

Documentary research finding on “Environmental Benefits and Environmental Justices”

Abstract

Sustainable development can be ensured by conserving the environmental benefits and ecosystem services. All stakeholders need to participate in the use of best environmental practices such as Responsible Appliance Disposal (RAD) program to promote environmental justices. The people from Myanmar also need to enhance environmental ethics, waste disposal etiquette and take part in implementing National Environmental Policy, Myanmar National Water Policy, National Waste Management Strategy and Master Plan for Myanmar to promote environmental justices.

1. Introduction

Forest Resource Environment Development and Conservation Association (FREDA) is implementing the project on “Advancing Cooperation Between Lower Mekong Countries to support governance, transparency and local voices, concerning with water and Water Related Ecosystem” from 5th October, 2022 to 15 August 2023, with the financial assistant of Pact, Inc. under “Mekong Connections: Governance, Transparency, and Local Voices” funded by the US Department of State East Asia and Pacific Bureau. Documentary research finding on “Environmental Benefits and Environmental Justices.” are reported.

2. Literature review

Law insider defined that the Environmental benefits as follow;[1]

1. The assets and services that enhance the capability of communities and individuals to function and flourish in society, such as access to a healthy environment and clean natural resources, including air, water, land, green spaces, constructed playgrounds, and other outdoor recreational facilities and venues; affordable clean renewable energy sources; public transportation; fulfilling and dignified green jobs; healthy homes and buildings; health care; nutritious food; Indigenous food and cultural resources; environmental enforcement, and training and funding disbursed or administered by governmental agencies.

2. Access to funding, open space, enforcement, technical assistance, or training including, but not limited to, grants, environmental benefits packages and supplemental environmental projects, environmental quality improvement initiatives, distribution of environmental funding from the City and other governmental entities, open space purchases, greening initiatives and full access to the waterfront and to all of the usual benefits associated with residence near a waterfront and any other beneficial resources.
3. All current and future statutory or governmental incentives, any nature whatsoever and howsoever structured, aimed (whether in whole or in part) at the protection of, benefit to or mitigation of detrimental impact on the environment, including those aimed at: reducing harm to and pollution of the environment; reducing the combustion of fossil and other carbon based fuels (including carbon or emission reduction credits, benefits or allowances or other climate change schemes); reducing the emission of harmful gases (including greenhouse gases); increasing energy efficiency; or promoting the use of energy from renewable/sustainable or waste sources.
4. Potential for energy efficiency improvements and greenhouse gas emission reductions, deriving from the subprojects can potentially become eligible for the Clean Development Mechanism. Cultural and existence values can incorporate egalitarian values for others to use or encounter fish species, currently or intergenerationally.
5. Environmental benefits include additional habitat protections for other aquatic life and wildlife, including those organisms that depend on salmonids for their food. Increased non-use values.
6. Environmental benefits, such as reduction in greenhouse gas emissions, criteria pollutant emissions, or oil consumption and preservation of recreational areas, farm land, or open space while balancing the need for affordable housing in the community.
7. **Environmental benefit** means, for the promotion of habitat for migratory birds and wetland-dependent wildlife, habitat for threatened and endangered or other at-risk species, protection or restoration of native vegetative communities, increased resilience of ecosystems during climatic change, habitat and species diversity and abundance, water quality protection or improvement, attenuation of floodwater flows, and water quantity benefits through increased water storage.
8. **Environmental benefit** means the positive environmental impact minus the negative environmental impact attained by specific actions including, but not

limited to, energy generation and distribution, transmission service, conservation, customer-sited generation, DR, or DSM.

9. **Environmental benefit** means the positive environmental impact of environmental services, practices or other ecological influences attained by specific actions, minus the negative environmental impacts caused by those actions. Staff will give due consideration to input from DNREC, interveners and public comment.
10. Environmental benefit was considered in the NPV analysis (through the social cost of plastic and willingness to pay) and by quantifying the impact on total consumption. Environmental benefit is one of the most commonly cited reasons for using alternative fuels.

In United States, the U.S. Environmental Protection Agency's (EPA's) launched "Responsible Appliance Disposal (RAD)" program in 2006. [2] RAD is a partnership to protect the ozone layer, cut greenhouse gas (GHG) emissions, and benefit communities. The RAD Program recognizes Partners that commit to collecting and disposing of old refrigerated appliances using best environmental practices and going beyond what is required by federal law. Since the inception of the RAD Program, partners have successfully reduced emissions of ozone-depleting substances (ODS) and greenhouse gases (GHGs). Partners have also reduced energy consumption, increased the recycling of durable goods, and ensured the proper handling of hazardous substances.

Stratospheric Ozone Benefits; RAD partners reduce emissions of ODS by recovering and reclaiming or destroying ODS refrigerant (CFC-12, HCFC-22) and foam-blowing agent (CFC-11, HCFC-141b) contained in household appliances.

Climate Benefits; The recovery of CFC, HCFC, and HFC refrigerants and foam-blowing agents from household appliances results in significant climate benefits, as these substances are all potent GHGs. In addition, the recycling of durable materials from appliances results in lower emissions of carbon dioxide (CO₂) associated with the generation of electricity, which would have otherwise been needed to produce virgin materials.

Energy Savings; For utilities, appliance recycling programs can be an important component of a successful demand side management (DSM) program. Replacing old, inefficient refrigerant-containing appliances reduces the amount of electricity needed to power them and, therefore, the amount of CO₂ emissions released. By collecting old, inefficient appliances for proper disposal, RAD's utility partners have

generated the benefits summarized in the table below. As shown, the energy savings realized by RAD utility partners, as well as the associated climate benefits and consumer savings, have increased steadily over the last eight years.

Other Environmental Benefits; RAD partners further protect the environment by keeping recyclable materials—such as glass, plastics, and metals—out of landfills and by ensuring the proper handling of hazardous wastes—namely used oil from compressors, polychlorinated biphenyls (PCBs) from capacitors, and mercury from thermostatic switches. RAD partners have recovered significant quantities of these materials.

