxic chemicals.

Figure 12 Agroecology in Action: rice farm in Batard (Phillipines)*, Credit: Joy Coyle via Flickr*

Agroforestry

Agroforestry is the intentional combination of agriculture and forestry to create integrated and sustainable land-use systems. These systems take advantage of the interactive benefits from integrating trees and shrubs with crops and/or livestock.[94] For example places like northern Vietnam would benefit greatly from agroforestry. In northern Vietnam, the expansion of the monocropping systems through shifting cultivation and forest conversion has degraded forests and caused losses in yield and stable food supply for thousands of farmers. One solution to the country's problem is to have the right mixture of forest rehabilitation and market-based agroforestry systems, which revitalizes the soil, forests and performance of smallholder farming systems. Developing and promoting market-based agroforestry options would help to develop local capacity for agroforestry, forest rehabilitation and integrated landscape management.

Recognizing the potential of agroforestry, the World Agroforestry Centre Vietnam, with the support from the Australian Centre for International Agricultural Research (ACIAR) and Consultative Group on International Agricultural Research (CGIAR), implemented a comprehensive agroforestry and forest rehabilitation research with local partners in northwest Vietnam. [95]

[94] National Agroforestry Center. USDA National Agroforestry Center (NAC). (https://nac.unl.edu/practices/index.htm)

[95] See: http://www.worldagroforestry.org/project/developing-and-promoting-market-based-agroforestry-and-forest-rehabilitation-options

Figure 13: Argofestry in Yilou (Burkina Faso) Credit: FAO / Renee VanDis

Soil fertility management

Indeed, soil fertility management in and of itself represents a key tool to shrink agricultural footprint of climate change. Today, too many farmers import fossil fuel-intensive fertilizers and pesticides that ultimately wreak havoc on soil fertility. By planting various indigenous crop varieties and cover crops, switching to organic fertilizers and reducing soil tillage, farmers can take steps to ensure the long-term sustainability of their land while contributing to the sequestration of carbon dioxide. In some regions, such as China, where desertification is a major issue, the government is carrying out its largest ecological project, known as 'The Green Wall of China' which aims to increase human-made tree coverage in the northern part of the country.[96]

Climate Change Story: Kubuqi Ecological Restoration Project[97]

The Kubuqi project illustrates how private firms can tackle environmental degradation, boost livelihoods of locals and safeguard the planet — all while chasing profits for the company. In 1988, Elion founder, Wang Wenbiao, a Kubuqi native, bought up the near-bankrupt Hangjinqi

[96] See R. Alvarez, 2012. Fighting desertification in China. Al Jazeera, 8 December 2012. (https://www.aljazeera.com/indepth/features/2012/12/2012126123056457256.html)

[97] See Charlie Campbell / Baotou, July 27, 2017, China's Greening of the Vast Kubuqi Desert is a Model for Land Restoration Projects Everywhere. TIME. (http://time.com/4851013/china-greening-kubuqi-desert-land-restoration/)

Saltworks situated in the middle of the desert. All the salt produced had to be transferred to the market via a long 350 km route, because there was no road through the desert to the nearest train depot, which was just 65 km away. In order to build a direct route, Wang paid the local community to plant trees and offered bonus for trees that survived. Following that, they pioneered a method of planting willow trees (chosen because they require little rain) using high-pressure water jets, reducing planting time from 10 minutes to 10 seconds per seedling. As a result, today, the desert is lush with drought-resistant trees and local people are encouraged to grow licorice, which does not require much water. Licorice, which is mainly used for traditional medicine can be sold for a high price. The United Nations Environment Programme estimates the Kubuqi Ecological Restoration Project to be worth US$1.8 billion over 50 years.

Urban farming

Although the vast majority of agriculture occurs in rural areas, residents of the world's cities have the ability to fight climate change while simultaneously promoting nutritional lifestyles and economic growth through urban farming, or the practice of developing micro-farms on small plots of land.[98] In our increasingly globalized world, the domestic and international transportation of food is a major source of global greenhouse gas emissions. By allowing city-dwellers to grow their own food in the backyard, on their rooftop, or across the street, urban agriculture greatly reduces the need to deforest land for agricultural purposes and cuts out the fossil-fuel intensive process of getting food from the farm to the plate. And with 75 per cent of Africans, Asians and Latin Americans located in city centres by 2020, urban residents can too be a powerful driver in the mitigation of climate change.[99]

[98] See Climate Progress, 2012. How urban farming can transform our cities – and our agricultural system. (http://thinkprogress.org/climate/2012/05/29/491271/how-urban-farming-can-transform-our-cities-and-our-agricultural-system/)

[99] See E. Kio, 2012. Breaking off the poverty chains: Urban farming in Nairobi, Kenya. The GCARD blog (http://gcardglog.wordpress.com/2012/10/20/breaking-off-poverty-chains-case-urban-farming-nairobi-kenya/)

How can we adapt to the impacts of climate change?

According to the IPCC's Third Assessment Report (2001), "adaptation refers to adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change".[100] In the long term, climate change can only be tackled by mitigation – steep cuts in greenhouse gases emissions – and the faster this happens the less adaptation will be needed. But even if all greenhouse gases emissions stopped today, the planet would continue to warm because greenhouse gases persist in the atmosphere for hundreds of years. This makes adaptation today all the more urgent. Adaptation actions range from large scale infrastructure projects to smallscale, community based initiatives. It includes information, research and action as well as changes to livelihoods, behaviours and business practices. The IPCC's Fifth Assessment Report estimates that the cost of adaptation to climate change in developing countries will be US$ 70 billion-$100 billion per year by 2050.[101]

Climate Change Tip: The Adaptation Fund

The Adaptation Fund (AF) was created in 2001 to finance adaptation projects and programmes in developing countries that are parties to the Kyoto Protocol. AF generates finance by charging a two percent levy on all transactions made through the protocol's Clean Development Mechanism. They have about US$157 million in the fund as of December 2013[102] hence other sources of finance will be needed to support adaptation across the developing world.

Countries can access the fund, if they choose, without having to apply through a third party such as the UN Development Programme. To do this, a country must first have an accredited National Implementing Entity (NIE). In the Asia Pacific region, there are several NIEs constituted already: the Micronesia Conservation Trust (MCT), the National Bank for Agriculture and Rural Development (NABARD) in India and the Partnership for Governance Reform in Indonesia (*Kemitraan*).[103]

Other projects supported by the fund include[104]:

- Promoting climate resilience of vulnerable islands in Federated States of Micronesia
- Building climate resilience of emerging urban settlements in Lao PDR

[100] See IPCC 2001. Third Assessment Report. (https://www.ipcc.ch/ipccreports/tar/wg2/index.htm)

[101] See A. Olhoff, S. Bee and D. Puig, 2016. The Adaptation Finance Gap Update with insights from the INDCs. UNEP (www.unep.org/sites/default/gapreport/UNEP_Adaptation_Finance_Gap_Update.pdf)

[102] See Adaptation Fund, 2013. The Adaptation Fund surpasses $100 million fundraising target at COP19. Adaptation Fund press release (https://www.adaptation-fund.org/media/adaptation-fund-surpasses-100-million-fundraising-target-cop19)

[103] See National Implementing Entities, Adaptation Fund (https://www.adaptation-fund.org/apply-funding/implemeting-entities/national-implementing-entity/)

[104] See https://www.adaptation-fund.org/

- Adaptation programmes for communities to improve livelihoods and ecological security in India
- Enhancing adaptive capacities of communities to floods in Papua New Guinea
- Developing farming systems at a national and community level in Turkmenistan
- Maintaining water security in Mongolia

Climate Change Tip: The Green Climate Fund[105]

The Green Climate Fund (GCF) aims to support developing countries to reduce their greenhouse gases emissions and adapt to climate change impacts. The Governing Instrument for the Green Climate Fund was approved by the Conference of the Parties to UNFCCC at its 17th session on 11 December 2011 in Durban, South Africa.[106] The Fund will contribute to the achievement of the ultimate objective of the UNFCCC within the context of sustainable development.

GCF has a multi-layered approach to mobilize climate finance, working directly with the public and private sectors. It is important to note that developing countries are in the driving seat of GCF's targeting and disbursement of climate finance. National Designated Authorities (NDAs) for each developing country act as the country's interface with the Fund, and are involved closely in all of GCF's funding processes.

Transparency of information is important in the implementation of GCF. Some projects supported by the fund are:

- Scaling up of Glacial Lake Outburst Flood (GLOF) risk reduction in Northern Pakistan[107]
- The Bhutan for Life (BFL) project[108]
- Climate Adaptation and Mitigation Programme for the Aral Sea Basin[109]
- Improving the resilience of vulnerable coastal communities to climate change related impacts in Vietnam[110]

Adapting agriculture to climate change

Adaptations that can increase food production and minimize crop failure despite extreme and less predictable climate will be crucial. These include:

Changes to crop and livestock varieties that tolerate more variable and extreme weather. In India, farmers have begun to use a new variety of wheat that is more resistant to climate

[105] See http://www.greenclimate.fund/home

[106] See http://www.greenclimate.fund/documents/20182/574763/Governing_Instrument.pdf/caa6ce45-cd54-4ab0-9e37-fb637a9c6235

[107] See http://www.greenclimate.fund/home

[108] See http://www.greenclimate.fund/documents/20182/820027/GCF_B.18_04_Add.05_-_Funding_proposal_package_for_FP050.pdf/00936faf-d7a7-4fb3-96d5-fa50b4901c42

[109] See Aral Sea Basin https://www.greenclimate.fund/what-we-do/projects-programmes#gcf-project

[110] See Vietnam under https://www.greenclimate.fund/what-we-do/projects-programmes

change and gives a higher yield of grain.[111] In the Philippines, the use of hybrid rice varieties provided by China that produce higher yields has been adopted, however there are also concerns about whether this is altruism or business as usual.[112]
Strengthening systems for predicting and monitoring climate and warning farmers of extreme weather conditions in order to ensure capacity building.

There have been **pilot studies in Vietnam and the Philippines** that show significant benefits of using weather and climate forecast for agriculture management.[113]

Promoting conservation in agriculture including minimum soil disturbances, permanent organic soil cover and a variety of crop species grown. There are examples of this sort of agriculture in China and DPR Korea.[114]

Diversification of livelihoods to include a greater variety of crops, or a mix of agriculture with other activities. For instance, Myanmar is planting a wider range of crops to enhance efficiency in agriculture.[115]

Teaching communities about methods of farming in climatechanging environment and raising awareness and knowledge about the impact of weather and climate-related issues. For example the Federated States of Micronesia are working with the Australian Government's Pacific Adaptation Strategy Assistance Programme to deliver this knowledge.[116]

Providing insurances to farmers in Thailand. However, the country needs to expand and improve the schemes to provide an appropriate coverage against climate change.[117]

Changing ways of managing water supplies, including collecting and storing rainwater.[118] Reinforcing long-term adaptation strategy on water resources and the irrigation sector.

[111] See G. Sylverster, 2017, Success stories on information and communication technologies for agriculture and rural development. FAO. (http://www.fao.org/publications/card/en/c/0861ef58-c555-43da-9cfd-4a60668coc64/)
[112] https://www.devex.com/news/in-the-philippines-a-chinese-hybrid-rice-program-highlights-the-win-win-policy-90976
[113] See Global Framework for Climate Services, Cooperation between MET Norway and the NMHSs in Bangladesh, Myanmar and Vietnam on Capacity Building (http://www.wmo.int/gfcs/node/957)
[114] See FAO, 2011. Climate change adaptation in agricultural investment in East Asia and the Pacific. Issues and options. FAO Investment Center. (http://www.fao.org/docrep/015/i2505e00.pdf)
[115] See Regional Climate Change Adaptation Knowledge Platform for Asia, 2010. Adaptation Strategies for Water and Agricultural Sectors in Southeast Asia (http://rrcap.ait.asia/Publications/Adaptation_Strategies_Water_Agri.pdf)
[116] See Australian Government, 2017. Securing food resources in the Federated States of Micronesia. Australian Government, Department of the Environment and Energy (http://www.environment.gov.au/climate-change/adaptation/international-climate-change-adaptation-initiative/pasap/micronesia)
[117] See G. Vulturius and M. Boyland, 2016. Can insurance help Southeast Asia's farmers cope with climate change? Stockholm Environment Institute (https://www.sei-international.org/blog-articles/3564)
[118] See Hindustan Times, 2015. TN's success story: Rain water harvesting (http://www.hindustantimes.com/india/tn-s-success-story-rain-water-harvesting/story-u2LJmSHM4O4vA155wEtmOK.)

Figure 14: Farmers in Central Java, Indonesia uses eco-friendly technology to harvest fog and collect water for the crops during drought in the highlands. Photo credit: Arnee Sunarni

In 2008, the International Food Policy Research Institute analyzed climate change in the context of adaptation, risk management and mitigation strategies in Asia. According to the sectoral vulnerability for the different regions of Asia, there are several adaptation measures that can be carried out to reduce the impacts of climate change[119]:

- Agricultural cropping: introduce higher yielding, earlier maturing crop varieties in cold regions
- Farm management: alter application of nutrients or fertilizers
- Livestock production: breed livestock for greater tolerance and productivity
- Fisheries: breed fish tolerant to high water temperatures
- Agricultural biotechnologies: improve crossbreeds of high-productivity animals

Large-scale investments in infrastructure like dams, irrigation and levees can provide major benefits by helping countries limit flooding, provide water for agriculture and generate electricity if constructed and managed properly. At the opposite end, the local knowledge of smallholder farmers attuned to their environments can also provide low-cost solutions to major issues on water management.

