IMPROVING FOREST GOVERNANCE COURSE

Malaysia

3rd – 14th September 2018

Forests and Climate Change

About this Module

Climate change is one of the most significant threats to the achievement of national development goals. Forestry as a sector is also impacted by climate change. It is important to note that forests contribute to climate change, but they are also key to the reduction of carbon, a compound that is at the centre of climate change, through acting as sinks. By the end of this module learners will be able to (1) Describe the basic science of climate change and evaluate its impacts on forests; (2) Describe adaptation and mitigation as responses to climate change in the forestry sector; (3) Evaluate the implications of international agreements, discussions, conventions, and negotiations on climate change; (4) Relate the concept of gender mainstreaming to climate change.

Section 1: Introduction to Climate Change

Malaysia ranks as the 133th most climate-vulnerable country in the world. Nevertheless, significant improvements have been made in the last few years, including strengthening capacity in disaster risk reduction, improving water and sanitation as well as reducing dependence on climate-sensitive economic activities such as agriculture. There is scope for improving knowledge on the relationship between forests and climate change in Malaysia and SE Asia in general, particularly as it relates to adaptation, mitigation and building resilience to the impacts of climate change, as well as exploiting the opportunities that climate change offers to the country and region.

WHAT IS CLIMATE CHANGE?

Before we can define climate change, let us start by clarifying the difference between weather and climate:

- **weather is what happens on any given day** (i.e.: it is not raining on May 10),
- **climate is what *usually* happens** in a location (i.e.: it usually rains in May),

Therefore, **climate change** is about the changes to the climate system, which means changes to what is *usual* for a location. If the climate of a location is expected to get warmer, it means that location will be warmer *on average*, but we can't predict how the weather will turn out on any given day.

An easy way to remember the difference: "Climate is what you expect, weather is what you get."

WHAT DO WE KNOW ABOUT CLIMATE CHANGE?

The Intergovernmental Panel of Climate Change has presented several findings regarding climate change. On the basis of evidence presented by top scientists globally, the following conclusions about climate change have been made:

- Climate change is already happening
- It is mostly caused by man
- It will continue
- The rate of change is alarming
- Extreme weather is getting more frequent
- It is urgent to stop further warming

WHY IS THE EARTH GETTING WARMER?

Historical records show that our climate has always varied naturally over time, for instance due to changes in the intensity of the Sun's energy reaching the earth, volcanic eruptions, and natural changes in greenhouse gas (GHG) concentrations. However, the rather rapid warming in recent decades cannot be attributed only to natural causes. Scientific consensus now tells us that human activities are very likely to blame.

CO2 is the most important GHG - some other greenhouse gases are methane, nitrous oxide, water vapor.

The rapid global warming of the past 100 years is caused mostly by human activity, mainly:

1. **Burning fossil fuels** (e.g. coal, oil, natural gas) at unprecedented rates, sending "greenhouse gases" into the atmosphere
2. **Widespread deforestation** (trees contain a lot of carbon, and when burnt CO_2 is released)
3. **Changing agricultural** and land-use practices (agriculture releases other GHGs, CH_4 and NO_2

THE GREENHOUSE EFFECT

Short answer: Greenhouse gases act as a blanket over the earth, keeping it warmer. Human activities (as mentioned on the previous page) are adding greenhouse gases to the atmosphere, making it warmer and warmer.

Technical Explanation

The greenhouse effect is actually part of a natural process: the sun warms up the earth, the earth radiates the heat back into the atmosphere through thermal radiation. This heat is absorbed by greenhouse gases in the atmosphere, and is re-radiated in all directions. This "blanket" of greenhouse gases that prevents the heat from escaping right away causes the temperature to be higher than what it would be without greenhouse gases in our atmosphere (which is a good think, because without our atmosphere it would be very cold on earth).

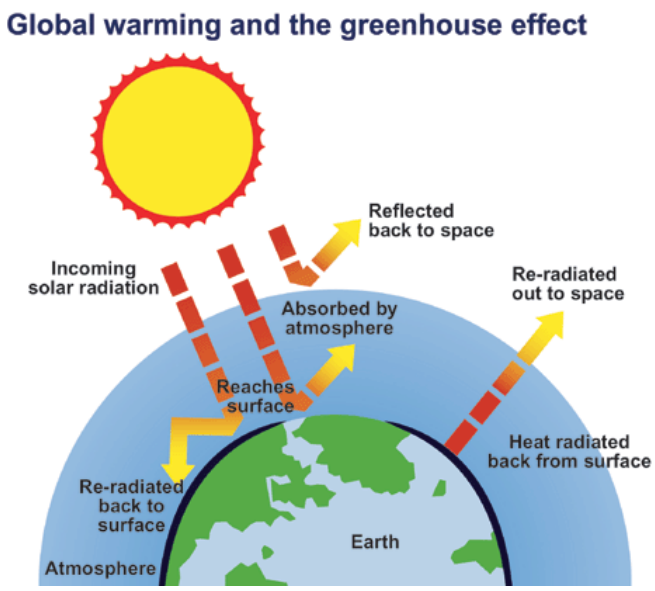


Figure 1: Global warming and the greenhouse effect

However, the human activities mentioned on the previous slide are now rapidly adding additional greenhouse gases to the atmosphere, as can be seen on this graph the 2013 IPCC report. It shows the annual variation (red) concentration of CO2 in the atmosphere measured at one station in Hawaii. In 2013 the concentration for the first time in at least 800 000 years exceeded the 400 parts per million mark on the graph (not shown). This rapid rise in greenhouse gases is resulting in a rising global temperature which is driving climate change.

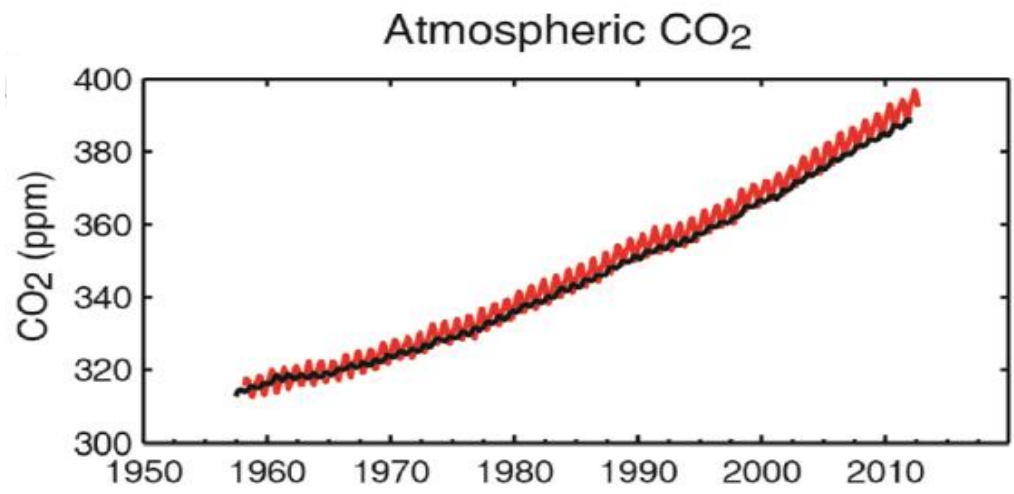


Figure 2: Trends in atmospheric CO_2

GLOBAL WARMING AND CLIMATE CHANGE

The difference between global warming and climate change is often misunderstood.

Global warming refers only to the Earth's rising surface temperature, while **climate change** includes warming and the "side effects" of warming—like melting glaciers, heavier rainstorms, or more frequent drought. Said another way, global warming is one symptom of the much larger problem of human-caused climate change.

EFFECTS OF CLIMATE CHANGE

1) Rising temperatures – with heat waves:

We know that at the "global scale" (i.e. for most land areas with sufficient data)

- It is very likely that there has been an overall DECREASE in the number of cold days and nights.
- It is very likely that there's been an overall INCREASE in the number of warm days and nights.
- In the future, for most land areas, this trend is expected to continue.
- Sea surface temperatures are also rising; "minimum" temperature extremes have risen.
- Heat waves are expected to become more frequent and more intense.

Rising temperatures can have several negative effects on people and the planet including:

- More frequent and more intense heat waves
- Higher incidence of water and vector-borne diseases
- Forest fires
- Faster ice melt

2) Sea level rise

-Ocean thermal expansion and glacier melting have been the dominant contributors to 20th century global mean sea level rise.

-Thermal expansion: ocean temperatures have been increasing, water expands as it warms → sea level rise

-Glacier melting: land based ice that melts and flows into the ocean, increasing mass of water in the ocean → sea level rise.

-Higher sea levels put coastal cities at risk from flooding, more intense storm surges, and coastal erosion.

-Higher sea levels also increase risks for salt-water contamination of farmland and freshwater sources.

3) Melting ice (sea ice and glaciers)

→ **Sea ice = frozen sea water that floats on the ocean's surface**

→ **Glaciers = dense ice exceeding a surface area of 0.1 km² constantly moving under its own gravity. Example: Greenland ice sheet**

- Rising temperatures have caused glaciers and sea ice (especially around the North Pole) to melt faster than many scientific projections
- Melting ice has implications for sea level rise and ocean chemistry

4) Ocean acidification – and its effects

- The ocean has absorbed more CO2 as emissions have risen, this increases the pH of the water and has serious implications for marine life. Biodiversity is under pressure due to increasingly inhospitable environmental conditions (e.g., coral bleaching because of acidifying oceans).

5) Changing rainfall patterns

- Data limitations make it difficult to say with certainty what the rainfall trends will be in all regions of the globe
- BUT, on average, places that have currently have heavy precipitation can expect to see the intensity of rainfall events increase, places that are dry can expect less frequent rainfall (but more intense rain when it falls).
- Or in other words: "The wet get wetter and the dry get drier"; this means drought becomes more frequent in many places around the world.

6) Changes in extreme events

- Heat waves and droughts have become more frequent, and in some places, more intense.
- It is difficult to measure the frequency and intensity of floods, but generally there has been an increasing trend.
- Climate change is expected in increase the frequency of high-intensity tropical storms. - Very difficult to identify trends with tornados, dust storms, hail, and other severe local events because data reliability is low and current climate models don't simulate this phenomenon. BUT, risks are expected to increase with demographic and land use changes increase people's exposure to these events.

The vast majority of scientists believe that the average global temperature rise must be limited to 2°C in order to avoid catastrophic climate change.

Many people believe a rise of 2 degrees C is a tipping point for disastrous and irreversible impacts, like the melting of the arctic ice, Greenland ice sheet, and melting of permafrost (which would even trigger methane bubbles under the ice to be released into the atmosphere, exacerbating the level of greenhouse gasses in the atmosphere).

Even if greenhouse gasses are reduced substantially worldwide, some scientists state we still have a 50% chance of reaching 2 degrees' rise.

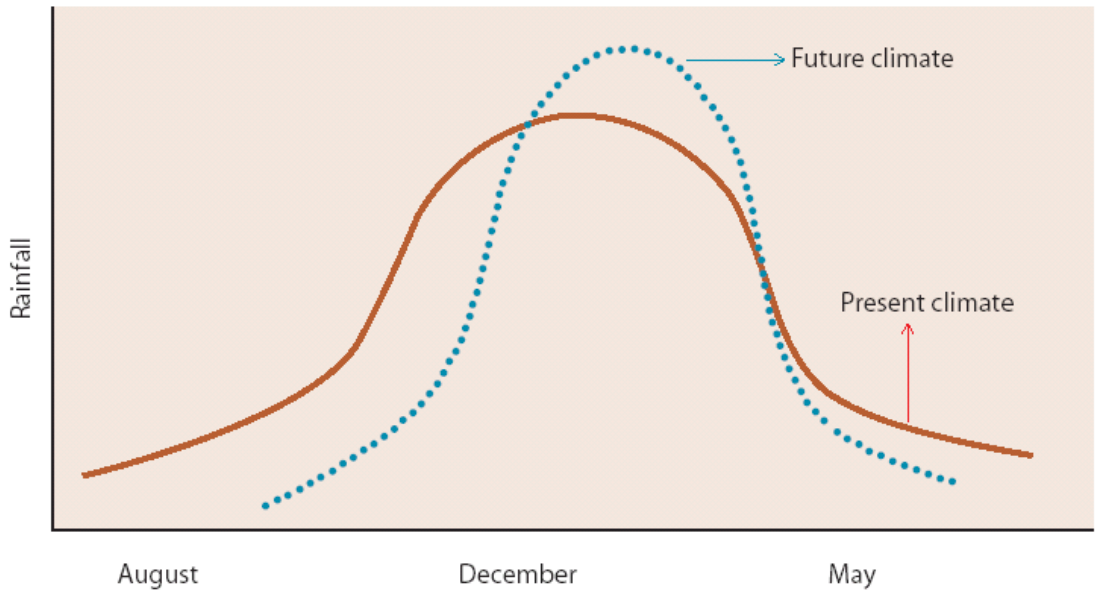
POTENTIAL IMPACTS OF CLIMATE CHANGE

1. Rising Temperatures

Rising temperatures lead not only to changes of average temperature but also to weather extremes, including heat waves.

Climate change will increase the risk of temperature extremes for most places. We can expect an increase of the number of hot days and nights and more heat waves worldwide. Heat waves are a large risk, causing higher death rates amongst the elderly and the chronically ill. Especially if the nights are not cooling off during heat waves the human body cannot cool itself enough, which can result in heat stress/ heat stroke or dehydration. We have already experienced an increase in the frequency and intensity of heat waves.

2. Shift in seasonality as important as amount



Changes in rainy season – start and duration, and with more intense rain events – may be a bigger challenge to farmers, and for general flood risks, than the changes in the average amount of rains season.

3. Floods

Difficult to measure the frequency and intensity of floods, but generally there has been an increasing trend.

Changes in rainfall patterns and precipitation intensity could put more people at risk from flooding.

- → Floods depend on a number of different factors (land use, water management, flood policies, etc.) so measurement can be difficult.
- → Climate is never the *only* factor that can increase risk of flooding. Floods can of course also be strongly affected by other factors, such as rapid and unplanned urbanization, population growth and poor natural resource management.
- → BUT, changes in rainfall patterns and precipitation intensity could put more people at risk from flooding.

4. Coastal erosion, coastal flooding and salt water intrusion

The risk of coastal flooding is also increasing due to the rising average sea levels, and this can be exacerbated by changing patterns of storms or extreme rainfall events.

Climate is never the *only* factor that can increase risk of flooding. Floods can of course also be strongly affected by other factors, such as rapid and unplanned urbanization, population growth and poor natural resource management.

