

# Land Degradation

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Definition- “a substantial decrease in either or both of an area’s biological productivity or usefulness to humans due to human activities” (Johnson and Lewis 2007)

## Forms of land degradation (UNEP 2007)

- soil erosion
- nutrient depletion
- water scarcity
- salinity
- disruption of biological cycles
- land pollution
- desertification
- deforestation

## Origin (Johnson and Lewis 2007)

- an ancient problem beginning with the human discovery of fire.
- after the discovery of fire, humans would carve an ever increasing path of land alternation, with the Industrial revolution (technology) serving as the catalyst for massive habitat alteration

## Land Degradation/Land Use Issues within the Sub-regions of Asia

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### China:

- **Major land issues: Loss of arable lands, loss of forest land, soil erosion, and desertification, land pollution**
  - **Drivers** are the developing Chinese economy, specifically area expansion, implementation of grain-for-green policy which converted cropland into forests or grasslands (Xin et al. 2009).
    - Grain-for green policy program has lead to major debate in China with leads stating this program is responsible for the increasing grain prices and food imports (Ministry of Land and Resources 2004).
  - **Pressures** are the increasing population from 1.22 billion in 1996 to 1.31in 2005 (Xin et al. 2009)
  - **State** of the lands in China show increased levels of soil erosion and salinization which has lead to desertification of lands in China (Xin et. al. 2009)
    - Pollution is now a serious problem in China and includes: heavy metal pollution, chemical fertilizer and pesticide pollution, radioactive pollution, pathogen pollution (Xin et al. 2009).
  - **Responses:**
    - Grain-for green policy program to prevent loss of forest land and prevent soil erosion on sloped cropland (Xu et al. 2002).

- Ministry of Agriculture Programs such as programs of agriculture scientific and technology extensions, and soil testing and teaching to rural communities on the proper and effective use of chemical fertilizers and pesticides (Xin et al. 2009).
- Environmental Impact Assessment Law of People's Republic of China in 2003 adopted legal requirement for Strategic Environmental Assessment (SEA), which was seen as a more effective tool for achieving sustainable development with a major focus on lands (Tao et al. 2007).
  - SEA remains in an undeveloped state partly because of representatives and departments do not fully understand SEA, institutional systems for SEA are not fully established (Tao et al. 2007)
  - In order for SEA to succeed in China it needs wide support that it positively does contribute to more environmental friendly practices for land use (Tao et al. 2007).

## Northeast Asia:

### Mongolia

Forest of Mongolia are not very rich in terms of area or quality, covering around 17.5 million ha on southern fringe of Great Siberian forest and a little in western and northwestern portions of Mongolia (Tsogtbaatar 2004). Forests are mainly coniferous and deciduous species (Tsogtbaatar 2004).

- **Major land issues: Deforestation and desertification**
- **Deforestation:**
  - **Drivers** are the increasing exports of timber products and sawn timber to China (Tsogtbaatar 2004). The timber products are sold for very small prices to China.
  - **Pressures** are the population which is increasing the demand for forest products through logging, impacts from forest fires as well as increasing livestock numbers (Tsogtbaatar 2004).
  - Forest fire increased between 1992-1995 because of the increasing number of people who used the forest to cut trees, pick berries, collect firewood (Tsogtbaatar 2004).
  - In 1999 it was reported that 33.3 million heads of livestock existed in Mongolia, these livestock destroy the forests through grazing and preventing natural regeneration through trampling (Tsogtbaatar 2004).
  - Arid lands with little woody areas are used for firewood and there is virtually no management in these areas (Tsogtbaatar 2004).
  - Settled areas near wooded forest have been cleared allowing for increasing deforestation rates (Ykhanbai et al. 1997).
  - Northern forests is where commercial logging is prevalent and clear cutting of trees is the dominate practice (Tsogtbaatar 2004).
    - Clear cut areas are in harsh climates which leads to little regrowth and productivity, and in some cases no regrowth of the forests (Tsogtbaatar 2004)