Climate Change Story: Genetically-modified crops and climate change

A plant's genetic properties can determine if a crop will survive a drought, flood or extreme heat. Farmers have selectively bred crop varieties to exhibit favourable qualities since the

[119] See G. Wynn, I. Burton, S. Huq, M. Rosegrant, 2008. Reducing hunger and poverty in Asia: Climate change in the context of Asia: pro-poor adaptation, risk management and mitigation strategies. IFPRI (https://www.ifpri.org/publication/reducting-hunger-and-poverty-asia-climate-change-context-asia-pro-poor-adaptation-risk)

dawn of agriculture over 10,000 years ago. Genetically- modified (GM) crops are varieties that scientists have developed by altering the structure of their genetic material (DNA) to make them exhibit specific new traits. They were first grown commercially in 1996. By 2012, farmers in 30 countries grew them on more than 170 million hectares.[120] In 2016, global hectarage of biotech crops increased from 179.7 million hectares to 185.1 million hectares, a three percent increase equivalent to 5.4 million hectares.[121]

The advantage of genetic modification is that new traits can be introduced into crops far faster and with more precision than by traditional plant -breeding techniques. To achieve this, scientists either remove or deactivate genes from a crop's existing DNA, or insert new genes into the DNA. The new genes can come from plants that could normally breed with the modified crop or from a very different species (which can be another plant, a bacterium or even an animal). In the context of climate change, GM crops include drought-tolerant and salt-tolerant varieties, which can withstand coastal flooding and drought.

Critics of GM crops fear that they will promote corporate control over agriculture. Others say GM crops could pose threats to human health or the environment, but there is no strong scientific evidence to support those claims.[122] There is also little evidence that GM crops will be able to boost yields in a changing climate, on the scale needed and at the price farmers can afford to pay. The Union of Concerned Scientists, for instance, doubts that there is a GM solution to drought tolerance: "Drought tolerance is a complex trait that can involve many different genes, corresponding to different ways the plant can respond to drought; genetic engineering can manipulate only a few genes at a time. And in the real world, droughts vary widely in severity and duration, affecting the crop at different stages of its growth, so any engineered gene will be more successful under some drought conditions than others."[123]

[120] See ISAAA, 2012. Global Status of Commercialized Biotech/GM Crops: 2012. Brief44-2012: Executive Summary (www.isaaa.org/resources/publications/briefs/44/executivesummary/)

[121] See Global Status of Commercialized Biotech/GM Crops: 2016. Brief 52. (http://africenter.isaaa.org/wp-content/uploads/2017/06/ISAAA-Briefs-No-52.pdf)

[122] See J. Foley, 2013. Changing the global food narrative. Ensia.com (http://ensia.com/voices/changing-the-global-food-narrative/)

[123] See UCS, 2012. High and Dry: Why genetic engineering is not solving agriculture's drought problem in a thirsty world. Union of Concerned Scientists. (http://ucsusa.org/food_and_agriculture/our-failing-food-system/genetic-engineering/high-and-dry.html)

Figure 15: Climate-smart, tree-based, co-investment in adaptation and mitigation in Asia. Credit: World Agroforestry Centre

Adapting through education

Education[124] is an essential element in global response to climate change. It helps people understand and address the impact of global warming, encourages and helps them adapt to climate change-related trends. UNESCO responds to climate change through education within the framework of the Global Action Programme on Education for Sustainable Development.

Adapting towns and cities

Globally, more people now live in cities than in rural areas and Asian nations are experiencing rapid urbanization. The UN Population Fund reports that most new urban population growth will occur in smaller towns and cities with populations under 500,000,[125] which have fewer resources to respond to the challenges of climate change. According to World Cities Report 2016[126], it has been projected that by 2030, the urban population of developing countries will double, while the area covered by cites would triple and such urban expansion would increase greenhouse gas emissions.

Ways to adapt urban centres include:

- Creating new eco-friendly buildings and infrastructure to decrease risks
- Building seawalls to protect houses against coastal erosion, as in Pacific islands such as Kiribati[127]

[124] Climate Change Education (https://en.unesco.org/themes/education-sustainable-development/cce)

[125] B. Cohen, 2006. Urbanization in Developing Countries: Current trends, future projections and key challenges for sustainability. Technology in Society 28: 63-80

[126] http://wcr.unhabitat.org/wp-content/uploads/sites/16/2016/05/WCR-%20Full-Report-2016.pdf

[127] See BBC, 2013. Kiribati Island: Sinking into the sea? Science and Environment, BBC. 25 November 2013 (http://www.bbc.com/news/science-environment-25086963)

- Planting mangrove forests to limit coastal erosion and protect both the environment and local population like in Vietnam[128]
- Working with vulnerable people and settlements to find solutions that serve them
- Preparing for disasters
- Creating networks of waterways to absorb sudden influxes of seawater
- Using floating schools and other buildings in flood-prone communities as in Bangladesh[129]
- Planting trees and roof gardens to reduce temperatures, provide shade and increase food security
- Building multi-storey shelters to protect coastal communities during tidal surges and cyclones
- Installing storm drains and raising walls around landfill sites to limit the risk of floods spreading diseases, as in Asian cities such as Jakarta, Kuala Lumpur or Bangkok[130]

Climate Change Story: A Case Study in Indonesia

Indonesia launched "The Climate Kampung Programme" (ProKlim) in 27 province in 2012 to encourage the active participation of communities in rural and urban areas. It is a nationwide scheme which encourages all stakeholders to carry out local actions to improve resilience to climate change impacts and reducing GHG emissions by 26 per cent by 2020. The government is targeting 1,000 climate villages until 2020.

Climate Kampung (*Kampung Iklim*) is a model village developed based on the concept of disaster risk reduction due to climate change through adaptation and mitigation efforts. Adaptation includes meeting daily needs of the villagers including food needs and being energy independent. This regional programme adapts to and mitigates climate change with waste management, greening, urban farming and use of alternative energy sources.

"The Climate Kampung Programme" (ProKlim)

For people living in informal settlements, the relationship between city governments, community organization and individuals is vital to adapting to climate change. Adaptation is all about the quality of local knowledge and of local capacity and willingness to act, combined with support provided by higher levels of government and international agencies.

The degree to which cities adapt to the anticipated disruptions of climate change is important. The more efficient they are in the use of resources, the more resilient they are to bounce back in the event of climate change -related disruptions. This is going to be a major determinant of how humanity adapts because cities are now where most people are. There is a growing economic rationale that the resource efficiency of cities point the way to

[128] See E. Porteus, 2008. Natural Coastline Defense: Mangrove Forest in Southeast Asia. World Resources Institute. 8 September 2008. (http://www.wri.org/blog/2008/09/natural-coastline-defense-mangrove-forests-southeast-asia)

[129] See A. Yee, 2013. 'Floating Schools' Bring Classrooms to Stranded Students. The New York Times, 30 June 2013 (http://www.nytimes.com/2013/07/01/world/asia/floating-schools-in-bangladesh.html)

[130] See Living Asean, 2017. How 3 ASEAN capitals deal with urban flooding. Living Asean, 30 May 2017 (http://www.livingasean.com/explore/urban-flooding-kuala-lumpur-jakarta-bangkok/)

sustainability and climate resilience. High population density typically means lower per person cost of providing infrastructure and basic services and may also help to minimise people's effects on local ecosystems if land use is concentrated[131]. However, cities draw together many of Earth's major environmental problems: population growth, pollution, overconsumption, resource degradation and waste generation. Paradoxically, the efficiency of cities may also hold our best chance for a sustainable future.

Adapting to urban flooding in Asian cities[132]

Urban floods spread disease, interrupt schooling and destroy houses, assets and livelihoods. Meanwhile, droughts and floods in rural areas have forced many people to migrate to towns and cities. Many of these new arrivals live in hazardous places, building their homes on floodplains, steep, unstable hillsides or on tidal flats. This can aggravate the flood risk by obstructing natural channels through which flood waters could seep away from urban centers. As Asia has been the victim of the most destructive floods in recent history, efforts to adapt are underway in cities that include Manila (the Philippines), Bangkok (Thailand), Beijing (China), Kuala Lumpur (Malaysia) and Jakarta (Indonesia). These include planting trees along river banks and using sand bags to limit the entry of water into urban areas, digging canals and trenches to manage the flow or floodwaters and making sure waste does not block waterways and drains. These are mainly individual strategies to cope with the problem at a community level. Support to local communities from governments and national disaster reduction organizations enable larger scale activity such as treatment of storm water by reusing it for nondrinking water purposes, design of squares so they act as drainages when it rains and construction of infrastructures like Kuala Lumpur's Storm Water Management and Road Tunnel (SMART).

[131] B. Cohen, 2006. Urbanization in Developing Countries: Current trends, future projections and key challenges for sustainability. Technology in Society 28: 63-80

[132] Z. Vojinovic and J. Huang, 2014. Unflooding Asia. The Green Cities Way. Asian Development Bank. (http://www.adb.org/sites/default/files/publication/149304/unflooding-asia.pdf)

Figure 16 Children walk through ruins of a flooded district in the northern port area of Jakarta. Almost 40% of Jakarta lies below sea-level leading to flooding in many areas, even during the dry season. Photo credit: Sean Gallagher

Part Four: Climate change policies and plans

International treaties to tackle climate change

The international community created the UN Framework Convention on Climate Change (UNFCCC) in 1992 to prevent dangerous climate change. Under the Convention, nearly 200 nations agreed to protect the climate system for present and future generations according to their "common but differentiated responsibilities and respective capabilities".

Parties to the convention agreed that the extent to which developing nations can meet their treaty obligations would depend on the extent to which developed countries provide finance and technology and that developed countries "should take the lead in combating climate change and the adverse effects". According to the agreement, "Economic and social development and poverty eradication are the first and overriding priorities of the developing country parties".

The UNFCCC entered into force in March 1994. Each year since then a Conference of Parties (COP) to the UNFCCC has met to assess progress towards its goal and to negotiate new actions in light of improved knowledge about the threat climate change poses.

At each session of the international negotiations under the UNFCCC, the talks divide into several simultaneous streams, each of which focuses on specific aspects of the whole. This makes it hard for smaller and poorer nations to be present in each discussion as they tend to have smaller negotiating teams than the wealthier nations. Many argue that this system makes the talks inherently unfair. To help overcome this challenge, countries can join forces and negotiate together on common positions, as, for example, the Asian States do. Almost all nations in Asia and the Pacific are also members of the G77+China block, which encompasses 134 nations. Some of the countries in Asia and the Pacific are also members of the Least Developed Countries bloc. Other negotiating blocs include the 43-member Alliance of Small Island States, the European Union, the BASIC group (Brazil, South Africa, India and China), the Umbrella Group, the Environmental Integrity Group, the Arab States and the African Group.

A brief history of the UNFCCC's main impacts

The first major change came in 1997 at the third conference (COP3), when parties to the UNFCCC adopted the Kyoto Protocol. This agreement created the first and only legally-binding targets for developed nations to reduce their emissions, as well as important international monitoring, reporting and verification mechanisms to enforce compliance.

The Kyoto Protocol obliged developed nations to reduce their emissions to an average of 5.2 per cent less than their 1990 levels, between 2008 and 2012 (the protocol's first commitment period). To help countries meet their targets, the protocol created 'flexibility mechanisms'– such as carbon trading and the Clean Development Mechanism, which allows industrialised nations to reach their targets by investing in emissions reductions in developing nations.

The Kyoto Protocol entered into force in 2005. From that year onwards, each COP has also served as the 'meeting of parties' to the Kyoto Protocol, meaning that there are two main sets of parallel negotiations taking place at each event. Two permanent subsidiary bodies that

serve both the UNFCCC and Kyoto Protocol talks meet at least twice a year, once during the COP/MOP. One of these bodies focuses on implementation of the agreements while the other provides scientific and technological advice.

Parties to the UNFCCC[133] have agreed that the Least Developed Countries and Small Island Developing States are the most vulnerable to climate change. In light of this, another important milestone came in 2007 at COP7 in Marrakesh, when parties to the UNFCCC agreed that the Least Developed Countries would receive funding to produce National Adaptation Programmes of Action (NAPAs) to identify their most urgent needs to adapt to climate change.

Unlike other industrialised nations that are party to the UNFCCC, the United States did not ratify the Kyoto Protocol and so had no international commitments to reduce its emissions. The other developed countries that did ratify the protocol were legally bound to establish new targets for a second commitment period to begin when the first period ended in 2012. It soon became clear that the United States would never ratify the Kyoto Protocol, because it did not require major economies such as China and India to reduce their own emissions.

COP13 (Bali, 2007): The disconnect between the United States (the world's biggest historical contributor to climate change) and the rest of the industrialised parties to the UNFCCC, led to the creation of the Bali Action Plan at COP13. This opened a new negotiation track under the UNFCCC in an effort to bring the United States into line with other developed nations. Under the Bali Action Plan, parties to the UNFCCC pledged to reach agreement by the end of COP15 in Copenhagen in December 2009 in five main areas:

1. A shared vision of what parties to the Convention aim to achieve, including a long-term goal for emissions reductions;
2. Mitigation of climate change by reducing the atmospheric concentration of greenhouse gas emissions, including quantified 'commitments' from developed nations and nationally appropriate mitigation 'actions' (NAMAs) from developing nations, including through reduced emissions from Deforestation and Forest Degradation (REDD);
3. Adaptation to impacts such as changing rainfall patterns, extreme weather events, rising sea levels and shifting patterns of disease;
4. Technology transfer and development to support both adaptation and mitigation; and
5. Finance and investment to pay for all of the above.

