HUMAN IMPACT IN THE EXTINCTION OF ANIMALS

Field Project Submitted to the Department

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HUMAN IMPACT IN THE EXTINCTION OF ANIMALS

Extinction, in biology, the dying out or extermination of a species. Extinction occurs when species are diminished because of environmental forces (habitat fragmentation, global change, natural disaster, overexploitation of species for human use) or because of evolutionary changes in their members (genetic inbreeding, poor reproduction, decline in population numbers).

More than 99% of all species that ever lived on Earth, amounting to over five billion species, are estimated to have died out. It is estimated that there are currently around 8.7 million species of eukaryote globally, and possibly many times more if microorganisms, like bacteria, are included. Notable extinct animal species include non-avian dinosaurs, saber-toothed cats, dodos, mammoths, ground sloths, thylacines, trilobites and golden toads.

Through evolution, species arise through the process of speciation—where new varieties of organisms arise and thrive when they are able to find and exploit an ecological niche—and species become extinct when they are no longer able to survive in changing conditions or against superior competition. The relationship between animals and their ecological niches has been firmly established.A typical species becomes extinct within 10 million years of its first appearance, although some species, called living fossils, survive with little to no morphological change for hundreds of millions of years.

Rates of extinction vary widely. For example, during the last 100,000 years of the Pleistocene Epoch (about 2.6 million to 11,700 years ago), some 40 percent of the existing genera of large mammals in Africa and more than 70 percent in North America, South America, and Australia went extinct. Ecologists estimate that the present-day extinction rate is 1,000 to 10,000 times the background extinction rate (between one and five species per year) because of deforestation, habitat loss, overhunting, pollution, climate change, and other human activities—the sum total of which will likely result in the loss of between 30 and 50 percent of extant species by the middle of the 21st century.

According to the 2019 Global Assessment Report on Biodiversity and Ecosystem Services by IPBES, the biomass of wild mammals has fallen by 82%, natural ecosystems have lost about half their area and a million species are at risk of extinction—all largely as a result of human actions. Twenty-five percent of plant and animal species are threatened with extinction.

A cruel evolutionary logic is at work among the world's wildlife. Charles Darwin said the ability to adapt to change determined which species survived. For Darwin, extinction was a constant side effect of competition.Because of the wide reach of On the Origin of Species, it was widely accepted that extinction occurred gradually and evenly (a concept now referred to as background extinction). It was not until 1982, when David Raup and Jack Sepkoski published their seminal paper on mass extinctions, that Cuvier was vindicated and catastrophic extinction was accepted as an important mechanism. The current understanding of extinction is a synthesis of the cataclysmic extinction events proposed by Cuvier, and the background extinction events proposed by Lyell and Darwin.

Today, change is so fast, many of our larger animals simply don't have time to adapt. Larger animals are most at risk because they take longer to reproduce and reach maturity than smaller birds and animals. Most cannot easily change diet or habitat. So there is simply not enough time for them to adapt to a fast-changing world.The future belongs to "smaller, faster-lived, more fecund, more generalist and preferentially insect-eating species" which, the researchers say, will fundamentally restructure life on our planet.

Many species have become extinct because of hunting and overharvesting, the conversion of wetlands and forests to croplands and urban areas, pollution, the introduction of invasive species, and other forms of human-caused destruction of their natural environments. Indeed, current rates of human-induced extinctions are estimated to be about 1,000 times greater than past natural (background) rates of extinction, leading some scientists to call modern times the sixth mass extinction. This high extinction rate is largely due to the exponential growth in human numbers: growing from about 1 billion in 1850, the world's population reached 2 billion in 1930 and more than 7.8 billion in 2020 and is expected to reach about 10 billion by 2050. As a result of increasing human populations, habitat loss is the greatest factor in current levels of extinction. For example, less than one-sixth of the land area of Europe has remained unmodified by human activity, and more than half of all wildlife habitat has been eliminated in more than four-fifths of countries in the paleotropics (the Old World tropics that span Africa, Asia, and Indonesia). By 2020 several ecological studies had reported dramatic decreases in wildlife populations worldwide and increases in the numbers of threatened and endangered species, especially among terrestrial mammals and vertebrates.

Many species are hunted for meat and other products, including whales and various fish. Yet other species are harvested for body parts, such as tiger bones and rhino horns, which are used in Asian medicines. A wide variety of plants are harvested too, again often for medicinal purposes. Simply put, any species that is used for food, wood, or medicine or as pets or houseplants, that is collected (such as butterflies or invertebrate shells), or that attracts attention for any other reason suffers an increased risk of extinction.

Pollution is a special case of habitat destruction; it is chemical destruction rather than the more obvious physical destruction. Pollution occurs in all habitats—land, sea, and fresh water—and in the atmosphere. Global warming, which is discussed separately below , is one consequence of the increasing pollution of the atmosphere by emissions of carbon dioxide and other greenhouse gases.

Water pollution is a global-scale problem, no less so for rivers and marine life. Wastes are often dumped into rivers, and they end up in estuaries and coastal habitats, regions that support the most diverse shallow-water ecosystems and the most productive fisheries. Rivers receive pollution directly from factories that dump a wide variety of wastes into them. They also receive runoff, which is rainwater that has passed over and through the soil while moving toward the rivers. In fact, water entering rivers after it has been used for irrigation has passed through the soil more than once—first as runoff, which is then returned to the land for irrigation, whereupon it soaks through the soil again, often picking up fertilizers and pesticides and these runoff from the agricultural areas upstream adds unwanted nutrients to an ecosystem that is naturally nutrient-poor. As it does so,

the vegetation changes, and species not common in the region begin to take over the natural habitats, causing a competition among species eventually resulting in an imbalance in the ecosystem.

In addition, increased levels of greenhouse gases have begun to alter the world's climate, with slowly increasing surface temperatures expected by the middle of the 21st century to force many species to migrate toward the poles and up mountain slopes in order to remain in habitats with the same climate conditions. Most ecologists, conservation biologists, and climate scientists worry that global warming will contribute greatly to species extinctions. For example, one study released in 2015 that examined 130 extinction models from previous studies predicted that 5.2 percent of species would be lost as a result of global warming alone with a rise in average temperatures of 2 °C (3.6 °F) above temperature benchmarks taken before the start of the Industrial Revolution. The study also predicted that about 16 percent of Earth's species would be lost if surface warming increased to about 4.3 °C (7.7 °F). Changes in ocean temperatures and increasing ocean acidification also threaten many marine species, especially corals and mollusks with external shells.

Overexploitation from hunting and harvesting also has adversely affected many species. For example, about 20 million tropical fish and 12 million corals are harvested annually for the aquarium trade, depleting natural populations in some parts of the world.

All these factors have increased the numbers of threatened species. Almost one in four mammal species, including four of the six remaining species of great apes, and one in eight bird species were considered at significant risk of extinction at the

start of the 21st century. In addition, the World Wildlife Fund noted in a 2016 report that vertebrate populations overall declined by 58 percent between 1970 and 2010.

While extinctions are always multi-faceted, the extermination of some species can be almost directly linked to the insatiable appetites of modern humans. Below are few of the animals we have lost to our unthinking exploitation.

Dodo - Raphus cucullatus

"Dead as a dodo." Yep. These flightless, ground-nesting birds were once bountiful on the island of Mauritius in the Indian Ocean. Larger than turkeys, dodos weighed about 23 kg (about 50 pounds) and had blue-gray plumage and a large head. With no natural predators, the birds were unfazed by the Portuguese sailors that discovered them around 1507. These and subsequent sailors quickly decimated the dodo population as an easy source of fresh meat for their voyages. The later introduction of monkeys, pigs, and rats to the island proved catastrophic to the languishing birds as the mammals feasted on their vulnerable eggs. The last dodo

was killed in 1681. Sadly, very few scientific descriptions or museum specimens exist.