[Reagan Pearce](#) [3] defined ecosystem services as the direct and indirect contributions of ecosystems to human well-being, and have an impact on our survival and quality of life. There are **four types of ecosystem services: provisioning, regulating, cultural and supporting services**. The term “ecosystem services” is a relatively new one, first used to ascertain the value of nature to bring attention to environmental degradation. In 1997, Constanza et al. estimated that ecosystems provided on average US\$33 trillion per year in services, compared to the global GNP at the time being \$18 trillion per year. However, more recent estimates in 2011 suggest that ecosystems actually provide the equivalent of \$125 trillion in services per year. Our growing understanding of the true worth of nature is worrying when set against the degradation ecosystems face. Four types of Ecosystem Services can be found,

1. Provisioning Services

[Provisioning services](#) are characterized by the ability of humans to obtain products from ecosystems, such as food, water and resources, including wood, oil and genetic resources and medicines.

2. Regulating Services

[Regulating services](#) are categorized as any benefit obtained from the natural processes and functioning of ecosystems. Examples include climate regulation, flood regulation and other natural hazard regulation, pollination, water purification and more. For example, natural water purification services in [Europe are valued at an estimated €33 billion per year](#). Further, pollination by wind and insects is a service that would not be possible without nature, particularly bees, as discussed in [another one of our articles on the climate crisis and bees](#).

3. Cultural Services

[Cultural services](#) include non-material benefits that people can obtain from ecosystems. These include spiritual enrichment, intellectual development, recreation and aesthetic values. These types of services can be hard to monitor and value compared to regulating and provisioning services, but research in this area is growing. For example, [studies have shown](#) that an ability to see or interact with nature, through hospital windows or hospital gardens respectively, increases the speed of patient recovery.

4. Supporting Services

Finally, [supporting services](#) are those which relate to habitat functioning themselves, and therefore influence survival. For example, photosynthesis, the water cycle and nutrient cycles are the basis of ecosystems, which in turn allow us to support ourselves. This type of ecosystem service also goes down to the genetic level, such as the maintenance of viable species gene pools.

The loss, therefore, of ecosystem services is not just an environmental issue, but an economic and social issue as it not only affects the environment, but the economy and individual well being. However, the holistic nature of ecosystem services and their interactive behavior means that common anthropogenic pressures often affect more than one service. However, habitat destruction, pollution, and invasive species are among the most prolific threats to ecosystem services.

Resource extraction is one of the [key drivers of habitat destruction](#). Most resource industries – logging, mining and farming – require infrastructure that transforms the ecosystem where the resource is being extracted. For example, deforestation for [mining](#) has impacts on [soil erosion and biodiversity](#), as well as requiring vast quantities of water, which impacts the water cycle. Additionally, [when the water is released in more concentrated polluted amounts](#), this influences the ability of the ecosystem to purify water.

Water, land and air pollution all have severe impacts on ecosystem health, which consequently affects ecosystem services. A common example is [eutrophication](#). As fertilisers leave the surface soils during rainfall and surface runoff from agricultural land, the nutrients, or pollutants, enrich the water, affecting the natural balance in lakes and more stagnant stretches of water. The result is a bloom in algae, which reduces the ability of subsurface plants to photosynthesize, [leading to](#)

decomposition, lowering water quality and damaging the water, habitat integrity and more cultural aesthetic services.

Invasive species are [a direct threat](#) to ecosystem integrity and health. Introductions of invasive species into habitats can occur naturally or be caused by humans, but once an invasive species enters an ecosystem, it can be difficult to remove and it can have [cascading impacts](#) on ecosystem services. Depending on the species, they can threaten [food security](#) and [affect provisioning services](#), as insect-pollinator pollutions can decrease through competition or predation by a newly introduced species. Crops themselves can be killed by new insects through consumption or disease-spreading. Through competition, invasive species can [reduce biodiversity](#), and therefore, supporting services in terms of genetics if the new invasive species dominates the ecosystem. The extent of the effects of invasive species is hard to determine, but the expected cascade of impacts on ecosystem services is [expected to worsen](#) under the climate crisis.

However, further research on ecosystem services has led to the growth of fields such as [environmental economics](#), which investigates [natural capital](#). In a capitalist society, the monetary value attached to nature through these disciplines has the [benefit](#) of incentivizing industry and governments towards more sustainable and eco-friendly policies. However, there are [ethical questions](#) as to whether this is the best way to energies conservation efforts. The work of environmental economics and investigations into natural capital is now a big driver in conservation, which has [great promise for the protection of ecosystem services](#).

Human-environment interaction refers to how humans impact Earth's ecosystems. Here's a full human-environment interaction definition and useful examples.[4]The term human-environment interaction defines how humans influence — and are influenced by — our surrounding ecosystems. Humans can, for example, impact their environment by clearing trees from a forest to make farmland. In contrast, the environment may affect the behavior of the people living within it — for example, by pushing them to invent warm clothing for colder climates. Understanding the dynamics within human-environment interactions is integral to developing sustainable solutions to environmental issues. Human behavior has changed local ecosystems and had a tremendous effect. For example, human fire usage caused a major wave of extinction and ecological change during the Pleistocene Era. Identifying how our current actions could have similar impacts can help us change for the better. On the flip side, creating a full human-environment interaction definition and understanding the effects of climate change can inform how we adapt

to our new world. According to the World Meteorological Organization, there are five times as many extreme weather, climate, and water events as there were 50 years ago. Nonetheless, deaths have decreased thanks to improvements in early alert programs, which were developed in response to human needs. As you can see, understanding how our changing planet affects us can help us plan for the future. Three types of Human-Environment Interaction are; (1) Dependence on the Environment: Humans depend on the world around us for basic needs like food, water, and shelter. In modern society, we also depend on other resources. Many of us rely on money or fossil fuels that often supply energy to our homes. For better or for worse, these dependencies shape how humans behave. They have a significant impact on the resources we seek and maintain. (2) Modification of the Environment: We modify the world around us to suit our needs, like building shelters to shield ourselves from the weather or clearing land for farming. These modifications can minimally impact nature and the surrounding environment, or they can be to being completely disruptive. For example, an innovative agricultural technique, [vertical farming](#) may offer a more ecologically friendly alternative to large-scale industrial farming. According to the UN, these conventional techniques are bad for the environment and promote animal and human diseases. Learning which modifications are environmentally harmful will help us create more sustainable alternatives. (3) Adaptation to the Environment: Humans have adapted to live in various environments, from the freezing arctic circle to blazing regions along the equator. Adaptation to nature can be both genetic and learned. Having darker skin is a genetic adaptation that might help an individual living in sunny environments, for example. In contrast, a learned adaptation that could have the same effect is creating garments that shield your skin from the sun. Developing new ways to adapt is vital for a sustainable future.

