Application of DPSIR framework to identify the drivers and impacts of Western Ghats envermental issues

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Description of the environmental problem

The Western Ghats is one of the 10 most significant biodiversity hotspots in the world. Shortly described an area qualified as a biodiversity hotspot is an area that has prominent levels of biodiversity that is threatened by human interference. Additionally it must have lost 75% of its primary vegetation in order to be counted as a biodiversity hotspot. (Myers et al. 2000)

The Western Ghats hosts one of the four watersheds of India with large river systems originating from the area reaching all over the southern parts of the country. Further the mountains of Ghats cover only a small part of India's total land area, the Ghats are home to more than 27% of the country's species and 1600 flowering plants that are unique to the area. (Nayar et al. 2014)

Since the onset of the British colonial era and expansion in the Indian subcontinent around 1860 large areas of land in the Western Ghats have been cleared for such uses as agricultural plantations, quarries, dams (hydro-electrical and agricultural) as well as the timber industry. Over the years more than 50 dams have been constructed along the Western Ghats both for hydro electric purposes as well as irrigation. The dams not only obstruct the natural flow of the rivers but also submerge large areas with water as well as displacing indigenous populations and damaging the surrounding ecosystems. Numerous quarries further results in extensive deforestation and clear-felling in the area which encroaches on the natural ecosystem. The removal of terrestrial forests are also done for the purpose of the plantation industry such as tea and coffee as well as the timber industry (Daniels 2007).

The Western Ghats perform essential roles of hydrology and watersheds. Approximately 245 million people live in the Indian peninsular states that receive much of their water supply from Western Ghats rivers. Thus this region's soil and water sustain millions of people's livelihoods. As a water basin for all of southern India ecological issues are not localized to the area but rather affects the entirety of the region. Along the river deltas stemming from the watershed such as the Godavari river (India's second largest river) houses more than twice the population density at 729 houses/km^2 compared to the national average making it increasingly sensitive to floods and droughts (South Asia Network on Dams Rivers and People 2014).