COP15 (Copenhagen, 2009): The negotiations failed to make necessary progress and the conference ended with only a weak agreement called the Copenhagen Accord, which placed no firm obligations on any countries to act. Moreover, because not every party to the UNFCCC accepted the accord, it remained unofficial. The Copenhagen Accord did, however, include some important aspirations. It called on industrialised countries to provide US$30 billion to developing nations in 'fast-start finance' by 2012 to help them adapt to and mitigate climate change. Furthermore, it urged these countries to increase this figure to US$100 billion a year by 2020. The Copenhagen Accord also recognised the scientific view that to avoid dangerous climate change, the average global temperature increase should not exceed 2 degrees Celsius

[133] **See http://unfccc.int/2860.php**

above pre-industrial levels, and it invited countries to pledge non-binding action to reduce their emissions.

COP16 (Cancún, 2010): Parties to the UNFCCC aadopted the Cancún Agreements, which built upon the contents of the Copenhagen Accord and brought them within the UNFCCC so that they were now formally agreed to by all parties. The Cancún Agreements also included plans to set up a climate adaptation framework, a Green Climate Fund and a technology transfer mechanism. Despite these gains, the Cancún Agreements fell short of the new legally-binding deal that parties were meant to agree to the year before and did not include any new targets for emissions reductions under the Kyoto Protocol.

COP17 (Durban, 2011): Parties agreed to negotiate by 2015 a comprehensive new legal agreement to take effect in 2020. In effect, this meant that parties were extending by six years their 2009 deadline for forming a deal. They agreed that negotiations towards that new agreement would take place in a new stream of talks called the Ad-hoc Working Group on the Durban Platform for Enhanced Action (or ADP).

COP18 (Doha, 2012): Parties developed an amendment to the Kyoto Protocol, albeit one that countries would need to ratify before it entered into effect. It featured a second commitment period that would run from 2012 until 2020 but included fewer countries and emissions reductions than the original agreement.

COP19 (Warsaw, 2013): Parties agreed to an "international mechanism for loss and damage", which recognises that if mitigation does not take place quickly enough and if countries cannot adapt to the resulting climate change, detrimental impacts will be inevitable. Developing countries want this mechanism to be a channel through which they can seek compensation from countries with high greenhouse gas emissions for this damage.

COP20 (Lima, 2014): Parties agreed on developing their ''nationally- determined contributions'' and advanced the drafting of the future climate agreement that was meant to be decided in 2015. Over the years, it is an undeniable fact that the vast differentiation between developing and developed countries hampered a global strategy towards climate change.

COP21 (Paris, 2015): Also known as the 2015 Climate Conference, it has been a big step forward in the fight against climate change. The Parties negotiated a universal agreement on the reduction of climate change which entered into force in 2016. The aim is to limit global warming to less than 2 degrees Celsius above pre-industrial levels through its own legal system and mechanisms while it allows the countries to outline their own national objectives in line with the global response to climate change.

COP22 (Marrakech, 2016): At the 22nd session, countries were urged to strengthen climate finance including increasing their financial contributions towards the pre-agreed US$100bn a year by 2020 goal and to achieve a greater balance between adaptation and mitigation.

COP23 (Bonn, 2017): The United States' unilateral announcement to pull out of the Paris Agreement in June 2017 proved to be a major distraction in the international negotiations. More than 20 countries and other sub-national actors launched the "Powering Past Coal

Alliance" at this the COP23.

What does the UNFCCC require governments to do in Asia and the Pacific?

Mitigation

Unlike industrialised nations that are party to the Kyoto Protocol (for instance, Australia) countries in Asia and the Pacific do not have binding targets to which to reduce their greenhouse gas emissions. But all countries are now expected to identify Nationally Appropriate Mitigation Actions[134], which will attract international finance. These mitigation actions include efforts to reduce greenhouse gas emissions that arise from deforestation. Under the international REDD+ framework, countries can expect financial compensation for keeping or enriching their forest stocks. But to take part they must set up the systems to apply for, receive and manage funds as well as monitor and report on the state of their forests. Various governments in the region are developing what are called REDD-Readiness frameworks. Malaysia, for instance, is involved in international climate change and REDD+ related initiatives and it participates as an observer under the UN-REDD Programme. Another way that nations in Asia and the Pacific are mitigating climate change is through renewable energy and improved energy efficiency. One source of international finance for such projects is the Clean Development Mechanism, which now has enabled activities in 10 nations in the region.[135]

Adaptation

Each country in Asia and the Pacific that is also on the UN list of Least Developed Countries[136] has already produced a National Adaptation Programme of Action (NAPA). This is a document that identifies the most urgent needs and puts a price tag on chosen adaptation projects. You can see the full list of NAPAs on the UNFCCC website[137]. All countries are now also supposed to prepare National Adaptation Plans to identify medium and long-term needs and how to address them. The UNFCCC site has details of the work underway to produce these plans. [138] For examples of adaptation activities in specific countries see Part Three of this book.

Communication, information and learning

All nations in Asia and the Pacific that are party to the UNFCCC are obligated to make periodic reports about what they are doing, or plan to do, to implement the convention. These National Communications include information about emissions, vulnerabilities, financial resources and public awareness of climate change. Most nations in this region have so far submitted the First National Communication and some have also submitted their Second National Communication. All of these documents are available on the UNFCCC website.[139]

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[134] See IISD Learning Centre. Developing Financeable NAMAs webinar series (http://www.iisd.org/learning/course/category.php?id=18)

[135] See UNEP DTU Partnership. Center on Energy, Climate and Sustainable Development (http://www.cdmpipeline.org/cdm-projects-region.htm#2)

[136] **See list of Least Developed Countries (http://unfccc.int/cooperation_and_support/ldc/items/2666.php)**

[137] See UNFCCC. National Adaptation Programmes of Action received by the Secretariat (https://unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/4585.php)

[138] See UNFCCC National Adaptation Plans (https://unfccc.int/adaptation/workstreams/national_adaptation_plans/items/6057.php)

[139] See UNFCCC. Non-Annex I national communications (https://unfccc.int/national_reports/non-

Under **Article 6** of the UNFCCC, parties agreed to promote actions to develop and implement "educational and public awareness programmes on climate change and its effects". They also agreed to promote "public access to information about climate change and its effects." Action on Article 6 has been slow, however and in 2012, the nearly 200 nations who are parties to the UNFCCC, agreed to implement something called the "Doha Work Programme on Article 6". Under this8-year programme, nations are meant to step up to their obligations under Article 6.[140] Training is among the activities that fall under Article 6. Indonesia is among the first countries to benefit from a UN programme that provides assistance with these activities. Each has worked to develop a national strategy for strengthening the skills and knowledge of people who work on climate change.[141]

annex_i_natcom/items/2979.php)

[140] See UNFCCC. Doha work programme on Article 6 of the Convention. (http://unfccc.int/resource/docs/2012/cop18/eng/08a02.pdf#page=17)

[141] See UNCC. Learn Country Pilot Projects to Strengthen Human Resources and Skills to Address Climate Change (http://www.uncclearn.org/country-projects)

Intergovernmental actions on climate change

The Association of Southeast Asian Nations (ASEAN), Pacific Island Countries and Territories and regional bodies in Asia and the Pacific all have taken initiatives to address climate change.

In 2007, ASEAN heads of state adopted the Association of Southeast Asian Nations' Declaration on Environmental Sustainability.[142] It called for member-states to:

- honour and implement commitments to sustainable and environmental agreements; participate in the UNFCCC
- build capacity and invest in afforestation and reforestation
- integrate adaptation strategies into country policies
- raise awareness; strengthen cooperation on the joint research, development and deployment of low emission technologies for the cleaner use of fossil fuels
- transfer technologies
- put pressure on developed countries on the 'polluter pays' principle to seek deeper greenhouse gas emission cuts

More recently, ASEAN adopted the "ASEAN 2025 Forging Ahead Together" declaration that said that "ASEAN is also among the most highly vulnerable regions to climate change and will need to find solutions to adapt to climate change in building a resilient ASEAN"[143] including empowering its people and strengthening its institutions.

The latest Pacific Islands' climate change policy was developed following the Suva Declaration on Climate Change on 2015. After past declarations regarding climate change impacts on the Pacific Islands, the countries focused on sending a joint message highlighting the enormous distress the environmental changes are causing on their islands and people. They aimed to create a regional task force on climate financing ensuring funding for adaptation and mitigation measures and at the same time urged all the countries to fulfill their agreements and objectives regarding climate change.[144]

A number of decisions and actions have been taken since 2007 through ASEAN and the Pacific Islands Regional Organization to establish joint positions in international negotiations and to set up institutions, including Regional Forums that derived on actions such as Manila Declaration on Health and the Environment; collaboration with the Asian Development Bank for climate-related projects, the establishment of the Regional Climate Projections

[142] See 2007 ASEAN Declaration on Environmental Sustainability signed on 20 November 2007 in Singapore by the Heads of State/Government, National University of Singapore (https://cil.nus.edu.sg/2007/2007-asean-declaration-on-environmental-sustainability-signed-on-20-november-2007-in-singapore-by-the-heads-of-stategovernment/)

[143] See the "ASEAN 2025 Forging Ahead Together" Declaration at http://www.asean.org/storage/2015/12/ASEAN-2025-Forging-Ahead-Together-final.pdf

[144] See Pacific Island Development Forum Secretariat, 2015, Suva Declaration on Climate Change (http://pacificidf.org/wp-content/uploads/2013/06/PACIFIC-ISLAND-DEVELOPMENT-FORUM-SUVA-DECLARATION-ON-CLIMATE-CHANGE.v2.pdf)

Consortium and Data Facility, and many other partnerships.[145]

Leadership on climate change in Asia and the Pacific

Countries in Asia and the Pacific have responded to climate change with varying degrees of pace and ambition. Some developed national climate change strategies while others have plans that relate to specific sectors such as agriculture or water. The following examples draw from different sources and show more detailed information on leadership in the Asia and Pacific region – national and subnational and from governments, business and civil society.

China might emerge as the new climate change leader after taking a stronger stance towards reinforcing climate change actions. The country has undertaken objectives such as reducing carbon intensity by 40-45 per cent in 2020 compared to the levels of 2005 and reaching the peak of carbon emissions by 2030 or earlier which are the most ambitious measures the country has planned already.[146]

Japan, after withdrawing from Kyoto Protocol in 2011, committed to reduce its GHG emissions by 2020 by setting up an effective and fair comprehensive international framework, which will incorporate all major economies in the world. There is a structured scheme for the reduction of GHG emissions where even the Japanese municipalities have made their own reduction targets.

South Korea has emerged during recent years as a regional leader in the fight against climate change in Asia. The strategy is defined under the 'green growth' paradigm, which encompasses economic growth and sustainability objectives. Climate change has become a priority in the government's plan by launching a national emission-trading scheme that includes more than 500 facilities from more than 20 sectors.[147]

India is the third in the world in terms of highest GHG emissions. It has pledged to source 40 per cent of its energy from renewable and other low-carbon sources by 2030. The country's stance puts the focus on clean energy and reforestation to absorb part of the carbon emissions.[148]

Vietnam is notable for its reforestation policies that have led to a notable overall increase of the forest coverage in the last decades. Furthermore, the country is one of the original pilot sites for launching REDD+ activities, which has developed technical capacity to estimate forest biomass.[149]

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[145] P. Bhandari, 2015. Asia: Climate change battleground. UNA-UK (http://www.climate2020.org.uk/asia-climate-change-battleground/)

[146] J. Griffiths, 2017. Can China pick up US slack on climate change? CNN, 29 March 2017. (http://edition.cnn.com/2017/03/29/asia/china-trump-climate-change/index.html)

[147] T. Patel and S. Lee, 2015. Korea's Leadership in Climate Action. The Asia Foundation, 9 December 2015 (http://asiafoundation.org/2015/12/09/koreas-leadership-in-climate-action/)

[148] A. Vaughan, 2015. India unveils climate change plan. The Guardian, 2 October 2015. (https://www.theguardian.com/world/2015/oct/02/india-pledges-40-percent-electricity-renewables-2030)

[149] J. Krzyzanowski, Climate Change and Forest Policy in the Asia Pacific. Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (http://www.apfnet.cn/uploads/projects/ongoing-project/464/Climate%20Change%20and%20Forestry%20Policy%20in%20the%20Asia-Pacific.pdf)

Fiji, among other countries, is in the process of developing and managing its own climate change agencies.

Vanuatu and other countries located in the Pacific region have submitted their Nationally-Determined Contributions that point out the solutions and goals for mitigating and adapting to climate change.

Indonesia is vulnerable to natural disasters, the consequences of which are being exacerbated by climate change. The country has made huge steps in the fight against climate change including committing to reducing a minimum of 29 per cent of its emissions, and the development of a strategy for land use and forestry emissions that recognizes the rights of forest communities and indigenous people.[150]

[150] See World Resources Institute, Forest and Landscapes in Indonesia (http://www.wri.org/our-work/project/forests-and-landscapes-indonesia/climate-change-indonesia)

Part Five:
Reporting on climate change

Why media matters?

Importance of media in reporting climate change

As was mentioned in Part One, climate change is here to stay and everyone will need to know how to deal with it. Communicating climate change has to be located within the wider context of social, political and economic structure of countries in the Asia Pacific region. Not only is the context important, there must also be a constant and consistent flow of information through different channels and stakeholders to help raise awareness and consciousness of climate change.

It is therefore essential to have open and honest channels of communication on climate change that provide platforms for discourse and deliberations among policy makers, activists, academics, corporations and citizen in the hope to work towards transformation and a more sustainable environment. Media plays a very important role here. To cover reports on climate change, this section provides some tips to find and write better stories, as well as how to report on specific aspects of climate change.