GEF investments are predicated on the delivery of global environmental benefits in biodiversity, climate change mitigation, international waters, land degradation and forests, and chemicals and waste. Increasingly, GEF is seeking to deliver multiple environmental benefits through integrated investments across the various dimensions of the global environment. [5]

Global environmental benefits resulting from GEF's biodiversity financing include:

- Conservation of globally significant biodiversity;
- Sustainable use of the components of globally significant biodiversity; and

- Fair and equitable sharing of the benefits arising from the utilization of genetic resources, including by appropriate access to genetic resources.

Global environmental benefit in the Climate Change Mitigation focal area is the sustainable mitigation of the concentration of anthropogenic greenhouse gases (GHG) in the atmosphere. Specifically, it includes:

- Mitigated GHG emissions;
- Increased use of renewable energy and decreased use of fossil energy resources;
- Improved energy efficiency;
- Increased adoption of innovative technologies and management practices for GHG emission reduction and carbon sequestration; and
- Conservation and enhanced carbon stocks in agriculture, forest, and other land use.

Global environmental benefits resulting from GEF's focus on land degradation focal area, specifically addressing desertification and deforestation, include:

- Improved provision of agro-ecosystem and forest ecosystem goods and services;
- Mitigated/avoided greenhouse gas emissions and increased carbon sequestration in production landscapes;
- Conservation and sustainable use of biodiversity in productive landscapes; and
- Reduced pollution and siltation of international waters.

Global environmental benefits targeted by GEF's work in international waters relate to transboundary concerns, including:

- Multi-state cooperation to reduce threats to international waters;
- Reduced pollution load in international waters from nutrient enrichment and other land-based activities;
- Restored and sustained freshwater, coastal, and marine ecosystems goods and services, including globally significant biodiversity, as well as maintained capacity of natural systems to sequester carbon; and
- Reduced vulnerability to climate variability and climate-related risks, and increased ecosystem resilience.

GEF's long term goal in chemicals and waste is to prevent the exposure of humans and the environment to harmful chemicals and waste of global importance, including

persistent organic pollutants, mercury and ozone depleting substances, through a significant reduction in the production, use, consumption and emissions/releases of those chemicals and waste. Global environmental benefits resulting from GEF's objectives in the area of chemicals and waste include:

- Protected human health and environment through the reduction and elimination of mercury use and prevention of anthropogenic emissions and releases of mercury and mercury compounds;
- Protected human health and environment through the phase out of production and consumption of ozone depleting substances;
- Reduced risks on human health and the environment through reducing and eliminating production, use and releases of Persistent Organic Pollutants and their waste; and
- Reduced risks on human health and the environment through sound management of chemicals and waste of global concern.

Multiple global environmental benefits addressing the emphasis placed by UNFCCC, CBD and UNCCD on the importance of conservation, sustainable use and management of forests, include:

- Reduction in forest loss and forest degradation;
- Maintenance of the range of environmental services and products derived from forests; and
- Enhanced sustainable livelihoods for local communities and forest-dependent peoples.

Difference Between Environment and Ecosystem [6]

Environment refers to the surroundings, whereas, ecosystem is the interaction between the environment and the living organisms. Environment is the area where living organisms live. Ecosystem is the community where the biotic and abiotic elements interact with each other. Following are the important difference between environment and ecosystem:

Environment	Ecosystem
It is the surrounding where organisms live.	It is the community where the biotic and abiotic components interact with each other.

Environment	Ecosystem
It comprises physical components.	It comprises biological components.
It provides a living space for the elements	It provides interaction between the elements
It provides the condition to live.	It provides the relation between components to live.
Environment can be macro or micro.	Ecosystem can be aquatic or terrestrial.
An organism's environment changes as it moves from one place to another.	The ecosystem remains the same no matter where the organism travels.
Environment is just a place in time.	Ecosystem depends upon all the essential life processes such as photosynthesis.

The environment is everything that makes up the surroundings and enables us to live on earth. It includes all the physical, chemical and natural forces. Modernization and industrialization have deteriorated the environmental conditions over the past few years. Deforestation, air pollution, acid rain are the consequences of environmental imbalance.

An ecosystem is a community where the living and non-living components of the environment interact with each other. It maintains stability within the environment. Desert, forest, coral reef, savanna, taiga, tundra are a few types of ecosystem. An ecosystem is constantly evolving.

Environmental Justice is a concept that was [coined in the early 1960s during the Civil Rights](#) movement and has increasingly picked up momentum as our social justice movements and environmental issues have grown. The issues of racism and socioeconomic justice are central to the issue of Environmental Justice. At its core, *Environmental Justice guarantees that all people have equal access to a healthy, safe, and sustainable environment, as well as equal protection from environmental harm.*

Environmental Justice assumes and recognizes [community care](#) and Indigenous and first nations' knowledge. It acknowledges how privilege, power, and oppression are

integral to our understanding of how we are impacted by climate change and our environment.

We witness environmental injustice when our single-use plastic is incinerated causing air pollution in low-income communities in the US, or when it is shipped overseas to overwhelm South East Asian communities. We witness environmental injustice in Flint, MI, a majority-black community that still has lead in its water and when state violence harms Indigenous youth fighting to protect their land. These are only a few examples of the impact of environmental injustice that highlight the necessity of centering Environmental Justice in our movement.

As our planet continues to warm, forest fires burn, plastics dump into our oceans, and natural disasters worsen, we are witnessing increases in negative impacts. Our movements must keep pace with the rapid degradation of our natural world as well as our social world, challenging us to understand how climate change and environmental degradation impact humans differently.

We have lifetimes of relearning to do around our notions of community, trauma, and social justice. Racism, patriarchy, militarism, corporate greed, capitalism, state violence — these and other causes of immense harm to those most at risk continue, largely unchecked. When we recognize who is most at risk, we find institutional harm is interwoven with the impact of the climate catastrophe. Understanding this, fighting oppression, and centering those most marginalized help us create an environmentally just future for all.

Environmental Justice requires that we incorporate racial and socioeconomic justice into the way we fight for the protection of our planet. Exploring the ways that global warming harms low-income communities, primarily black, brown, Indigenous, and migrant communities are critical to understanding how our fight must be won. [7]

National People of Color Environmental Leadership Summit held on October 24-27, 1991, in Washington DC, drafted and adopted 17 principles of Environmental Justice. [8]

- 1) Environmental Justice affirms the sacredness of Mother Earth, ecological unity and the interdependence of all species, and the right to be free from ecological destruction.
- 2) Environmental Justice demands that public policy be based on mutual respect and justice for all peoples, free from any form of discrimination or bias.