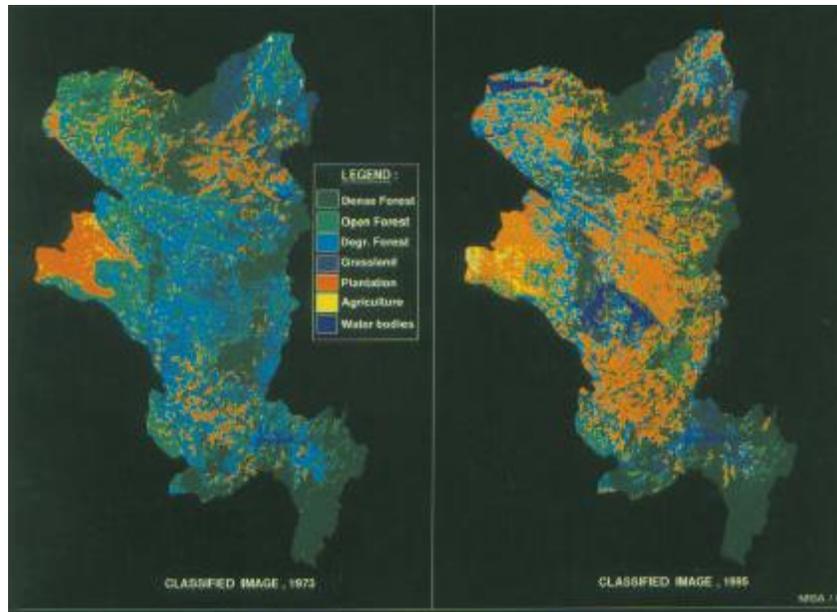
- Only way to restore the forests in these areas is through replanting
- **Response:** Government imposed high tax on wood in hopes of developing a national industry and improving the domestic supply of wood (Tsogtbaatar and Saule 1996).
  - 1995 Mongolian Forest Law was adopted and allowed the private sector as well as communities to establish plantations on state land with the approval from the government (Tsogtbaatar 2004). Also this law promoted forest protection as well as detailing proper utilization and regeneration of Mongolian forests (Tsogtbaatar 2004).
  - Land assessments are conducted but very limited and much of the forestry administrative units do not regulate any management (Ministry of Nature and Environment of Mongolia 1995).
  - Reforestation efforts have been through transplanting of young saplings but the major problem are difficult climates, labor intensive, time consuming, insufficient skill labor, and limited funds (Tsogtbaatar 2004).
  - Total amount of planted areas during 30 years is much smaller than the rate of deforestation
- **Future** for deforestation problems in Mongolia
  - National-integrated land use policy
  - Improvement of seed orchards and seed production to insure quality trees
  - Establishment of forestry research institutes to determine ideal trees for planting and timing etc.
  - Effective monitoring program and strengthening of Forestry Bureau (Tsogtbaatar 2004).
- **Desertification**-land degradation in arid-semi-arid and dry humid areas is a result from various factors such as climatic variation and human activities (UN 1994).
  - **Drivers** of desertification in Mongolia
    - Climate
      - Strong winds up to 140-160km an hour have carried away fertile top soil in Southern part of Mongolia
      - Heavy rainfall (Batjargal 1997).
    - Human factors
      - Droughts of water resources
        - water is used for irrigation and mining activities which have lead to reduced river flows, drying up of lakes, and lowering of ground water tables
      - Crop cultivation which had lead to soil erosion (Batjargal 1997)
      - Livestock grazing.
        - Grazing is heaviest near settlements and water sources. Grazed areas typical exceed carrying capacity and lands are left degraded of composition

- and plant species and soil productivity is reduced (Batjargal 1997).
  - Livestock numbers continue to increase without a livestock control and monitoring and livestock is no longer done with traditional livestock herding which was more sustainable (Batjargal 1997)
- **Future** for desertification in Mongolia
  - Develop a animal husbandry management system that is based from traditional livestock herding methods and modern scientific technology (Batjargal 1997)