Great Auk - Pinguinus impennis

The great auk was a flightless seabird that bred in colonies on rocky islands in the North Atlantic, namely St. Kilda, the Faroe Islands, Iceland, and Funk Island off Newfoundland. The birds were approximately 75 cm (30 inches) long and had short wings which were used for underwater swimming. Utterly defenseless, great

auks were killed by rapacious hunters for food and bait, particularly during the early 1800s. Enormous numbers were captured by sailors, who often drove the birds up planks and slaughtered them on their way into the hold of a vessel. The last known specimens were killed in June 1844 at Eldey island, Iceland, for a museum collection.

Woolly Mammoth - Mammuthus primigenius

Thanks to a number of well-preserved, frozen carcasses in Siberia, the woolly mammoth is the best-known of all mammoth species. These massive animals died

out around 7,500 years ago, after the end of the last Ice Age. While climate change definitely played a significant role in their extinction, recent studies suggest that humans may have also been a driving force in their demise, or at least the final cause. Extensive hunting and the stresses of a warming climate are a lethal combination, and it seems even the mighty mammoth could not withstand the human appetite in a changing world.

Currently there are 1.75 million species that have been identified; however, some speculate that there are at least 10 million living species on earth (Eldredge, 2000). To look at the loss of biodiversity, the number of extinctions of species should be examined. Rates of extinction are currently up to 40,000 species per year (that's 100 per day or 4 per hour) (Wood, 2000). This rate is 50 -100 times the natural rate of extinction and is expected to increase in the coming years (Sherbinin, 2002).

The current extinction crisis is entirely of our own making. More than a century of habitat destruction, pollution, the spread of invasive species, overharvest from the wild, climate change, population growth and other human activities have pushed nature to the brink. Addressing the extinction crisis will require leadership — especially from the developed countries — alongside bold, courageous, far-reaching initiatives that attack this emergency at its root.

The extinction of animals and plants is a natural process that has caused species to come and go, throughout history. Whereas, this natural extinction is no longer in nature's control, but is manipulated by humanity, thus increasing the extinction

rate of species abnormally. However, this does not mean that the extinction of species cannot be repaired. If every human being makes an effort to save the endangered species, they can be preserved. Humanity's prosperity, health and advancement, all is dependent on these, species. Elimination of endangered species can lead to the ultimate death of humans.

The problem with extinction is that it's irreversible, and it has a profound effect on the planet's ecosystem. Everything from the food we eat to the resources that we use are with us because of the Earth's extraordinary biodiversity. Each time a species goes extinct, the world around us unravels a bit. The consequences are profound, not just in those places and for those species but for all of us.

Although often obscured by the noise and rush of modern life, people retain deep emotional connections to the wild world. Wildlife and plants have inspired our histories, mythologies, languages and how we view the world. The presence of wildlife brings joy and enriches us all — and each extinction makes our home a lonelier and colder place for us and future generations.

GROUNDWATER DEPLETION AND ITS HAZARDS

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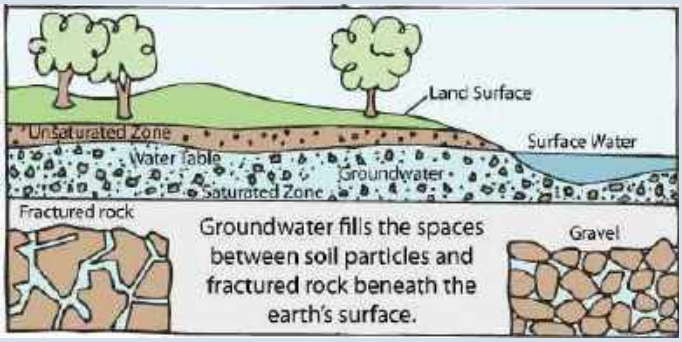
GROUNDWATER DEPLETION AND ITS HAZARDS

"Water, though it has no colour, no taste, no odour, is life which fills us with gratification that exceeds the delight of senses." These remarkable words from the French writer Antoine de Saint-Expurey, highlights the worth of the most common element in the Earth, which we, as quotidian users, tend to go unnoticed. Water is incredibly an important substance for survival and its presence make Earth suitable for supporting life. We often believe water as an unlimited gift from our creator, but is it so? Have we ever thought about a life without fresh water? It is indeed the right time to think about such a raucous situation and the whole world fighting for drinking water. We must visualize the whole world carrying pots of water just as we see the women of Rajasthan and other desert areas carrying water, if the present condition goes on without any pause. The next question would be who is responsible for such a situation? Yes, the answer is quite clear. Man's ruthless attitude of encroaching into the tranquility of nature has caused all the detrimental effects. His merciless hands have even interfered into the balance of ecosystem, which is the basis of his survival. In short, man is digging his own grave under the shade of the word 'development'. Groundwater depletion is also an upshot of human's unnecessary interference into the natural world.

Groundwater is the water present beneath Earth's surface in rock and soil pore spaces and in the fractures of rock formations. Aquifer is a unit of rock from where we can yield usable quantity of water. The depth at which this soil pore spaces and voids in rock become completely saturated with water is called water table. Most often, groundwater is thought of



only as flowing water, but it can also contain soil moisture, permafrost (frozen soil), geothermal water. The study of distribution and movement of groundwater is called hydrogeology, also called as groundwater hydrology.

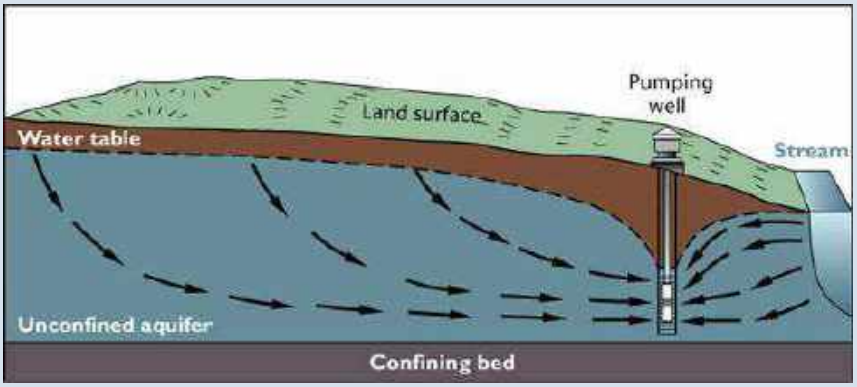
Groundwater makes up about thirty percent of the world's fresh water supply, which is about 0.76 % of the entire world's water, including oceans and permanent ice. About 99% of world's liquid fresh water is groundwater. This makes it an important natural resource that can act as a natural storage which can be used against shortages of surface water, as in during the time of droughts. But surely, we are going to face groundwater stress soon. Groundwater depletion can be defined as the long-term water level declines caused by sustained groundwater pumping. The water stored in the ground can be compared to money kept in bank account. If we withdraw money at a faster rate than depositing new money, we will eventually start having account supply problems. Similarly pumping out groundwater faster than it is replenished over the long term causes similar problems. Hydrologists refer to this type of accounting as a water budget. Before finding methods to solve any issue, we must understand the causes of the problem. The major causes of groundwater depletion are population explosion, development of infrastructure and urbanization, excess extraction for agriculture, climate change and industrialization.

As a growing world with a population that continues to rise, the more we pump water from the ground at a rapid rate the more difficult it is for the groundwater to provide to our needs. More humans mean more human activities, whether household, industrial, or agricultural. When the number of people is high, the amount of water required per head will also

increase. So as a result, we draw more water to fulfill our needs. But at the same time, we are not providing adequate time to get naturally replenished.