Seven quick tips for finding stories to report

1. **Follow the money.** Climate change is a story about hundreds of billions of dollars. Where is that money for adaptation and mitigation? Who controls it? Who spends it? Who makes sure it does what it is meant to do? Who funds the NGOs and the politicians? Which companies stand to profit from action to address climate change? Who stands to lose? Another area for media attention is whether rich countries keep their promises to fund climate action in developing nations, and whether the money really is 'new and additional' and not from existing aid budgets. There will also be big debates about how much climate finance should come from public funds and how much should come from the private sector (which would be unlikely to show interest in funding small-scale adaptation projects that are needed because they offer little chance of a return on any investment). Follow the money trail and you will find all the elements of a good story. There are some examples of reports from Fiji [151], and the Philippines[152] that looked at delays in disbursements of Green Climate Fund (GCF) and policies on disbursements of GCF that will have positive contributions to tribal communities.
2. **Localise the global.** Every day scientists publish new research, policymakers make new announcements, environmental activists issue new demands and strange weather patterns occur. Even if these things happen far away, smart journalists can work out ways of relating these stories to their own local circumstances and audiences.

   For example in Indonesia, journalists use multi-platform media with digital technology to present climate change issues in interesting ways. Reporters and contributors in Jakarta and various cities in the country contribute stories in a news feature called "*Saga*".

   Indonesia's KBR (**largest independent radio news agency) has a network of 600 local**

[151] **http://islandtimes.us/cook-islands-question-delay-in-disbursement-of-green-climate-fund/**
[152] **http://www.climatechangenews.com/2016/07/20/green-climate-fund-asked-for-indigenous-peoples-rights-policy/**

radio broadcast (commercial and community). Partnering with *Green Radio 96.7 FM* in Pekanbaru, KBR created a talk show program called "*Mahogany*" to discuss the environment and the role of humans can play in preserving nature.

"*Asia Calling*" is another weekly program on current affairs that can be used effectively to communicate climate change to a wider audience. Another example is the "*Bumi Hijau TV*" (bumihijau.tv) that produces and disseminates environmental programmes to more than 100 local television stations throughout Indonesia.[153] Each year, they produce 150 documentaries on environment.

3. **Wear climate change glasses and report from new angles.** For every new policy, new invention, new anything, look through with your climate-change lenses and ask two questions; "How could X affect climate change?" and "How could climate change affect X?" You will find many new angles for your reporting. These angles include health, business, technology, food, culture, sport, tourism, religion, politics – in fact, almost everything else.
4. **Follow the pack.** Keep on top of the climate-change story by reading the work of other journalists who are covering it well (you will find some great international stories at *IPS*, *Reuters AlertNet*, *The Guardian*, *The New York Times* and the *BBC* but there are also many good reporters covering climate change for national media around the world). Use social media such as Facebook, Instagram[154] or Twitter to find out what people are saying about climate change and to share your own stories. The *Climate News Network* offers stories that journalists can adapt for their own use. (http://www.climatenewsnetwork. net/).
5. **Read journals.** The most important and significant research appears in journals such as Nature Climate Change, Geophysical Research Letters, Nature, Science, PNAS, Climatic Change. You can keep track of new research by subscribing to the journal's mailing list – through the free *EurekAlert* and *AlphaGalileo* press release services. Journal papers tend to be available only to paying subscribers but journalists can get copies by searching on Google Scholar (http://scholar.google.com) for a PDF file or by visiting the journal's website for a given paper. The website will often display the email address of the lead author, who will usually be willing to send journalists a copy of the paper and answer questions. Another way to build up a good contact book of experts is to search the Internet for recent scientific papers on a particular topic (Google Scholar is a good tool as it reveals how many times a paper has been cited by later studies, indicating how important the research is).
6. **Stay updated and keep track of information flows,** international negotiations through networking or through editors and journalists' forums such as The Conversations.[155]
7. **Get connected.** A journalist can never have too many sources. The good news with climate change is that this is something that affects everyone. Journalists can build large contact lists of sources from a broad variety of different sectors, both within and outside of their own countries. These include: policymakers, intergovernmental

[153] See http://www.mongabay.co.id/2015/09/03/joe-yaggi-program-siaran-televisi-indonesia-belum-banyak-angkat-isu-lingkungan/
[154] See Everyday Climate Change feed - https://www.instagram.com/everydayclimatechange/
[155] See http://theconversation.com/global

organisations, UN agencies, civil society organisations and research centres. Some of the best sources will not be from organisations but from the general public – such as farmers and fisherfolk, pastoralists and small business owners. Few people know more about the changing climate than those whose livelihoods it most closely affects. **Journalists can j**oin mailing lists such as Climate-L (http://www.iisd.ca/email/subscribe.htm), through which thousands of climate specialists share their latest reports and information about events. For information on the UN climate-change negotiations journalists can subscribe to the Earth Negotiations Bulletin (http://www.iisd.ca/process/climate_atm.htm).

Climate Change Story: Climate change on the radio

In some countries, radio journalists are more able than most to interact directly with their audiences and bring audience-contributions into their stories. For a subject like climate change, this is valuable for two reasons.

First, radio journalists can provide opportunities for their listeners to ask about climate change, either through phone-in shows or via short messaging system (SMS). A climate expert in the studio can then answer these questions for all to hear. The role of the journalist here will be to ensure that the expert gives answers that are not too technical. The journalist who is familiar with the issue could also become an expert to respond to the listeners' questions.

Second, many radio listeners will themselves have important knowledge about climate change, even if they don't themselves connect their experiences to the global atmosphere. Farmers especially can share information about the changes they have experienced – from growing seasons or pest outbreaks – and about the ways they deal with the changes.

In seven districts in Nepal, five FM radio stations broadcast discussions on climate change and its effects on the lives of farmers. Since 2009, *Community information Network* (CIN) broadcasts a programme "*Jeevan Rakshya*" or "Life Saving" every Tuesday and "*Sajhanepal*" every Saturday to help people from remote rural areas who were affected by the impact of climate change. The programmes discuss how the affected people can adapt to their situations. Along with climate change, it also teaches about various other related subject matters such as disaster, food security, rebuilding, life skill and various aspects of people's livelihood.

These programmes are broadcasted from 280 community radios at same time. The local reporters working in these 280 radios contribute to the "Jeevan Rakshya "program. Since reporters come from different parts of the country, their contributions into these programs provide an opportunity for people to learn from other communities with similar kind of problems and how they deal with them. The radio program like "*Jeevan Rakshya*" has been effective, as even today radio is the sole medium of communication in Nepal's 25 mountainous districts.

Figure 17: Participatory video project Nepal. A group of 12 women from Dhanusha District, South Nepal, received three-day video production training and shot their own stories about how climate change have affected their livelihoods. Credit: CCAFS/Pawan Kumar

Ten quick tips for better stories

Remember that climate change itself is not necessarily the story — it is the context in which so many other stories will unfold. You don't even need to mention the climate to tell a good climate change story. You will probably have more success with editors – and attract more readers – if you keep climate change out of your headlines and opening paragraphs. After all, typical "climate change" stories may repel an important and sizeable audience that has been either turned off by doom and gloom, or has a political reaction against the climate-change narrative.

1. **Know your audience.** When you sit down to write a story there is only one person that matters: not you, not your editor and not the person you just interviewed. It is the reader, the listener or the viewer – someone you are unlikely to ever meet. Be familiar with your audience's level of knowledge about climate change and about the things they care most about. If in doubt, assume your audience knows nothing but never make the mistake of assuming they are stupid. The classic error in journalism is to over-estimate the audience's knowledge and under-estimate their intelligence. Before you finish your story, remember your audience. Read it through. Put yourself in the shoes of a typical member of your audience and imagine what questions they might ask about your story. Then answer those questions in your story before you sign off on it.
2. **Team up.** To tell the story of climate change well you need to understand and accurately present the science, the politics, the economics and more. But nobody can excel in all of these aspects. Even superheroes achieve more as a team, so team up with other journalists. Journalist Eric Pooley has urged media outlets to create climate policy teams that include environmental science reporters, political reporters and business and energy reporters.[156] This mix, working together, would be able to combine their strengths to report more effectively on these three angles, which are deeply connected but usually reported on in isolation.
3. **Localise the jargon.** You need to understand what CDM, REDD+ and UNFCCC mean but your reader or listener or viewer almost certainly does not. If your interviewees use jargon, be ready to ask them to simplify their language. If your interviewees speak in complicated terms, remind them that while they have been working on climate change for years, you have been researching your particular story for just a few days or even hours. Remind them that your job is to ensure your audience understands their words. Most experts would prefer to give you a simpler message in their own words rather than have you simplify things for them. Never be embarrassed to say "I don't understand. Can you explain it again?"
4. **Be visual.** Many climate and environmental stories are complex, but they can often be illustrated with appropriate visuals that represent the issue and make it an engaging human story. Journalists should always ask, "How can I visualize this story?" Perhaps it can be a photo-essay, a portrait series, a short online explainer video, a more in-depth documentary, or a clear and easy to understand infographic. A good photo series, or video can vividly explain the issue to readers. Multimedia projects are also very effective online by presenting a story with a combination of multiple visual elements such as photos, video and infographics. Use

[156] E. Pooley, 2009. How much would you pay to save the planet? The American press and the economics of climate change. Joan Shorenstein Center on the Press, Politics and Public Policy Discussion Paper Series #D-49, January 2009 (http://www.hks.harvard.edu/presspol/publications/papers/dicussion_papers/d49_pooley.pdf)

all the resources you have to bring the story to life – headlines, photos, graphs, maps, sidebars.

5. **Get a second opinion** — and a third. Your interviewees can be wrong; they can be biased. They can have vested interests. Ask yourself why they are saying what they say and whether they stand to gain from your reporting of their words. Seek the opinion of other experts from other institutions.
6. **Quote varied voices.** Climate change affects everyone and everyone can respond to it in a different way. Think about both gender and generation. Climate change will affect men and women in different ways. Young and elderly people are both more vulnerable than healthy middle-aged people. They also have different perspectives. Very senior people have long memories and can describe decades of change. Young people will inherit the problems of climate change and so may have powerful perspectives. By speaking to many different kinds of people about climate change you will get a richer understanding of it, more story ideas and new angles that you can use to tell the story.
7. **Get reactions.** It is important for journalists to interview ordinary citizens and create a platform for the voices of those most vulnerable to climate change. The poorest communities are often most at risk yet their views generally go unreported. Quoting members of communities who are often at risk is a great way to add human characters to complex scientific topics but remember that it is important to check their facts as well by reviewing research reports and data about your topic.
8. **Humanise, Humanise, Humanise.** More than anything else, people care about their health, their wealth and the future of their children. Climate change is relevant to all three of these things, so try to think in those terms when you are working out how to tell your story, both to your editor and your audience. And make the abstract real. Putting a price tag on action or inaction will help, especially if you do it in terms people readily understand (like the price of bread or petrol).
9. **Do justice to press releases.** Too often journalists will copy-and-paste press releases and just add their name. In doing so, they do a disservice to their readers. A press release is not a story, but information that contains the seeds of story that a journalist can develop. While international press releases may be relevant, they will never have been written with any journalist's specific audience in mind. Localise them, get new perspectives and make them relevant to your audience.
10. **Tell success stories.** Climate change has often brought out the best in human imagination and ingenuity. Around the world, individuals are proving that through innovation, cooperation, and mobilization, solutions to climate change not only exist, but also provide new means of earning livelihoods. The value in highlighting these cases does not lie simply in leaving readers smiling but also in demonstrating what is possible.

Reporting climate change in local languages

Journalists face additional challenges in reporting climate change when their audiences do not understand English. Most debates on science and international policies are often carried out in English. To overcome this, journalists can translate and report climate change in local language using local knowledge, local terms and giving good examples.

The following words and phrase types can typically can be localised rather than translated literally:

- Idioms, metaphors and cultural references – many phrases familiar to an English speaker will make no sense if translated literally into another language. These enable journalists to add local perspectives to stories that will feel more natural to audiences
- Names of places – many locations have different names or administrative jurisdictions depending on the languages. You can reference an atlas or an encyclopedia to ensure accuracy
- Names of organizations (and their acronyms)

Figure 18: Second Scenarios workshop in South Asia. Colombo (Sri Lanka). Credit: Elisabeth van de Grift

Reporting on specific aspects of climate change

As mentioned in Part One, there are aspects of media coverage on climate change that are wanting. Specialists from academia, civil society organisations and government agencies in Asia and the Pacific on climate change have indicated that they want to see more areas covered. This would include human rights and human security, culture, gender, health, migration and displacement, resources, and conflict, adaptation, REDD+ and international climate change negotiations. Journalists can find many stories from these areas and themes. If they track the progress and ask pertinent questions, good stories on climate change can be covered. The following are questions to ask to cover a story in specific areas.

Human rights dimension of climate change

- Who are most vulnerable to climate change? What are the segments of the society affected by climate change?
- How does climate change affect human rights? Which dimension of these rights affect the community/country the most?
- What are the principal threats to human security from climate change?
- Who are the most affected people in your communities/country? How are they affected by climate change differently from other group? Are their vulnerability and needs addressed in any policy/adaptation plan? How can their vulnerability to climate change be reduced? Are they involved/engaged in the formulation of government plans and strategies addressing climate change?
- Is there any relevance between climate change and food security on social and political stability?
- What are the links between climate change and its impact on political, economic and social fragility in Asia and Pacific region?

Culture dimension of climate change

- How can climate change and the changes in natural resources affect culture and livelihood and its related activities?
- How are rural livelihoods and, therefore, cultural practices and associated impacts on natural capital affected by changes in climate?
- What are the effects of culture on climate change mitigation and adaptation?
- How do different cultures adapt to significant environmental changes?

Gender dimension of climate change

- Why is climate change a gender issue?
- How and why does climate change affects women different? What are the different impacts of climate change on women?