3) Environmental Justice mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other living things.

4) Environmental Justice calls for universal protection from nuclear testing, extraction, production and disposal of toxic/hazardous wastes and poisons and nuclear testing that threaten the fundamental right to clean air, land, water, and food.

5) Environmental Justice affirms the fundamental right to political, economic, cultural and environmental self-determination of all peoples.

6) Environmental Justice demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials, and that all past and current producers be held strictly accountable to the people for detoxification and the containment at the point of production.

7) Environmental Justice demands the right to participate as equal partners at every level of decision-making, including needs assessment, planning, implementation, enforcement and evaluation.

8) Environmental Justice affirms the right of all workers to a safe and healthy work environment without being forced to choose between an unsafe livelihood and unemployment. It also affirms the right of those who work at home to be free from environmental hazards.

9) Environmental Justice protects the right of victims of environmental injustice to receive full compensation and reparations for damages as well as quality health care.

10) Environmental Justice considers governmental acts of environmental injustice a violation of international law, the Universal Declaration On Human Rights, and the United Nations Convention on Genocide.

11) Environmental Justice must recognize a special legal and natural relationship of Native Peoples to the U.S. government through treaties, agreements, compacts, and covenants affirming sovereignty and self-determination.

12) Environmental Justice affirms the need for urban and rural ecological policies to clean up and rebuild our cities and rural areas in balance with nature, honoring the cultural integrity of all our communities, and provided fair access for all to the full range of resources.

13) Environmental Justice calls for the strict enforcement of principles of informed consent, and a halt to the testing of experimental reproductive and medical procedures and vaccinations on people of color.

14) Environmental Justice opposes the destructive operations of multi-national corporations.

15) Environmental Justice opposes military occupation, repression and exploitation of lands, peoples and cultures, and other life forms.

16) Environmental Justice calls for the education of present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives.

17) Environmental Justice requires that we, as individuals, make personal and consumer choices to consume as little of Mother Earth's resources and to produce as little waste as possible; and make the conscious decision to challenge and reprioritize our lifestyles to ensure the health of the natural world for present and future generations

3. Objective

The objectives of the documentary research on “Environmental Benefits and Environmental Justices” are;

1. to learn and share the knowledge on the environmental benefits and environmental justices.
2. to learn and share the knowledge on environmental services, and four types of Ecosystem Services([Provisioning services](#), [Regulating services](#), [Cultural services](#), and [supporting services](#))
3. to give recommendation or suggestions to protect environmental benefits and ecosystem services and to promote environmental justices.

4. Materials and Method

4.1 Research Method

Desk research or Secondary research or “[documentary research](#)” was used in this study. *Desk research* is a type of research that is based on the material published in reports and similar documents that are available in public libraries, websites, data obtained from surveys already carried out, etc. Some organizations also store data

that can be used for research purposes. It is a research method that involves the use of existing data. These are collected and summarized to increase the overall effectiveness of the investigation. Secondary research is much more cost-effective than [primary research](#), as it uses existing data, unlike primary research, in which data is collected first-hand by organizations, companies, or may employ a third party to obtain the data in your name. It's also called "[documentary research](#)". One of the most popular ways to collect data for desk research is through the Internet. [9]

4.2 Research Orientation

4.2.1 Discussion and meeting were made with the consultants, NGO, CSO and people who had experiences in environmental conservation, sustainable agriculture, extension on plastic pollution control, and sustainable management of water related ecosystem. Questionnaire survey was conducted related to water pollution in November and December, 2022 to get information. SWOT analysis was done to address plastic waste disposal in Ayeyarwaddy river, by consultant and gave presentation on 28th December, 2022. Participants suggested to address issues. Literature review was done based on the literatures shown in the references.

5. Findings

The Myanmar Country Environmental Analysis (CEA), concluded that [10]

1. The forest cover has been declining at an average rate of 1.2 percent a year, totaling around 10 million hectares, between 1990 and 2015. The primary drivers of deforestation in Myanmar are land conversion (primarily for agriculture and mining), development of roads and other infrastructure, excessive and poor governance of the mining sector, increase in dams and reservoirs. Some reports put wood fuel extraction as the biggest single demand on forest biomass, significantly greater than timber. Fuelwood is the primary fuel for as much as 95 percent of rural domestic energy needs, and estimations range between 60 to 80 percent of total energy consumption. The area of mangroves in Myanmar is the second largest in Southeast Asia after Indonesia, totaling around 500,000 hectares, but the rates of mangrove loss in this country are the highest in the region, with 2.2 percent annual over the period 2000-2012 or net loss of 191,120 hectares.
2. Myanmar Development Research Institute (MDRI) conducted Ayeyarwaddy research in 2013 and found that the water quality of Ayeyarwaddy River

decline for many years, siltation with the rate of 360 million tons annually especially from mining operations, due to the result of deforestation, and lack of soil protection or over exploitation of land.

3. The overexploitation of fish stocks has contributed to a severe decline in Myanmar's marine fish resources, reportedly by as much as 90 percent since 1979/80. Open-access and the 'race to fish' is the primary driver of depletion and overfishing in Myanmar. Large declines in numerous species of freshwater fish are reported throughout the Ayeyarwady River Basin, which covers around 60 percent of Myanmar's land area. Illegal fishing in the inshore and offshore segments of Myanmar's marine fisheries is commonplace and enforcement in many marine fisheries remain limited.
4. Due to the current practice of open dumping of waste and the insufficient collection coverage and cleanliness, there are key environmental and operational issues as follows: landfills that are almost at their full capacity, waste dumping without any compaction, surface and groundwater contamination, methane production, release of greenhouse gas and potential landfill fires.
5. In 2017, air pollution is estimated to have attributed to more than 45,000 deaths in Myanmar. As a risk factor for death, air pollution is higher in Myanmar than in other countries in the region and is almost twice the average for Southeast Asia. For Myanmar youth aged 5 to 14 years, particulate matter pollution is the leading risk factor of death among all risk factors, including malnutrition and other behavioral risks.