5. Drought

Drought frequency and duration has increased, this trend is generally expected to continue (with the exception of some of the far northern and far southern latitudes, where droughts may decrease).

Droughts have important implications for for global food production.

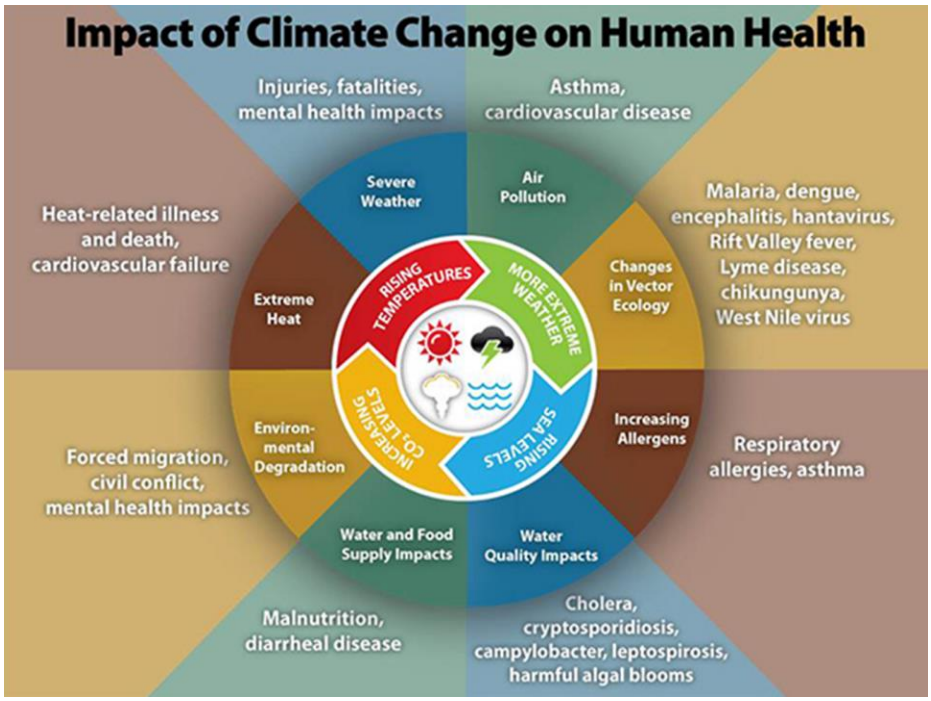
6. Increased food insecurity

Linked to increasing likelihood of drought in major food producing areas (for instance: China, southern Europe and the Mediterranean region, central Europe, central North America, Central America and Mexico); agricultural yields may decline due to climate change.

More people will be at risk from food insecurity if yields decrease and food prices increases.

7. Human Health

Climate change can lead to a shifting of vector borne (=insect/animal carried) diseases such as malaria, dengue, west Nile virus, lyme, schistosomiasis. The insects/animals that carry these viruses could shift to new territories and survive in more places where they never occurred before because of the changes in temperatures and humidity patterns around the world. Drought and flooding both have a negative effect on quality of water and sanitation, with implications for outbreaks of diseases such as cholera.



8. Melting Ice

Since the mid-19th century, most **glaciers have retreated (melted**) and the speed of melting has been higher than ever before in history. Mostly in the Arctic Ocean and along the Antarctic Peninsula, there are clear **decreases in the extent and seasonal duration of sea ice**.

The melting of ice on land will contribute to rising sea levels.

The pictures shows how fast the front of the world's most production glacier (in Greenland) has retreated the last 150 years – and how it got faster in recent years (the arrow shows the direction of ice flow from the glacier to the ocean) (data: NASA 2009 – from UNDP Climate Change Science Compendium 2009)

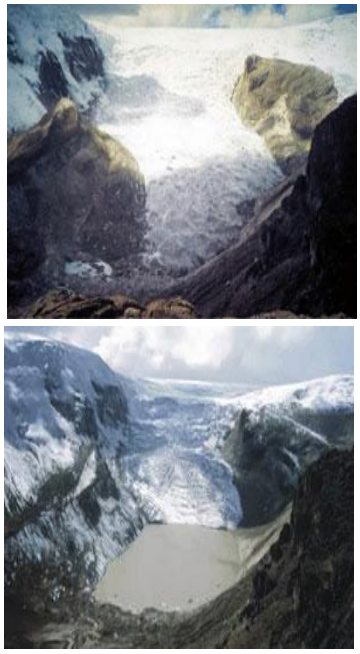


Figure 3: Glacier retreat in Greenland over 150 year period

Melting of glaciers can also affect steady fresh water flows / supplies: Countries such as Peru – and much of South Asia (south of Himalaya) are completely dependent on water supplies offered by glaciers.

A constant melt during the dry season is of utmost importance for continued water supply. Glaciers are then usually 'recharged' with more snowfall during the wet season. If the rate of melting is greater than the rate of replenishment, the glaciers will eventually disappear, having long term implications for water security (e.g. 1,5 billion people depend on Himalaya-fed rivers).

Glacial melt can also cause a glacial lake outburst flood, which is a type of outburst flood that occurs when a dam consisting of glacier ice containing a glacial lake fails.

9. Sea Level Rise

Sea levels are rising at a faster rate. The rise in sea levels is rising due to two main factors:

1. as the ocean gets warmer, the water expands, and
2. ice on land melts (i.e. the glaciers, including the ice caps in Greenland and Antarctica, melts and water flows into the ocean)

The graph is from IPCC 2013 – showing showing historical records of sea levels, and projected sea level rise for the future if we

- stop GHG emissions now (dark blue line),
- or continue emitting large amounts og GHG (red line)

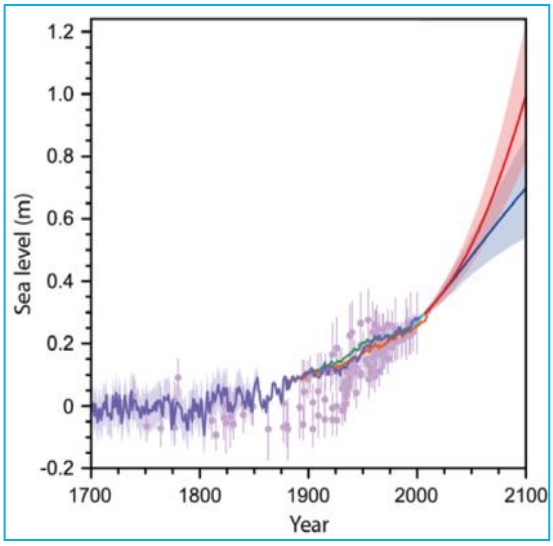


Figure 4: Sea level rise since 1700

10. Ocean Changes

Ocean acidification damages coral reefs – reducing their coastal protection effects ... and fish stocks decline, eroding livelihoods for millions of people.

The acidity of the ocean is increasing as a direct result of the increasing concentration of the amount of greenhouse gases (especially CO2) in the atmosphere.

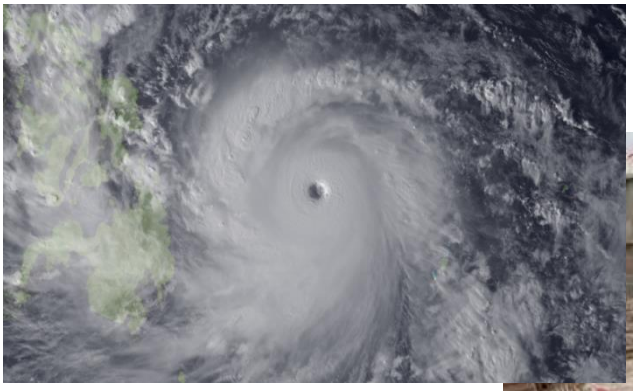
The oceans absorb the CO2, which makes them more acidic. More acid water harms many ocean ecosystems such as coral reefs.

The degradation to coral reefs can be harmful for human habitations nearby, which used to use the coral reefs as protection from storms. Also, many costal populations depend on

animals and plants living in these reefs for their livelihoods (fishing), and their food security is at risk if the reefs are destroyed.

11.Tropical Cyclones

- Possibly an increase in the intensity of tropical cyclone activity (hurricanes/typhoons), coupled with higher storm surges due to sea level rise
- → economic/human losses are expected to increase



Cyclones are affected by climate change, especially by the increase in ocean temperatures and changes in winds patterns.

- Globally scientists expect that there will be less or a similar number of cyclones, although this might vary around the world. The worrying thing is that when they do form, they may on average be more intense in terms of rainfall and wind speed – exemplified by typhoon "Haiyan" (photo) that hit the Philippines in November 2013. It should be noted that research on trends in tropical cyclones is ongoing, and there is low confidence in current projections.
- However, the storm surges that often accompany cyclones are likely to become more damaging, simply because of the higher sea levels
- In addition, losses (assets and human life) are expected to increase because of greater exposure to storms → demographic trends indicate that coastlines are becoming more populated.

PROJECTED CHANGES IN DISASTER PATTERNS

A changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather and climate events, and can result in unprecedented extreme weather and climate events.

By reducing vulnerability and limiting exposure, disaster risk can be reduced.

- Disaster risk management and climate change adaptation should be integrated into development to help improve resiliency to climate change impacts. Let's look at some of the impacts of climate change:

EVIDENCE OF CLIMATE CHANGE IN MALAYSIA

- Increasing mean temperature observed over time. Average surface temperature is increased by 0.14°C -0.25°C per decade.
- Approximately, 17% increase of rainfall compared to the 1970s values.
- Expected sea level rise higher than the global predictions: between 2.7 – 7.0 mm/year, for coastal Malaysia (Awang & Radzi Bin Abd).
- Frequent and more dangerous floods, as the recent example of the Penang's floods. Annual average loss due to floods amount to RM915 million, with peaks at approx. RM3 billion.
-

VULNERABILITY

Vulnerability is 'the degree to which a system is susceptible to and unable to cope with adverse effects of climate change, including climate variability and extremes.

Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system.

Components of Vulnerability

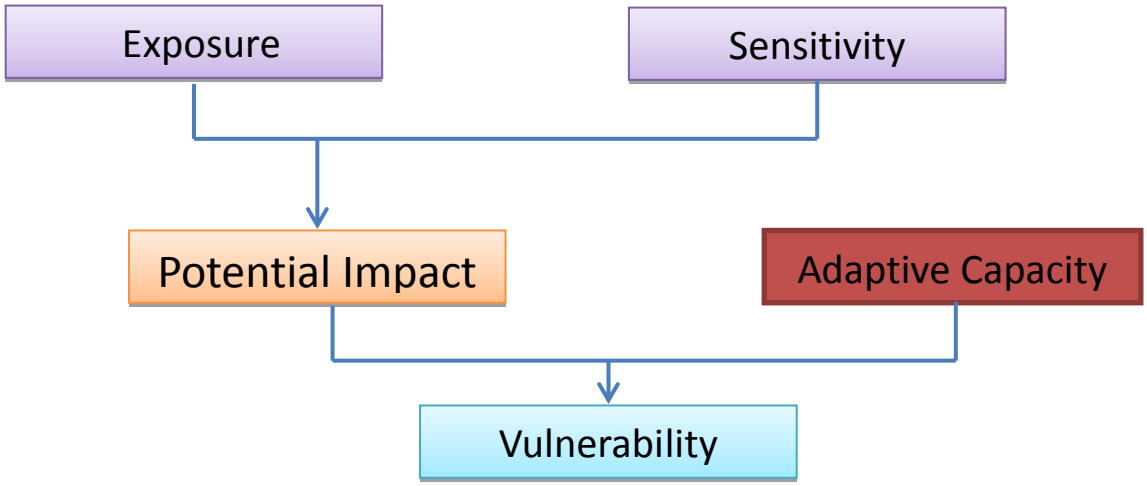
The IPCC identifies three components of vulnerability:

Exposure: refers to 'the nature and degree to which a system is exposed to significant climatic variations'.

Sensitivity: refers 'to the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise)'.

Adaptive Capacity: Adaptive capacity refers to 'the ability of a system to adjust to climate change – including climate variability and extremes – to moderate potential damages, to take advantage of opportunities, or to cope with the consequences'.

Relationship between the Components of Vulnerability

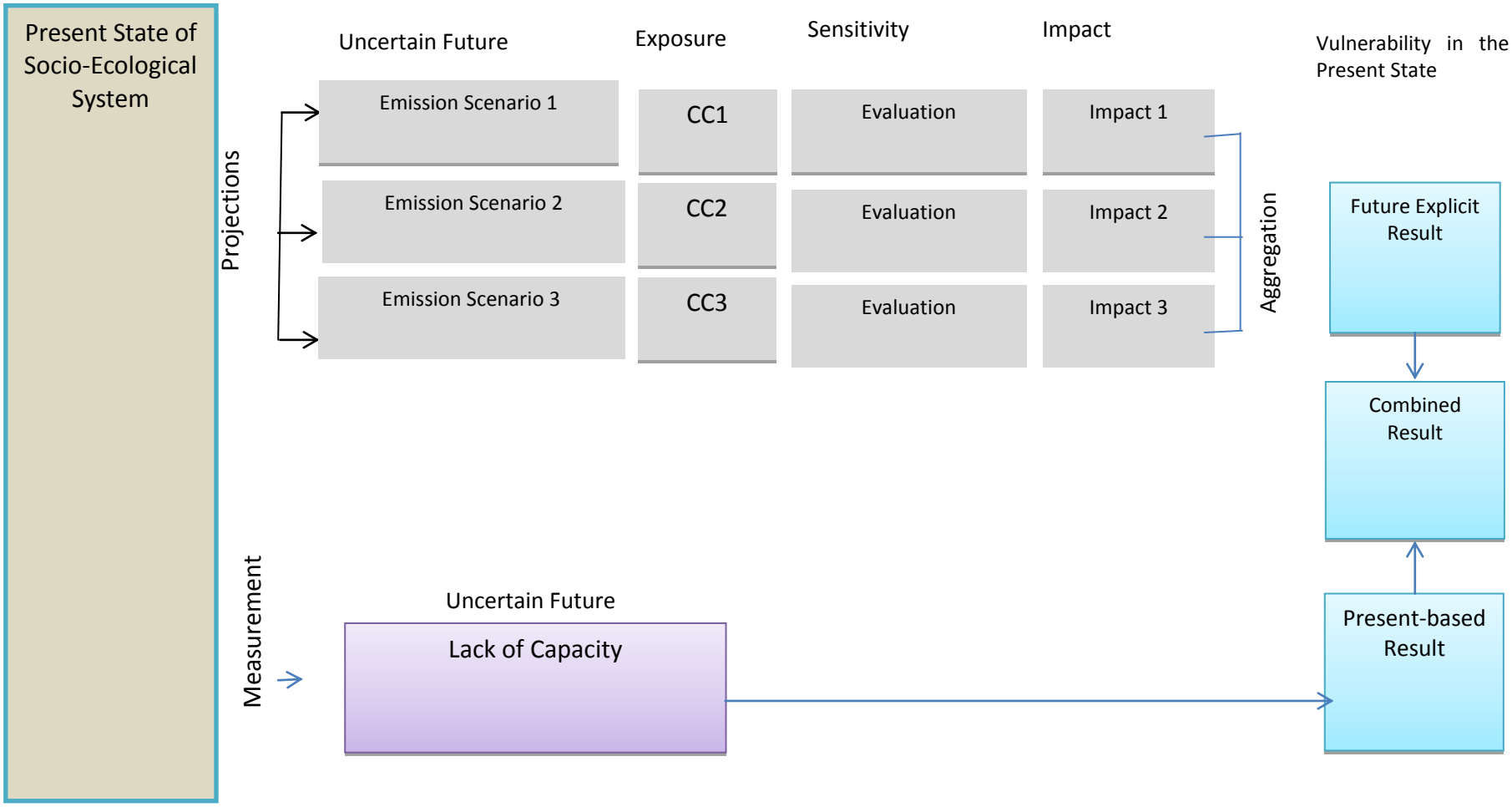


APPROACHES TO VULNERABILITY ASSESSMENT

1. Top Down Approach

- Future explicit as it uses simulation models to project future impacts
- Concentrate on biophysical effects if climate change that can be readily quantified
- Higher order socio-economic impacts only considered if quantitative models are available to link them to the biophysical effects
- Inform policy on physical vulnerability for specified time period.