- How are women engaged in climate change adaptation and developing disaster risk reduction plans? How are youth and children engaged in the process of adaptation to climate change?
- What are the roles of women in climate action in your country/region?

Migration, displacement and climate change

- How does climate change affect migration and human mobility?
- Who are the environmental migrants in your country or in the region?
- What are the international policies that protect environmental migrants? How have they been implemented?
- Are there environmental migrants in your country? What are their patterns of migration and how are their mobility and adaptation linked with climate change?
- What role does migration play in adaptation to climate change?

Climate change and security: resources-based conflict fueled by climate change

- What are the effects of climate change on resources and conflicts?
- Examine cases where climate changes and variability were managed peacefully, in addition to cases where conflict emerged. What are the processes that reduce violence despite climate variability and change? What are necessary steps to elicit responses that help sustain and improve peace in a future where the climate is changing?

Adaptation

- What are the adaptation plans/strategy at your local, national and regional level? How much progress have they made at each level? Is there any relevance/synergies between national adaptation strategies at the local level or regional level?
- Is your national adaptation plan/strategy gender -responsive?
- Is there any involvement of marginalized groups in the adaptation planning and design?
- What can facilitate the integration of mitigation and adaptation?
- How can countries link climate goals (NDCs) with sustainable development?
- What can countries do to reach their climate target?
- How can businesses adapt to climate change impacts?
- Why is climate change resilience important for business sector?

REDD+

- How does forest management relate to adaptation?
- What are the links between mitigation and forest adaptation?

- How do you ensure that REDD+ leads to emissions reductions that are "real and additional," meaning they would not have happened without a REDD programme?
- How do you know that reducing deforestation in one place will not cause increased deforestation in another? How can we avoid that?
- How can we ensure that REDD+ will not just be a temporary fix, but rather will protect forests permanently? How can we ensure sustainability?
- How can mitigation project affect people's adaptation?
- How do we ensure that REDD+ will not adversely affect the rights and livelihoods of people who live in or around forests?
- What safeguards are in place to ensure the full and effective participation of indigenous people and local communities in a REDD+ programme?
- How do you measure, report and verify emission reductions from forests? This is especially challenging for measuring reductions in forest degradation.
- How can we integrate commodity supply chain initiatives, domestic policies and finances, and international REDD+ finance into a set of policies to increase food production, reduce GHG emissions and conserve forests?

Sources of information

The **Intergovernmental Panel on Climate Change**'s Working Group II (http://www.ipcc-wg2.org/) covers impacts, vulnerability and adaptation.

The **UNFCCC** website has a database of local coping strategies, which journalists can search by hazard (e.g. drought) and impact (http://maindb.unfccc.int/public/adaptation/). It also has details of the National Adaptation Programmes of Action in each of the countries in Asia and Pacific as well as the newer National Adaptation Plans that all countries are encouraged to develop.

The **UNDP Adaptation Learning Mechanism** includes country profiles for each nation (http://www. adaptationlearning.net/) in the Asia and Pacific region
The Asia Pacific Adaptation Network shares knowledge between researchers, civil society, policymakers, etc., (http://www.asiapacificadapt.net/).

The **Eldis dossier on adaptation** includes detailed information organized by theme and region, as well as a comprehensive listing of organizations that work on adaptation and are good sources for journalists (http://www. linkingclimateadaptation.org/)

The **Community Based Adaptation Exchange**, which is an online network with hundreds of members who are sharing information on adaptation (http://community.eldis.org/cbax/)

The **WeAdapt website** (www.weadapt.org) also includes contact details of experts in this field and has a Google Earth layer with information on adaptation around the world (http://www.weadapt.org/placemarks/#/).

UN-REDD is the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. http://www.un-redd.org/

The REDD Desk (http://www.theredddesk.org/) is an online collaborative platform for sharing information about all aspects of REDD. It has a country database with information about several countries in Asia and the Pacific. (http://www.theredddesk. org/countries).

REDD Monitor takes a critical view of REDD and its potential problems. It is a good source of news and story ideas (http://www.redd-monitor.org/).

The Global Canopy Programme (http://www.globalcanopy.org/) is an international NGO that works largely on REDD+. Its Little REDD+ Book summarizes more than 30 proposals that have been made by different countries, nongovernmental groups and others (http://www.globalcanopy.org/sites/default/files/lrb_en_0.pdf).

UN Framework Convention on Climate Change: This site gathers information about the status of REDD+ in the UN climate change negotiations, and what individual countries have proposed in terms of mitigation and adaptation (https://unfccc.int/methods/redd/items/7377.php).

The International Center for Forestry Research (CIFOR) is a leading source of research on REDD+. It has produced a global map of REDD+ projects (http://www.forestsclimatechange.org/redd-map/).

The Ecosystems Climate Alliance (http://www.ecosystemsclimate.org/) is a network on nongovernmental organisations that campaign for stronger environmental and social safeguards in REDD+ design and implementation.

Reporting REDD: A guide for journalists produced by the Climate Change Media Partnership (http://www.unep.org/ forests/Portals/142/docs/Reporting_REDD-Media_Pack.pdf)

The World Bank Forest Carbon Partnership Facility helps countries prepare for REDD+, explores ways to provide payments and tests ways REDD+ can improve livelihoods and biodiversity conservation (http://www. forestcarbonpartnership.org/fcp/).

The REDD+ Partnership (http://reddpluspartnership.org/) is a platform for countries to coordinate and scale-up their REDD+ activities. In time it will be replaced by or included in the official REDD+ mechanism that parties to the UN Framework Convention on Climate Change are still to agree upon.

Figure 19: Children play around the Navua Resettlement Area (Serua Province, Fiji). Credit: Asian Development Bank

Reporting on climate change and health

While climate change can have diverse direct and indirect effects on human health, there are also many false assumptions about these links. Journalists need to understand what researchers are sure about and where they have doubts. They also need to be skilled in explaining risk and uncertainty and placing the links between climate change and health into a wider context of other health priorities.

Questions to ask

- What does climate change mean for existing health threats? What new health threats could climate change pose?
- How certain are scientists about these threats? What other factors are at play?
- What aspects of the climate-health link are scientists uncertain about?
- Is there scientific consensus or is this just a single study? What does the new study add?
- How much of a risk is there? And how does it compare to other risks?
- How reliable is the baseline data (about incidence of malaria, and about climatic conditions, for instance)?
- What would hospitals and government departments need to do to be prepared for a climatic disaster or new disease outbreak?
- What are the co-benefits of acting to limit the threats climate change poses to health?
- What does your country's National Adaptation Programme of Action, or National Adaptation Plan, say about health?
- What has your country done so far to adapt to the health impacts of climate change?

Sources of information

Medical journal ***The Lancet*** has published a special collection of research papers, commentaries and audio-visual material on climate change and health. http://www.thelancet.com/series/health-and-climate-change

World Health Organization http://www.who.int/topics/climate/en/ has data and statistics on how climate change affects health.

Atlas of Climate Change and Health. This publication by the WHO is free to download and includes major sections on infectious diseases, emergencies and new health threats. http://www.who.int/globalchange/publications/atlas/report/ en/index.html

SciDev.Net: The challenges of reporting on climate change and health. http://www.scidev.net/global/malaria/opinion/the-challenge-of-reporting-on-climate-change-and-h.html.

Earth Journalism Toolkit: Communicating Risk. http://earthjournalism.net/toolkit/?p=237

Figure 20: Dho Tarap Valley (Nepal). Credit: Erwin Burstaller

Reporting on the international climate change negotiations

The UN negotiations on climate change provide plenty of reporting opportunities for journalists, even if they are not there in person. The outcomes of talks define what countries agree to do in order to address climate change – on adaptation, mitigation, finance and technology – and in doing so create storylines that will last for years.

Questions to ask

- How many people are in your country's delegation to the UNFCCC talks? What are their day jobs?
- What are your national negotiators doing ahead of each negotiating session? What are their demands and what do other negotiators think about them?
- Through what process does your country decide its negotiating position, and how does it contribute to the position adopted by larger blocks of nations, such as the group of G77+China?
- What is your country doing to implement the decisions that parties to the UNFCCC have already agreed upon?
- How much money has your country received from each of the UNFCCC funds (Adaptation Fund, Least Developed Countries Fund, Special Climate Change Fund, Green Climate Fund)? Does it have pending applications for funding?
- What are the climate control measures in your country and region? (e.g. national plan, bilateral cooperation, regional cooperation, development aid)
- What are the main climate action in your country/region? Who are the key actors in fighting climate change in your country/region?
- What are the role of business sector in tackling climate change?
- What are each nation's role and responsibilities under UN CC Convention? Are they binding? How do we hold government accountable? How to ensure that they act according to their responsibility?
- Did your country take part in the Paris Pledge for Action (L'Appel de Paris)? What are their goals? What are the progress?
- Are the current pledges by countries at the Paris Conference adequate for tackling climate change?
- Is reducing emissions incompatible with national economic development?

Sources of information:

The **UNFCCC secretariat's website** (www.unfccc.int) is full of important information for journalists – from the text of the convention and the Kyoto Protocol to details of the decisions that parties to the UNFCCC make each year. The site also includes each country's national reports and detailed information on emission targets, pledges of action on mitigation, adaptation and finance.

The **UNFCCC secretariat** also broadcasts some negotiating sessions and press conferences live on its website, press releases (http://unfccc.int/press/items/2794.php), factsheets and

contact details of experts in each country that is party to the convention (http://maindb.unfccc.int/public/roe/.

IISD's Earth Negotiations Bulletin (http://www.iisd.ca/process/climate_atm.htm) provides daily reports during each Conference of Parties to the UNFCCC and each Meeting of Parties to the Kyoto Protocol. Journalists can subscribe to this good source of neutral information on each negotiating session.

IISD also manages the Climate-L (http://www.iisd.ca/email/climate-L.htm) email-based mailing list for news and announcements about climate policy, which is another good source of information about the negotiations.

For nongovernmental perspective, sources include the **Climate Action Network** (http://www.climatenetwork.org), a global alliance of more than 450 organisations. It publishes a daily newsletter called Eco (http://www.climatenetwork. org/eco-newsletters) during each UNFCCC meeting.

The **Third World Network** (http://www.twnside.org.sg/climate.htm) produces briefing papers and daily news updates during UNFCCC sessions.

Reporting on scientific research on climate change

Covering climate science can be challenging. But journalists who can report accurately on the science in ways their audiences can relate to and understand will find they have more opportunities to tell stories, and even make a difference. Rather than just reporting what scientists have found, the key challenges for journalists are to understand the real-life implications of new research for media audiences and to help them appreciate how the new information is relevant to them.

Finding research to report

Often, the first step for journalists is to know when scientists have published new climate-related studies. Luckily, there are many ways to stay up to date without having to dig through technical and research papers. Science information sources such as Science Alert, Science Daily and SciMex provide regular, English language updates of the latest scientific research from around the world. The Conversation website provides short, professionally -edited stories and opinions from experts around the globe and has a daily email newsletter. Of course you can always keep an eye on the professional scientific literature as well by subscribing to newsletters both from the specific academic journals and universities who employ relevant researchers. Research in journals is usually not free to access, but scientists will often be happy to email journalists copies of their new papers, or provide a few summary quotes for you.

There are also websites to search for reports on climate science, such as the Intergovernmental Panel on Climate Change (www.ipcc. ch/), the Public Library of Science (www.plos.org), Google Scholar (www.scholar.google.com), the Directory of Open Access Journals (www.doaj.org) and numerous think tanks a from around the world. It is neither critical (nor probably not possible) for you become a climate science expert yourself, but you should certainly cultivate a good network of experts who can explain things to you clearly, and who will respond quickly to your requests for interviews or information.

Related to this, it is important that you know your limitations, and – after careful read-throughs and background research – you are not afraid to reach out to the researchers to gain clarification and direct quotes can help give the researchers a voice in your article. They can provide important context for climate stories, for example: how do these studies compare to one another? Do their findings corroborate one another? Do the new results draw previous findings into question? Remember though, that interpreting complicated statistics is not easy; even experts can draw the wrong conclusions from their peers' research. This is why it is important to cross-check your facts with more than one expert wherever possible.

Of course, reporting the findings of a study is just one component of a journalist's job: providing a balanced assessment is just as important. Just because a study is peer-reviewed does not mean it is above critical evaluation. Journalists must remember to be as nuanced as possible and remember that even when scientists – or their press officers – say their research is "revolutionary," very rarely does a study completely contradict a large body of scientific research. To most effectively cast a critical eye on academic studies, journalists should examine the purpose of this study (what does this contribute to the field?), researchers' methodology (what controls and variables did they account for?) and report funding (did a corporation with a vested interest in the findings one way or the other support this research?).

Journalists who report on new science should seek the views of scientists who work in the same field but were not involved in the research. To see which researchers are active in a particular field of study, the resources listed above can be extremely useful for identifying people to interview, as can a simple Google Scholar search.

Avoiding sensationalism

Just as journalists should be careful when interpreting the results of an academic study, they should go to great lengths to avoid sensationalism in their reporting. While it is of course important to draw the appropriate linkages between climate change and extreme weather, it is unwise to attribute any single event to global warming. As key figures who inform public policy and individual behaviour, journalists are responsible for presenting new facts – even dire warnings – in an objective light and considering all external factors that may be at play. Additionally, as building trust with an audience is crucial to a reporter's success, blowing a claim out of proportion will trigger a reader to (rightfully) approach future articles with skepticism.