Institute for Global Environmental Strategies (IGES) Centre Collaborating with UNEP on Environmental Technologies (CCET) made a study on Waste Management in Myanmar, and found that Myanmar has been facing considerable challenges with the management of waste in the recent past as a result of increasing income and consumption levels, urban growth, and lack of effective waste treatment and disposal methods. Waste management is also a cross-cutting issue that touches on many aspects of social and economic development, and as such is widely associated with a range of global challenges including public health, climate change, poverty reduction, food security, resource efficiency and sustainable production and consumption. In this regard, the IGES Centre Collaborating with UNEP on Environmental Technologies (CCET) has been providing technical assistance to the Ministry of Natural Resources and Environmental Conservation (MONREC) and other key stakeholders, including Mandalay City Development Committee (MCDC), towards the development of sustainable waste management strategies at

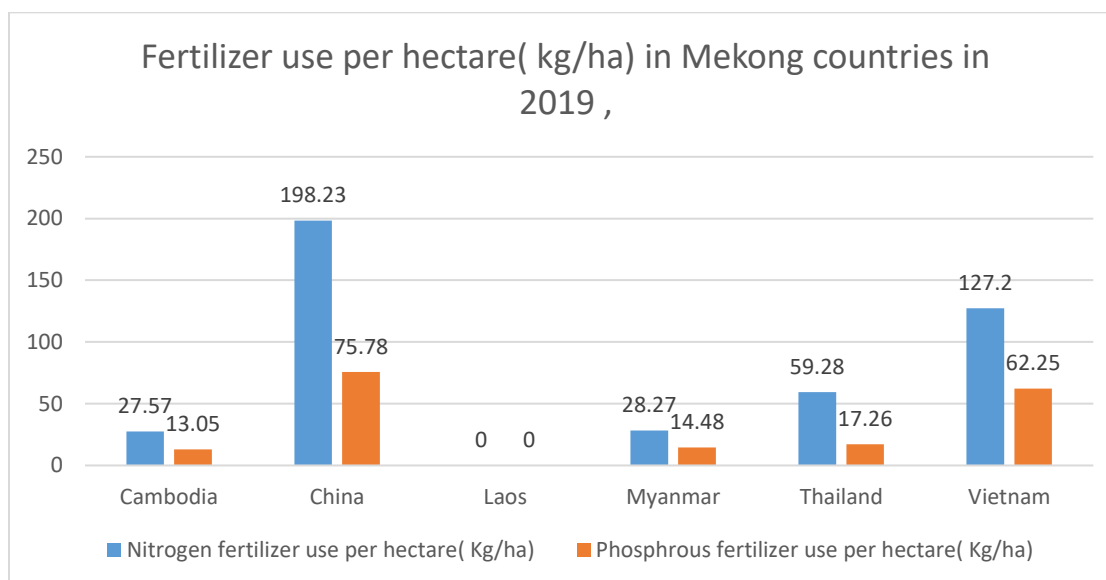
the national and city levels based on a holistic waste management approach: addressing all waste streams (solid waste, liquid waste / wastewater, and gaseous emissions), primarily focusing on solid waste and its relationship with other types of waste since early 2016. This policy report therefore discusses the major findings of a quick study on Myanmar's existing waste management systems and practices as well as a series of multi stakeholder workshops organized between January through December 2016. It presents an overview of the present status of waste management in Myanmar, discusses key challenges and obstacles, and provides a number of policy recommendations for MONREC and other stakeholders to consider in the development of the country's National and City Waste Management Strategies and Action Plans supported by CCET. Waste management in Myanmar has traditionally been the responsibility of township and city development committees designated within respective States and Regions. In Yangon, Mandalay and Nay Pyi Taw, three autonomous City Development Committees, their respective Pollution Control and Cleansing Departments (PCCDs) and their network of administrative branches and sub-units are tasked with solid waste management. At present, waste collected by respective townships and city development committees is transported to open dumping sites located within city boundaries, which face a number of challenges in terms of operations and management. Municipal waste collection systems in Myanmar cities can largely be characterized as labor intensive, relying on the use of both manual workers and non-specialized vehicles. Similarly, recycling activities are carried out in many cities in Myanmar mostly by the informal sector, which includes waste pickers, waste collectors, and waste dealers. All major cities (Yangon, Mandalay and Nay Pyi Taw) experience bottlenecks with regard to managing industrial waste, which is often transported to landfill sites without prior treatment. Mandalay and Yangon collect medical waste from large hospitals and special clinics on a daily basis while collection service is provided to smaller facilities once a week or on an on-call basis. Domestic waste water is usually released into storm water drainage systems and natural waterways; industrial wastewater is currently managed in a haphazard manner, although a number of private companies located in selected Special Economic Zones (SEZ) are progressively implementing wastewater treatment systems.[11]

The fertilizer applied reached 75 kg per hectare in the peak year (1985/86) and went down to 30 kg in the early 1990s, and has been fluctuating widely in the range of between 30 and 60 kg. It is clear from these figures that fertilizer application per hectare is low in Myanmar in comparison with the international average.[12]

Use of chemical fertilizer and pesticide (kg/ha) in Mekong countries at 2019 is shown in following table for taking into consideration on their impacts.

Sr	Mekong countries	Nitrogen fertilizer use per hectare(Kg/ha)	Phosphrous fertilizer use per hectare(Kg/ha)	Pesticide use per hectare
1	Cambodia	27.57	13.05	No data
2	China	198.23	75.78	13.07
3	Laos	No data	No data	0.11
4	Myanmar	28.27	14.48	1.39
5	Thailand	59.28	17.26	1.32
6	Vietnam	127.2	62.25	1.63

Source <https://ourworldindata.org/fertilizers>(Fertilizers Data Explorer)
<https://ourworldindata.org/grapher/pesticide-use-per-hectare-of-cropland>