Top-Down Approach



Source: Wolf et al., 2013

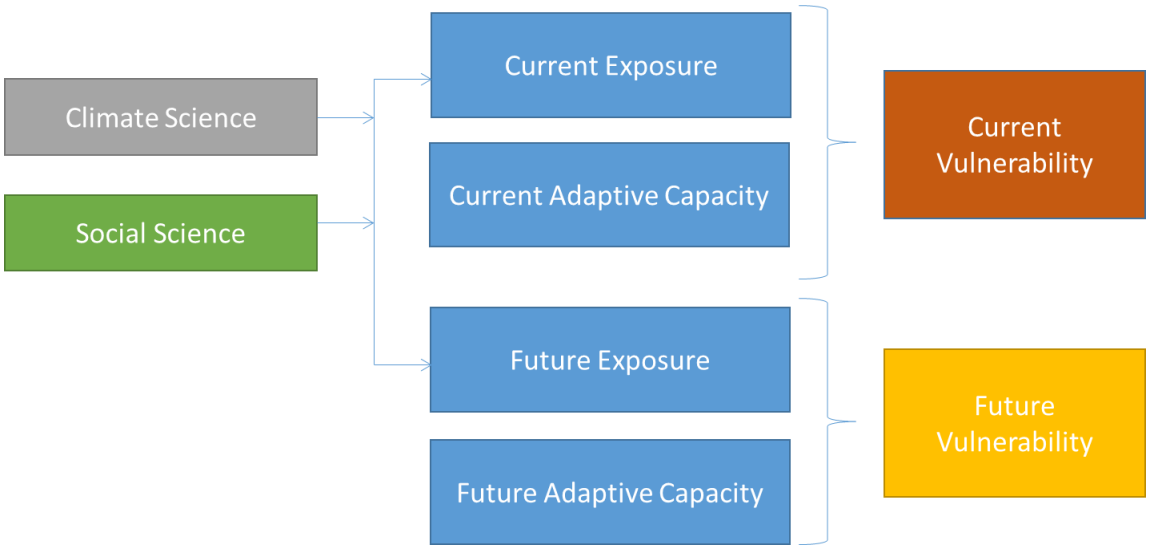
Strengths of Top-Down Approach

- Has ability to represent direct cause-effect relationships of climate stimuli and their biophysical impacts
- Provide scientifically sound analysis based on state of the art understanding of relationship between climate variables and biophysical processes e.g. rainfall and forest growth
- Can project the state of a system far into the future
- Climate models are coupled with sectorial e.g. agricultural or hydrological models, to assess how certain biophysical variables will develop in the future under different climate change scenarios
- Suitable for estimating large scale climate change impacts and informing national or international climate change adaptation policies.

Weaknesses of Top-Down Approach

- All modelling exercises have inherent uncertainties e.g. uncertainties about economic or social development are compounded by uncertainties in climate.
- Global simulation models are not good in predicting regional or local level scenarios.

2. Bottom-Up CC Vulnerability Assessment



- This approach focuses on what causes people to be vulnerable to hazards and climate change
- Focus is not on the hazard itself, but rather why people are exposed and are sensitive to the hazard
- Differences in vulnerability may be on the basis of gender, ethnicity, caste, legality, location and livelihood source
- Commonly used for assessing current vulnerability.

Strengths of the Bottom Up Approach

- Basic, do not require too much training (mostly based on participatory approaches)
- Shows which groups of people are vulnerable to a particular change or hazard
- Allow for vulnerability to be assessed at different scales.

Weaknesses of the Bottom-Up

- Tends to be place specific and therefore findings cannot be generalised e.g. the vulnerability assessment for a village cannot be used to make conclusions for a district
- Difficult to make conclusions of future vulnerability on the basis of current vulnerability

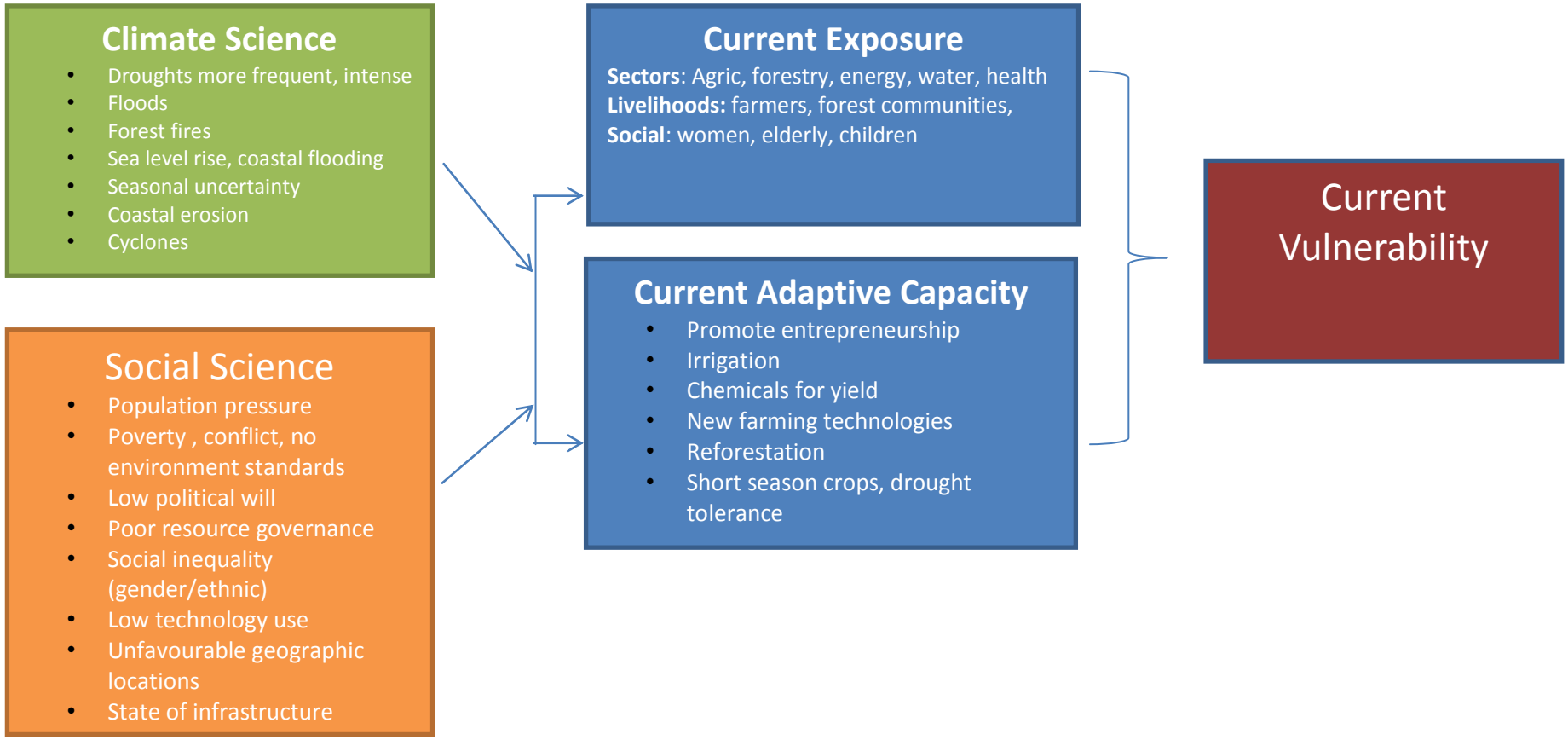
1. Combining the Top-Down and Bottom Up Approaches

- The two approaches complement each other and offer better planning information when used together
- Start by using climate change scenarios to identify the vulnerability hotspots in the future
- Thereafter, assessments are carried out in the vulnerability hotspots to validate the results obtained through top-down methods.

Climate Change Vulnerability Matrix

	CLIMATIC HAZARDS					Exposure Index
	Drought	Dry Spells	Floods	Warm Spells	Fire	
ECOSYSTEM SERVICES						
Forests	5					
Water supply	5					
Wood Fuel	1					
Grazing/fodder	3					
Soil water	3					
LIVELIHOOD ACTIVITIES						
Food crop production	5					
Market crops	3					
Forestry products	2					
Livestock	4					
Charcoal	1					
Casual labour	5					
LIVELIHOODS						
Forest users	3					
Logger	2					
Smallholder farmers	5					
Traders	4					
Impact Index						

Bottom-Up CC Vulnerability Assessment



Section 2: Forests and Climate Change

What is a Forest?

A

B

C

D

E

Photo A = W hemlock natural forest in BC, Canada – structurally and functionally a forest
Photo B = Ashdown forest, England – legally designated a forest
Photo C = Nyungwe Forest, Rwanda – structurally and functionally a forest
Photo D = Eucalytpus plantation, RSA – structurally a forest. (*would it also qualify as a forest under the functionality criterion, if it was in Australia?*)
Photo E = Caledonian Forest, Scotland – functionally a quite distinctive forest (*does it qualify under the structural criteria?*)

Structural Definition of Forest

The FAO defines forest as "lands of more than 0.5 hectares, with a tree_canopy cover of >10% (not under agricultural or urban land use). The trees should be able to reach a minimum height of 5m.

Functional Definition of Forest

a forest as a "natural forest ecosystem integrated by mature native trees, with different species of plants and animals, associated to the topsoil, subsoil, atmosphere, climate and water resources, [. . .] under conditions of dynamic equilibrium [. . .]".

Legal Definition
In the UK a legal forest is land designated as a Royal Hunting Reserve: there may be few, or even no, trees present.

The Impact of Climate Change on Forests

- Forests are dynamic systems, responding to environmental changes affecting them.
- Increased atmospheric CO_2 stimulates a 'carbon fertilisation' effect whereby the rate of photosynthesis increases.
- Tree mortality and associated forest dieback will become apparent in many regions sooner than previously anticipated (medium confidence)
- Increased tree mortality and forest loss due to, for example, fires, droughts, and pest attacks.
- Forest growth rates have increased during the last decades, but the variability is large, and in some areas production has decreased.
- Many plant and animal species have moved their ranges…in response to observed climate change… and will continue to do so:
- Community composition will change
- The seasonal activity of many species will change differentially, disrupting life cycles and interactions between species
- Modelling of the Amazon region has indicated that 43 per cent of… plant species could become non-viable by the year 2095
- Increases in the frequency or intensity of ecosystem disturbances (droughts, wind storms, fires, and pest outbreaks) will alter the structure, composition, and functioning of ecosystems
- Forests' ability to moderate and regulate water flows are likely to be affected by changes in rainfall and incidences and severity of flooding
- Sea level rise poses a major threat to coastal mangrove forests.
- Forest growth, species and ecosystems will change

Forests as Sinks and Sources of Carbon

Forests act as both sinks and sources of Carbon.

Sinks- means that forests remove (or sequestrate) carbon from the atmosphere

Source: they add carbon to the atmosphere thereby contributing to climate change

- Forests take up carbon in new growth
- Forests store carbon in their biomass and soils
- Forests release carbon dioxide through respiration, decay and when they are burned
- Multiple factors determine whether a forest is a net carbon sink or source
- Carbon is also locked in timber and wood products, but released when these are burnt or decomposed

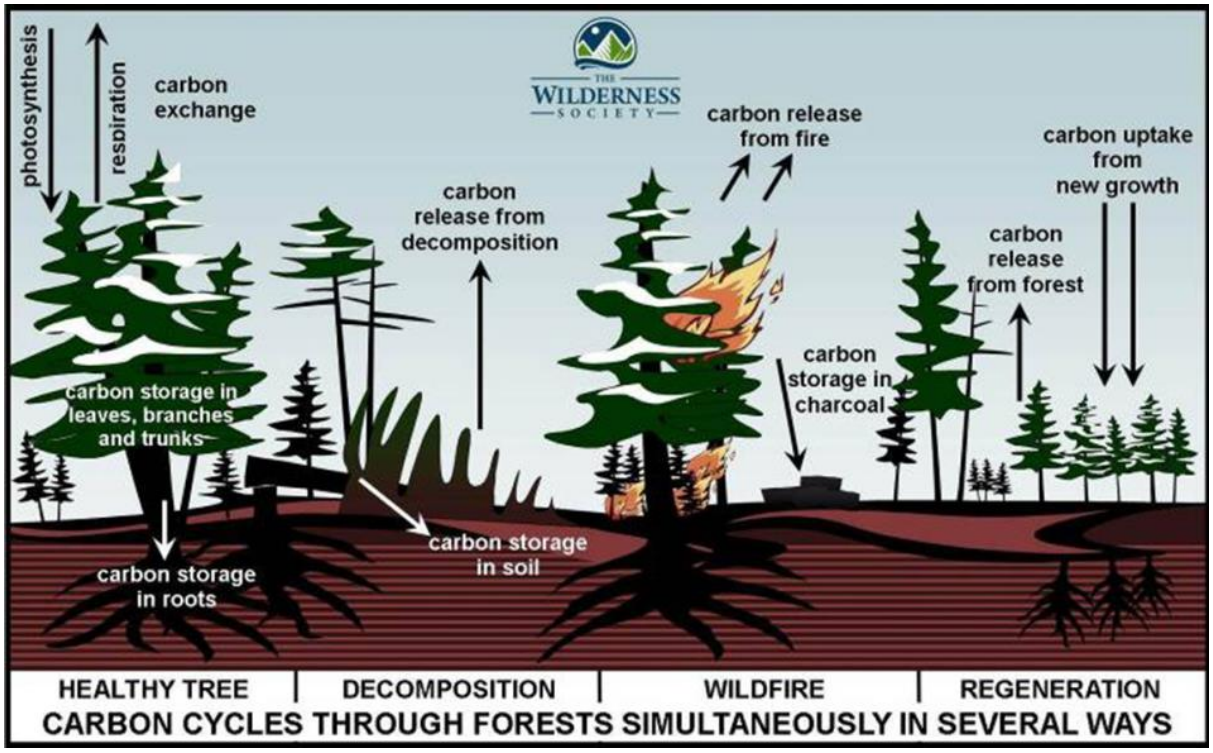


Figure 1 shows the circulation of Carbon through a typical forest.