Risk and uncertainty

Journalists who report on climate change need to be able to communicate the implications of two scientific concepts — risk and uncertainty — with non- scientific audiences. It's a big challenge, not least because scientists themselves have struggled for years to explain these concepts to journalists. Risk is all about the likelihood of something happening and the likelihood of that thing being a problem (relative to other problems). Uncertainty is a measure of how sure scientists are about something being real. In the context of climate change, there are two excellent, freely available handbooks that can be helpful here: The Uncertainty

Handbook and the Debunking Handbook.[157]

Reporting scientific uncertainty

As the Union of Concerned Scientists puts it: "To most of us, uncertainty means not knowing. To scientists, however, uncertainty is how well something *is* known."[158] While scientists know that research points towards a greater understanding of a phenomenon or event even if there is uncertainty, that uncertainty can be enough for the public and policymakers to conclude that something is not real. In the case of climate change, that's a dangerous difference.

One challenge is that while scientists use numbers that describe how statistically probable something is, non-scientists use words to explain how certain they are. The IPCC uses a simple chart to convert the numbers into words, so a probability above 99 per cent means "virtually certain", a value above 66 per cent means "likely" and so on.[159]

However, one person's understanding of "likely" is the same as another person's understanding of "virtually certain". Journalists may help their audience understand more clearly if they report both the verbal and numerical terms and use the full numerical range of certainty. For instance: "Scientists say they think is it likely (66-85 percent) that the region will experience more frequent flooding if global temperatures rise on average by two degrees above pre-industrial levels."

Journalists can also report on the factors that scientists say account for their uncertainty. In the example above, they might say: "We are sure that there will be more rain but we can't predict yet when it will fall and timing is a big factor in flooding."

Journalists should note that scientists can have various levels of certainty about a given subject. Take rising sea levels. Scientists are sure the seas are rising – they can measure that directly. They are nearly certain about what is causing sea levels to rise. But they are much less certain about how much sea levels will rise in different parts of the world and when. Such scientific uncertainty makes it important for journalists to avoid comparing unlike scenarios and aggregating statistics from different studies or regions. Doing so may be tempting, but will not illustrate the entire picture.

Reporting on risk

Risk is the other major scientific concept for journalists to understand and explain. Journalists who report on risks to people or the environment must take care neither to exaggerate nor underplay the scale of any threat. Risk is not the same as danger: it is a measure of the likelihood of danger. Though deceptively simple, risk is one of the hardest things to communicate accurately, partially because it can be very hard to actually determine what a real risk is and partially because public perceptions of risk can be very different from those of scientists and other experts.

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[157] https://www.skepticalscience.com/docs/Debunking_Handbook.pdf
https://skepticalscience.com/The-Uncertainty-Handbook-Download-and-Translations.html

[158] See Union of Concerned Scientist. Certainty vs. Uncertainty (http://www.ucsusa.org/global_warming/science_and_impacts/science/certainty-vs-uncertainty.html)

[159] See IPCC, 2007. Climate Change 2007: synthesis Report. Intergovernmental Panel of Climate Change, Geneva, Switzerland. (http://www.ipcc.ch.pdf/assessment-report/ar4/syr/ar4_syr.pdf)

Technically speaking, risk equals the probability of something happening multiplied by the consequences of that thing happening. But when dealing with non-experts, risk tends to mean "hazard plus outrage". Here hazard is the demonstrable harm caused by a risk, and outrage is our emotional, fear-based response to that same risk.[160] In this more common way of perceiving risks, people's responses are far more influenced by how horrible the consequences of a bad thing happening would be than the scientific likelihood of it happening at all. This is why, for example, people tend to be more frightened of the risk of a plane crash than a car crash, even though the technical likelihood of being in a car crash is dramatically higher.

To report accurately on risk, it is important that journalists present relevant statistics and be able explain them in a way that is accurate and clear to their audience. But it is at least as important that they are aware of the perceptions of hazards and outrage that the risk might represent in their audiences' minds. Journalists should be aware, for example, that people tend to perceive risks that have been imposed upon them as more dangerous than those they have chosen, or that risks that have natural origins are often seen as less threatening than human-made ones. Journalists who fail to become familiar with this can create disproportionate fears or unrealistic hopes, lose the trust of their audiences, and can discourage scientists from talking to the media for fear that reporters will distort their findings.

When reporting on a risk it is important to state what the risk is relative to. For instance, a study may conclude that climate change would double the risk of major floods in a coastal city. This 100 per cent increase sounds serious, but if the current frequency of floods is low, a doubling is still a relatively small risk. Journalists should also note susceptibility to risk varies greatly by demographic, so they should try to explain what other factors could heighten a risk, such as age, gender, livelihood, or wealth.

Journalists should understand how significant the evidence of risk is, as individual studies often contradict one another. If one study identifies a certain risk, but 20 others on the same subject find no risk, journalists should be wary of reporting the risk until they seek the views of credible independent sources.

The easiest way for a journalist to be sure that they understand a risk is to talk with the source of the information, such as the author of a scientific report. Reporters can also check whether they can effectively communicate the risk by asking colleagues to see if they understand it. To help make sense of risks, it can be useful to compare them to other well-known factors that people are more familiar with.

Sources of information

US Department of Energy guide "Reporting on climate change: understanding the science" http://www.elistore.org/ Data/products/d13-11.pdf

New Scientist magazine's guide to the science of climate change http://www.newscientist.com/article/dn11462- climate-change-a-guide-for-the-

[160] https://theconversation.com/speak-out-climate-experts-but-stop-making-tactical-mistakes-30732

perplexed.html

The **Intergovernmental Panel on Climate Change** website has some pages for journalists, which include press releases, information about meetings, and fact sheets. http://www.ipcc.ch/press_information/press_information.htm

SciDev.Net's guide to communicating statistics and risk http://www.scidev.net/en/science-communication/ practical-guides/communicating-statistics-and-risk.html

Union of Concerned Scientists – Certainty vs. Uncertainty: Understanding scientific terms about climate change http://www.ucsusa.org/global_warming/science_and_impacts/science/certainty-vs-uncertainty.html

Making a good story: Sourcing and using data, photos, videos, maps and graphics

The volume of freely available data about climate change is steadily increasing as governments and international groups publish more of their information online. For a journalist working to explain the realities of climate change, data is a helpful assistant. It can add both concrete evidence for a specific claim and help explain the global context for a local story. For this reason, this book includes a sampling of climate data focused on carbon emissions, finance, and key sectors at risk for every country in Asia Pacific (see Part Six). This data comes from a variety of sources detailed below. But the data in this book is just a good place to start as many governments, academics and civil society groups have more detailed local information available on topics ranging from weather to land use and more.

World Bank Climate Indicators http://data.worldbank.org/topic/climate-change
The World Bank has compiled a database that includes 52 climate change-related indicators for nearly all Asia Pacific countries. There are time sequences available that can help provide insights into regional and country trends. This data is not limited to climate information. Many of the indicators focus on trends in economic development, health, agricultural productivity, and natural hazards. In addition to the data included in this book, the World Bank also hosts long -term analysis of historical weather patterns available through the World Bank Climate Change Knowledge Portal.

Climate Funds Update (CFU) http://www.climatefundsupdate.org/
The CFU tracks all multilaterally -governed funds focused on climate change, many of which have links to the UNFCCC. Bilateral initiatives are also tracked but not complete so it is important to realize that not all climate financing is included in this database. The data is cumulative since 2003 and updated twice a month. Analyses of regional and country funding trends are also available on the site.

Dara Climate Vulnerability Monitor http://daraint.org/climate-vulnerability-monitor
This database is structured around two core areas, the impacts of climate change on society and the independent impact of the carbon economy on society (separate from climate change). Within each category are specific indicators like desertification for climate impacts or oil spills for the carbon economy. The goal of the monitor is to analyse the degree to which a community experiences harm as a result of a change in climate. Each indicator is compiled on a country-by-county basis and can be used to identify the specific climate change induced vulnerabilities your country faces.

Intergovernmental Panel on Climate Change (IPCC) Data Distribution Centre http://www.ipcc-data.org
The data used to create IPCC's assessment reports is made available through the Data Distribution Centre. This site combines observed climate dataset and climate model data that is used to create predictions about the future results of climate change.

Using data

Journalists can do more than just present data. They can use it as a research tool. It can reveal the trends that can support the conclusions included in articles. Finding outliers—extreme or atypical occurrences—in data can be the start of an investigation. Why is this data different

than the norm? Finding that answer can itself be a story. The other major use of data is visualization. Turning data into a map or an infographic can help you narrate a story in a visual way. This approach requires some design skills and planning and it is advisable to review previous examples and tutorials found in this book and elsewhere if you are going to make your own visualizations.

Images that add to the climate change story

Climate change presents unique challenges to reporters seeking to describe it. The climate is the pattern of average weather over a long time, the atmosphere itself is invisible and a direct impact like an extreme weather event or a food shortage only demonstrates a relationship to climate change. Ask yourself, have you ever seen "climate change?"

Words alone often fail to describe the interconnected web of influences. and impacts summarized in a term as big as climate change. Images are well suited to help make stories personal and real. By using a range of complementary images including pictures, maps, graphics and drawings, journalists can help strengthen their reports with evidence and explanation.

Many news outlets have photographers available either on staff or on contract. In these situations, close collaboration between writers and photographers is important. Working as a team and discussing the story's background research, the angles and the key photo opportunities will help yield good results. If you don't have the option of working directly with a photographer, there are still ways to include photos in your reporting. You can take the photos yourself, search for images online (Creative Commons images are free while stock photos are not), or request pictures from your audience via social media.

For example, Instagram[161] can be very useful for journalists in finding images about an issue they are working on in a particular location. If a journalist is working on a story about flooding in Jakarta, they can use Instagram hashtags to find images on this subject. They might then contact the photographers for permission to use their images, collaborate with them and/or find local sources and contacts on the subject they are covering.

Video has become increasingly important for communicating stories online, especially through social media. Whether in the form of short video clips, or short to long form documentary productions, video is a powerful tool in vividly communicating climate change stories. As when working with photographers, reporters can work with videographers in similar manner to help research, plan and carry out climate change related stories with video elements. Many news organisations have staff videographers, as well as networks of freelancers.

Data driven images like maps and infographics help readers visualize patterns or processes that underlie the narrative of your article. Though they do take time and resources to create, using maps and graphics is beneficial if they effectively connect abstract ideas to real life. Someone might not care about ocean level rise, but they will if they take note of a map showing their own house under water. When deciding if you should use a map in your article, ask yourself if location is an important part of your story. If you are dealing with a broad or

[161] See reference on 'Everyday Climate Change' Instagram feed to help in visualizing climate change impacts and effects https://www.instagram.com/everydayclimatechange/

contentious subject, you can use maps to show local or regional variations in a trend.

Similarly, infographics can help present statistical information in a more understandable way or efficiently describe an intricate process. There are many types of infographics such as timelines, comparisons, charts and process diagrams.

Much like photography, some media organizations have staff dedicated to creating maps and graphics to accompany their stories but the vast majority still don't have the funds or time to make the investment. It is difficult but not impossible for a journalist to incorporate a multitude of visual elements into their reporting and there are many free training resources available to help you get started learning to use these new communications tools.

Resources for Finding Photos & Video:

Free: Flickr, Picasa, Wikimedia Commons

Paid: iStockPhoto, Getty, Shutterstock, AdobeStock, Alamy, National Geographic Creative, AP, Reuters, Magnum, VII

Resources for Making Maps:

Google Fusion Tables, MapBox, CartoDB, qGIS, School of Data, Google Maps, Kartograph, Polymaps

Resources for Making Graphics:

Google Spreadsheets, Tableau Public, Gephi, Many Eyes, D3 (Data Driven Documents), Infogram, Piktochart

Part Six: Reference section

Climate in Asia and the Pacific: how it might change

The science of climate change in Asia and the Pacific is too complex and evolving too quickly to summarise in this guide. To effectively cover climate change, journalists should familiarise themselves with the regional drivers of climatic conditions and the ways that, within regions, topography, vegetation and the presence of large bodies of water can affect local weather.

Key drivers of climatic conditions in Asia Pacific

Inter-Tropical Convergence Zone

This is the equatorial zone where northeast and southeast winds close to the Earth's surface merge, forming a band of clouds that give rise to tropical monsoons.

El Niño–Southern Oscillation

For at least nine months roughly every five years, the Pacific Ocean experiences anomalously warm (El Niño) or cold (La Niña) temperatures. During La Niña, colder temperatures in the eastern Pacific cause low-lying winds to intensify. El Niño Southern Oscillation events produce dramatic changes in rainfall, rising sea levels and other weather-related phenomena.[162]

Regional variations in climate

What follows is only an overview. For more detailed information, journalists can consult the Fifth Assessment Report of the IPCC.

North Asia

Being one of the coldest areas in winter, changes on the ecosystems are predicted to happen due to the region's most pronounced rising temperatures. The direction and rate of change of the steppe vegetation is still unclear because of the uncertain trends. Not only there will be changes on tundra and forest-tundra biomes but also it will affect water availability and especially indigenous people, who rely on fishing and hunting for living.

Central Asia

The region includes several countries of predominantly arid and semi-arid region. Although there are no coherent trends on precipitation and monsoons in the region, Central Asia is expected to become warmer in the coming years, especially in the Western parts of Turkmenistan, Uzbekistan and Kazakhstan. If climate change maintains its current pace throughout the next century, water supply will remain as one of the major challenges of the region while it will affect crop yield at the same time.

South Asia

South Asia is physiographically and ecologically diverse. It is characterized for its tropical forest, semi-desert areas in the northwest and alpine ecosystems in the north. On the following years, there will be an increased variability on the monsoon trends. Over India, an increase in the number of monsoon break days and a decrease in the number of monsoon

[162] **See Climate Change and Small Islands and Developing States:** https://unfccc.int/resource/docs/publications/cc_sids.pdf

depressions are consistent with the overall decrease in seasonal mean rainfall. This will not only have effects on the country's vegetation and fauna but it will have a tremendous impact on poverty as climate-driven issues will impact on the most vulnerable parts of population.