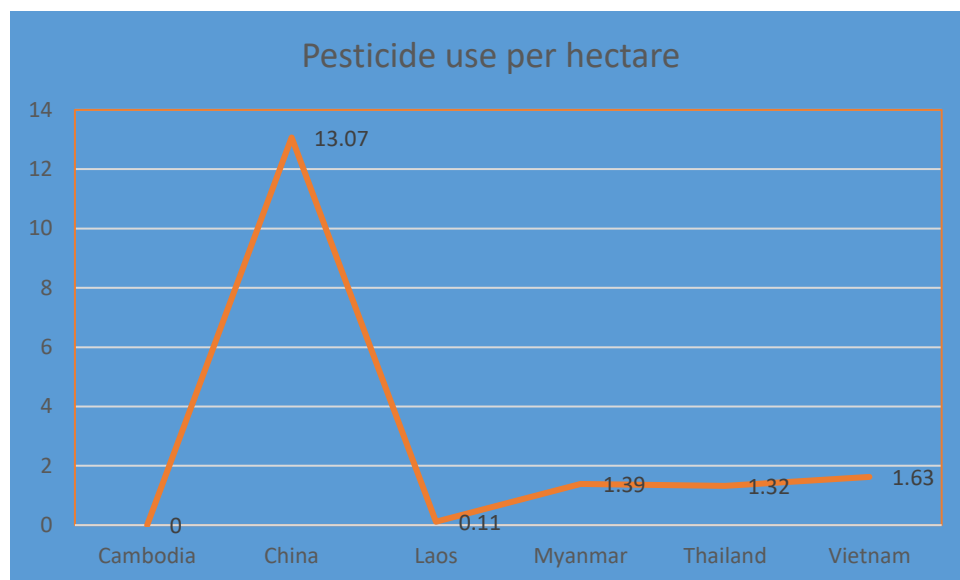
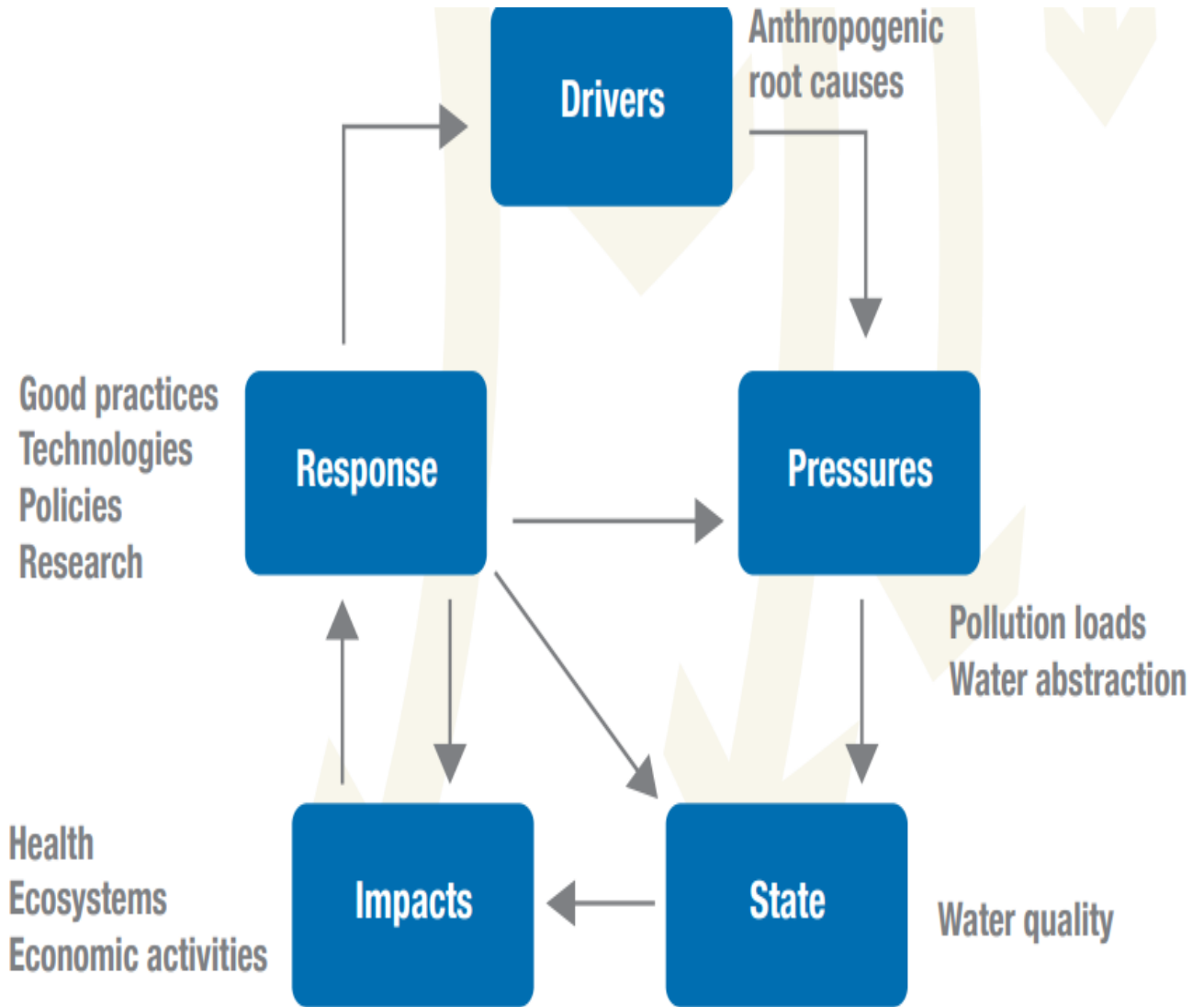


Table 1 Fertilizer application levels worldwide and by country (data from FAO)

Number	Region	N fertilizer application level (kg/ha/year)			P fertilizer application level (kg/ha/year)		
		2005	2010	2015	2005	2010	2015
1	World	57.55	65.13	68.61	24.98	27.75	30.10
2	USA	65.63	69.75	77.46	24.56	21.21	26.82
3	China	213.5	241.92	228.48	94.73	115.27	116.4
4	India	74.99	97.21	102.51	30.71	48.43	41.18
5	Indonesia	59.05	62.43	61.27	8.03	11.19	17.11
6	Japan	117.98	97.86	79.87	130.25	92.38	76.78
7	Netherlands	244.35	205.82	203.11	42.55	29.02	12.22
8	Spain	51.77	54.65	62.54	28.77	19.55	24.16
9	Thailand	55.43	79.21	80.74	17.12	24.11	16.39
10	Argentina	18.89	19.79	14.52	15.14	17.54	11.62
11	Australia	19.14	22.85	28.04	20.94	19.17	19.98
12	Brazil	27.11	47.36	44.23	37.57	43.58	52.65

Food and Agriculture Organization of the United Nations Rome and the International Water Management Institute on behalf of the Water Land and Ecosystems research program of the CGIAR Colombo, published “More people, more food, worse water? a global review of water pollution from agriculture” in 2018, and it provides an analysis of

problems and options for improvement. It is structured using the Drivers, Pressures, State, Impact, Response (DPSIR) model.