(Forest) Ecosystem Services

- **An ecosystem** is a biological environment including all of the organisms that live there, and both living and non-living components.
- Ecosystems provide a wide range of goods and services used by society and people. These benefits are known as **ecosystem** (or sometimes environmental**) services.**

ECOSYSTEM SERVICES	
Supporting Services: • Nutrient cycling • Primary production • Soil formation	**Regulating Services:** • Climate regulation • Water purification • Flood regulation • Disease regulation
Provisioning Services: • Timber • Fibre • Food • Water • Fuel	**Cultural Services:** • Aesthetic • Landscape • Historical • Recreation & Tourism • Educational • Spiritual • Traditional

Climate Change &(Forest) Ecosystem Services

- Many plant and animal species have moved their ranges…in response to observed climate change… and will continue to do so:
    - community composition will change
    - The seasonal activity of many species will change differentially, disrupting life cycles and interactions between species.
    - modelling of the Amazon region has indicated that 43 per cent of… plant species could become non-viable by the year 2095
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- Sea level rise poses a major threat to coastal mangrove forests
- **Forest growth, species and ecosystems will change**

Section 3: Responses to Climate Change

Responses to climate change are broadly categorised as mitigation or adaptation.

Mitigation: *C*onsists of activities that aim to reduce GHG emissions, directly or indirectly, by avoiding or capturing GHGs before they are emitted to the atmosphere or sequestering those already in the atmosphere by enhancing "sinks" such as forests. Such activities may entail, for example, changes to behaviour patterns or technology development and diffusion.

Forests and Mitigation

- Forests absorb the greenhouse gas carbon dioxide, thereby mitigating the effects of climate change,
- Using wood from a sustainably- managed forest as fuel instead of oil, coal and natural gas, can also reduce global warming.
- Changes in global climate are already stressing forests through higher temperatures, altered rain patterns and more frequent and extreme weather.
- The world's forests and forest soils currently store more than one trillion tons of carbon – twice the amount found floating free in the atmosphere
- However, when destroyed or over-harvested and burned, forests can become sources of carbon dioxide.
- Substitute fossil fuels with biofuels - like wood fuels from responsibly managed forests - in order to reduce carbon emissions
- Use more wood in long-lasting products to keep trapped carbon out of the atmosphere for longer periods of time
- Harvested wood is also a carbon sink - wood used in construction or for furniture effectively stores carbon for centuries.
- Use of wood fuel instead of oil, coal and natural gas, can actually mitigate climate change

Other Approaches to Mitigation

- Food miles
- Efficient consumption of energy
- Green Growth approach
- Low carbon economies

- Green transport
- Forestation

Policy & Market Responses to Climate Change

The UNFCCC

Main international agreements on climate change, formed in 1992 to::

- gather and share information concerning greenhouse gas (GHG) emissions, national policies, and best practice
- form and implement strategies for mitigation
- form and implement strategies for, and co-operate in, adaptation measures
    - 1997: Kyoto Protocol – international treaty, included CDM
    - 2007 – REDD to be developed / included
    - 2010 – goals of REDD+ agreed (the '+' added)
    - 2013 – REDD+ formally accepted
    - 2014 - Intended Nationally Determined Contributions (INDCs)

+ Other **country level responses / policies** - National Adaptation Programmes of Action (NAPAs); Nationally Appropriate Mitigation Actions (NAMAs) etc.

Forests and the Clean Development Mechanism

Eligible Activities

- Only Afforestation and Reforestation (may include agroforestry)
- Land without forest since at least 31 December 1989

Requirements

- Additionality and baseline
- Methodologies
- Permanence and temporary credits

Complexity and transaction costs

- Scale issues

Current Status

- IPCC AR5 WG3 – of 6989 CDM projects just 400 are A-R CDM projects

FOREST-BASED CLIMATE CHANGE ADAPTATION

Payments and Markets for Ecosystem Services

PES can be defined as the practice of offering incentives to landowners, e.g. farmers, forest owners, in exchange for managing their land to provide some sort of ecosystem / environmental service. The basic idea is that external environmental services beneficiaries make direct, contractual and conditional payments to landowners and users in return for adopting management practices that secure and enhance the delivery of the ecosystem services in question. Wunder (2005) defines PES as:

1. a voluntary transaction where
2. a well-defined environmental service (ES) (or a land-use likely to secure that service)
3. is being 'bought' by a (minimum one) ES buyer
4. from a (minimum one) ES provider
5. if and only if the ES provider secures ES provision conditionally.

Even though there is no global definition of PES schemes, there is a series of classifications based on environmental services, structure, approaches, types of payments, and others which help to define the concept. The lack of a global definition reflects the vast diversity of models, yet the lack of clarity generates confusion about which mechanisms should be considered payments for environmental services. PES schemes are commonly classified by type of services provided; they also can be classified according to the type of transactions they involve. Wunder (2005) considers four ecosystem services as of particular relevance:

1. Carbon sequestration and storage (e.g. a northern electricity company paying farmers in the tropics for planting and maintaining additional trees)
2. Biodiversity protection (e.g. conservation donors paying local people for setting aside or naturally restoring areas to create a biological corridor)
3. Watershed protection (e.g. downstream water users paying upstream farmers for adopting land uses that limit deforestation, soil erosion, flooding etc)
4. Landscape beauty (e.g. a tourism operator paying a local community not to hunt in a forest used by tourists' wildlife viewing.

All PES schemes share an objective: providing environmental services that are undersupplied due to the previous lack of compensatory mechanisms. They thus provide a mechanism through which

services can be provided in a cost efficient manner. PES schemes seek to formulate a certain value to ecosystem services and establish appropriate pricing, institutional and redistribution systems that should lead to sustainable and socially optimal land use practices. These schemes tend to work best when the value of ecosystem services is high for beneficiaries and the cost of providing the services is low.

PES transactions can occur in various forms including;

- **Private transactions** – where the government does not participate

- **Public schemes** where the government (local, state, or national) participate in the process as a buyer or intermediary in receiving and distributing resources,

- **Mixed schemes** in which businesses, community members and governments are all involved.

- **Open Trading of Credits under a Cap or Floor** An example is carbon emission offset trading, where carbon polluters with a cap on the emissions that they can make, can either reduce their emissions below the cap, or have to buy more credits – placing a price on emitting.

- **Eco-labelled farm, forest, natural products** - this system focuses on payments for ecosystem services through certified sustainable supplies. The price of service is embedded as part of product price For example; 'salmon-safe' labelled products from farmers in the northwest US that maintain forest protection of waterways important for salmon.

Common types of markets are related to:

1. **Markets for Watershed Services**

Watershed protection has pioneered the use of PES schemes, and these schemes usually involve upstream land users and downstream water users. Upstream land users may be paid for, as an example, not to build roads, harvest trees, or other land activities that could affect water quality and quantity for drinking water, irrigation, among others, downstream.

Using payments for water services can be a tool for poverty alleviation. For example, if downstream water users pay upstream communities to maintain good water quality, their livelihood could be enhanced.

The institutional and policy framework for payments for watershed protection depend on the size of the watershed and the number of providers and users of the service and their social, economic and cultural situation. Issues include:

- the difficulty of distinguishing the actual watershed services provided by upstream land users/owners;

- property rights, which in some countries are not easy to define, are needed to develop markets for water services;

- PES transaction costs may be very high in case of large watersheds.

FOREST CARBON MARKETS

Carbon markets refer to the buying and selling of carbon credits (these are GHG emissions reduction units which, although including other GHGs, are usually measured and traded in terms of the equivalent tonnes of CO_2 (tCO_2e) (Bayon et al., 2007, p. 4).

There can appear to be a rather confusing number of different types of carbon market but they tend to fall under the following categories:

1) ***Compliance markets***: involving the trade of credits that contribute towards the meeting of legislated or regulated emissions reductions.

2) ***Non-compliance or voluntary markets***: involving the trade of emissions reductions undertaken for other reasons - Many governments, companies, individuals and organisations are interested in reducing their carbon impact for ideological, marketing, Social Corporate Responsibility or public image reasons or in anticipation of future regulation (Taiyab, 2006).

They can also be categorised as:

a) ***Allowance based transactions***: involving the trade of emissions credits under a cap and trade system. These can be either under compliance markets (e.g. the EU ETS) or voluntary markets.

b) ***Project based transactions:*** generating credits through specific activities. Again these operate under both the compliance markets (e.g. the Clean Development Mechanism of the Kyoto Protocol) and voluntary market.

And further classified by the type of activities involved:

I. Carbon sequestration – the uptake of CO_2 by trees in their growth;

II. Carbon storage – the 'holding' of CO_2 within forest biomass and soils, which is released through decomposition and when forests are burned or felled (if the biomass is not used) – thus the 'credit' is in reducing the quantity of GHGs released in such ways.

Compliance Forestry Carbon Markets

The main international compliance market was created through the Kyoto Protocol, where industrialised nations agreed specific emissions reductions targets (though many nations have not met these, and some countries have withdrawn from the Protocol entirely).

The only forest carbon credits eligible under the KP are those generated from afforestation and reforestation (of land un-forested at the turn of the year 1989/1990) under the Clean Development Mechanism (AR CDM) – i.e. from carbon sequestration.

(In Kyoto Protocol terminology, the CDM allows for the collaboration of Annex 1 countries (signatory countries with binding GHG emissions reduction targets) and non-Annex 1 countries (those without binding targets, principally developing countries) by which GHG emissions reduction activities in non-Annex 1 countries may count towards the reduction targets of the partner Annex 1 country (Grubb, 2006)).

There are a huge number of rules and regulations applied to the CDM, and tow are of particular relevance to forestry: Total AR CDM activities are limited to <1% of the Annex 1 country's base year emissions (Tippmann, 2005) and the potential for forest loss, i.e. non-permanence, via pest attach or fire, for example, meaning that forestry carbon credits and are only issued as temporary credits, and therefore devalued in comparison with 'permanent' credits (Schlamadinger, 2006).

Details of existing forestry CDM projects can be accessed via the UNFCCC CDM project search webpages). The IPCC AR5 WG3 reports that of the 6989 CDM projects globally, just over 400 are AR CDM projects.

There are compliance schemes outside the scope of the Kyoto Protocol, but these are carried out exclusively at the national level, with no relation to the Protocol. In 2011, Australia started the Carbon Farming Initiative (CFI) that allows farmers and investors to generate tradable carbon offsets from farmland and forestry projects.

Voluntary Forestry Carbon Markets

Voluntary carbon markets have been operative for longer than any compliance market. The first forestry carbon offset transaction was brokered in 1989, with an agro-forestry project in Guatemala (Bayon et al., 2007, p. 11). Voluntary forestry carbon transactions can be for credits generated through carbon sequestration, carbon storage or a combination of both.

Over the counter markets

Many voluntary forestry carbon projects operate under a system whereby activities are designed and implemented that attract carbon credits and these are then sold 'over the counter' to institutions wishing to 'offset' their carbon footprint or to support GHG emissions reductions for other reasons. It is important to realise that the generation of carbon credits often requires third party verification: there are various standards used, each with their own verification requirements.

Voluntary Market Industries

Since the 1980's a whole industry has emerged to provide services to develop voluntary carbon credit projects and connect buyers and sellers. One online directory to such services lists 139 voluntary carbon market project developers, of which 79 offer services for forestry projects. Such companies can aid communities and forest owners and managers to design and implement activities which will attract carbon credits according to different standards and facilitate credit verification. Once verified, credits can either be marketed through independent brokers or a number of project development companies can directly link the project to buyers (Ends Carbon Offsets webpages: http://www.endscarbonoffsets.com/).

Plan Vivo (Carbon) Certificates

Plan Vivo Certificates are issued by the Plan Vivo Foundation following the validation of a project and submission of evidence that activities have been implemented.
Each Plan Vivo project has its own annual cycle for recruiting producers, implementing activities (e.g. planting during the wet season), monitoring and payments based on its geography, type of activities and work schedule. Each project therefore defines its own annual reporting schedule which determines when Certificates are issued (Plan Vivo webpages).

Plan Vivo Certificates are issued, tracked and retired through the Markit Environmental Registry, a service that enables buyers to manage their environmental credits and ensures against double-selling by giving each credit a unique serial number (Markit Environmental webpages).

2. Markets for Biodiversity Protection

The market for biodiversity protection is a relatively new market. Many approaches are emerging to financially remunerate the owners / occupiers of land and resources for their good stewardship of biodiversity.

Markets for biodiversity services exist at a local, national and international scale. They can therefore resemble carbon or watershed markets. According to Pagiola et al. (2002), the variety of biodiversity services generates a multiplicity of demands that increase the complexity of creating payments systems. As is the case of watershed services, biodiversity services are not sold directly. Instead, specific land uses that are thought to protect species, ecosystems or genetic diversity are sold.

3. Markets for landscape beauty

Landscape beauty services are primarily associated with the cultural value given to a specific site. Landscape beauty services may involve the protection of natural heritage sites, coral reefs, cultural sanctuaries, or traditional livelihoods.

