Assessment of Soil Erosion Effect on Inle Lake in Mountainous Region

Kyaw Zaya Htun
Remote Sensing Department
Mandalay Technological University
Ministry of Science and Technology
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Inle watershed

- It is situated in Taung Gyi District, Southern Shan State, Myanmar
- And covers 4303 km$^2$
- There are 194 villages surrounding areas and 169 villages are around the lake
- More than 120,000 people live around the lake
- Annual rainfall is about 1400 mm
- Annual temperature ranges from 12°C to 28°C
Inle watershed (cont.)
- INLAY Lake has been one of the famous tourist destinations in Myanmar

- The lake was 30 km long 10 km wide before, it shrinks to 11 km long and 5 km wide at present.

- The lake is also a popular attraction for bird watchers as it hosts migratory birds from the north in winter season and also several resident birds as well.

- Used for multi-purpose
Estimated open water area change in Inle Lake between 1935/1936 and 2000

- Based on the 1935/1937 maps, Inle Lake was composed of approximately 69 km$^2$ of open water, not including river channels.

- By 2000, this area had decreased substantially to approximately 45 km$^2$. 
Major Environmental Problems

- Increase Population
- Progressiveness of economic activities
- Deforestation
- Shifting cultivation practices in adjacent watershed area
- Chemical fertilizer usage in floating gardens
- Waste water sewage from villages and towns

• Increasing amount of silt & nutrients into shallow lakes which results in sediments
Land use of Inle Watershed

• It is famous for various agricultural products being favorable condition for various types of fruits and vegetables.

• More than 60% of the whole watershed is utilized as agriculture permanently or seasonally.

• About 100-250km² forest land was converted to other land use mostly into cultivated land from 1990 to 2005
Land Cover Map of Inle Watershed (1990)

Legend:
- Watershed
- Agriculture land
- Close forest
- Open forest
- Scrub grass
- Water

Land Cover Area, 1990 (%):
- Agriculture: 11%
- Close Forest: 16%
- Open Forest: 66%
- Scrub Grass: 5%
- Water: 2%
Land Cover Map of Inle Watershed (2000)
Land Cover Map of Inle Watershed (2010)
Potential Soil Erosion Maps

Conclusion

- Deforestation is a major problem in the surrounding mountains, especially in the western watersheds.

- Shifting cultivation, wood for construction, firewood cutting, frequent burning and village expansion has greatly increased erosion. Erosion from these areas should follow drainages into the south-eastern portion of the lake.

- Estimates of sediment delivery to Inle Lake range widely from 0.65 million m³ year⁻¹ to 0.84 million m³ year⁻¹.

- Using chemical fertilizers on the floating tomato gardens can cause pollution of the water.

- Transportation of local and tourism agencies pollute the lake water to some extent.
Thank you for your kind attention
\[ R = \sum_{i=1}^{12} 1.735 \times 10^{1.5 \log_{10} \left( \frac{p_i^2}{p} \right) - 0.08188} \]

\[ K = [2.1 \times 10^{-4} \cdot 1.14 \cdot (12 - OM) + 3.25 \cdot (s - 2) + 2.5 \cdot (p - 3)]/759 \]

\[ LS = \left( \frac{Flow\text{accumulation} \times Cell\ size}{22.13} \right)^{0.4} \times \left( \frac{\sin\ slope}{0.0896} \right)^{1.3} \]

C-factor = 1.02 – 1.21 * NDVI
are in full agreement with the concepts of the present study. Some points regarding environment and land use in the 1995 paper are:

- to discourage shifting cultivation practices causing extensive damage through adoption of improved practices for better food production and quality of life for shifting cultivators;
- to pursue sound programmes of forest development through reforestation and rehabilitation operations to optimize productivity from natural forest;
- to encourage planting of fast growing multi-purpose tree species in and farmlands, to meet industrial and domestic demand, and re-establish balance;
- to enlist people's participation in forest sector development activities and provide 'people-based development' as also create public awareness, motivation for protection and conservation of forests;
- to promote community forestry plantation on state lands through cooperatives;
- to prepare a land use plan to specify the ultimate purpose for land should be used and to provide the kind of security that is being provided catchment protection and nature conservation, since changes or losses are irreversible.

Although the emphasis of these aspects is mostly on forestry, the protection and preservation of both natural and cultivated forests is essential for the sustainability of the ecosystem.
To stop using chemical fertilizers,
To replace with biofertilizers / organic fertilizers
To provide training and capacity building to all local farmers.
To establish demonstration plots to educate local farmers.
To enforce waste water treatment to all stakeholders.
* Importance of Inle Lake nationally/globally

* Deterioration of Inle Lake environment

* Draw lessons from one past
11. I would say the Lake itself is a “National Heritage Site of Myanmar” and we have to save this “Valuable National Asset” by all means.

12. I do hope, these 3 days’ workshop provide more information on the causes of deteriorating environment and also help to solve varieties of environmental problems and throw more light and vision for the future of this lovely Lake “INLAY”.
6. Suggestion

- Awareness of all level
  (Policy maker, implementers, experts, user, public)
- Coordination in each other
- Participation of public & stakeholder
- Financial & budgeting
- Comprehensive legislative framework
- Capacity building is the most important