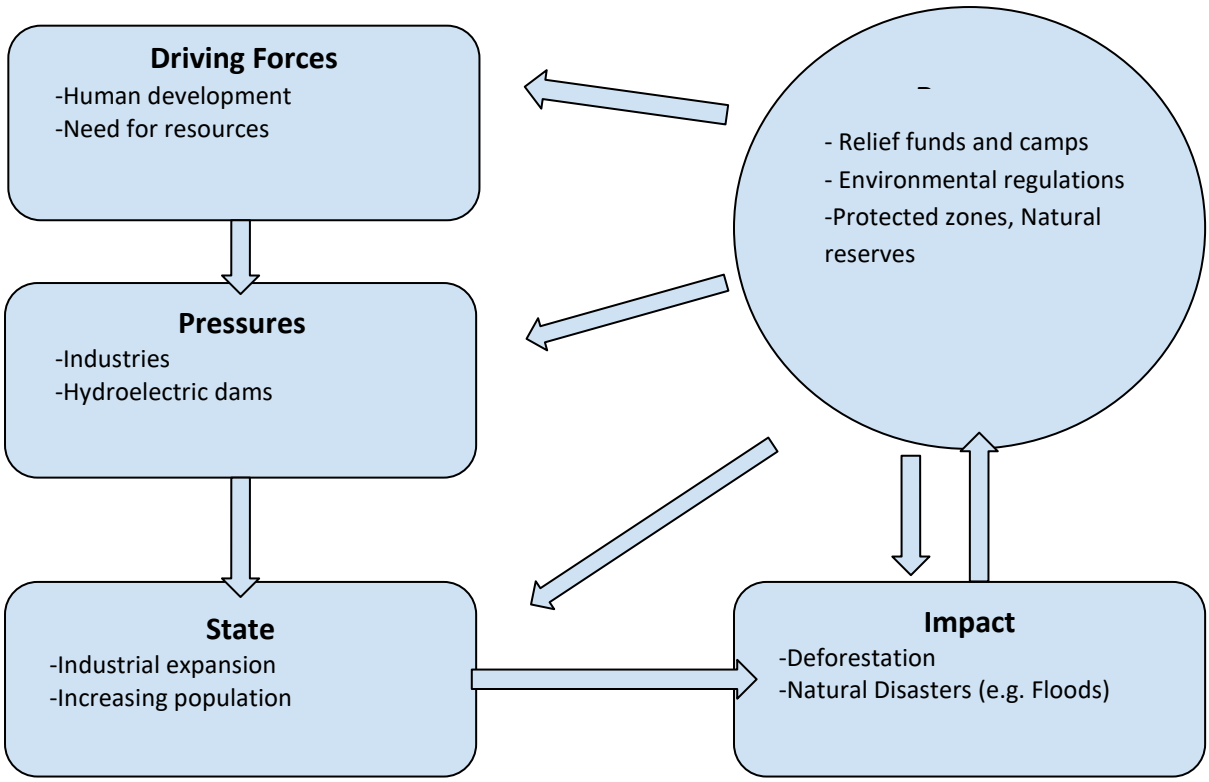


Figure 1: DPSIR-framework of the issue

Driving forces

The driving forces of the problem in the Western Ghats are factors that come from the need for resources that firstly include need for more electricity in the area, due to human development and population growth. The area has historically been greatly populated and people have been living side by side with the natural habitat, even though the area has also been heavily farmed (Hance, 2011). But the increased need for renewable electricity in India is causing this drive to construct more hydroelectric dams. This in turn forces a change in land use in the Western Ghats, since the land taken up by the hydroelectric dams are not habitable anymore when there must be water storage for the dams there (Bidoglio et al, 2019).

Secondly there is also a drive for more resources than just electricity, and that has expressed itself as new stone quarries (both legal and illegal) that have emerged around the Western Ghats (The Hindu Business Line, 2018). The stones and sand are needed by the construction industry to further develop the area.

These two industries together both create a drive for a change in land use.

Pressures

The pressures of the problems in the Western Ghats are manifested that hydroelectric dams are being constructed for generating electricity from a renewable source. The change in land use that this causes in turn forces people to move away from the areas that are changed by the water outflow and then seek other places where they can farm the land. This creates a

pressure where forests are cut down to create farmland in places that has not been used as farmland before.

Another pressure is that the area is exploited where quarries are emerging all over the Western Ghats. The quarries do not only create a change in the landscape, they also, like the hydroelectric dams, change how the water in that area is behaving (Vandana et al, 2020). Both these industries are forcing people to change their land use in the area.

State

The expansion of large dams in major rivers, which are powered by growing demands on electricity and irrigation, has led to a significant shift in natural flow regimes. The dams completely change the nature of the river downstream, altered physical and chemical properties, severely affecting communities dependent on the river for drinking, irrigation, fishing, transport and ecosystem services.

Increased funding for small hydropower projects in the form of support policies and financial assistance and carbon credits from domestic and international organizations has increased the spread of these projects. The impacts of small hydropower projects may be as severe or more serious than those of large dams, when normalized for power output (Kibler and Tullos, 2013).

The Western Ghats had once been covered in dense forest. Due to human activity the forests were heavily disrupted and turned into agricultural land. There are several illegal environmental activities in the Western Ghats that include-mining, quarrying, thermal power plants and highly polluting industries. Although Western Ghats are also a major source of livelihood for the indigenous population, the illegal activities of local industry damage the environment as well as local residents.

Impact

Rise of human populations across Western Ghats, increased demand for energy and massive expansion of the construction of dams has resulted in habitat loss, increased deforestation, destruction of ecosystems and human-wildlife conflict.

Hydro power projects will reduce the natural flow system, frequently several kilometers below the dam, caused by the diversion of impounded water for power generation; and significant changes in the flow downstream of the dam due to unexpected discharges of impounded water. These changes can affect the water chemistry and reduce the availability of habitat for aquatic biota.

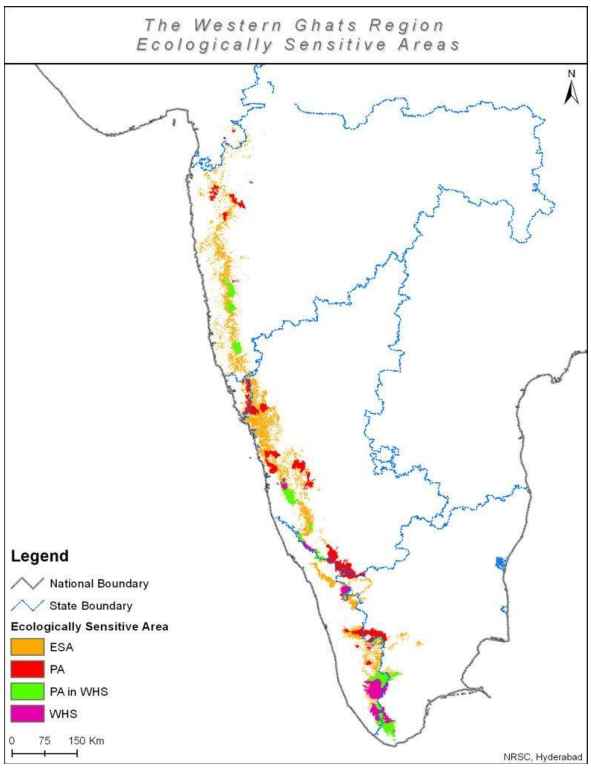
Deforestation in the catchment area of the river decreases the water retention potential of the land and increases the flood risk. Floods have already started to become more frequent and more severe, threatening human life and the environment.