Our world is developing at a very faster rate. Buildings, roads, railways, bridges, tunnels, and many more constitute the infrastructures. But with the rapid development, we are actually creating concrete jungles. In olden days, with minimum concrete structures, there was enough space in the ground for the rainwater to seep deep into the earth and replenish the water table. But in concrete jungles, there is not even a small gap among the tall sky touching buildings. Thus, the most important method of replenishing groundwater is also blocked by human activities.

We get our food through the process of agriculture. Here too, water is an essential element. Groundwater forms the major percentage of water usage for irrigation process because access to groundwater is free and anyone has the right to pump it out. With the growing demands of food supplies, farmers must cultivate crops on a larger scale. This would lead to more water requirement for irrigation and thus they draw more and more water. Green revolution and the introduction of Minimum Support Price (MSP), enabled farmers to cultivate more water intense crops, which require more water compared to normal crops which led to over exploitation of groundwater. Unscientific methods of agriculture like over irrigation is also one of the major reasons for groundwater



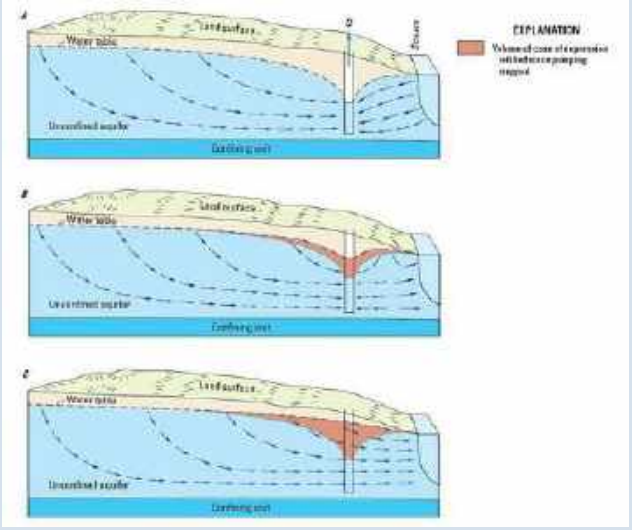
depletion.

We know that the water table is replenished through precipitation. But in the present world, the climate is unpredictable and varying due to human intrusions. The pattern of rainfall has changed a lot due to deforestation. Trees play a major role in rainfall and their disappearance directly affected rainfall pattern which indirectly affected the level of water table.

With the introduction factories with heavy and highly complicated machines, water became an inevitable component especially for cooling purposes. They usually draw groundwater mainly due to the large quantity of water required without spending much money. Thus, profit mind leads to the depletion of a valuable resource which consequently hits back as a boomerang. Moreover, they release harmful chemicals which can contaminate the entire aquifer leading to the contamination of the surface water bodies of the entire area. For example, the aquifer under Karachi, Pakistan is enormous, but is contaminated with industrial arsenic, and to make the matter worse, it is being progressively depleted. It is recorded that about 40% of deaths in Pakistan are attributed to contaminated water.

Water contamination is also another major problem affecting the usability of groundwater. Pollution of water table can occur due to chemical leaching from landfills, septic tanks, leaky underground gas tanks and most importantly due to the overuse of chemical fertilizers and pesticides.

One of the major drawbacks in our law-making system which went on to become a cause for groundwater depletion is that inadequate regulation of groundwater laws. Since groundwater can be drained without any limit or penalty, exhaustion of water table cannot be considered



as an inventive disaster.

The effects of groundwater depletion are so horrendous. The most appalling fact is that whoever is held responsible for the destruction, suffers. In simple words, humans destroy the natural balance and they face the repercussions. The most common effects of groundwater depletion include- depletion of the normal water layer will force us to dig so deep into the ground. The further down we must go in order to get more, we could satisfy that time's need, but in future we end up not even a single drop of water.

In most areas, the surface and groundwater systems are intimately linked. Moreover, the depletion prevents additional water from flowing into lakes, rivers, and seas. This means that over time, less water will enter as the existing surface water continues to evaporate. As the water becomes shallow, it will affect everything in that particular region, including marine and wildlife.

When there is a decline in the water table, sea water intrusion happens. When we pump fresh water rapidly, we lower the height of the fresh water in the aquifer forming a cone of depression. The saltwater rises 40 feet for every 1 foot of freshwater depression and forms a cone of ascension. It is often believed that saltwater intrusion decreases the ability of wetlands to store carbon. As a result, plants are killed which absorb carbon dioxide from the atmosphere. Intrusion of saltwater into the water table results in contamination of surface

water, which is unfit for useful purposes.

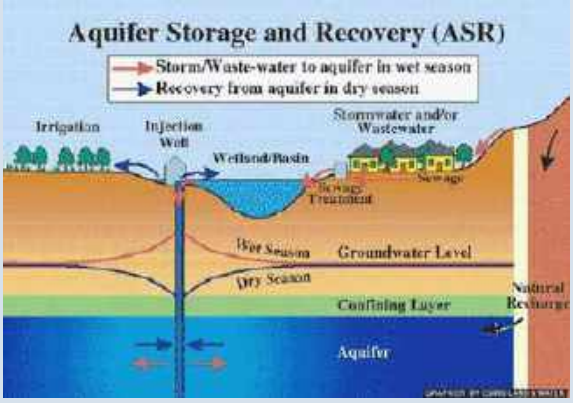
Declining groundwater levels have three main effects on water wells. As the depth to water increases, the water must be lifted higher to reach the land surface. As the lift distance increases, so does the energy required to drive the pump. Thus, power costs increase as groundwater levels decline. Then depending on the use of the water and the energy costs, it may no longer be economically feasible to use water for a given purpose. Groundwater levels may decline below the bottom of the existing pumps, necessitating the expense of lowering the pumps, deepening the well or drilling a deeper replacement well. Other problem is that the yield of the well may decline below usable rates.

The next major issue related to decline in groundwater is subsidence. ‘It is the sudden sinking or gradual downward settling of the ground’s surface with little or no horizontal motion.’ There are many causes for land subsidence, but 80% of it occurs due to groundwater depletion. Land subsidence occurs when large amounts of groundwater have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rock falls in on itself. Land subsidence can lead to settlement of upper clay layer leading to damage of infrastructure (roads, bridges) and flooding due to ineffective drainage systems of the city. Lines of weakness in the layer can also be activated and this

may cause earthquake in the area.

So then, what will we do? ‘Prevention is better than cure.’ The only way to avoid groundwater shortage is to avoid such a situation. The day when humans resort to ‘needs’ instead of ‘greeds’, there arises a ray of hope of healthy environment. Conserving water right from our home on everyday basis can contribute a great change. From home, we move to society, then to the nation and finally to the whole world. Thus, simple changes, including fixing leakages, turning off taps when not in use, avoid using of showers while bathing, using water used for washing vegetables for watering plants, can create prominent changes. Less usage can save surface water, thus indirectly protecting groundwater. Afforestation, that is planting more trees and plants, must be encouraged. On a long term basis, trees helps in more precipitation which in turn can help in recharging water table. Contamination of groundwater must be prevented and for that we must be more careful about the position of landfills, septic tanks, and other underground storage containers. Any leakage in them can completely affect the quality of not only the groundwater but also the surface hydrological units.

As aquifers and other groundwater sources are depleted at a rate greater than the recharge rate, due to the ever increasing population, artificial recharge is needed to maintain a lasting water supply to prevent complete withdrawal of groundwater in near future. Artificial recharge is the process of spreading or impounding water on the land to increase



the infiltration through the soil and percolation to the aquifer or of injecting water by injecting water by wells directly into the aquifer. Managed Aquifer Recharge (MAR) identifies sites that are ideal for water to enter aquifers and diverts water to them. Some of the advantages of this process are improved water quality due to dilution of toxic chemicals, no loss of crops and displacement of local people and utilizes the excess surface water which usually drains off.