According to Mayrand and Paquin (2004), *markets* for landscape beauty are the least developed of all markets for environmental services, which are difficult to quantify and evaluate due to their

cultural foundations. Most payments are based on site-specific negotiations or reformed entrance fees. More recently, the establishment of community-based ecotourism operations and joint ventures has allowed land stewards to tap tourists' demand directly for land conservation purposes.

4. Markets for Bundled Services

Bundled services are found where different environmental services are sold from a single land area. Markets for bundled services share features with markets for environmental services that are incorporated in the bundle. The services can be sold in merged bundles (in which case it is impossible to separate the services) or in 'shopping basket' bundles (where specific services can be bought and land users sell different services to buyers).

Some example PES Schemes

1. COSTA RICA: Environmental Services Payments Program (ESPP)

Costa Rica is one of the pioneer countries where PES schemes have been successful at a national scale. The Environmental Services Payments Programme was launched by The National Forestry Financing Fund (FONAFIFO) in 1997 to benefit small and medium-sized landowners whose included forests are suitable for forestry activities, with the aim of promoting the conservation and recovery of the country's forest cover. The ESPP started investing US$ 14 million in payments for environmental services, which resulted in: reforestation of 6,500 ha, sustainable management of 10 000 ha of natural forests and the preservation of 79,000 ha of private natural forests. PES in Costa Rica provides subsidies to farmers for plantations and agroforestry systems. The tax on fossil fuels is the main source of funding (80%), and the other 20% comes from international sale of carbon from public protected areas.

FONAFIFO's main objective is to "finance small and medium-sized producers, through loans and other mechanisms, to promote the management of forests, both intervened and natural forest, in order to encourage forest plantation and reforestation processes, the establishment of forest nurseries and agroforestry systems, the rehabilitation of deforested areas, and also to benefit from technological advances in the use and industrialization of forest resources. FONAFIFO also mobilises funds to pay for the environmental services provided by forests, forest plantations and other activities to strengthen the development of the natural resources sector."

FONAFIFO is a decentralized body within the organisational structure of the State Forest Administration. Forest Law 7575 grants it relative autonomy, instrumental legal status and the authority to engage in any type of licit non-speculative legal transaction, including the establishment of Trust Funds, to guarantee the effective administration of its patrimonial resources.

FONAFIFO's funding comes from:

- The Ordinary National Budget, as stipulated in the Fiscal Simplification and Efficiency Law No. 8114;

- forestry tax revenues;
- revenues generated in accordance with Law No. 8058, with the Approval of the Loan Contract between the World Bank and the Government of Costa Rica; and
- financial contributions of the German Government, through the KfW Bank, ratified by Law No 8355.

At the local level, FONAFIFO receives resources from water protection agreements signed with water companies; and Environmental Services contracts signed with the National Power and Light Company (Compañia Nacional de Fuerza y Luz- CNFL) and Florida Ice & Farm.

The Heredia Public Water Company (Servicios Públicos de Heredia) charges the consumers an additional tax based on water consumption. The taxes are then used to pay farmers who own land where the water company operates for forest protection and reforestation and to purchase affordable land holding water reservoirs. The Matamoros Hydroelectric Company pays US$ 15 per hectare annually to FONAFIFO after signing a voluntary agreement in 1991. This payment is used to finance conservation or reforestation activities within the Matamoros basin over a period of five years. Since 1997, FONAFIFO has agreements with other companies: Energía Global, Hidroeléctrica Platanar, Compañía Nacional de Fuerza y Luz, y Florida Ice and Farm.

EcoMarkets Project

The EcoMarkets Project strives to increase forest conservation in Costa Rica by supporting private suppliers and markets for the environmental services offered by private forests, such as protecting biological diversity, mitigating greenhouse-effect gases, and favouring water services.

The World Bank loaned US$ 32 million to Costa Rica, in order to implement the EcoMarkets project. This loan was accompanied by a US$ 8 million grant from the Global Environment Facility (GEF). The funding is enough only to cover 15-30 % of the demand. In a study carried out by CATIE, it was found that most Costa Ricans agree to pay in the form of taxes for the environmental services provided by forests.

The project supports the execution of environmental policies in the forestry and energy-producing sectors, and contribute to sustainable human development. In addition, it is intended that the project will strengthen relevant bodies within the Ministry of the Environment and Energy (MINAE), as well as local and regional nongovernmental organizations responsible for the execution, promotion, supervision and follow-up of the ESP Program.

For more information on Payments for Environmental Services in Costa Rica. visit: www.fonafifo.com

2. MEXICO: Payment for Hydrological Environmental Services Program

Mexico faces many environmental challenges, deforestation and water scarcity being two of the most important. According to the National Water Commission, two thirds of the 188 most important aquifers in the country suffer from overexploitation.

The Payment for Hydrological Environmental Services Program was designed by the federal government to pay forest owners for the benefits of watershed protection and aquifer recharge in areas where commercial forestry is not currently competitive. It seeks to complement the forestry and water policy by providing economic incentives to avoid deforestation in areas where water problems are severe. Funding comes from a fee charged to federal water users, from which nearly US$ 18 million are earmarked for the payment of environmental services.

This program consists on direct payments to landowners with primary forest cover given at the end of the year, once it has been proven that the forests were not deforested. Part of its innovative approach is that it is funded through an assigned percentage of the federal fiscal revenue derived from water fees, creating a direct link between those who benefit from the environmental services and those who provide them.

For more information on Payments for Environmental Services in Mexico visit: www.ine.gob.mx

3. Cocoa Carbon in Ghana[1]

Ghana is the second largest producer of cocoa after the Ivory Coast, with a yield (2009/10) of nearly 600,000 metric tonnes. It is estimated that there are more than 1.5 million hectares enrolled in cocoa production in Ghana. The crop supports 30% of the population, and cocoa exports account for about 40% of total exports. Cocoa is both key to local livelihoods but also an important driver of deforestation as farmers search for more productive ground.

Common cocoa farming techniques severely impact on both soil and surrounding forests – contributing to both global warming and biodiversity loss. For example, instead of growing cocoa under the shade of numerous tree species, some farmers have adopted monocultures which decrease the amount of standing trees sequestering carbon and available habitats for animals and plants per hectare. Evidenced by the decline in cocoa yield per hectare farmed, the cocoa industry in Ghana is threatened by depleted soil fertility, reduced water supplies, and disease.

Over 66% of Ghana's stored carbon lies in its high-forest region, where much cocoa farming takes place. Industry insiders estimate that the value of carbon stored in Ghana's cocoa landscapes is over US$ 2.2 billion dollars. Traditional shade- cocoa stores as much as twice the carbon as shade-free farms – farmers could potentially get paid to decrease cocoa yield and increase canopy.

The Katoomba Incubator and Nature Conservation Research Centre (NCRC) are collaborating to test whether carbon finance can play a pivotal role in shifting cocoa farming onto a more sustainable path, through a number of potential activities under Reduced Emissions from Deforestation and Degradation (REDD) and REDD+. They are working with farmer and cocoa buyer organizations in the Bonsambepo Landscape, a corridor including six Forest Reserves of high biodiversity value (key species include Chimpanzee, Bongo, Forest Buffalo, and the White-Necked Rock Fowl, which was previously thought to be extinct in Ghana) surrounded by a mosaic of settlements, cocoa farms, food crop farms, and fallow lands.

[1] Forest Trends and the Katoomba Group

Overall, the initiative aims to pilot the development of REDD+ / agricultural carbon credits that will focus on climate change mitigation and adaptation by:

- Reducing emissions from forest degradation and enhancing above ground and below ground carbon stocks;
- Improving the overall productivity and ecological resilience of the cocoa farming system through access to associated agronomic and economic resources; and
- Improving livelihoods from increased farming income and access to other project benefits.

More specifically, the strategy is to avoid forest degradation by preventing community members from encroaching into forested areas to establish new farms, and encouraging them not to cut down mature forest trees in replanting old cocoa farms. In addition, it focuses on carbon stock enhancement through the planting of shade trees or enabled natural regeneration in new/young farms. The initiative could also target enhancement of soil carbon stocks through improved farming practices. Furthermore, it plans to use the associated carbon-based financing to leverage other potential streams of revenue and benefits, including certification (which brings a premium of at least US$ 150/ton of cocoa), and access to extension services and credit facilities that will enable significant increases in on-farm productivity.

It is expected that at full implementation, the activities within the Bonsambepo landscape will cover 60,000 ha of the cocoa farming landscape (off-reserve) and possibly another 20 000-50 000 ha within the forest reserves. Studies show that, including soil carbon and the cocoa trees, shaded cocoa (crown canopy in excess of 30%) was found to store about 159 tonnes of carbon per hectare – 70% of the carbon found in intact high forest and over double that stored in un-shaded (under 10% canopy cover) cocoa. There may be some trade-offs, however, given that shade-grown cocoa may lead to lower productivity and thus more land will be needed to maintain current cocoa production levels.

- **The Equitable Payments for Watershed Services Program (EPWS) Tanzania[2]**

CARE International in Tanzania, in partnership with the World Wildlife Fund (WWF), the International Institute for Environment and Development (IIED), and the Poverty Reduction & Environmental Management Program (PREM) initiated a new project in 2006, Equitable Payment for Water Services (EPWS). The program is based in the Uluguru and East Usambara mountains, focussing on the Ruvu and Sigi River basins, which are the major sources of water to the cities of Dar es Salaam and Tanga, respectively. The City of Dar es Salaam provides water to some four million inhabitants and roughly 80% of industries. The public water utility, Dar es Salaam Water Supply and Sewerage Corporation (DAWASCO), currently spends nearly US$ 2 million per year in water treatment costs due to increased sediment load in the Ruvu river, which feeds the city.

The Equitable Payments for Watershed Services (EPWS) program aims to improve the quality and flow of water for downstream users by compensating upstream farmers to engage in various land-

[2] Forest Trends and the Katoomba Group

use practices to control soil erosion brought on by unsustainable farmland expansion and irrigation practices, deforestation, and illegal mining activities in river systems and within forest reserves. The project aims to establish long-term financial investment in modifying land use to conserve and improve watersheds for reliable flow and quality of water to establish a compensation mechanism that recognizes the needs and priorities of marginalized and poor people, and to improve quality of life of communities through substantial benefits to the rural poor hence contributing to poverty reduction. As of 2008, DAWASCO and the Coca-Cola Company had enrolled more than 450 farmers.

- **Example Voluntary Forestry Carbon Market Projects**

Project	Location	Project Type	Project Information	Market Information
Restoration of degraded areas and reforestation in Cáceres and Cravo Norte, Colombia	Columbia	Afforestation / reforestation Started 2002 Area: 11,000 ha	The reforestation of 11.000 ha of degraded land in the area of Cáceres/Antioquia and climato-edaphic naturally grassland in Arauca/Cravo Norte; Colombia. The project area has been previously exposed to extensive grazing activities and unsuitable agriculture practices.	Over the counter market Standards: Climate, Community and Biodiversity (CCB);Voluntary Carbon Standard (VCS)
Oddar Meanchey REDD Project (Cambodia)	Cambodia	REDD / AR Area: 67,853 ha	The Royal Government of Cambodia and the Forestry Administration, along with Pact, Terra Global Capital and Community Forestry International have developed the first Cambodian "avoided deforestation" project. The project involves 13 Community Forestry Groups, comprised of 58 villages, which protect 67,853 hectares of forest land in the Northwestern province of Oddar Meanchey.	Over the counter market 7.1 $MtCO_2$ over 30 years Standards: Climate, Community and Biodiversity (CCB);Voluntary Carbon Standard (VCS)
MASISA S.A.	Chile, Argentina, Brazil, and Venezuela.	A/R Area: 159,646 ha	MASISA S.A. is a forest company with plantations of pine and eucalyptus, which are FSC-certified.	Chicago Climate Exchange
INFAPRO Forest Rehabilitation	Malaysia	Improved Forest Management Area: 25,000 ha	A severely damaged Malaysian tropical rainforest is being rehabilitated on the island of Borneo (Sabah). The Malaysian government is striving toward sustainable use of the rainforest and has assigned significant areas as nature conservation area.	Over the counter 1 $MtCO_2$

Sofala Community Carbon Project	Mozambique	AR / REDD+ Started: 2008 Area: 514,392 ha	The Sofala Community Carbon Project (formerly the N'hambita Community Carbon Project) is developing sustainable land use and rural development activities in communities within the Gorongosa National Park buffer zone in Sofala State, central Mozambique, to improve rural livelihoods, engage in habitat restoration, forest management and conservation of biodiversity and generate verified emission reductions (VERs). The projects work with a large number of rural smallholders (i.e. farmers or producers), and promote the adoption of sustainable land use management. The individual smallholders choose to adopt mitigation activities from a menu of different land use systems.	Over the counter 1,179,266 tCO_2
Scolel Té Plan Vivo Project	Mexico	AR / REDD / Forest restoration Started 1998 Area: 7,342 ha 669 participants	SEE BELOW	Plan Vivo Markit Environmental Registry 50,000 tCO_2yr^{-1}
General Notes on Plan Vivo	Project participants ('producers') are small-scale farmers, forest dwellers and other land users with recognised land tenure or user rights. They participate in projects through community structures or groups such as cooperatives, organisations, and associations. The producers create sustainable land management plans ('*plan vivos*') by combining existing land uses and agricultural activities with additional activities such as the creation, restoration and protection of indigenous forests and woodlands, as well as agroforestry initiatives. Carbon benefits are owned by individual producers or community producer groups who have enrolled with projects by submitting and having their *plan vivos* (management plans) approved, and entering into sale agreements with the project coordinator. It is possible to trace carbon benefits back to individual *plan vivos.* Producers are accountable for their performance under their management plans and only receive payments when targets are met. In addition to greenhouse gas emission reductions, the project provides numerous environmental and social co-benefits.			
Emiti Nibwo Bulora	Tanzania	AR Area: 130 ha	The Emiti Nibwo Bulora project involves small scale farmers for mitigation of greenhouse gas (GHG) emissions and climate change in Kagera region in western Tanzania. It is based on a long term commitment to tree	Plan Vivo Markit Environmental Registry

		24 participants	planting and subsequent management under different feasible, controlled and verified farming systems will be the major means for participation in mitigating GHG emissions which enables small scale farmer to access carbon finance through a process of aggregation of carbon assets and receive additional carbon revenue streams through the adoption of productivity enhancing practices and technologies.	40,000 tCO_2yr^{-1}

SOURCE: Compiled from Ecosystem Marketplace's Forest Carbon Portal and Plan Vivo websites

REDUCING EMISSIONS FROM DEFORESTATION AND DEGRADATION - REDD+

Introduction

Let's start with a recap on what we looked at in the previous section. Climate change is caused (in part) by an increase in the concentration of greenhouse gases in the atmosphere. There are several greenhouse gases but the most prevalent one is CO_2. All plants including trees and other forest plants use photosynthesis to absorb CO_2 and convert it into the organic compounds that make up plant material, such as wood, bark, leaves etc. This process removes CO_2 from the atmosphere. When forests are disturbed and trees and plants die, the plant material decomposes or is burnt and the CO_2 is released back into the atmosphere. Therefore, conserving the carbon in forests or at least reducing the rate at which it is emitted as CO_2 could significantly reduce global emissions of greenhouse gases. This is the basic rational behind the concept of REDD+. At the same time, enhancing the quantity of CO_2 absorbed by forests through planting or replanting areas with trees can accelerate the absorption of CO_2, thus reducing the overall concentration of greenhouse gases in the atmosphere.