DPSIR framework and water quality.

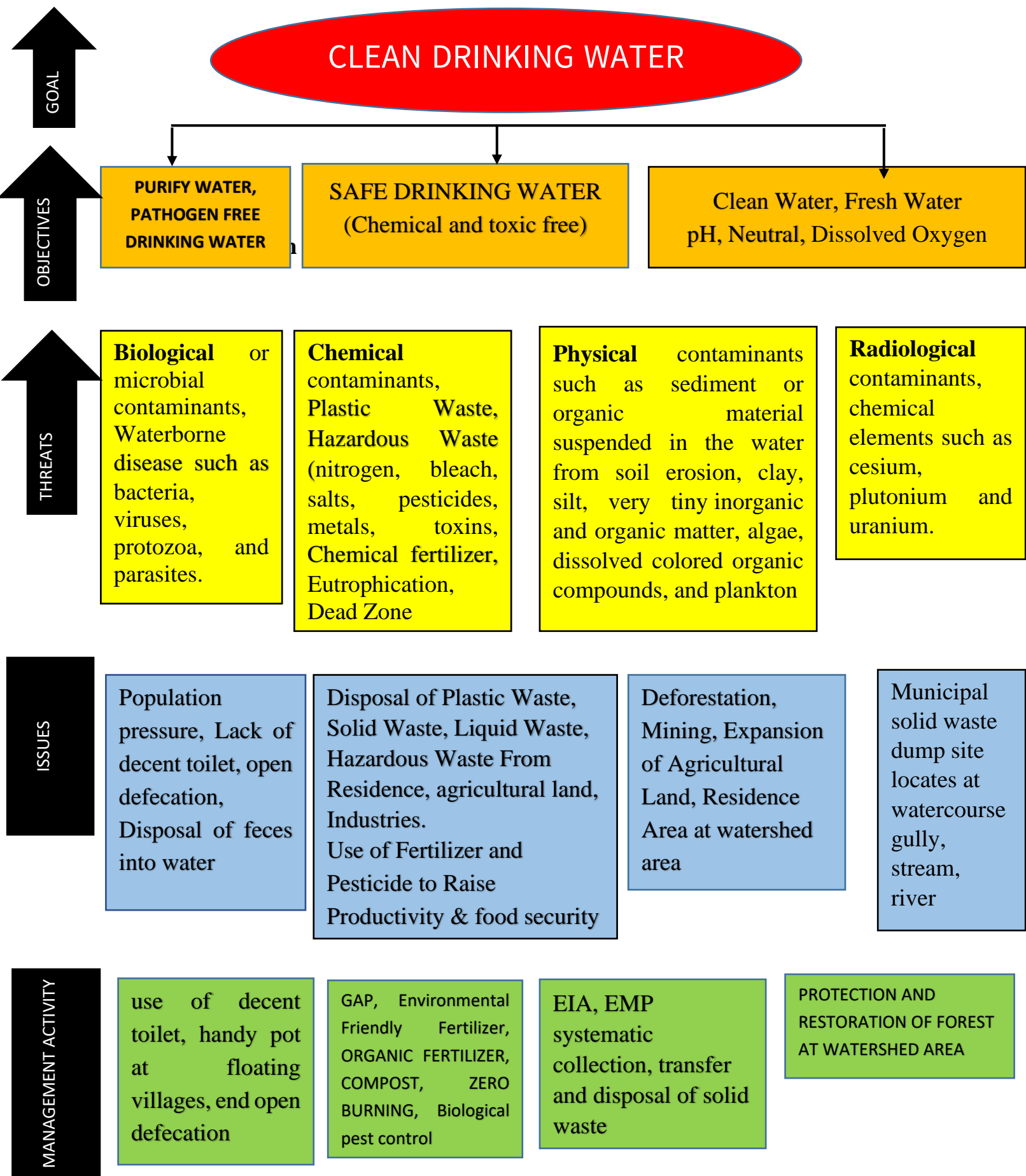
DPSIR Framework, Definition, and Example from agriculture

Term	Definition	Examples from agricultural water pollution
Driver	An anthropogenic activity that may have an environmental effect	Primary drivers: population growth and mobility, and change in consumption patterns Secondary drivers: expansion and intensification of irrigated agriculture, rain-fed agriculture, livestock production and inland aquaculture
Pressure	The direct effect of the driver	Loads of nitrogen, phosphorus, pesticides, biochemical oxygen demand, sediments, salts, organic matter, pathogens or emerging pollutants generated on-farm (at source) and reaching water bodies (e.g. rivers, lakes, aquifers, coastal waters, marine waters)
State	The condition of the water body resulting from both natural and anthropogenic factors (i.e. physical, chemical and biological characteristics of the water body)	Concentration of ammonia, nitrate phosphate, persistent organic pollutants, suspended solids and other agricultural pollutants in water bodies (e.g. rivers, lakes, aquifers, coastal waters, marine waters)
Impact	The effects of the pressure on the environment, health and the economy	ENVIRONMENT: e.g. fish killed, ecosystems modified-eutrophication HEALTH: e.g. increased human mortality or morbidity resulting from water pollution by agriculture ECONOMY: e.g. as a result of unsafe agricultural products irrigated with polluted waters or a decrease in productivity due to toxicity or salinity / sodicity
Response	The measures taken to improve the state of the water body or to mitigate the impacts of water quality degradation	Responses on drivers (including change in diets and consumption habits), pressures (including pollution prevention on-farm), state (including remediation or restoration of ecosystems) and impacts (including the control of human exposure to polluted waters)

Note: The distinction made here between state and impact separates effects that are sometimes combined, or confused. One reason for this is that because many of the impacts are not easily measurable, state is often used as an indicator of, or surrogate for, impact.

Source: adapted from the European Commission, 2002.

Source: FAO 2018[13]



CLEAN DRINKING WATER

PURIFY WATER, PATHOGEN FREE DRINKING WATER

SAFE DRINKING WATER (Chemical and toxic free)

Clean Water, Fresh Water pH, Neutral, Dissolved Oxygen

Biological or microbial contaminants, Waterborne disease such as bacteria, viruses, protozoa, and parasites.