The sources of this recharge include precipitation over the demarcated area, rainwater harvesting, canals from large reservoirs, natural streams from which surplus water can be diverted for recharge and from properly treated municipal and industrial wastewaters. Some of the other methods and techniques for groundwater recharge include:

Roof top rainwater harvesting: Roof top rainwater harvesting is the technique through which rainwater is captured from the roof catchments and stored in reservoirs. Harvested rainwater can be stored in sub-surface groundwater reservoir by adopting artificial recharge techniques to meet the household needs through storage in tanks.

Contour Bund: This process involves the placement of lines of stones along the natural rise of landscape. Contour bunds aims to slow down runoff and improve water infiltration in the soil. It also helps in controlling soil erosion.

Pervious concrete pavements: These pavements allow water that might have been disposed of in gutters to percolate into aquifers. There are many more structures such as recharge

trench, tubewell, check dam, cement plug, gabion structures, nala bund and subsurface dyke, which can contribute to effective groundwater recharging.

Brackish water desalination is a viable option in places where aquifers are already contaminated with saltwater. Moreover, brackish water is easier and less expensive to desalinate than seawater. What makes it more viable is its recovery rate. While seawater desalination typically yields half its volume in freshwater, desalination of brackish water can yield as much as 90% freshwater.

Another way is to encourage farmers to adopt micro irrigation such as drip irrigation or micro sprinklers. They should also be encouraged to avoid the use of chemical fertilizers and pesticides, which can leach down into the water table contaminating it.

The implementation of strict and stringent laws regarding the extraction of groundwater is absolutely necessary now when the current trend of exploitation can exhaust the entire water table. There must be a certain limit up to which groundwater can be extracted for free. Then for every extra amount of water drawn, there must be a fixed amount. The thought that we get it for free, actually urges us to extract more and more, without any limit. Thus, the government must play a major role in implementing such laws. Also, there must be a regulation in extracting water from ‘critical’ or ‘dark zones’, where the water table is overused or is very low.

Another important step is bottom up approach by empowering the local communities to become active participants in managing groundwater. Key hydrogeological skills can be

imparted to nonprofits and rural practitioners to improve decentralized water management

system. Moreover, technology must be used extensively for determining the relation between surface hydrological units and groundwater, identification of groundwater recharge areas, and mapping of groundwater.

Everyone in this world is aware about the consequences of groundwater depletion and contamination. We do write essays and speeches about the need to conserve the underground hydrological unit, but are we following it? Majority of us are aware about the causes, effects, and solution to the crisis, but we do not implement it in our life. It is not late to think and act wisely. It is said that “Better late than never.” Small changes that each one of us adopt in our day-to-day life along with revolutionary measures adopted by the governments across the globe can help the Earth to sustain as ‘Blue Planet’. It is our time to time to serve our mother planet, to provide her peace and vitality. Our actions must change endless water extraction to sustainable water management. Let us pave the way to a brighter future where both conservation of natural elements and basic needs of all people are taken care of.

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AN ANALYSIS OF 'HOW TO HAVE A RESILIENT ECOSYSTEM'

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AN ANALYSIS OF ‘HOW TO HAVE A RESILIENT ECOSYSTEM’

In ecology, **resilience** is the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly. Such perturbations and disturbances can include stochastic events such as fires, flooding, windstorm, insect population explosions, and human activities such as deforestation, fracking of the ground for oil extraction, pesticide sprayed in soil, and the introduction of exotic plant or animal species. Disturbances of sufficient magnitude or duration can profoundly affect an ecosystem and may force an ecosystem to reach a threshold beyond which a different regime of processes and structures predominates. When such thresholds are associated with a critical or bifurcation point, these regime shifts may also be referred to as critical transition.

Human activities that adversely affect ecological resilience such as reduction of biodiversity, exploitation of natural resources, pollution, land use, and anthropogenic climate change are increasingly causing regime shifts in ecosystems, often to less desirable and degraded conditions. Interdisciplinary discourse on resilience now includes consideration of the interactions of humans and ecosystems via socio-ecological systems, and the need for shift from the maximum sustainable yield paradigm to environmental resource management and ecosystem management, which aim to build ecological resilience through "resilience analysis, adaptive resource management, and

adaptive governance". Ecological resilience has inspired other fields and challenged the way

For example, forests are major reservoirs of terrestrial biodiversity and contain about 50% of the global terrestrial biomass carbon stocks, emissions from deforestation and degradation remain a significant source of annual greenhouse gas emissions into the atmosphere, and therefore the conservation, appropriate management, and restoration of forests will make a significant contribution to climate change mitigation. Resilience is the capacity of an ecosystem to withstand external pressures and return to its pre disturbance state over time, the loss of ecosystem resilience indicates that ecosystems are prone to the shifts to undesirable states in which the ecosystem services needed by humans can no longer be delivered, and maintaining or restoring the forest ecosystem resilience is often cited as a necessary societal adaptation to climate change. However, forest ecosystem resilience has continually declined at the regional scale and even global scale due to the climate change and human disturbance. The quantitative assessment of ecosystem resilience can provide a scientific basis for the forest resource management and conservation and therefore is of great significance to the maintenance of critical ecosystem services.

The concept of resilience has been widely used, and there have been some ecological theories that attempt to explain the mechanism of resilience through a variety of models, for example, “species richness-diversity”, “functional

redundancy", "keystone species hypothesis", "resilience-productivity hypothesis". However, these theories are generally based on the concept of species populations as the basic functional unit and therefore fail to capture the importance of the interactions amongst individual organisms in the ecosystem. Among the current theories, the theory of dissipative structures seems particularly suitable for investigating the dynamics of structural change and resilience of ecosystems. It shows that the open and self-organizing systems maintain their structural order by keeping their internal state far from thermodynamic equilibrium through active exchanges with their environment. Those dissipative structures are in principle stable as long as the exchanges with the environment are maintained and the continuous perturbations are absorbed within the framework of the given dynamic regime.

The theory of dissipative structures provides a scientific theoretical framework for explaining the mechanism of the ecosystem resilience; however, there have been very few researches on the quantitative measurement of ecosystem resilience on the basis of this theory; more in-depth research should be carried out on how to more scientifically and accurately assess the ecosystem resilience with reasonable indicators of the ecosystem resilience.

Resilience can be measured in terms of change in a system level property and function following perturbation, and the perturbation can be simulated. In previous research, the ecosystem resilience was generally measured by the rate of return of the ecosystem state after disturbance or the maximum disturbance that the ecosystem can absorb before shifting to another state. Currently, researchers generally select one key indicator associated with the ecosystem, for example, the key species and vigor of the ecosystem, and they then simulate the time for the key indicator to return from the stressed state to the normal state (Tr) and the maximum stress that the ecosystem can withstand (MS) with models such as the CENTRURY model and the GAP model. Ecosystem resilience can be represented by the values of MS, 1/Tr, or MS/Tr. This approach assumes that the dynamics of the ecosystem can be understood by analysing a few key variables, which is termed the “rule of hand”. However, the concept of “rule of hand” is limited and relatively unrepresentative because it is impossible to represent the complete recovery of ecosystem function by the recovery of only a few key variables. In addition, although it is in principle possible to measure ecosystem resilience by fitting a dynamic model to time series, this approach imposes extraordinary data requirements. It is usually difficult to obtain the data that can meet such requirements in practice. It is more plausible to measure resilience in terms of the factors influencing resilience.

The literature reported a number of factors that influence the ecosystem resilience, for example, the diversity within functional groups and variability of habitats. However, these factors have not previously been considered comprehensively by researchers. The operational indicators of resilience have received little attention in the literature, and there is no consensus-based view of how to measure resilience or even of the exact nature of resilience. Rosset and Oertli assessed the resilience of species to warming with five ecological and biogeographical metrics and explained their theoretical basis; however, this approach may be relatively biased since these researchers simply used equal weights for each metric.