The acronym 'REDD+' stands for "Reduced Emissions from Deforestation and [forest] Degradation. It usually refers to forests in developing countries. REDD+ covers reducing emissions from deforestation and forest degradation, sustainable management of forests, and enhancement of forest carbon stocks. Reducing emissions from deforestation and forest degradation is a mechanism that has been under negotiation by the United Nations Framework Convention on Climate Change (UNFCCC) since 2005, with the objective of mitigating climate change through reducing net emissions of greenhouse gases through enhanced forest management in developing countries.

Most REDD+ discourse refers to the multi-lateral process and programme driven by the UNFCCC but it is worth noting that many 'REDD+ type' activities are currently operational under voluntary carbon market systems and are supported through bilateral government arrangements. Whilst eh activities are similar, these are different to UNFCCC REDD+, particularly in terms of the money being talked about or pledged, and scale of implementation).

Why is REDD+ seen as so important in terms of climate change?

Tropical deforestation is a major source of emissions. According to the IPCC Fifth Assessment Report (IPCC, AR5, 2014), emissions from Agriculture, Forestry and Other Land Use (AFOLU) account for just under a quarter (25%) of anthropogenic GHG emissions mainly from deforestation and agricultural emissions from livestock, soil and nutrient management. Emissions from Forestry and Other Land Use (FOLU) amount to about 12% and these are largely from tropical deforestation. Therefore tropical deforestation is a major source of emissions that cause climate change. If tropical deforestation were its own country, it would be the largest emitter ahead of the USA and on par with China (Seymour and Busch, 2014). Reducing emissions from deforestation and forest degradation is therefore an essential element of the global climate change mitigation strategy.
Since around about 2005 there has been a particular focus on the link between forest loss and climate change. In 2005 a discussion on deforestation was tabled for the first time to the United Nations Framework Convention on Climate Change (UNFCCC). This was the emergence of the concept of reducing emission from deforestation within the international climate change negotiations. The concept of REDD was later expanded to include conservation of forest carbon stocks, sustainable management of forests and the enhancement of forest carbon stocks. This is what is called REDD+. From its initial introduction to the international climate change negotiations in 2005 REDD+ did not form part of the formal negotiations until the Bali COP in 2007. The evolution of REDD+ within the international climate change negotiations of the UNFCCC can be summarised as below;

Kyoto Protocol: discussions resulted in not including "avoided deforestation" under the Clean Development Mechanism due to poor information and technology for monitoring, reporting, and verification (MRV).

COP7 (Marrakech, 2001): another unsuccessful attempt… impossibility of avoiding leakage and ensuring additionality were the reasons why avoided deforestation was excluded.

COP11 (Montreal, 2005): Parties considered the idea of paying developing countries to slow their deforestation rates as a way to offset emissions in the developed world. Agenda item created (RED).

COP13 (Bali, 2007): there was recognition of the importance of addressing forest degradation, therefore REDD acronym was created.

COP14 (Poznan, 2008): the notion of sustainable management of forests and conservation and enhancement of forest carbon stocks was introduced.

COP15 (Copenhagen, 2009): advanced discussions about social and environmental safeguards and drivers of deforestation.

COP16 (Cancun 2010): finally REDD+ is defined in the Cancun Agreements; the participation requirements were established (national strategy, RL, MRV, SIS); the safeguards were defined and included in an annex; the phased-approach was included; and REDD+ was conceived as a national commitment (moving very far away from the "project" notion).

COP19 (Warsaw, 2013): the Warsaw Framework for REDD+ is adopted containing the methodological guidance known also as "rule book for REDD+"; it also contains a decision on coordination of support, and a decision on results-based finance for REDD+. With its adoption, REDD+ is considered "complete and ready for business".

REDD+ in Practice

A functional REDD+ mechanism, whether the global UNFCCC led mechanism or the other REDD+ type activities have two main aspects i.e. reducing emissions and providing compensation or incentives.

a. Reducing emissions

To reduce emissions or conserve existing forest stocks, it is very important to identify and address the drivers of forest loss and forest degradation. Although this can appear to be very simple, it is actually very difficult to apply in practice because of the large number of direct and indirect drivers of deforestation and degradation and the wide range of actors and influences involved.

- Direct drivers include logging, large scale forest conversion for agriculture, firewood and charcoal collection and production and sometimes subsistence agriculture by poor rural communities
- Indirect drivers include poor governance, weak institutions and inadequate tenure systems

b. Compensation or incentives mechanisms

The global REDD+ mechanism being negotiated within the UNFCCC envisages payments from developed countries to developing countries in return for reducing greenhouse gas emissions from forests or for increasing forest carbon stocks. The source of this money is still under discussion. Early finance has come from public funds, but public funds alone cannot cover the full cost of a global REDD+ mechanism. Therefore the use of private financing is being discussed. This could involve some form of market mechanism linked to offsets or other innovative approaches to attract private sector investments.

c. A phased approach to implementation

A long term of the REDD+ mechanism under negotiation is that countries would be compensated after results have been achieved, according to the actual emission reductions achieved relative to the agreed baseline; this approach is known as payments for results. Most of the work in achieving REDD+ lie between the initial readiness step and the final goal of full implementation and payment for results. Mechanisms must be developed to address the direct and indirect drivers of deforestation. The three phases of REDD+ implementation are outlined below;

- **REDD+ Readiness Phase**

The readiness phase involves establishing the framework for REDD+. This includes both formulating a strategy for reducing emissions and developing the required infrastructure, such as establishing baselines, monitoring and reporting capacity, and mechanisms for receiving finance. Achieving REDD+ readiness has been the goal of several fast-start initiatives.

- **Scaling up**

During this phase all the policies and measures designed to address the direct and indirect drivers of deforestation are established, improved or scaled up. Most countries will need many measures that are integral to achieving REDD+ but are not directly linked to a particular forest area or rate of forest loss. Examples are activities to improve governance and build institutional capacity. At the same time, projects
and programmes that undertake activities aimed directly at controlling emissions from forest degradation and loss are needed. Many initiatives, both existing and new, contribute during this phase.

- **Implementation**

During implementation, planned reductions in emissions from forest loss and forest degradation are achieved and measured annually. The intention for the global REDD+ mechanism is that compensation during implementation will consist entirely of results-based payments made for reductions in emissions achieved. In the short term, some pilot initiatives with individual jurisdictions are possible, but making it work at a global level will require a global mechanism.

Phase	Type of activities	Type of payments
REDD+ Readiness	Identify drivers Develop an national plan Develop REDD+ infrastructure and institutions	Payments for activities
Scaling Up	Implement support activities Carry out pilot projects	Payments for activities Payments for results
REDD+ Implementation	Control/reduce emissions Measure, monitor, review and verify	Payments for results

d. REDD+ fast-start initiatives

While negotiations on a global REDD+ mechanism continue within the UNFCCC, many intergovernmental and multilateral early-action initiatives aimed at funding and developing REDD+ programmes are underway. These tend to focus on readiness and scaling up. By the end of 2013, approximately USD 4.5 billion of funding has been pledged for these activities. Several of these initiatives support readiness activities, including the development of national strategies for addressing drivers and the establishment of REDD+ institutions for monitoring, measuring, reporting and verification. Examples are the Forest Carbon Partnership Facility (FCPF) administered by the World Bank, the UN-REDD Programme and a range of bilateral initiatives.

- **REDD+ Partnership**

The REDD+ Partnership was launched in early 2010 as a follow-up to the Copenhagen negotiations, and to build on the momentum created. More than 70 countries are in the partnership. Among those involved are all the developed countries that have pledged fast-start finance and all the developing countries interested in implementing REDD+. The aims of the partnership are to support the commitments made in Copenhagen and to improve coordination of fast-start financing for REDD+. The partnership helps advance discussions about how REDD+ will work and develop and test approaches for delivering REDD+ results. The partnership does not disburse funding directly.

More information is available at; www.reddpluspartnership.org

- **UN-REDD**

The United Nations Collaborative Programme on REDD, was launched in September 2008, is a collaboration of three UN agencies: Food and Agriculture Organization (FAO), UN Environment Programme (UNEP) and UN Development Programme (UNDP). The UN-REDD Programme supports nationally led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including indigenous people and other forest-dependent communities, in national and international REDD+ implementation. The programme has an approved budget of USD 168.7 million.

More information is available at; www.un-redd.org

- **Forest Carbon Partnership Facility (FCPF)**

The FCPF is a partnership of 44 developing and 14 developed countries, including nine countries in the EU, the European Union, NGOs and the private sector. It is administered by the World Bank. The FCPF includes a Readiness Fund through which it provide grants and technical assistance for countries to prepare for REDD+ so they can analyse the drivers of deforestation and forest degradation, draft a national REDD+ strategy, consult with stakeholders about the strategy, establish a reference scenario and develop a monitoring, measuring, reporting and verification system. The FCPF also includes a Carbon Fund to fund the testing of incentive payments at national and subnational levels in five pilot countries. Together the two funds oversee more than USD 750 million.

More information is available at; www.forestcarbonpartnership.org

- **Forest Investment Program (FIP)**

The Forest Investment Program (FIP) is a partnership between the World Bank, the International Finance Corporation (IFC) and Regional Development Banks (e.g. the Africa Development Bank) and a sub-fund under the Climate Investment Funds. It has about USD 640 million of funding. The FIP supports developing countries' efforts to reduce deforestation and forest degradation by providing up-front bridging finance (grants and loans) for readiness reforms and public and private investments identified during the development of the national REDD+ strategy. The FIP has selected eight pilot countries.

More information is available at www.climateinvestmentfunds.org/cif/node/5

Activity

Research the progress in UNFCCC REDD development in a country of your choice: What has been achieved? What more needs to be done? Do you think the country now has the capacity to implement REDD and if not, what further support is required?

- **Bilateral initiatives**

Several countries have developed major bilateral programmes including the Norwegian International Climate and Forest Initiative, the German International Climate Initiative, the UK International Climate Fund and US programmes such as the Tropical Forest Alliance.

More information is available at; www.miljo.no/climate-and-forest-initiative, www.international-climate-initiative.com/en/issues/natural-carbon-sinksredd/

- **NORWAY**

Norway has supported forestry GHG emission reduction and carbon sequestration activities for decades and was instrumental in forging support for bilateral Joint Implementation forestry projects in the early 1990's (Moura-Costa and Stuart, 1998).

More recently the Government of Norway's support has focused more on REDD and REDD+ activity. The Norwegian Climate and Forest Initiative was launched at COP 13 at Bali in 2007, pledging NOK three billion a year to efforts to reduce greenhouse gas emissions from deforestation in developing countries. The initiative applies to all types of tropical forests (Government of Norway, 2010). The initiative supports:

- The multi-national UN driven REDD / REDD+ programme;
- The World Bank Forest Carbon Partnership Facility and Forest Investment Programme;
- The Congo Basin Forest Fund (run by the AfDB and also supported by the UK).

Launched in June 2008 with a grant of £100 million from the governments of the UK and Norway to develop the capacity of the people and institutions of the Congo Basin to preserve and manage their forests. The Congo Basin Forest Fund accepts proposals from NGOs and governments for innovative and transformative projects that change the way people live in and earn a living from the Congo Basin forests and the way that governments protect and preserve them.

Norway Support to Liberia for REDD+

Liberia is currently in the process of developing its national REDD+ strategy under the FCPF, however in September 2014 Norway and Liberia signed a Letter of Intent on Cooperation on reducing greenhouse gas emissions from deforestation and forest degradation and developing Liberia's agriculture sector. Norway agreed to commit $150m to support Liberia with its REDD+ strategy until 2020. Norway will help Liberia to initially build up the capacity to monitor and manage its forest, refrain from issuing new logging concessions until all existing ones have been reviewed by an independent body. In turn Liberia agreed to place 30% or more of its forests under protected area status by 2020.

It will also pilot direct payments to communities for protecting the forest.

Guyana's REDD+ investment Fund

Norway pledged US$ 30 million in 2010 and up to US$ 250 million until 2015 to support Guyana to accelerate its efforts to limit forest-based greenhouse gas emissions, and protect its rainforest. Financial support is based on Guyana's success in limiting emissions, with conditions that certain specific, jointly agreed enabling activities are conducted in a satisfactory manner.

Brazil's Amazon Fund

Norway's contributions to the Amazon Fund forms part of its broad-based climate policy cooperation with Brazil. In addition to support to the Amazon Fund, the cooperation includes a systematic dialogue on climate and forest policy. There will also be cooperation on the technical

aspects of monitoring, reporting and verification (including support for monitoring efforts in third countries) and on identifying projects under the Clean Development Mechanism (CDM) that may be of interest to Norwegian investors. In 2012 Norway increased its commitment to this fund by US$ 180 million.

- **UNITED KINGDOM**

DFID's Forest Governance Markets and Climate Programme seeks to support partner countries in actions that will support REDD+, among other objectives. As the programme title indicates it directly seeks to link REDD+ support to governance and to incorporate lessons from the FLEGT VPA process in the timber industry and applying them to REDD+, including other commodity groups such as palm oil, soy and cattle ranching to tackle drivers of deforestation.