## South Asia:

### India

- **Major land issues: deforestation**
  - **Drivers and Pressures** are high population densities. This has lead to increases in plantation and agriculture areas (Jha et al. 2000)
  - **Responses** monitoring of forest areas this has been conducted by three sources, Ministry of Agriculture, Ministry of Environment and Forests and the Forest Survey of India (FSI) (Gupta 2007)
    - But analyses indicated drastic discrepancies with some showing a increasing in forest cover while others showed a decrease.
    - Problems with analysis were also the land classification was very coarse. For example the natural forest cover is not distinguished into tree plantations.
    - Different methodologies, so an accurate estimate of India's forest cover was not provided until the use of remote sensing technology (Gupta 2007).
      - Jha et al. 2000 used satellite images and extensive ground truthing to determine the extent of vegetation change in Western Ghats of India.
      - Western Ghats of India are along the Western coast of India and mark one of the world's 24 biodiversity hotspots (Jha et al. 2000)
      - Jha et al. (2000) found higher rates of deforestation than ever reported for India with 25.6% loss in forest cover in 22 years.



Indukki district had the highest rate of open forest conversion during the period 1973-1995.  
Source: Jha et al. (2000).

- 2003 FSI began to use remote sensing, and concluded that deforestation rates were increasing in other areas of India such as Himachal Pradesh along the Himalayas (Gupta 2007).
- National Forest Policy 1988 sought to bring one-third of geographic area under forest and tree cover in order to maintain ecological balance and environmental stability (Gupta 2007)
  - But present estimates indicate that forest cover in the country is less therefore a revision of the global policy is greatly needed according to Gupta (2007).
- Causes of deforestation are debated issue in India:
  - Some blame deforestation on subsistence activity such as shifting cultivation, grazing and fuel collection
  - Others blame the lack of government policy and commercial logging in India (Gupta 2007).

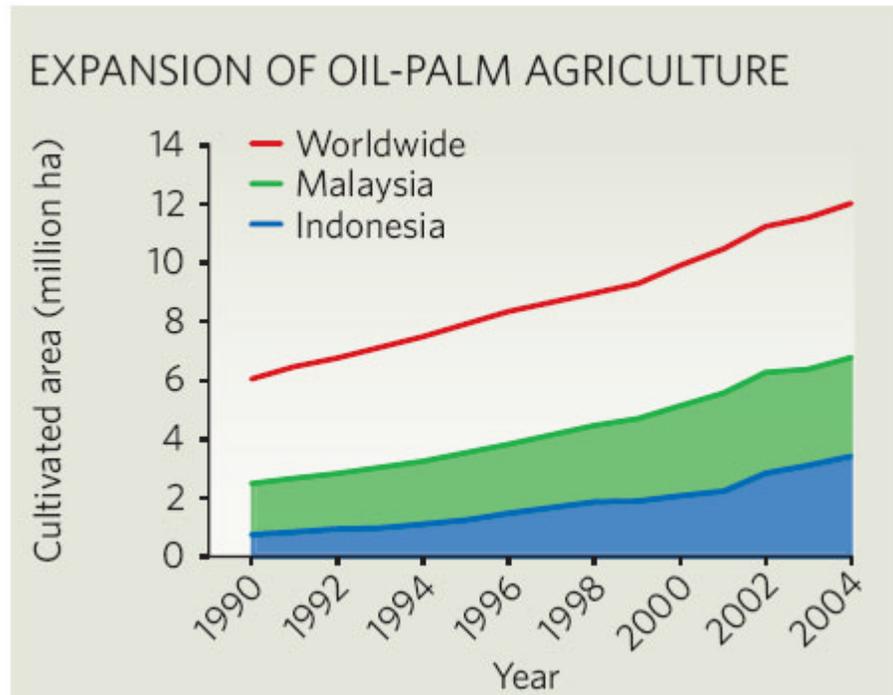
### Southeast Asia:

- 11% of the world's remaining tropical forests are in Southeast Asia (Iremonger and Quinton 1997)

### Malaysia

- **Major land issues: Palm oil production**
  - Palm oil production is a major threat to the remaining tropical forests of Asia
  - **Drivers** for palm oil are increasing global demand, it has a variety of uses for ex. cooking oil, food additives, cosmetics etc (Pin Koh 2007)