This study aims to develop a conceptual framework for the spatially explicit assessment of the forest ecosystem resilience based on the theory of dissipative structures, and the rest of this paper is organized as follows. The second part presents a brief overview of the study area and explains how the indicator system was constructed, how the indicator weights were determined, and how the resilience index was calculated. Besides, this part also shows the data used in this study and how they were processed. The third part presents the results and discusses the underlying reasons for the spatial heterogeneity of the forest ecosystem resilience, and the final part concludes.

What is resilient ecosystem?

The concept of resilience in ecological systems was first introduced by the Canadian ecologist C.S. Holling in order to describe the persistence of natural systems in the face of changes in ecosystem variables due to natural or anthropogenic causes. Resilience has been defined in two ways in ecological literature:

1. as the time required for an ecosystem to return to an equilibrium or steady-state following a perturbation (which is also defined as stability by some authors). This definition of resilience is used in other fields such as physics and engineering, and hence has been termed ‘engineering resilience’ by Holling.
2. as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks".

The second definition has been termed ‘ecological resilience’, and it presumes the existence of multiple stable states or regimes.

Some shallow temperate lakes can exist within either clear water regime, which provides many ecosystems service, or a turbid water regime, which provides reduced ecosystem services and can produce toxic algae bloom. The regime or state is dependent upon lake phosphorus cycles, and either regime can be resilient dependent upon the lake's ecology and management.

Mulga woodlands of Australia can exist in a grass-rich regime that supports sheep herding, or a shrub-dominated regime of no value for sheep grazing. Regime shifts are driven by the interaction of fire, herbivory, and variable rainfall. Either state can be resilient dependent upon management.

THEORY

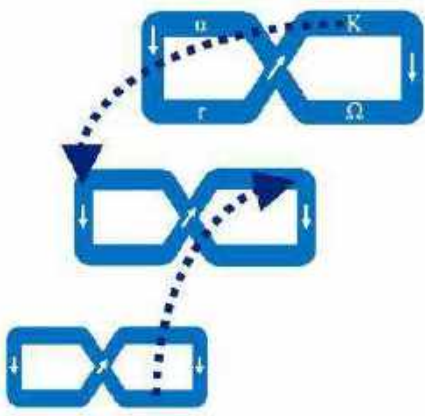
Ecologists Brian walker, C S Holling and others describe four critical aspects of resilience: latitude, resistance, precariousness, and panarchy.

The first three can apply both to a whole system or the sub-systems that make it up.

1. Latitude: the maximum amount a system can be changed before losing its ability to recover (before crossing a threshold which, if breached, makes recovery difficult or impossible).
2. Resistance: the ease or difficulty of changing the system; how "resistant" it is to being changed.
3. Precariousness: how close the current state of the system is to a limit or "threshold.".
4. Panarchy: the degree to which a certain hierarchical level of an ecosystem is influenced by other levels. For example, organisms living in communities that are in isolation from one another may

be organized differently from the same type of organism living in a large continuous population, thus the community-level structure is influenced by population-level interactions.

5. Closely linked to resilience is adaptive capacity, which is the property of an ecosystem that describes change in stability landscapes and resilience. Adaptive capacity in socio-ecological systems refers to the ability of humans to deal with change in their environment by observation, learning and altering their interactions.



Three levels of a panarchy, three adaptive cycles, and two cross-level linkages (remember and revolt)

HUMAN IMPACTS

Resilience refers to ecosystem's stability and capability of tolerating disturbance and restoring itself. If the disturbance is of sufficient magnitude or duration, a threshold may be reached where the ecosystem undergoes a regime shift, possibly permanently. Sustainable use of environmental goods and services

requires understanding and consideration of the resilience of the ecosystem and its limits. However, the elements which influence ecosystem resilience are complicated. For example, various elements such as the water cycle, fertility, biodiversity, plant diversity and climate, interact fiercely and affect different systems.

There are many areas where human activity impacts upon and is also dependent upon the resilience of terrestrial, aquatic and marine ecosystems. These include agriculture, deforestation, pollution, mining, recreation, overfishing, dumping of waste into the sea and climate change.

Agriculture

Agriculture can be seen as a significant example which the resilience of terrestrial ecosystems should be considered. The organic matter (elements carbon and nitrogen) in soil, which is supposed to be recharged by multiple plants, is the main source of nutrients for crop growth. At the same time, intensive agriculture practices in response to global food demand and shortages involves the removal of weeds and the application of fertilisers to increase food production. However, as a result of agricultural intensification and the application of herbicides to control weeds, fertilisers to accelerate and increase crop growth and pesticides to control insects, plant biodiversity is reduced as is the supply of organic matter to replenish soil nutrients and prevent surface runoff. This leads to a reduction in soil fertility and

productivity. More sustainable agricultural practices would take into account and estimate the resilience of the land and monitor and balance the input and output of organic matter.

Deforestation

The term deforestation has a meaning that covers crossing the threshold of forest's resilience and losing its ability to return its originally stable state. To recover itself, a forest ecosystem needs suitable interactions among climate conditions and bio-actions, and enough area. In addition, generally, the resilience of a forest system allows recovery from a relatively small scale of damage (such as lightning or landslide) of up to 10 per cent of its area. The larger the scale of damage, the more difficult it is for the forest ecosystem to restore and maintain its balance.

Deforestation also decreases biodiversity of both plant and animal life and can lead to an alteration of the climatic conditions of an entire area. Deforestation can also lead to species extinction, which can have a domino effect particularly when keystone species are removed or when a significant number of species is removed and their ecological function is lost.

Climate change

Climate resilience is generally defined as the capacity for a socio-ecological system to: (1) absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and (2) adapt, reorganize, and

evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.

Increasingly, climate change is threatening human communities around the world in a variety of ways such as rising sea levels, increasingly frequent large storms, tidal surges and flooding damage. One of the main results of climate change is rising sea water temperature which has a serious effect on coral reefs, through thermal-stress related coral bleaching. Between 1997-1998 the most significant worldwide coral bleaching event was recorded which corresponded with the EL Nino Southern Oscillation, with significant damage to the coral reefs of the Western Indian Ocean.

Overfishing

It has been estimated by the United Nations Food and Agriculture Organisation that over 70% of the world's fish stocks are either fully exploited or depleted which means overfishing threatens marine ecosystem resilience and this is mostly by rapid growth of fishing technology. One of the negative effects on marine ecosystems is that over the last half-century the stocks of coastal fish have had a huge reduction as a result of overfishing for its economic benefits. Blue fin tuna is at particular risk of extinction. Depletion of fish stocks results in lowered biodiversity and consequently imbalance in the food chain, and increased vulnerability to disease.

In addition to overfishing, coastal communities are suffering the impacts of growing numbers of large commercial fishing vessels in causing reductions of small local fishing fleets. Many local lowland rivers which are sources of fresh water have become degraded because of the inflows of pollutants and sediments.

Dumping of waste into sea

Dumping both depends upon ecosystem resilience whilst threatening it. Dumping of sewage and other contaminants into the ocean is often undertaken for the dispersive nature of the oceans and adaptive nature and ability for marine life to process the marine debris and contaminants. However, waste dumping threatens marine ecosystems by poisoning marine life and eutrophication.

Poisoning marine life

According to the International Maritime Organisation oil spills can have serious effects on marine life. The OILPOL Convention recognized that most oil pollution resulted from routine shipboard operations such as the cleaning of cargo tanks. In the 1950s, the normal practice was simply to wash the tanks out with water and then pump the resulting mixture of oil and water into the sea. OILPOL 54 prohibited the dumping of oily wastes within a certain distance from land and in 'special areas' where the danger to the environment was especially acute. In 1962 the limits were extended by means of an amendment

adopted at a conference organized by IMO. Meanwhile, IMO in 1965 set up a Subcommittee on Oil Pollution, under the auspices of its Maritime Safety committee, to address oil pollution issues.