East Asia

The region will experience rising temperatures and an increase in precipitation in all seasons, but especially during the East Asian summer monsoons. Also, summer heat waves will be longer, more intense and more frequent. There are signals that suggest that the extreme rainfall and winds that come with tropical cyclones are likely to increase.

Southeast Asia

Southeast Asian region is identified with tropical rainforest, monsoon climates with constant and high rainfall, heavily -leached soils and a wide variety of ethnic groups. Similarly, to East Asia, there is an increasing trend in rising temperatures while raining patters will differ depending on the country (paradoxically some of them will face the threat of flood while others will face droughts). The northern part of the region will be highly affected by any change on cyclone behavior.

Australasia

Australasia's climate is strongly influenced by the surrounding oceans. Usually, the region is affected by tropical monsoons or ENSO phenomenon, which causes floods and droughts. The projected impacts of climate change are consistent with the other regions. The mean temperature will increase and the rainfall patterns will change, becoming less frequent and consistently threatening the population and ecosystem.

Small Islands

The particular conditions of small Pacific islands make them highly vulnerable to the negative effects of climate change. Among the climate-related risks for these islands are: sea level rise, cyclones, increasing temperatures and changing rainfall patterns. Sea level rise is the most visible threat to these territories, as they have a high surface of low-lying coastal areas that risk erosion, floods and ecosystem degradation. Although small islands are prone to suffering the consequences of sea level rise more than other countries or areas, they do not have a uniform climate change risk profile.

Climate Change Story: Lake Urmia: Where climate and mismanagement collide

The World's Great Lakes disappearance is one of the most striking images of the physical consequences of climatic change. Experts blame much of the disappearance of the lake on both human actions, such as inefficient damming and irrigation and shifting climate patterns. For instance, Lake Urmia, located in Iran, has suffered consequences from ill-conceived irrigation schemes but climate change has caused 65 per cent of the lake's reduction. Similarly, not only lakes but also rivers can suffer from both human and climate change actions such as the Mekong River where water management and climate change are having vast impacts.

Country-by-country: Finance, emissions and vulnerability

This table provides country-by-country data on greenhouse gas emissions, climate finance and vulnerability for each nation. The finance data is from climate funds update (www.climatefundsupdate.org), the emissions data is from the World Bank, and the vulnerability assessments come from Dara, which also has details of which of 22 different aspects of vulnerability are most relevant to each country (see http://daraint.org/climate-vulnerability-monitor).

	Climate finance (US$ millions) in 2016	Total CO_2 emissions (kt CO_2) in 2013	Per capita CO_2 emissions (metric tons) in 2013	Climate vulnerability 2010	Climate vulnerability 2030
Afghanistan	33	21269	0.7	Acute	Acute
Australia	N/A	377906	16.3	Moderate	Moderate
Bangladesh	277	68951	0.4	Severe	Acute
Bhutan	44	884	1.2	Severe	Acute
Brunei Darussalam	N/A	7785	19.2	Moderate	Moderate
Cambodia	170.9	5574	0.4	Severe	Severe
China	322.4	10249463	7.6	Moderate	High
Cook Islands	9.7	N/A	N/A	N/A	N/A
Democratic People's Republic of Korea	N/A	50091	2.0	Severe	Acute
Fiji	N/A	1709	1.9	Moderate	High
India	1070	2034752	1.6	High	Acute
Indonesia	515.9	479365	1.9	Moderate	High
Iran, Islamic Republic of	9.5	616976	8.0	Moderate	High
Japan	N/A	1243384	9.8	Low	Low
Kazakhstan	164	262902	15.4	Severe	Acute
Kiribati	8.6	62	0.6	High	Acute
Kyrgyzstan	26	9842	1.7	High	High
Lao People's Democratic Republic	77.2	2175	0.3	Moderate	High
Malaysia	21.7	236510	8.0	Moderate	Moderate
Marshall Islands	1	103	1.9	Severe	Acute
Micronesia, Federated States of	9	147	1.4	Severe	Acute
Mongolia	59.5	41591	14.5	Moderate	Severe
Myanmar	50.6	12603	0.2	Acute	Acute
Nauru	N/A	44	4.1	N/A	N/A
Nepal	193	6502	0.2	High	Severe
New Zealand	N/A	33960	7.6	Low	Low
Pakistan	66	153369	0.8	High	Acute
Palau	1	224	10.7	Moderate	High
Papua New Guinea	53	6073	0.8	High	Acute

Philippines	163.7	98239	1.0	Moderate	High
Republic of Korea	N/A	592499	11.7	Low	Moderate
Samoa	N/A	238	1.2	High	Acute
Singapore	N/A	50557	9.4	Moderate	Moderate
Solomon Islands	117.2	198	0.2	Severe	Acute
Sri Lanka	68	16025	0.8	Moderate	Moderate
Tajikistan	137	3589	0.4	High	Severe
Thailand	145.5	303118	4.4	Moderate	High
Timor-Leste	35.8	440	0.4	Severe	Acute
Tonga	N/A	209	2.0	Moderate	High
Turkey	450	323451	4.3	Moderate	Moderate
Turkmenistan	15	66893	12.5	High	High
Tuvalu	46.5	N/A	N/A	High	Severe
Uzbekistan	18	103226	3.4	High	High
Vanuatu	N/A	106	0.4	Acute	Acute
Vietnam	281.5	152624	1.7	High	Acute

Part 6: Directory of climate change contacts for journalists

This section of the book provides contact details of nongovernmental organisations, research centres and intergovernmental organisations that work on climate change in Asia Pacific. This is not an exhaustive list, but should help journalists who need such contacts. The Climate Change Media Partnership's roster of experts also has details of many relevant contacts (http://climatechangemedia.ning.com), as does the UNFCCC roster http://maindb.unfccc.int/public/roe/)

Civil society organisations

Non-governmental organisations that work on climate change tend to focus on raising community awareness of the threats, supporting projects through which people can adapt to climate change, providing early warnings of climatic disasters and relief after they strike,and supporting mitigation activities such as tree-planting and renewable energy projects. Such organisations are not only useful sources of comment on climate change, but can also be sources of stories. As they work closely with communities, they can help journalists to reach people with personal testimony of climate change and its effects.

- Asia-Pacific Network for Global Change Research http://www.apn-gcr.org
- CARE's Climate Change Information Centre http://www.careclimatechange.org/
- Climate Action Network – International http://www.climatenetwork.org/
- Bangladesh Poribesh Andolon (BAPA) http://www.bapa.org.bd/
- Beijing Climate Centre http://www.bcc.cma.gov.cn/en/
- Centre for Environmental Education India (CEE) http://www.ceeindia.org/
- Centre for Environmental Justice Sri Lanka (CEJ) http://www.ejustice.lk/
- Centre for Science and Environment India (CSE) http://www.cseindia.org/
- Climate South Asia Network http://www.climatsouthasia.org/
- Culture and Environment Preservation Association Cambodia (CEPA) http://www.cepa-cambodia.org/
- Education for Nature-Vietnam (ENV) http://www.envietnam.org/
- Environmental Foundation – Justice for Nature Sri Lanka (EFL) http://www.efl.lk
- Environmental Legal Assistance Center Philippines (ELAC) http://www.elac.org.ph/
- Excellent Development www.excellentdevelopment.com
- Farmer Livelihood Development Cambodia (FLD) http://www.fldcambodia.org/
- Federation of Wildlife Conservation Sri Lanka (FWC) http://www.wildfed.org/
- Friends of Earth Hong Kong (FOE) http://www.foe.org.hk/
- Friends of Nature China (FON) http://www.fon.org.cn/
- Green Korea United http://www.green-korea.tistory.com/
- Green Women Kazakhstan http://www.greenwomen.kz.presentation.htm/
- Green World Foundation Thailand (GWF) http://www.greenworld.or.th/about-en/
- Green World India http://www.greenworld.org/where-we-wrk/india

- The Forest Carbon Partnership Facility https://www.forestcarbonpartnership.org/
- Indonesian Development of Education and Permaculture (IDEP) http://www.idepfoundation.org/
- Integrated Research for Action and Development India (IRADe) http://www.irade.org/
- Japan Center for a Sustainable Environment and Society (JACSES) http://www.jacses.org/
- Japan Water Forum (JWF) http://www.waterforum.jp/
- Korean Federation for Environmental Movement (KFEM) http://www.english.kfem.or.kr/
- Love Green Nepal (LGN) http://www.lovegreennepal.org.np/
- Malaysian Nature Society (MNS) http://www.mns.my/
- Malaysian Water Association (MWA) http://www.mwa.org.my/
- Mekong Partnership for the Environment http://www.pactworld.org/mekong-partnership-environment/
- MENGO Malaysia http://www.mengo.org/
- Nature Fiji-Mareqeti Viti http://www.naturefiji.org/
- National Trust of Fiji (NTF) http://www.nationaltrust.org.fj/
- Raising Awareness on Environmental and Climate Change Programme (RAECP) http://www.raecp.org/
- Royal Society for Protection of Nature Bhutan (RSPN) http://www.rspnbhutan.org/
- Singapore Environment Council (SEC) http://www.sec.org.sg/
- Society, Environment, Economy, Knowledge Thailand (SEEK) http://www.myseek.org/
- Southeast Asia Network of Climate Change http://www.sean/cc.org/
- The Energy and Resources Institute India (TERI) http://www.teriin.org/
- The Red Cross / Red Crescent Climate Centre http://www.climatecentre.org

Academics and researchers

Researchers at universities, independent research centres and international organisations with offices in Asia and the Pacific nations are working to understand many aspects of climate change science and policy. But these organisations are not always very good at communicating about their work. Journalists need to make contact with staff there to find out about the projects they are working on and the results of any completed studies. A growing number of these sources employ press officers to liaise with the media about their forthcoming news and journalists can usually request to receive their press releases via email.

- Agrhymet Regional Centre http://www.agrhymet.net/eng/
- Agricultural Research for Development http://www.cirad.fr
- Assessments of Impacts and Adaptations to Climate Change – AIACC http://www.aiaccproject.org/
- Australian Science Media Center http://www.smc.org.au/

- Bangladesh Institute of International and Strategic Studies (BIISS) http://www.biiss.org/
- CCAFS -- The CGIAR Research Programme on Climate Change and Food Security www.ccafs.cgiar.org
- Centre for South Asian Studies (CSAS) http://www.csas.org.np/
- Centre for International Earth Science Information Network http://www.ciesin.columbia.edu
- Centre for International Forestry Research (CIFOR) http://www.cifor.org/
- Centre for the Public Awareness of Science (CPAS) http://www.cpas.anu.edu.au/
- Climate & Development Knowledge Network http://cdkn.org/regions/asia/
- Energy Research Centre, University of Cape Town http://www.erc.uct.ac.za/
- Famine Early Warning Systems Network – FEWSNET www.fews.net
- Food, Agriculture and Natural Resources Policy Analysis Network – FANRPAN http://www.fanrpan.org/
- Global Change and Hydrological Centre http://www.glowa.org/
- Global Climate Observing System https://www.wmo.int
- IGAD Climate Prediction and Applications Centre http://www.icpac.net/
- International Institute for Environment and Development –www.iied.org/climate-change-group
- International Institute for Sustainable Development www.iisd.org
- International Research Institute for Climate and Society http://portal.iri.columbia.edu/portal/server.pt
- Institute for Global Environmental Strategies (IGES) http://www.iges.or.jp/en/index.html/
- The Ecosystems and Livelihoods Adaptation Network http://www.elanadapt.net/
- University of Jos Centre for Environmental Resources and Hazards Research www.unijos.edu.ng/
- World Agroforestry Centre – ICRAF www.worldagroforestry.org
- World Meteorological Organization www.wmo.int

Government/intergovernmental/UN/donor

Each country has a national focal point for the UN Framework Convention on Climate Change. This is a named individual in a government department whose contact details are listed here: http://maindb.unfccc.int/public/nfp.pl. These are, however, not the only important government sources, as climate change increasingly features of the work of multiple ministries. The section of government that tends to take responsibility for climate change is the environment ministry, but as climate change is relevant to so many other sectors (water, agriculture, tourism, forestry, education, finance) governments are increasingly trying to integrate climate change into all areas of policy. Journalists need to know which civil servants and government departments work on climate change and what their budgets and plans are. They need to know what governments have committed to do, either domestically or in the international arena.