In January 2015 the Government of the United Kingdom of Great Britain and Northern Ireland (UK) announced a contribution of £40 million to the World Bank administered Bio Carbon Fund (BCF). The funding will support the BCF Initiative on Sustainable Forest Landscapes (ISFL) in order to reduce greenhouse gas (GHG) emissions from land use, deforestation and forest degradation

Other Financial Mechanisms

Many parties are increasingly working on ways to leverage private finances for landscape restoration / forestry, including REDD+ or REDD+ -type activities, including

- Green bonds (eg European Investment bank: http://www.eib.org/investor_relations/cab/index.htm)
- Nature conservation notes (Credit Suisse: https://www.environmental-finance.com/content/deals-of-the-year/sustainable-forestry-credit-suisse-althelia-ecosphere.html)
- Auctions (e.g. http://www.pilotauctionfacility.org/)
- These tend to be more geared towards monetised and tradable goods rather than all Ecosystem goods and services

Supply Side Mitigation Options

- Afforestation / Reforestation
    - Improved biomass stocks by planting trees on non-forested lands and replanting harvested or lost forest
- Forest Management
    - Including extending rotation cycles, reducing damage to remaining trees, reducing logging waste, implementing soil conservation practices, reducing fire risk and pest and disease controls.
    - Reducing deforestation

    - controlling deforestation and protecting forests, Reducing slash and burn agriculture, reducing forest fires

- Forest restoration
    - Protecting secondary forests and other degraded forests, natural or artificial regeneration, rehabilitation of degraded lands, long-term fallows.

Demand-Side Mitigation Options

Wood harvest in forests releases GHG and at least temporarily reduces forest C stocks. Conservation of wood (products) through:

- More efficient use or replacement with recycled materials
- Replacing wood from illegal logging or destructive harvest with wood from certified sustainable forestry.
- Substitution:
    - (of wood for non-renewable resources)
    - (from wood to renewable energy)
- The use of by-products and wastes for energy
- Increased efficiencies in wood use, including as fuel or charcoal

Forests and Adaptation

Adaptation is defined as adjustments in human and natural systems, in response to actual or expected climate stimuli or their effects, that moderate harm or exploit beneficial opportunities.

- Historically underrepresented in international discussions
- 'Rule of thumb': diversification of activities, managed goods and services and livelihoods options.
- Examples include:
    - Anticipatory planting of species along latitude and altitude,
    - Assisted natural regeneration,
    - Mixed-species forestry,
    - Species mix adapted to different temperature tolerance regimes,
    - Fire protection and management practices

- Thinning, sanitation and other silvicultural practices,
- Conservation of genetic diversity,
- Use of drought and pest resistance in commercial tree species, protected areas and linking them wherever possible to promote migration of species.

- **Adaptation** can refer to the forest as an economic entity, i.e. be concerned with maintaining the production of timber and direct market goods, or can be extended to reduce the impacts of climate change on other goods and services and forest dependent livelihoods.

- A 'rule of thumb' of much adaptation is to reduce risk by diversification of activities, managed goods and services and livelihoods options. An obvious example is the promotion and management of mixed stands, containing multiple species (or provenances), combined with natural regeneration. This is fairly easily undertaken in plantations and the basic premise is almost identical to that long employed by forest managers: – the matching of species with management objectives (which can include any combination of relevant forest ecosystem goods and services) and site conditions: the uncertainty comes from not knowing what the site conditions will be in the future as a result of climate change. This is far more difficult for tropical forests given incomplete knowledge of the ecology of tropical tree species and little experience in managing mixed tropical tree plantations.

- Adaptation of forests should also consider and address the associated ecosystem services. Under the UNFCCC, least-developed countries are required to produce a National Adaptation Programme of Action (NAPA) in which they assess their vulnerability to climate change and define adaptation priority projects. Many of these include ecosystem management measures with the explicit objective of reducing societal vulnerability. This emerging approach is known as ecosystem-based adaptation (EbA), a set of adaptation policies and measures that take into account the role of ecosystem services in reducing the vulnerability of society to climate change, in a multi-sectoral and multi-scale approach.

- Forest ecosystems require a long response time to adapt, and the development and implementation of adaptation strategies is also lengthy. Other examples of adaptation practices include: anticipatory planting of species along latitude and altitude, assisted natural regeneration, mixed-species forestry, species mix adapted to different temperature tolerance regimes, fire protection and management practices, thinning, sanitation and other silvicultural practices, in situ and ex situ conservation of genetic diversity, use of drought and pest resistance in commercial tree species, adoption of sustainable forest management practices, increase in protected areas and linking them wherever possible to promote migration of species, forests conservation and reduced forest fragmentation enabling species migration, and energy-efficient fuel-wood cooking devices to reduce pressure on forests.

TRADE –OFFS, SYNERGIES AND HOLISTIC MANAGEMENT

- Ultimately, viewing the management of forests solely through a single pathway (either mitigation or adaptation) can lead to expensive trade-offs and may not bring about desired outcomes. Focusing on mitigation alone results in a failure to anticipate the impact of climate change on available forests, which in turn can jeopardise the permanence of carbon storage. And relying only on adaptation approaches fails to take into account that mitigation actions are also needed to limit changes in the climate system (CIFOR website).

- There are realistic opportunities for synergies to be exploited in pursuing the dual targets of adaptation and mitigation, but there are also inevitable trade-offs to consider. For example, mitigation projects can protect the ecosystem services that are relevant for people's adaptation, such as water regulating services or the provision of forest products used as safety nets. Incorporating adaptation into a mitigation project can increase its perceived legitimacy and acceptance among local and national stakeholders. As mitigation is sometimes seen as driven by global interests, integrating adaptation into mitigation projects increases the attention given to local issues. In contrast, large-scale afforestation and reforestation aiming at carbon sequestration could reduce runoff and water available off-site (Locatelli et al., 2011). National policies can either facilitate or hinder the integration of adaptation and mitigation by providing incentives or imposing regulations on forest activities related to climate change. Nevertheless, there remains much more to do in generating a common understanding about the relationship between adaptation and mitigation, and to ensure that projects generated by reference to one take due regard of the other. Use of the ecosystems framework is one way to facilitate this as it places mitigation, notably carbon sequestration, in a much broader context, and identifies possible cross-effects if one service is developed to the exclusion of others.

- To make matters even more complicated, forests do not exist and provide their ecosystem services in a vacuum: they form one part of a much larger (and, in relation to climate change, global) context, including agriculture, energy and development systems – with their associated needs, priorities and policies. Truly holistic management of forest needs to not only consider the forest mitigation and adaptation options, but how these interact with, affect and are affected by this much wider landscape.
- The IUCN Global Forest Landscape Restoration programme is one example of efforts towards this goal, and information on this can be found at: https://www.iucn.org/about/work/programmes/forest/fp_our_work/fp_our_work_thematic/fp_our_work_flr/
-

- **Activity**
- **Play the CIFOR developed 'Landscape Game,' to explore the economic and environmental trade-offs of land-use decisions**
- **http://cifor.org/landscapegame**

DEFORESTATION AND REDD+ GOVERNANCE

REDD+ requires reduced deforestation, but deforestation is driven by multiple and complex factors (some of which might be 'good' – e.g. development aims). In terms of the success of REDD+, it is an empirical question as to whether the incentive of REDD+ payments outweighs the incentives offered or pressures exerted by existing drivers of deforestation; in terms of governance, the relative strengths and weaknesses of the governance of the policies and practices constituting the proximate and underlying causes of deforestation have significant implications for the success or otherwise of REDD+ initiatives.

The latter point (that REDD+ requires good governance across multiple boundaries) is further highlighted by point 2) listed above: that of the scale and significance of the financial incentives for REDD+. In addition to determining who will receive payments for what, and by what means, sound financial management, financial good governance and effective enforcement of financial law are needed to ensure that REDD+ funds will be well managed and that REDD revenues will flow sustainably (CIFOR, forests and climate change webpages, accessed 07 May 2013).

Forest governance

A major issue underpinning discussions around forests and climate change, including REDD+, is that of tenure and property rights.

In almost all countries the rights to use and benefit from forests are multiple: land ownership, the rights to harvest timber, access to NTFPs, or use forests for social or cultural practices (to name but a few) are often separated. In addition different peoples may hold overlapping rights or contest claims to rights by others. Freehold, leasehold, hereditary, usufructory and communal rights may exist, in law or in custom, for the same resource; and the capture of the benefits associated with these rights may be further disaggregated and governed by a range of formal and informal arrangements. Box 1 summarises the situation:

Box 1. Tenure issues with REDD+

The importance of tenure for REDD+ is obvious. REDD+ is essentially a broad set of policies to prevent or slow deforestation and degradation, and increase forest carbon stocks. A subset of these policies allocates rewards to carbon rights holders who achieve REDD+ objectives, either as measured directly by changes in forest carbon stocks or by proxies for those changes. But who are the legitimate carbon rights holders? In most developing countries, the answer to this question is not always clear – forest tenure is contested, rights overlap and are not secure. Tenure must be clarified, not only to create incentives for those managing the forests and to properly assign benefits, but also to protect people whose rights could be usurped if REDD+ leads to a rush of command-and-control measures to protect forests, or if REDD+ leads to a resource race when the value of forests increases.

A fundamental reality of contemporary forest tenure in developing countries (and some developed countries) is that it involves contestation between the state and civil society. In developing countries, the state claims ownership over most forests. Colonial and postcolonial state policies usurped, or at least failed to recognise, the rights of forest dwellers. Today, people living in forests continue to claim customary rights, even though

states often do not recognise such claims to vast areas of forest. Likewise, indigenous people and other traditional forest dwellers reject state control over forests they view as their own.

In some regions, forests are often considered to be unclaimed 'wastelands', and are open to both spontaneous and planned colonisation for agriculture. Clearing forest is often seen as a way to demonstrate and defend property claims. Peasants, loggers and wealthy agriculturalists continue to occupy many forests, such as the vast lowland areas of the Amazon.

Forest dwellers may already claim customary rights over these areas and conflicts may arise over whose claim will be formally sanctioned by the state. The less powerful claimants, such as indigenous or other marginalised groups, often lose out

Given the history of contested and overlapping rights, it is clear that there may be difficulties [with] REDD+.... It is easy to imagine that the less powerful stakeholders could be side-lined in conflicts over resource tenure. It is also easy to imagine that states could find it desirable or necessary to impose a command-and-control forest protection approach to maintain the stream of national REDD+ income if REDD+ fails to allocate benefits and management responsibilities successfully.

SOURCE: Adapted from: Sunderlin et al. (2009, pp. 141-142)

The reality of contested and overlapping claims highlights the importance of participation – and stakeholder acceptance – for REDD+ governance. (Also note that the stakeholders involved may extend beyond those with direct forest interests to those with primary interests in fields and sectors affected by the proximate and underlying causes of deforestation, which may also be affected by REDD+ initiatives).

The fact that REDD+ implies a change in forest management may have implications for other goods and services provided by forests, such as ecosystem services, biodiversity and conservation. The consequent impacts of REDD+ for these may additionally complicate the governance picture in relation to REDD+.

A final point to note at this stage is that the distribution of REDD+ monies will require transparent and adequate financial systems and credible monitoring, reporting and verification (MRV) of the forest carbon stored and sequestered by forests, and this will have to be undertaken in accordance with good governance structure and processes. Many commentators argue that MRV should extend beyond solely the measurement or carbon 'savings', to include impacts on the other ecological, social and political systems affected. The primary focus of carbon MRV perhaps reflects that history and policy context of REDD(+) as a GHG emissions reduction policy, rather than a forestry or development policy.

A survey of FCPF REDD-readiness plans (R-PPs) in 2010-11 makes the following observations (Dooley et al., 2011 pp 15-21):

- No (surveyed) R-PPs address indigenous peoples and community property rights
- If anything the R-PPs weaken these rights through pursuing a process of centralisation of powers
- There has been very weak, inadequate, consultation and participation in the development of the R-PPs
- The R-PPs use a narrow scope for MRV, focusing of carbon savings

REDD+ Safeguards

Despite the potential for REDD+ policies to bring significant benefits for people and the environment, concerns have been raised that REDD+ could have negative impacts, such as restricting access for local people to forest products, or the financing of forest management strategies that harm biodiversity. These concerns about the impacts of REDD+ led to the establishment of REDD+ "safeguards" within United Nations Framework Convention on Climate Change (UNFCCC) decisions. Safeguards are procedures and approaches that can help to ensure that REDD+ activities do no harm to people or the environment. Countries undertaking REDD+ activities need to develop country-level approaches that enable them to respond to the requirements outlined in these recent UNFCCC decisions and ensure that social and environmental risks are minimized and benefits enhanced. At COP 16 in Cancun 7 safeguards were agreed upon and included in the agreement and need to be promoted and supported;

a. Those actions complement or are consistent with the objectives of national forest programmes and relevant international conventions and agreements;

b. Transparent and effective national forest governance structures, taking into account national legislation and sovereignty;

c. Respect for the knowledge and rights of indigenous peoples and members of local communities, by taking into account relevant international obligations, national circumstances and laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples;

d. The **full and effective participation of relevant stakeholders**, in particular indigenous peoples and local communities

e. That actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions of this decision are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits

f. Actions to address the risks of reversals;

g. Actions to reduce displacement of emissions.

The United Nations Declaration on the Rights of Indigenous People – 2007

The rights recognised in the declaration are;

- Recognition of their rights over their traditionally owned or occupied lands, especially natural resources, and their customary forms of management.
- Respect the right of autonomy and self-determination, which means that the indigenous populations and local communities have the autonomy to manage their lands as well as the legal capacity to negotiate and make decisions regarding their participation in projects and initiatives that affect them directly and indirectly.
- Apply the right of free, prior, and informed consent in which the involved communities must have access to all of the information related to the project and principally be consulted BEFORE beginning any activity.

- Ensure the full and effective participation of the indigenous people in all of the stages of the project.

Free, prior and informed consent

Free, prior and informed consent (FPIC) refers to the right of local communities to give or withhold their consent to proposed measures that will affect them or the land or resources they own or use. FPIC is the method of ensuring effective participation of local communities in REDD processes. The process of FPIC is essential in ensuring that commitments made by communities are only when the community fully and realistically understand a REDD project. For indigenous communities FPIC is recognised in international law, but is also recognised as a very important tool for other local communities and small holder farmers.

Potential risks and how they can be managed?

If REDD mechanisms are not designed correctly, there are many potential risks that could be faced by community members who are signatories to a REDD agreement.

- Indigenous people and community members not involved in decision-making process at national or international level may lead to the implementation of activities with which communities do not agree or from which they are excluded
- Possible eviction from traditional lands due to exclusionary models of forest conservation and possible carbon revenues
- Benefits may not be distributed equally or fairly within a community
- Corruption and embezzlement of international funds by national elites
- Violation of free prior and informed consent and the United Nations Declaration on the Rights of Indigenous Peoples
- Reliance on markets to provide funding
- Current focus on carbon and not on the other services the forest also provides such as biodiversity protection, homes, and source of livelihoods for many people does not adequately value these ecosystems.