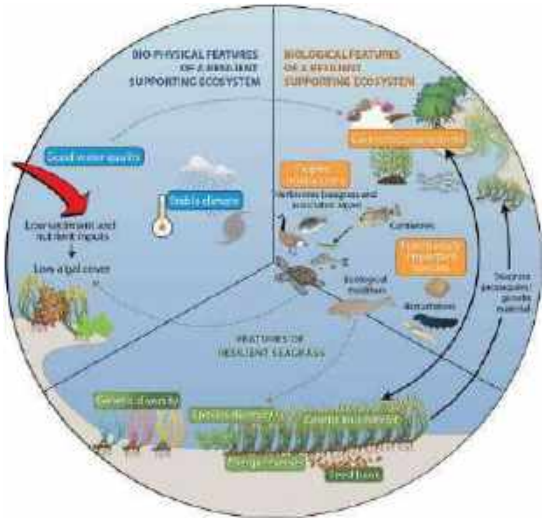
The threat of oil spills to marine life is recognised by those likely to be responsible for the pollution, such as the International Tanker Owners Pollution Federation:

The marine ecosystem is highly complex and natural fluctuations in species composition, abundance and distribution are a basic feature of its normal function. The extent of damage can therefore be difficult to detect against this background variability. Nevertheless, the key to understanding damage and its importance is whether spill effects result in a downturn in breeding success, productivity, diversity and the overall functioning of the system. Spills are not the only pressure on marine habitats; chronic urban and industrial contamination or the exploitation of the resources they provide are also serious threats.

Eutrophication and algal blooms

The Woods Hole Oceanographic Institution calls nutrient pollution the most widespread, chronic environmental problem in the coastal ocean. The discharges of nitrogen, phosphorus, and other nutrients come from agriculture, waste disposal, coastal development, and fossil fuel use. Once nutrient pollution reaches the coastal zone, it stimulates harmful overgrowths of algae, which can have direct toxic effects and ultimately result in low-oxygen conditions. Certain

types of algae are toxic. Overgrowths of these algae result in harmful algal blooms, which are more colloquially referred to as "red tides" or "brown tides". Zooplankton eat the toxic algae and begin passing the toxins up the food chain, affecting edibles like clams, and ultimately working their way up to seabirds, marine mammals, and humans. The result can be illness and sometimes death.



Ecological resilience and the thresholds by which resilience is defined are closely interrelated in the way that they influence environmental policy-making, legislation and subsequently environmental management. The ability of ecosystems to recover from certain levels of environmental impact is not explicitly noted in legislation, however, because of ecosystem resilience, some levels of environmental impact associated with development are made permissible by environmental policy- making and ensuing legislation.

IMPACT OF EMOTION IN COMMUNICATION

Field Project Submitted to the Department

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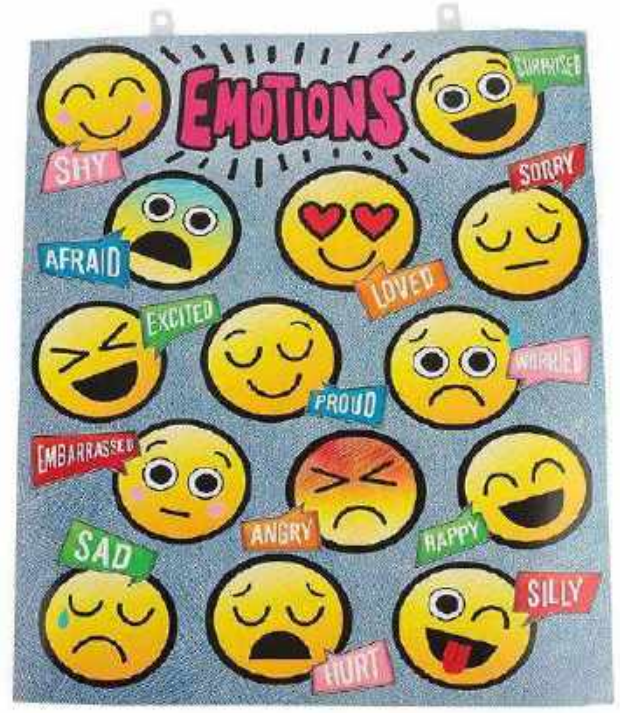
IMPACT OF EMOTION IN COMMUNICATION

Communication and emotions are closely linked. Emotions experienced while communicating with others can affect one's message both verbally and nonverbally. When emotions are expressed appropriately, senders are able to formulate a message that reflects their internal status and intentions. Emotions affect communication in many ways. Emotional barriers to effective communication represent the emotions that may hold you back from communicating what you want to your teammates. These emotions may also hold you back from listening to others attentively and accepting their point of view on matters discussed. When we interact with other people, emotions help them to understand our feelings or in what is the situation that we undergo. When we are emotionally down we will not be able to communicate properly with others. These emotional barriers include anger, pride, anxiety, happiness, stress,

depression, frustration etc. emotional reactions from either the speaker or the listener can prevent effective communication.

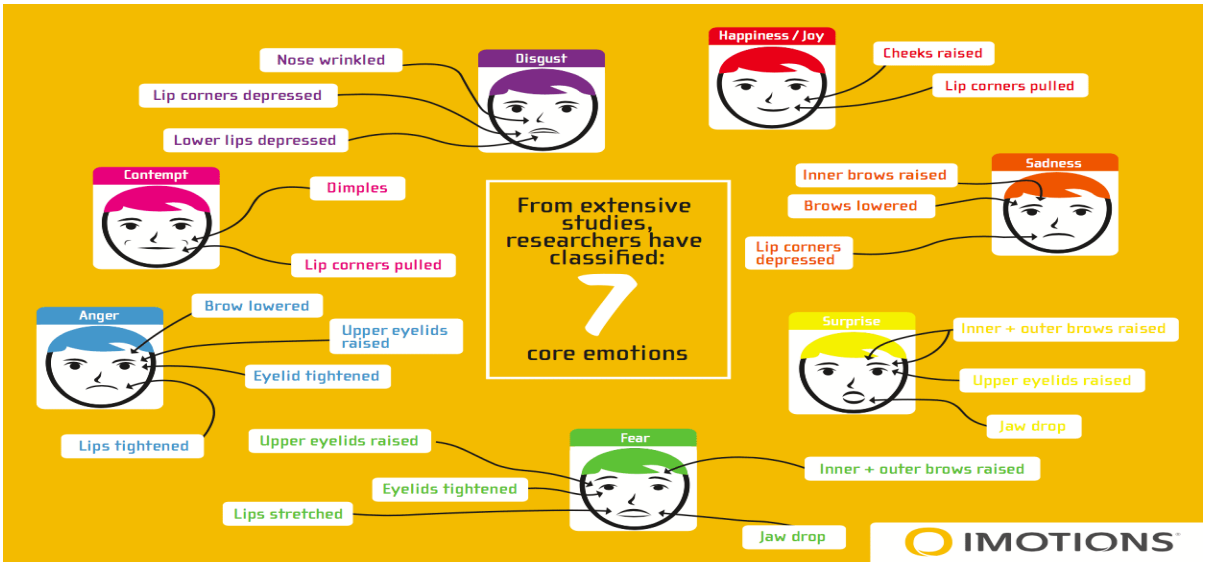
Emotions may even lead to disputes or quarrel between persons in conversations. Emotions are clearly personal, as they often project what we're feeling on the inside to those around us whether we want it to show or not. Emotions are also interpersonal in that another person's show of emotion usually triggers a reaction from us—perhaps support if the person is a close friend or awkwardness if the person is a stranger. Emotions are central to any interpersonal relationship, and it's important to know what causes and influences emotions so we can better understand our own emotions and better respond to others when they display emotions. Emotions are physiological, behavioral, and/or communicative reactions to stimuli that are cognitively processed and experienced as emotional. First, emotions are often internally experienced through physiological changes such as increased heart rate, a tense stomach, or a cold chill. These physiological reactions may not be noticeable by others and are therefore intrapersonal unless we exhibit some change in behavior that clues others into our internal state or we verbally or nonverbally communicate our internal state. Sometimes our behavior is voluntary—we ignore someone, which may indicate we are angry with them—or involuntary—we fidget or avoid eye contact while talking because we are nervous. When we communicate our emotions, we call attention to ourselves and

provide information to others that may inform how they should react. When we communicate through emotions the other person does not understand the pressure that we face at times and the may thing false of us. We should try to control our emotions as it may lead to misunderstandings. Emotion may even kill ones. People communicate with others after almost any emotional event, positive or negative, and that emotion sharing offers intrapersonal and interpersonal benefits, as individual feel inner satisfaction and relief after sharing, and social bonds are strengthened through the interaction. Emotions helps us to communicate with others, such as when we feel sad and need some help. Emotions has a particularly strong influence on attention.