Chemical contaminants, Plastic Waste, Hazardous Waste (nitrogen, bleach, salts, pesticides, metals, toxins, Chemical fertilizer, Eutrophication, Dead Zone

Physical contaminants such as sediment or organic material suspended in the water from soil erosion, clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton

Radiological contaminants, chemical elements such as cesium, plutonium and uranium.

Population pressure, Lack of decent toilet, open defecation, Disposal of feces into water

Disposal of Plastic Waste, Solid Waste, Liquid Waste, Hazardous Waste From Residence, agricultural land, Industries. Use of Fertilizer and Pesticide to Raise Productivity & food security

Deforestation, Mining, Expansion of Agricultural Land, Residence Area at watershed area

Municipal solid waste dump site locates at watercourse gully, stream, river

use of decent toilet, handy pot at floating villages, end open defecation

GAP, Environmental Friendly Fertilizer, ORGANIC FERTILIZER, COMPOST, ZERO BURNING, Biological pest control

EIA, EMP systematic collection, transfer and disposal of solid waste

PROTECTION AND RESTORATION OF FOREST AT WATERSHED AREA

Implement the National Environmental Policy of Myanmar, Myanmar National Water Policy, Forest Policy, National Waste Management Strategy and Master Plan for Myanmar (2018-2030), Conduct EIA, HIA on the use of chemical fertilizer and pesticide, Conduct Municipal solid waste dump site,

Conceptual Model

CLEAN WATER & SANITATION

PATHOGEN FREE, SAFE DRINKING WATER

SANITATION, HYGIENE TO PREVENT WATERBORNE DISEASE

Water Pollution/ Water Contamination
Pathogen, Harmful Germs, Parasites, Viruses, Bacteria, Protozoa

Spread of Waterborne Disease
Cholera, Acute Diarrhea, Dysentery Typhoid Fever, Hepatitis A, Malaria, Dengue,

POPULATION GROWTH, EXPANSION OF RESIDENCE AREA AT WATERSHED AREA

DISPOSAL OF SOLID WASTE, LIQUID WASTE, HAZARDOUS WASTE FROM RESIDENCE AND INDUSTRIES

LACK OF DECENT TOILET, OPEN DEFECATION, DISPOSAL OF FECES DIRECTLY INTO RIVER, LAKES, STREAM, GULLY

Natural disaster which destroy sewage pipes

Routine Health Information Network, Electronic Health Management Information Systems, (eHMIS),

Conduct Health impact assessment (HIA), EIA, [Drinking Water Monitoring](#), systematic collection, transfer and disposal of solid waste, Develop EMP and implement

End open defecation, Use Decent Toilet, Good Sewage System, Use Handy Pot At Floating Villages, wash hand, provide clean drinking water Enhance environmental ethics,

Apply One health approach, water purification methods Stakeholder participation, Stakeholder engagement. Early warning, Implement national health plan, Myanmar Sustainable Development Plan

GOAL

OBJECTIVES

THREATS/impact

ISSUES

MANAGEMENT ACTIVITY

Conceptual Model

CLEAN WATER

GOAL

OBJECTIVES

THREATS/ impact

ISSUES

MANAGEMENT ACTIVITY

SAFE DRINKING WATER

FRESH WATER

Water Pollution/ Water Contamination with chemicals such as Nitrate, Phosphate
Eutrophication, dead zone, ground water

Water Pollution/ Water Contamination with chemicals from pesticide, insecticide, fungicide, weedicide,

Population Growth, Expansion Of Agricultural Land At Watershed Area

DISPOSAL OF SOLID WASTE, LIQUID WASTE, HAZARDOUS WASTE FROM Agricultural land

Soil erosion from agricultural land,

Conduct Health impact assessment (HIA), EIA, [Drinking Water Monitoring](#), systematic collection, transfer and disposal of solid waste, Develop EMP and implement

Reduce the use of fertilizer and pesticides
Avoid soil erosion by planting all over the year
Plant trees or grasses along the edges of fields
Adjust the intensity of tillage of a field
• Education
• Biological control

Improve manure management
Change our consumption behavior
Prevent excessive nutrients from reaching the water
Raise the awareness of farmers on the topic of agricultural pollution

Implement, Myanmar Sustainable Development Plan (2018 – 2030)

6. Recommendations

I would like to recommend to adopt “Waste recycling etiquette” which is the set of rules to limit and appropriately manage the garbage and trash that we produce. Such rules help us avoid behaviors that may lead to a negative environmental impact. These rules can promote environmental justices and maintain environmental benefits. They include:

1. Limit garbage and trash to a minimum. Waste has a high environmental footprint. First, waste disposal and recycling require significant resources. Second, some materials are not easily recyclable and thus risk polluting and harming the environment. Adopt sustainable food practices to limit your food waste.
2. Avoid waste by reusing items whenever possible. Many non-food materials can be reused, such as glass jars or bottles, plastic bags or film, aluminum foil, or cardboard boxes. Similarly, many old items can still be reused differently.
3. Resell items instead of throwing them away.
4. Limit the use of plastic.
5. Recycle garbage and trash according to local rules.
6. [Dispose of garbage and trash frequently.](#)
7. Adopt waste segregation practice to produce organic fertilizer from food waste and kitchen waste.
8. Waste segregation is the process of separating waste into different categories so that it can be recycled or disposed of more effectively. By segregating waste, we can reduce the amount of waste that goes to landfill and recycle more materials. There are many types of waste, and each type should be segregated into its bin. [For example, dry waste includes wood and related products, metals and glass while wet waste typically refers to organic waste usually generated by eating establishments and are heavy in weight due to dampness.](#)
9. To manage the waste segregation method at your home, you can keep two dustbins in your home. [In the first bin, collect all the dry waste \(non-biodegradable\), and in the second bin, start collecting wet waste \(biodegradable waste\).](#)

7. Conclusion

Sustainable development can be ensured by conserving the environmental benefits and ecosystem services. All stakeholders need to participate in the use of best environmental practices such as Responsible Appliance Disposal (RAD) program to promote environmental justices. It also need to Ensure sustainable consumption and production patterns for environmental justices. The people from Myanmar also need to enhance environmental ethics and take part in implementing National Environmental Policy, Myanmar National Water Policy, National Waste Management Strategy and Master Plan for Myanmar to promote environmental justices. It requires to strengthen the means of implementation and revitalize the global partnership to end environmental injustice.

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