Two villages were completely destroyed during floods and landslides in August 2019 killing several people, while a year earlier the same area witnessed its worst floods in a century (Protect the Western Ghats, 2019). While the population depends on agriculture, the fertiliser runoff causes pollution in the rivers. Climate change and deforestation lead to severe, erratic precipitation, with recurring flooding in lowlands. Millions of people were also displaced, marginalizing the livelihoods of rivers, forests and agricultural products (Cullet & Gupta, 2009).

Responses

The environmental challenges in the Western Ghats has generated responses from Indian policymakers as well as from international organisations. Urgency measures to meet the impacts include relief camps and relief funds to the damaged areas, and the government has proposed the construction of flood-resilient buildings (Climate news network, 2019).

Over the years, the Indian central government has enacted several laws applicable to the region such as the Environment Protection Act, the Forest Conservation Act, and the Biodiversity Conservation Act (World Economic Forum, 2019). These policies protect areas belonging to a particular set of biogeographic provinces from infrastructural development through a legal framework, and respond to the pressures and the state of the problem (UNESCO, 2012). The Western Ghats Ecological Expert Panel (WGEEP) has suggested to bring 37 percent of the region under the Ecologically Sensitive Areas (ESA) zones (Babu, 2014).



Map of ESA zones (Ministry of Environment and Forests Government of India, 2013)

However, the WGEEP proposal has not been implemented as conflicting opinions between farmers in the region and environmentalists has caused difficulties regarding balancing environment protection and human needs and development. The needs of poor farmers are used as arguments for not shutting down the mines and to keep their settlements in the sensitive regions (ibid).

United Nations' Sustainable Development Goals (SDGs): Targets addressed with these responses

The burdens of human development and economic growth on the environment are unevenly distributed in this setting, since using alternatives for cleaner energy like hydroelectric power still has such an impact on land degradation of terrestrial ecosystems (Jumani et al, 2017). As mentioned above, transforming forests for agriculture purposes since the land is being used for quarrying exacerbates these issues and puts in danger the life of both humans and the ecosystems human life depends on to survive.

Thus, it is important to address the SDG 15 and to take into account strategies for the conservation and restoration of the forests along the Western Ghats. This proposition goes in line with obligations under international agreements like The Paris Agreement, and as suggested in target 15.1. Reforestation and water flow redirection from the affected areas, as mentioned in target 15.2, require the integration of values as well around biodiversity and ecosystem towards improving development processes. Hence, development assistance on sustainable management of these forests becomes crucial but requires financial allocation of resources from all sources at all levels, as mentioned in SDG target 15.b (United Nations). The latter enhances any possible collaboration opportunities between donors and recipients.

Key synergies identified to other SDGs

The synergies between SDG 15 and other related to human development, such as access to affordable and clean energy, responsible land use and action from the local authorities through inclusive policies; we could identify that upgrading infrastructure to cope with the needs of energy demands and supply require systems and industries to rethink their resource-use efficiency by adopting sound technologies and industrial processes, as mentioned in SDG targets 9.4 and 17.7. Thus, resource efficiency adapted to mitigate the environmental and biodiversity impacts could be implemented and regulated by policies promoting the inclusion of all stakeholders improving preparedness among communities along Western Ghats and towards climate disasters, as suggested in SDG target 11.b and 13.3 and both in line with the Sendai Framework (UNDDR). Consequently, awareness of sustainable development and lifestyles in harmony with nature should be promoted, as pointed out in SDG target 12.2 and 12.8 (UN).

Although, Western Ghats is a UNESCO World Heritage Site and one of the eight hot-spots of biodiversity in the world. Hence, resources in India should also be allocated to protect its natural heritage, as proposed in 2017 at the 41st World Heritage Convention and Sustainable development in Krakow (UNESCO), and mentioned in the SDG target 11.4 (UN).

Distribution of work

All of the group members took an active part in choosing the subject of this paper as well in discussing the disposition of the text.

- Victor Bergenek was in charge of describing the environmental problem and providing background information.
- Lisa-Mari Sundin was in charge of describing the drivers and the pressures of the problem.
- Mohammad Aljaradin was in charge of describing the state and the impact of the problem.
- Rebecca Pontén was in charge of describing the responses of the problem, and of the illustrations/ figures of this paper.
- Claudia Andersson was in charge of describing the links between our responses and the SDGs, as well as the synergies between other SDGs.

Rebecca had the overall responsibility of creating the powerpoint presentation of the assignment, but all members of the group added their respective content of the presentation and added graphs / pictures to their slides.

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