Emotions in virtual communication differ in a variety of ways from those in face to-face interactions. Text based communication eliminates audio and visual cues, there are other methods for adding emotions. In our daily life we are addicted to social media such as whatsApp, Instagram, Facebook, etc. we use emojis to express our emotions or feelings to the other person. With a single emoji the other

person can clearly understand our feelings and emotions. In virtual communication it may be sometimes difficult to understand the emotions of one person. As we are not able to see the person or if it is not a face-to-face interaction it may case difficulty in understanding the emotion of the person who is standing opposite.



Emotions affect communication in many ways. Humans use communicatory cues such as word choice and stress, volume, pitch, tone, rate of speech, facial expression, and physical Communications, movement to express distinct emotions and provide deeper insight into communication than words alone might convey. Someone feeling happy might smile, speak loudly, and make relaxed movements, while someone experiencing sadness might cry, frown, speak in a flat tone, and demonstrate poor posture. Paying attention to these often-subtle messages provides one with hints about unspoken implications and intentions, adds context to a message, and decreases the chance that misunderstandings and

conflicts will arise. Poor emotional mastery can lead to issues with communication. Attempting to communicate one emotion while really feeling and displaying the signs of another can lead to mixed messages that leave audiences confused or disconnected. Mehrabian (1971) said “a person’s nonverbal behavior has more bearing than his words on communicating feelings or attitudes to others,” and noted that about 93% of the emotion within a message is conveyed through nonverbal means. Audiences readily understand the real, emotional meaning being communicated even when verbal and nonverbal signals clash, making it essential for communicators to master their own emotions to better express ideas to an audience. An angry speaker may lash out at listeners, use language they do not mean to, and display inappropriate body language and facial expressions (Franchetti, 2016; Schmitz, 2016). A speaker who experiences anxiety is likely to avoid communication altogether when possible, and demonstrate unnatural body language, poor enunciation, distracted thinking, and overall impaired delivery when required to speak. Such behaviors can have negative effects across many aspects of life, including personal relationships and careers.

Recognizing how one’s emotional state affects behavior and communication is a component of emotional intelligence. Emotional intelligence is defined as “the ability to monitor one’s own and others’ feelings and emotions, to discriminate among them and to use this information to guide one’s thinking and actions”.

High emotional intelligence has links to increased problem-solving ability, creative thinking, planning, motivation, empathy, and verbal and non-verbal communication, all of which are necessary in any area of the modern workforce. It is also an effective predictor of employee performance, leadership, relationship development, and happiness on the job of Applied Communications. This need for effective communication is doubly important when considering fields such as education and medicine that require high levels of personal interaction and emotional input.

It is important to appropriately manage our emotional expressions. No doubt, inappropriate emotional expressions can wreak havoc and cause significant damage to our relationships. What are defined as appropriate emotional expressions varies cross-culturally, as it is, to some extent, culturally defined. In this article, we will discuss the range of natural and normal human emotions, followed by a discussion of emotional intelligence. All emotions are normal and natural. All are important and play their role in our lives. Some are more pleasant than others, for certain. But that doesn't mean that some should be avoided, or that we should seek to suppress any, for doing so might have adverse effects on our mental, emotional, and even physical well-being.

Emotions in Communication

Liking is the positive evaluation of another person. You probably like someone if you enjoy spending time around him or her and view that person's behavior

positively. Liking is different from love, in that liking is the positive evaluation of someone, while love is a sense of commitment to that person.

The hostile emotions are anger, contempt, disgust, jealousy, and envy. It is especially important to manage these emotions appropriately, as they can destroy our relationships. **Anger** is the emotion we feel when we perceive we have been wronged. **Contempt** leads someone to feel they are better than someone else. Naturally, this can have very adverse effects on personal relationships. The emotion of **disgust** occurs when you have a feeling of revulsion in reaction to something offensive. **Jealousy** and **envy** are often used interchangeably, but this is an error. In fact, we feel jealousy when we perceive that the existence or quality of an important relationship is being threatened by a third party. Envy, on the other hand, is a desire for something another person has.

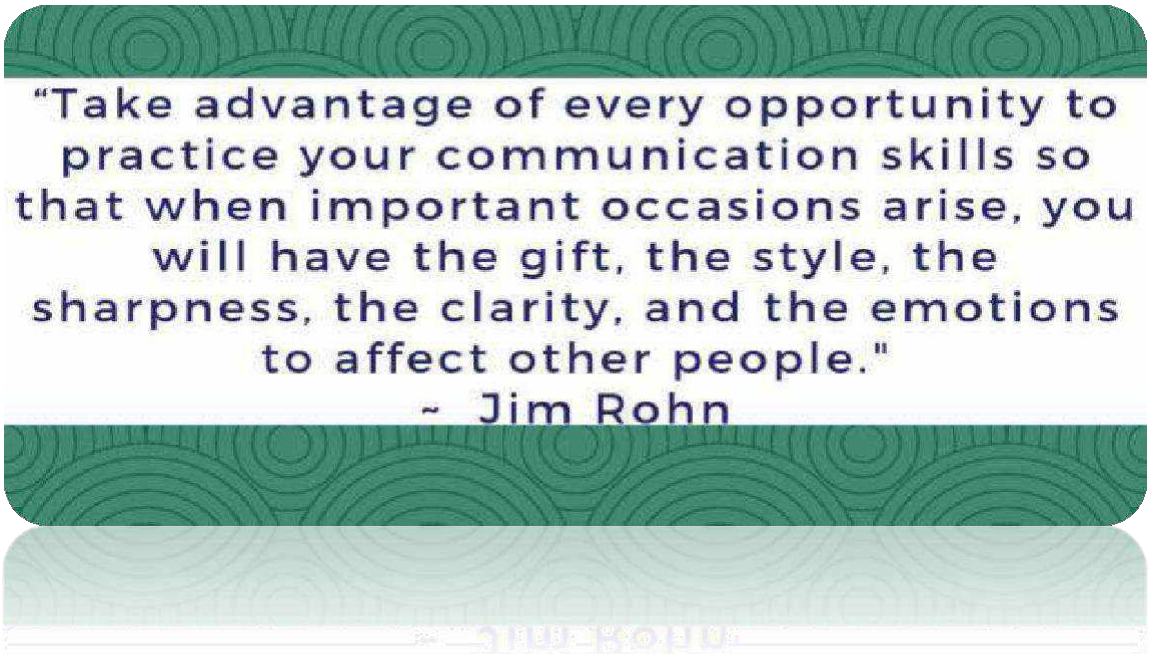
You can improve your emotional awareness by focusing on these five skills:

When we communicate through emotions there occurs many problems so as to avoid such issues we should focus on some skills they are:

1. Consider other people's feelings: Have you ever finished a conversation with someone and found yourself wondering, "Why did she tell me that?" or, "I wonder why he talked to me like that?"
2. Consider your own feelings: Just as other peoples' feelings can affect the message they're trying to send, your own feelings can get in the way of your communication as well. When you feel a strong emotion or feeling,

pay attention to that emotion and try not to let it get in the way of your message.