- ASEAN Cooperation on the Environment http://www.environment.asean.org/
- Asia-Pacific Forum of Environment and Development (APFED) http://www.apfed.net/
- Asian Environmental Compliance and Enforcement Network (AECEN) http://www.aecen.org/
- Asia-Pacific Adaptation Network (APAN) http://www.asiapacificadapt.net/
- Asia-Pacific Water Forum (APWF) http://www.apwf.org/
- Economy and Environment Program for Southeast Asia (EEPSEA) http://www.idrc.ca/EN/pages/
- ESCAP Centre for Alleviation of Poverty through Sustainable Agriculture http://www.uncapsa.org/
- Food and Agriculture Organisation of the United Nations – FAO www.fao.org/climatechange
- Global Environment Facility (GEF) http://www.thegef.org/
- Global Water Partnership (GWP) http://www.gwp.org/
- Interstate Commission for Water Coordination for Central Asia (ICWC for Central Asia)
- Pacific Community http://www.spc.int/
- Regional Environmental Centre for Central Asia (CAREC) http://www.carecnet.org/
- Secretariat of the Pacific Regional Environment Programme (SPREP) www.sprep.org
- Secretariat of the Pacific Community (SPC) www.spc.int
- South Asian Association for Regional Cooperation (SAARC) http://www.saarc-sec.org/
- South Asia Cooperative Environment Programme (SACEP) http://www.sacep.org/
- The Adaptation Fund https://www.adaptation-fund.org/
- UN Commission on Sustainable Development: http://www.un.org/en/development/
- UN Environment Programme World Conservation Monitoring Center (UNEP-WCMC) http://www.unep-wcmc.org/
- UN Inter-Agency Standing Committee Taskforce on Climate Change: http://www.humanitarianinfo.org/iasc/pageloader.aspx?page=content-subsidi-common-default&sb=76
- UNDP Adaptation Learning Mechanism http://www.adaptationlearning.net/
- UNDP Asia and the Pacific http://www.asia-pacific.undp.org/
- UNESCAP Environment and Development http://www.unescap.org/
- World Health Organization: Protection of the Human Environment: http://www.who.int/peh/index.html
- World Meteorological Organization: http://www.wmo.int/pages/index_en.html
- World Water Organization (WWO) http://www.theworldwater.org/

Networks of journalists
International / regional

- Asia-Pacific Forum of Environmental Journalists (APFEJ)
- Asian American Journalists Association (AAJA) http://www.aaja.org/
- Climate Change Media Partnership http://climatechangemedia.ning.com/
- Internews Earth Journalism Network http://earthjournalism.net/user/register
- International Federation of Environmental Journalists (IFEJ) http://www.ifej.org/
- Pacific Islands News Association (PINA) **www.pina.com.fj**
- Society of Environmental Journalists (SEJ) http://www.sej.org/

National networks

- Bangladesh: Earth Journalists Bangladesh http://www.profiles.eco/earthjournalists/
- Bangladesh: Forum of Environmental Journalists of Bangladesh
- Cambodia: Cambodia Environmental Journalist Network (CEJN) http://www.cejn-cambodia.com/
- China: China Forum of Environmental Journalists (CFEJ) http://www.cfej.net/
- Indonesia: Society of Indonesian Environmental Journalists (SIEJ) http://siej.or.id/
- Japanese Forum of Environmental Journalists (JFEJ) http://www.jfej.org/
- Nepal: Nepal Forum of Environmental Journalists (NFEJ) http://www.nefej.org.np/
- Philippines: The Philippines Network of Environmental Journalists (PNEJ) http://www.pnej.org/
- Sri Lanka: Sri Lanka Environmental Journalism Forum (SLEJF) http://www.environmentaljournalists.org/
- Vietnam: Vietnam Forum of Environmental Journalists (VFEJ) http://www.vfej.vn/

Glossary of climate change terms

Adaptation: Activities undertaken as well as individual and collective behavioural changes aiming to reduce the vulnerability and build the resilience of biological and human systems to the effects of global warming.

Aerosol: An aerosol is a collection of microscopic particles, solid or liquid, suspended in a gas. In the context of air pollution, an aerosol refers to fine particulate matter that is larger than a molecule, but small enough to remain suspended in the atmosphere for at least several hours.

Afforestation: The establishment of a forest through tree planting or seeding on land that has lacked forest cover for a very long time or has never been forested.

Agenda 21: Adopted in 1992 at the United Nations Conference on Environment and Development (UNCED), Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations system, governments, and major groups in every area in which humans impact the environment.

Agroforestry: An ecologically based farming system that, through the integration of trees in farms, increases social, environmental and economic benefits to land users.

Anthropogenic: Man-made, not natural.

Arable land: Land that can be used for growing crops.

Atmosphere: General name for the layer of gases around a material body; the Earth's atmosphere consists, from the ground up, of the troposphere, stratosphere, mesosphere, ionosphere (or thermosphere), exosphere and magnetosphere.

Biodiversity: The variety of life in all its forms, levels and combinations; includes ecosystem diversity, species diversity, and genetic diversity.

Bioenergy: Used in different senses: in its most narrow sense it is a synonym for Biofuel, fuel derived from biological sources. In its broader sense it encompasses also Biomass (e.g. wood), the biological material used as a biofuel.

Biofuel: The fuel produced by the chemical and/or biological processing of biomass. Biofuel will either be a solid (e.g. charcoal), liquid (e.g. ethanol) or gas (e.g. methane).

Biogas: Landfill gas and sewage gas, also called biomass gas.

Biomass: The materials derived from photosynthesis such as forest, agricultural crops, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, and municipal and industrial wastes; also, the quantity of organic material present in unit area at a particular time mostly expressed as tons of dry matter per unit area; also organic matter that can be used as fuel.

Biome: A climatic and geographically defined area of ecologically similar communities of plants, animals, and soil organisms, often referred to as ecosystems.

Biosphere: The part of the Earth, including air, land, surface rocks, and water, within which life occurs, and which biotic processes in turn alter or transform.

Carbon credit: A market-driven way of reducing the impact of greenhouse gas emissions; it allows an agent to benefit financially from an emission reduction.

Carbon dioxide equivalent (CO_2e): The unit used to measure the impacts of releasing (or avoiding the release of) different greenhouse gases; it is obtained by multiplying the mass of the greenhouse gas by its global warming potential. For example, this would be 21 for methane and 310 for nitrous oxide.

Carbon dioxide: A gas with the chemical formula CO_2; the most abundant greenhouse gas emitted from fossil fuels.

Carbon footprint: A measure of the carbon emissions that are emitted over the full life cycle of a product, service or lifestyle.

Carbon neutral: Generally refers to activities where net carbon inputs and outputs are the same. For example, assuming a constant amount of vegetation on the planet, in the short term burning wood will add carbon to the atmosphere but this carbon will cycle back into new plant growth.

Carbon sink: Any carbon storage system that causes a net removal of greenhouse gases from the atmosphere.

Carbon source: Opposite of carbon sink; a net source of carbon for the atmosphere.

CFC: Chloroflorocarbon. CFCs are potent greenhouse gases which are not regulated by the Kyoto Protocol since they are covered by the Montreal Protocol.

Chronic: Occurring over a long period of time, several weeks, months or years.

Climate: The composite or generally prevailing weather conditions of a region, as temperature, air pressure, humidity, precipitation, sunshine, cloudiness, and winds, throughout the year, averaged over a series of years.

Climate change: The long-term change in the earth's climate, especially due to an increase in the average atmospheric temperature, considered to be caused mainly by the emissions of greenhouse gases from human activities.

Concentration: The amount of one substance dissolved or contained in a given amount of another substance or medium. For example, sea water has a higher concentration of salt than fresh water does.

Cyclone: Intense low pressure weather systems; mid-latitude cyclones are atmospheric circulations that rotate clockwise in the Southern Hemisphere and anti-clockwise in the Northern Hemisphere and are generally associated with stronger winds, unsettled conditions, cloudiness and rainfall. Tropical cyclones (which are called hurricanes in the Northern Hemisphere) cause storm surges in coastal areas.

Deforestation: the conversion of forested areas to non-forest land for agriculture, urban use, development, or wasteland.

Desert: An area that receives an average annual precipitation of less than 250 mm, or an area in which more water is lost than falls as precipitation.

Desertification: The degradation of land in arid, semi-arid and dry sub-humid areas resulting from various climatic variations, but primarily from human activities.

Drought: An acute water shortage relative to availability, supply and demand in a particular region. An extended period of months or years when a region notes a deficiency in its water supply

Ecosystem: Whole complex of relationships between species among themselves and with the inert medium in which they operate. The ecosystem includes the biota and habitat.

Ecological Footprint: A measure of the area of biologically productive land and water needed to produce the resources and absorb the wastes of a given population (e.g. a country, a region or the whole world).

Ecology: The scientific study of living organisms and their relationships to one another and their environment; the scientific study of the processes regulating the distribution and abundance of organisms; the study of the design of ecosystem structure and function.

Energy efficiency: Using less energy to provide the same level of energy service.

El Niño: A warm water current which periodically flows southwards along the coast of Ecuador and Peru in South America, replacing the usually cold northwards flowing current; occurs once every five to seven years, usually during the Christmas season; the opposite phase is called a La Niña.

Emissions: Substances such as gases or particles discharged into the atmosphere as a result of natural processes of human activities, including those from chimneys, elevated point sources, and tailpipes of motor vehicles.

Erosion: Displacement of solids (sediment, soil, rock and other particles) usually by the agents of currents such as, wind, water, or ice by downward or down-slope movement in response to gravity or by living organisms.

Epidemic: A widespread outbreak of an infectious disease in which many people are infected at the same time.

Externality: A cost or benefit that is not borne by the producer or supplier of a good or service. In many environmental situations environmental deterioration may be caused by a few while the cost is borne by the community; examples would include overfishing, pollution (e.g. production of greenhouse emissions that are not compensated for in any way by taxes etc.), the environmental cost of land-clearing etc.

Food security: global food security refers to food produced in sufficient quantity to meet the full requirements of all people

Forest: Land with a canopy cover greater than 30%.

Fossil fuel: Any hydrocarbon deposit that can be burned for heat or power, such as coal, oil and natural gas (produces carbon dioxide when burnt); fuels formed from once-living

organisms that have become fossilized over geological time.

Freshwater: Water containing no significant amounts of salt.

Groundwater: Water located beneath the ground.

Geothermal energy: Energy derived from the natural heat of the earth contained in hot rocks, hot water, hot brine or steam.

Greenhouse effect: The insulating effect of atmospheric greenhouse gases (e.g., water vapor, carbon dioxide, methane, etc.) that keeps the Earth's temperature warmer than it would be otherwise.

Greenhouse gas: Any gas that contributes to the greenhouse effect

Hydrocarbons: Chemicals made up of carbon and hydrogen that are found in raw materials such as petroleum, coal and natural gas, and derived products such as plastics.

Hydroelectric power: The electrical power generated using the power of falling water.

Hydrological cycle (water cycle): The natural cycle of water from evaporation, transpiration in the atmosphere, condensation (rain and snow), and flows back to the ocean (e.g. rivers).

Industrial agriculture: A form of modern farming that refers to the industrialized production of livestock, poultry, fish, and crops.

Intercropping: the agricultural practice of cultivating two or more crops in the same space at the same time.

Intergovernmental Panel on Climate Change (IPCC): the IPCC was established in 1988 by the World Meteorological Organization and the UN Environment Programme to provide the scientific and technical foundation for the United Nations Framework Convention on Climate Change (UNFCCC), primarily through the publication of periodic assessment reports.

Irrigation: Watering of plants, no matter what system is used.

Kyoto Protocol: an international agreement adopted in December 1997 in Kyoto, Japan. The Protocol sets binding emission targets for developed countries that would reduce their emissions on average 5.2 percent below 1990 levels.

Land use, land-use change and forestry (LULUCF): Land uses and land-use changes can act either as sinks or as emission sources. LULUCF is terminology used in the UN Framework Convention on Climate Change whose Kyoto Protocol allows parties to receive emissions credit for certain LULUCF activities that reduce net emissions.

Mitigation: Activities undertaken as well as individual and collective behavioural changes aiming to limit human contributions to greenhouse gas emissions and global warming.

Monoculture: The practice of producing or growing one single crop over a wide area.

Natural resources: Natural substances that are considered valuable in their relatively unmodified (natural) form.

Non-Government Organization (NGO): A not-for-profit or community -based organization.

Ocean acidification: Reduction in pH of ocean water that is caused by its uptake of carbon dioxide from the atmosphere.

Organic agriculture: A farming system that avoids the use of synthetic fertilizers, pesticides and genetically modified organisms, minimizes pollution of air, soil and water,and optimizes the health and productivity of interdependent communities of plants, animals and people.

Pathogen: any disease-producing agent (especially a virus or bacterium or other microorganism)

pH: A measure of the acidity or alkalinity of a solution, (where 7 is neutral and greater than 7 is more alkaline and less than 7 is more acidic).

Polluter pays principle: The principle that producers of pollution should in some way compensate others for the effects of their pollution.

Precipitation: Any liquid or solid water particles that fall from the atmosphere to the Earth's surface; includes drizzle, rain, snow, snow pellets, ice crystals, ice pellets and hail.

Reforestation: The direct human conversion of non-forested land to forested land through planting, seeding or promotion of natural seed sources, on land that was once forested but no longer so.

Renewable energy: Any source of energy that can be used without depleting its reserves. These sources include sunlight (solar energy) and other sources such as, wind, wave, biomass, geothermal and hydro energy.

Sequestration: The removal of carbon dioxide from the Earth's atmosphere and storage in a sink as when trees absorb CO_2 in photosynthesis and store it in their tissues.

Sinks: Processes or places that remove or store gases, solutes or solids – for example, forests are carbon sinks that result in the net removal of greenhouse gases from the atmosphere.

Stakeholders: Parties having an interest in a particular project or outcome.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Temperate: With moderate temperatures, weather, or climate; neither hot nor cold; mean annual temperature between 0–20 degrees C.

Tropical: Occurring in the tropics (the region on either side of the equator); hot and humid with a mean annual temperature greater than 20 degrees C.

United Nations Environment Programme: The United Nations Environment Programme (UNEP), established in 1972, works to encourage sustainable development through sound environmental practices everywhere.

Volatile: Evaporating readily at normal temperatures and pressures. The air concentration of a highly volatile chemical can increase quickly in a closed room.

Water table: Upper level of water in saturated ground.

Watershed: A water catchment area.

Weather: The hourly or daily change in atmospheric conditions which over a longer period constitute the climate of a region (see climate).

Wetlands: Areas of permanent or intermittent inundation, whether natural or artificial, with water that is static or flowing, fresh, brackish or salt, including areas of marine water not exceeding 6 m at low tide.

Wind energy: the energy present in the motion of the wind, which can be converted to mechanical or electrical energy. A traditional mechanical windmill can be used for pumping water or grinding grain. A modern electrical wind turbine converts the force of the wind to electrical energy for consumption on-site and/or export to the electricity grid.