Benefits and their allocation

It is important that rules and regulations can be used to ensure that the benefits reach the hands of all the people committed to the project in a transparent manner. Important questions to be looked at include;

- How, how much and when will financial benefits be paid to community members?
- How will the resources be allocated?
- Will payments be made to the group or individuals?
- To whom are the payments made – gender (men or to women)?
- Will benefits be paid in cash or in-kind?

Activity

What are the main governance issues in your country, with relevance to engagement in, and success of, forestry carbon or PES activities? What, if anything, is being done to address them? What else needs to be done?

REDD+ GOVERNANCE & FLEGT

The EU FLEGT initiative seeks to reduce the harvesting and trade of illegal timber from tropical forest countries into the EU, through the negotiation of a Voluntary Partnership Agreement (VPA) and implementation of a Legal Assurance System (LAS) for timber.

VPA negotiation processes have explicitly and consciously been built around the development and facilitating of widespread stakeholder consultations and participation. Additionally FLEGT has supported and facilitated clarification of forest tenure, reform of forest laws and strengthening of civil society organisations and forest governance systems and processes; and the development and implementation of LAS' has improved MRV mechanisms for timber harvesting and export where this has been previously lacking.

Good forest governance is a pre-requisite for REDD+ (arguably not the only pre-requisite, but a vital component nonetheless). It might therefore appear obvious that REDD+ could (and perhaps should) utilise and build on the progress made through FLEGT, where this is present, and to learn from FLEGT to inform policy and practice more generally (remember that FLEGT is operative only where tropical forest countries are exporting (or wishing to export) to the EU, whilst REDD+ is, potentially, global). Whilst concerned with different commodities – timber and forest carbon – there are many overlapping commonalities in the issues facing both initiatives. REDD+ has been largely motivated by an urgent drive to reduce climate change: it has been formulated and developed in an international context that is not primarily concerned with forests *per se* but rather by the potential of changes to forests that reduce the speed and impact of global warming. But for REDD+ to be effective the successes and failings of FLEGT (along with other interventions and activities), perhaps particularly with regard to the development and facilitation of stakeholder participation, could be usefully learnt from. DFID's FGMC programme, among other initiatives, seeks to learn lessons from the FLEGT processes and apply them to REDD+ support, recognising that good governance must underpin REDD+.

Reducing illegal logging and REDD go hand in hand: illegal logging is one cause of deforestation and forest degradation that needs to be addressed for REDD to be successful. REDD also offers the potential for the capture of substantial funds from forests, so if implemented where there is poor governance could provide further incentives for corrupt or illegal behaviour.

Main differences between FLEGT and REDD+

FLEGT	REDD+
Bilateral	Multilateral
VPAs designed through national participatory approach to consensus building with a broad range of stakeholders to strengthen and reinforce the legal framework	Multilateral guidance requires translation into national strategies with a broad range of stakeholders
Focus on monitoring legality verification and timber supply chains	Focus on monitoring of carbon benefits and also recently co-benefits
Limited to timber production and trade	Comprehensive, including all deforestation and degradation drivers
Links market access and governance	Links performance based incentives and land use sector reforms

INTEGRATED LANDSCAPE APPROACH

Forests do not exist and provide their ecosystem services in a vacuum: they form one part of a much larger (and, in relation to climate change, global) context

Often, to address causes of deforestation it is necessary to address issues from 'non-forestry' sectors and society more widely:

- Agriculture
- Energy
- Infrastructure
- Population pressure
- Livelihoods & employment opportunities

Truly holistic management of forests needs to not only consider the forest mitigation and adaptation options, but how these interact with, affect and are affected by this much wider landscape.

Mal-adaptation

- Sometimes well-intended adaptation measures may have unintended negative consequences. Adaptation strategies used in other locations may be inappropriate in another location.
- Example of conservation farming which may have problems where farmers also keep livestock, or irrigation which leads to mono-cropping and reduced dietary diversity and may undermine women's access to land and control of income
- Adaptation and reduction of vulnerability should be approached from a more systems-wide thinking rather than narrow-thinking

- Policy may be a barrier
- Communication of climate change may be challenging but if done well has good impact.

THE NATIONAL ADAPTATION PRIORITIES FOR MALAYSIA

Malaysia's objective is to *"reduce its greenhouse gas (GHG) emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005. This consist of 35% on an unconditional basis and a further 10% is condition upon receipt of climate finance, technology transfer and capacity building from developed countries" (INDC)*.

Adaptation options for Malaysia, for the period of 2021-2030 (INDC) are focused on the following areas:

1. Addressing Flood Risks
2. Water Security
3. Food security
4. Protecting coastlines
5. Health

Section 4: Mainstreaming Gender and Climate Change

MAINSTREAMING GENDER IN CLIMATE CHANGE

Gender inequalities intersect with climate risks and vulnerabilities. Women's historic disadvantages– their limited access to resources, restricted rights, and a muted voice in shaping decisions –make them highly vulnerable to climate change. The nature of that vulnerability varies widely, cautioning against generalization. But climate change is likely to magnify existing patterns of gender disadvantage (UNDP Human Development Report, 2007).

Climate change will affect all countries, in all parts of the globe. But its impacts will be distributed differently among regions, generations, age classes, income groups, occupations and genders (IPCC, 2001). The poor, the majority of whom are women living in developing countries, will be disproportionately affected. Yet most of the debate on climate so far has been gender-blind.

Because climate change affects women and men differently, a gender equality perspective is essential when discussing policy development, decision making, and strategies for mitigation and adaptation. Women are not just helpless victims – they are powerful agents of change, and their leadership is critical. Women can help or hinder strategies related to energy use, deforestation, population, economic growth, science and technology, and policy making, among other things.

Climate change and gender inequalities are inextricably linked. By exacerbating inequality overall, climate change slows progress toward gender equality and thus impedes efforts to achieve wider goals like poverty reduction and sustainable development. Gender inequality can worsen the impacts of climate change (see Box 1); meanwhile, taking steps to narrow the gender gap and empower women can help reduce these impacts.

Gender Inequality and Climate Change

In some communities in Bangladesh, women are deprived of the capacity to cope with disasters by being kept in dependent positions in terms of accessing information from the world outside the *bari*, and by being denied the right to take major decisions. In this respect, *purdah* as an institution which prevents women from engaging in socioeconomic roles outside the household directly prescribes women's vulnerability to disaster. [*Source:* Ikeda, 1995].

Causes of vulnerability to climate change

Vulnerability is a reflection of the state of the individual and collective physical, social, economic and environmental conditions at hand. These individual and collective conditions are shaped by many factors, among which gender plays a key role. Gender-based vulnerability does not derive from a single factor, but reflects historically and culturally

specific patterns of relations in social institutions, culture, and personal lives (Enarson, 1998). Gender relations will shape the above-mentioned four conditions of vulnerability. The intersection of these factors with caste, racial and other inequalities, creates hazardous social conditions that place different groups of women at risk (Enarson, 1998).

However, there is a need to avoid being simplistic and just seeing women (because of their sex) as victims. Women are not vulnerable because they are "naturally weaker": women and men face different vulnerabilities due to their different social roles. For example, many women live in conditions of social exclusion. This is expressed in facts as simple as differentials in the capacity to run or swim, or constraints on their mobility, and behavioural restrictions, that hinder their ability to re-locate without their husband's, father's or brother's consent.

It has also been found that the vulnerability and capacity of a social group to adapt or change depends greatly on their assets. Next to their physical location, women's assets such as resources and land, knowledge, technology, power, decision-making potential, education, health care and food have been identified as determinant factors of vulnerability and adaptive capacity. As pointed out by Moser and Satterthwaite (2008), the more assets people have, the less vulnerable they are and the greater the erosion of people's assets, the greater their insecurity. Data from around the world indicates that women tend to have less or limited access to assets (physical, financial, human, social and natural capital).

Direct and indirect risks of climate change and their potential effect on women

Direct

Climate Change Effects	Potential Impacts	Potential effect on women
Increased ocean temperatures	Rising incidence of coral bleaching due to thermal stress	Loss of coral reefs can damage the tourism industry, a sector in which women comprise 46% of the workforce.
Increased drought and water shortage	Morocco had 10 years of drought from 1984 to 2000; northern Kenya experienced four severe droughts between 1983 and 2001.	Women and girls in developing countries are often the primary collectors, users and managers of water. Decreases in water availability will jeopardize their families' livelihoods and increase their workloads, and may have secondary effects such as lower school enrolment figures for girls or less opportunity for women to engage in income-generating activities.
Increased extreme weather events	Greater intensity and quantity of cyclones, hurricanes, floods and heat waves.	In a sample of 141 countries over the period 1981–2002, it was found that natural disasters (and their subsequent impact) on average kill more women than men or kill women at an earlier age than men.

Indirect

Climate Change Effects	Potential Impacts	Potential effect on women
Increased epidemics	Climate variability played a critical role in malaria epidemics in the East African highlands and accounted for an estimated 70% of variation in recent cholera series in Bangladesh.	Women have less access to medical services than men, and their workloads increase when they have to spend more time caring for the sick. Poorer households affected by HIV/AIDS have fewer resources to adapt to climate change impacts. Adopting new strategies for crop production or mobilizing livestock is harder for female-headed and infected households.
Loss of species	By 2050, climate change could result in species extinctions ranging from 18–35%.	Women often rely on crop diversity to accommodate climatic variability, but permanent temperature change will reduce agro-biodiversity and traditional medicine options, creating potential impacts on food security and health.
Decreased crop production	In Africa, crop production is expected to decline 20–50% in response to extreme El Niño-like conditions.	Rural women in particular are responsible for half of the world's food production and produce between 60-80% of the food in most developing countries. In Africa, the share of women affected by climate related crop changes could range from 48% in Burkina Faso to 73% in the Congo.

Hence interventions related to risk reduction and social risk management should pay especial attention to the need to enhance the capacity of women to manage climate change risks with a view to reducing their vulnerability and maintaining or increasing their opportunities for development. Some possible actions are:

- To improve access to skills, education and knowledge;
- To improve disaster preparedness and management;
- To support women in developing a voice and political capital to demand access to risk management instruments; and
- To develop policies to help households to stabilize consumption (credit, access to markets, social security mechanisms).

Divide the group in two and apply the technique:

1. "Does climate change have differentiated impacts?"

2. Do people have similar or equal conditions in which to address and adapt to climate change?
3. Do they have the same skills and capabilities to confront it?
4. Will the consequences of climate change affect all people equally?
5. Ask each group to present their findings. If possible, provide additional information on the issues and possible solutions.
6. Finally, ask the participants what they have learned from the assignment.

GENDER MAINSTREAMING IN CLIMATE CHANGE FINANCING MECHANISMS

Myths about Women and Finance

- Women are less capable of economic success than men;
- Women are risky borrowers;
- Women borrow for consumption without the capacity for repayment.

Yet the reality is that:

- Women, in developing countries, have higher repayment rates than men (97% higher);
- Women borrow for short-term liquidity purposes and have long-term cash flows for repayment;
- Consumer goods are often transformed into capital goods in the household and informal sectors (for example, refrigerators and stoves are often used to make and sell ice to neighbours, and to cook

Engendering climate change financing

- Demystifying the concepts and instruments of climate change financing and promoting the value of a gender-sensitive and woman-friendly approach. This can be done through a broad awareness raising process focusing on women's groups, gender, and policy makers as well as all levels of the institutions in charge of implementing climate change financing initiatives.

- Information and training on techniques to scale up knowledge and practices with regard to projects and programmes for gender-sensitive climate change financing both in the public and the private sectors.

- Dealing with underlying, persistent and pervasive structural issues that maintain and exacerbate gender inequalities, asymmetries and biases. This requires a coherent approach that consciously grounds advocacy in the broader framework of sustainable economic development, poverty eradication and rural and agriculture reform. Such an approach focuses on food sovereignty and reinforces micro, meso and macro linkages.

- Putting together programmes that will catalyze and assist women's and community-based organizations (CBOs) to design, put to tender and manage climate change initiatives locally, nationally, regionally and globally. This will require lobbying and advocacy in both the private and public sectors to expand the provision of finance and credit to women (a gender-sensitive financing facility?).

- Proactive work to secure, at national and global levels, new and increased funding, specially earmarked for women's empowerment and gender-equality interventions in the climate change area. This could for example be part of the GEF Small Grants

Programme which is flexible enough to allow for innovation and creativity, or a separate and autonomous funding model.

- A participatory research agenda focused on generating evidence on the impact of climate change financing mechanisms on women's status. Within this context, there could be the development of gender audits of financing projects, gender impact assessments, and progress towards the development of gender-sensitive climate change financing indicators.

Strategic opportunities and openings exist for modifying and reforming existing frameworks in institutions, instruments and mechanisms such as the World
Bank, the GEF, NAPAs and REDD.

The World Bank: The Bank's Strategic Framework on Climate Change and Development is supposed to address social and human dimensions, including gender, as well as economic, financial and environmental elements. The same approach should be applied to its two new facilities, the FCPF and the CPF. Lobbying should be done to ensure that, at the very least, the Bank integrates and embeds its own gender analysis and guidelines into these programmes. At best, the Bank should also take on board recommendations from women's groups for promoting greater gender sensitivity in the work programmes of the funds it administers.

The GEF: The GEF's two weak areas are in gender mainstreaming and adaptation mainstreaming. These two need to be intertwined to reinforce each other. A gender audit of GEF's programmes is certainly timely.

NAPAs: the process for working out the final structure and criteria for project funding for NAPA is currently on the table. Now is the time, therefore, for active lobbying to ensure that gender concerns and women's priorities are integrated and interwoven with any emerging sets of criteria.

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Where to find out more

In addition to the references provided, weblinks provided in the text and PES resources listed below, if there are areas of particular interest please ask the module staff and speakers for advice on where you can find more information: we will be happy to help.

Where to find additional information on PES

1. **Forest Trends**
   http://www.forest-trends.org
   Lists publications related to Payments for Ecosystem Services for a wide variety of audiences. Also information on upcoming events worldwide.

2. **Community Ecosystem Marketplace Portal**
   http://community.ecosystemmarketplace.com
   Information on PES for community members and NGOs that work with them. Includes a "Talking Circle" for communities to ask and answer questions regarding PES project development.

3. **The Katoomba Group**
   http://www.katoombagroup.org
   An international network of individuals working to promote PES. Includes tools and legal guidelines for project implementation.

4. **Ecosystem Market Place**
   http://www.ecosystemmarketplace.com
   Leading source of news, data and analytics on markets and PES. Updated daily with new information and yearly reports on carbon, watershed and biodiversity markets.

PES Reading List

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