- Production increased by 4.6 fold from 1980-2000 (4.5 million to 20.9 million) and is expected to further increase by 30.4 million in 210 (Corely and Tinker 2003)
- Major economic crop of Southeast Asia (Malaysia and Indonesia)



Source: Pin Koh (2007)

- **Impacts** from palm oil agriculture are the loss of forests, biodiversity and native species such as the orang-utan
- **Response:** NGOs are leading campaigns that boycott oil-palm products but oil-palm industry says, oil-palm agriculture is not a threat to biodiversity because they are planting in disturbed forests or existing croplands (Pin Koh 2007)
- **Future** of palm-oil industry Pin Koh (2007) suggests a new strategy using revenues to fund land acquisition for the establishment of private nature reserves because boycotting is not the answer. Palm-oil production is the livelihood for many communities in the rural areas of Southeast Asia (Pin Koh 2007).

## Indonesia

- **Major land issues: oil-palm production, illegal logging**

- **Illegal Logging**
  - **Drivers:** forestry industry, military and corrupt government
    - Since 1990 the country's forests have been cleared with the government having little involvement (Telapak and EIA 2007).
  - **State**
    - Forest loss has is reported at 2.8 million hectares a year, the worst in the world, UN found that lowland habitats of Sumatra and Borneo were worst critically endangering habitat of the orangutan and by 2022 it is predicted the forests will be wiped out (Telapak and EIA 2007).
  - **Impacts:** forests, flooding, landslides and loss of biodiversity, loss of traditional livelihoods (Telapak and EIA 2007).
  - **Responses**
    - 2005-and onward the government has taking greater steps to reduce illegal logging but these are mainly lower level workers (truck drivers, captains of ships, loggers of the forests) big culprits still remain
- Example of the illegal logging industry of Indonesia:
  - 1999 EIA/Telapak brought to light the illegal logging of ramin timber from Tanjung Putting National Park. Evidence led to Tanjung Lingga company and its founder, Abdul Rasyid
  - Abdul Rayid and officials from Tanjung Lingga never paid for their crimes
  - Similar stories are true for Papua, where enormous timber smuggling operation was caught in 2005 and connected to military and police officers but out of 186 suspects on 13 were jailed serving only a maximum sentence of 2 years
  - Problem is the forest crimes involve interconnected relationships between timber tycoons, military police, corrupt government officials and politicians.
  - Short video clip of the illegal logging industry between Indonesia and China presented by the Environmental Investigation Agency (EIA) and Telapak <http://209.40.104.24/multimedia/lastfrontup.mov>

## Philippines

- **Major land issues: deforestation of mangroves**
  - 1900's mangroves covered 450,000 ha in the Philippines including the major city, Manila, ('may" and "nila") literally meaning there are mangroves there (Primavera and Esteban 2008).
  - 1994-1995 mangroves declined to 120,000 ha (Primavera 2000).
  - **Major drivers** of deforestation
    - aquaculture with 95% of the brackishwater ponds in 1952-1987 being derived from mangroves (PCAFNRRD 1991).
  - **Other drives**
    - use of mangroves for firewood and housing materials (Primavera and Esteban 2008)

▪ **Responses:**

- To minimize impact from aquaculture it was proposed by Saenger et al. (1993) that fishponds should not exceed 1 ha of ponds for 4 ha of mangroves but this 4:1 ration was never used in the Philippines
- 1976 National Mangrove Committee (NMC) formed to develop a comprehensive mangrove management program to rationalize fishpond leases and timber license (Primavera and Esteban 2008).
- Replanting began more than 100 years ago in Manila Bay for the purposes of firewood and construction materials (Primavera and Esteban 2008)
- Government sponsored mangrove planting was developed in the 1980's
- International development assistance projects through World Bank funded replanting projects in the Visayas in 1984
- Since 80's numerous local government, NGO's replanting projects have occurred throughout the Philippines (Primavera and Esteban 2008)
- Very few of the many projects have had great success.
  - Poor success is attributed to low seedling survival, weak monitoring, planting in wrong sites, planting of inappropriate species, and poor community involvement (Primavera and Esteban 2008).
- Millions of dollars have been spent on mangrove rehabilitation projects in the Philippines since the 1980 but the longterm survival rate of most of the mangrove is only 10-20% (Primavera and Esteban 2008).
- Illegal ponds that should be converted to mangroves still exist because of the weak law enforcement. The Philippines has a lack of manpower and resources for proper enforcement (Primavera and Esteban 2008).



Source Primavera and Esteban (2008)

# DPSIR Model for Land Degradation

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DPSIR-(Driving Force, Pressure, State, Impact and Response) model is adapted OCED (1993). It is used as a policy tool to aid in the identification of possible management options for various environmental problems. It focuses primarily on the driving forces and pressures controlled by anthropocentric activities and their effect on the environment and the state of natural resources (Gisladdottir and Stocking 2005). The DPSIR model can easily be adapted to Land Degradation.

## Drivers and Forces:

- *Natural effects*
  - Climate change
    - Changes in rainfall patterns. Climate change can cause increases in surface temperatures which can lead to high temperatures lasting for months. This in turn can create droughts and prevent vegetation from growing (UNESCO 2003)
    - Changes in natural disasters such as increases in severe storms not allowing good vegetation to survive (Gisladdottir and Stocking 2005).
- *Human effects*- the most important factor driving human effects in land degradation is the population. As population continues to rise in Asia so do the below listed pressures of land degradation. An increasing population coupled with poverty leads to greater human effects on the environment.
  - Land-use development
    - As lands particular around coastal regions are developed the problems of soil erosion, siltation, and water pollution are exacerbated (Gisladdottir and Stocking 2005)
  - Economic-growth
    - Dependence on the forest products for growth of GDP, also a pressure as revealed below

## Pressures

- *Population*- as indicated from the drivers the growing population is a major pressure for land degradation specifically in terms of agriculture.
- *Agriculture industry*
  - Overgrazing
    - removes beneficial vegetation that protects the land from erosion
  - Overcultivation
    - Reduces the productivity of the soil
  - Poor irrigation

- Lead to increases of salinity and also the drought of water bodies supplying the water for irrigation.
- *Forestry Industry*
  - Deforestation
    - Trees that help support the soil are removed which leads to erosion and increases in carbon production (UNESCO 2003)

## State

- The agriculture and forestry industry have left the land and soil in a degraded state, there are problems of:
  - Reduced land productivity
  - Soil degradation
  - Desertification
  - Soil erosion
  - Increases in soil salinity
  - Loss of vegetation or forestry cover
  - Loss of land biodiversity

## Impacts

- Major impacts have resulted from land degradation
  - Loss of biodiversity- more biodiverse forests are being cut down for the growing and ever demanding forestry industry
  - Habitat destruction-quality habitats of animals is being removed at alarming rates altering reproduction and migration patterns of animals
  - Declines in crop production
  - Increases in poverty from decreased productivity of land
  - Water pollution and sedimentation (Gisladdottir and Stocking 2005)

## Responses

- *Formation of International conventions and organizations, key players for Land Degradation and Desertification are:*
  - United Nations Convention to Combat Desertification (UNCCD) main global player to address land degradations and problems for poor countries with a focus on Africa
  - Global Mechanism (GM)- established after Rio Earth Summit 1992 meeting to manage and mobilize coordination of funds for land degradation control but where rather weak and the UNCCD did not become a bigger player until 2002
  - Global Environmental Facility (GEF)- after 2002 meeting \$250 US dollars were given to GEF to focus on land degradation

- World Summit on Sustainable Development at Johannesburg 2004- reinforced land degradation control as a way to achieve millennium developmental goals (1) and (7). (Gisladdottir and Stocking 2005)
- *Conservation practices*
  - Restoration of fertilized land through composting
  - Restoration of sand dunes with planting
  - Reforestation of forest- helps improve the degraded state of land from the agriculture and forestry industry (UNESCO 2003)
- *Monitoring and Assessments*
  - Land degradation assessment in dryland- a project funded by the GEF is assessing the world's dryland with various techniques at a different scales (Gisladdottir and Stocking 2005)
- *Establishment of land policies within countries of land degradation problems*

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