3. Have empathy: Empathy is the ability to understand and relate to the feelings of someone else. Once you've learned to recognize another person's feelings, you can go one step further and actually relate to those feelings.
4. Operate on trust: Good communication requires you to build trust between yourself and the person with whom you're communicating. You can earn the trust of others by sending nonverbal cues that match your words.
5. Operate on trust: Good communication requires you to build trust between yourself and the person with whom you're communicating. You can earn the trust of others by sending nonverbal cues that match your words.



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RIVERS OF INDIA AND THEIR ROLE IN SUSTAINING LIFE

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RIVERS OF INDIA AND THEIR ROLE IN SUSTAINING LIFE

A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. In some cases, a river flows into the ground and becomes dry at the end of its course without reaching another body of water. Rivers and streams are often considered major features within a landscape; however, they actually only cover around 0.1% of the land on Earth.

RIVERS OF INDIA

They are made more obvious and significant to humans since many human cities and civilizations are built around the freshwater supplied by rivers and streams. Most of the major cities of the world are situated on the banks of rivers, as they are, or were, used as a source of water, for obtaining food, for transport, as

borders, as a defensive measure, as a source of hydropower to drive machinery, for bathing, and as a means of disposing of waste.

Rivers of India plays a very important role in the lives of Indian. Rivers provide water which people use for cultivation of crops, for the purpose of electricity and for the purpose of livelihood. Rivers are the reason because of which large numbers of cities are situated on the bank of Rivers. Rivers also plays an important role in Hindu Dharma. People of India consider rivers as holy. They play an important role in promoting trade and agriculture. For Indians rivers are like temple where they do prayer. There are seven major rivers in India along with their tributaries. The largest pour system of rivers is in Bay of Bengal and some of the rivers empty themselves in Arabian Sea. The Indian rivers are divided into two major groups:

1) The Himalayan rivers
2) The Peninsular rivers

THE HIMALIYAN RIVERS:

These rivers are perennial that is they have water throughout the year. These rivers obtain water from rain as well as from melted snow from high mountains. These rivers have large river basin. The rivers are mainly running in their youth stage. Two major Himalayan rivers, the Indus and the Brahmaputra originate from the north of the mountain ranges. The main source is from glaciers of the

Himalayan mountain range. The Himalayan rivers have long duration courses from their source to the sea.

THE PENISULAR RIVERS:

These rivers are seasonal. The flow of these rivers is based on rainfall. These rivers have a smaller basin as compared with the Himalayan rivers. These rivers are considered as old rivers. Most rivers of peninsular region originate in the Western Ghats and flow towards the Bay of Bengal. Godavari and Narmada are the main river system of peninsular rivers. The main source of the river is the peninsular plateau and the central highland. These rivers have shorter and shallower courses as compared to Himalayan rivers.

Origin of major rivers is from the following watersheds are Aravalli Range, Karakoram and Himalaya Ranges, Western Ghats and Sahyadri in western India Satpura and Vindhya ranges and Chota Nagpur plateau in central part of India

Indian rivers are classified as two types;

1. **Rivers of North India:** Rivers of north India originates from Himalayas.

Major rivers are:

- Ganga and its tributaries
- The Brahmaputra

- The Sutlej
- Ravi and Beas these are main tributaries of Indus

THE GANGA:

It is the most famous river. Because of the usefulness of Ganga this river is also called as Mother Ganga. The length of Ganga River is about 2400 kms. It originates from the glacier which is called as gadgetry at Gomulka in Himalayas, also known as Gangotri glacier.

THE GANGA

About 320 kms it flows in mountain bed and there it is called as Bhagirathi and then joins Alaknanda River at Devprayag. Ganga is the main holy river of India. It has its own significance in the hearts of Indian People. They worship river ganga as goddess Ganga.

In the plain stage the tributaries of Ganga like Rama Ganga, the Ghaghara, the Gomati, the Gander and Kaveri they all drain into Ganga from its left bank and Rivers like Yamuna, the Beta, the Chambal and the Son they drain in the right bank of Ganga. It joins with Brahmaputra in the lower. It is known by various

names in various states of India. Ganga has been very much polluted in the name of rituals. Government is making efforts to clean and purify it.

THE BRAHMAPUTRA:

Its length is 2880kms and originates from glacier cuff mount Kailas, from Tibet it flows from the name of Tango; it flows in Tibet around 1100kms. It joins Ganga and then falls into Bay of Bengal.

THE SUTLEJ:

The Sutlej River, alternatively spelled as Sutlej River, is the longest of the five rivers that flow through the historic crossroads region of Punjab. The source of the Sutlej is west of the catchment area of Lake Rakshastal in Tibet, as springs in an ephemeral stream. Lake Rakshastal used to be part of the Sutlej river basin long ago and separated from the Sutlej due to tectonic activity. northern India and Pakistan. The Sutlej River is also known as Satadree.

THE BEAS:

The Beas River is a river in north India. The river rises in the Himalayas in central Himachal Pradesh, India, and flows for some 470 kilometres (290 mi) to the Sutlej River in the Indian state of Punjab. Its total length is 470 kilometres (290 mi) and its drainage basin is 20,303 square kilometres (7,839 sq mi) large.

2. **Rivers of South India**: They originates from different mountain ranges and they are not perennial.

Major rivers of south India are:

- The Narmada
- The Tapti
- The Mahanadi
- The Godavari
- The Krishna
- The Cauvery

THE NARMADA:

The Narmada River, also called the Reva and previously also known as Narbada is the 5th longest river in India, the largest west-flowing river and largest flowing river of Madhya Pradesh. This river is located in Madhya Pradesh and Gujarat state of India. It forms the traditional boundary between North India and South India and flows westwards over a length of 1,312 km (815.2 mi) before draining through the Gulf of Khambhat into the Arabian Sea, 30 km (18.6 mi) west of Bharuch city of Gujarat

THE TAPTI:

The Tapti River is a river in central India located to the south of the Narmada river which flows westwards before draining into the Arabian Sea. The river has a length of around 700km and flows through the states of Maharashtra, Gujarat and Madhya Pradesh.

THE MAHANADI:

It is largest river of Orissa and its length is 858 kms. The origin of his river is in Amarkantak plateau of Madhya Pradesh and then it enters into Orissa. At false point it falls into Bay of Bengal.

THE GODAVARI:

It is the largest river of south India with a length of 1440 kms. From Nasik of Western Ghats, it originates. To drain in Bay of Bengal it takes eastward course. The major tributaries of this river are Yen Ganga and Indrāvati. Measuring up to 312,812 km2 (120,777 square mi), it forms one of the largest river basins in the Indian subcontinent, with only the Ganga and Indus rivers having a larger drainage basin.

THE KRISHNA:

From Western Ghats of Mahabaleshwar, it originates and then flows about 1280kms down the western Ghats. It drains into Bay of Bengal towards the east. Main tributaries of Krishna river are Tungabhadra and the Bhima.t is one of the

most suitable arable basins in the world as 75.6% area of the Krishna basin is under cultivation because of the availability of water.

THE CAUVERY:

The Kaveri (also known as Cauvery, the anglicized name) is an Indian river flowing through the states of Karnataka and Tamil Nadu. The Kaveri river rises at Talakaveri in the Brahmagiri range in the Western Ghats, Kodagu district of the state of Karnataka, at an elevation of 1,341 m above mean sea level and flows for about 800 km before its outfall into the Bay of Bengal. Cauvery or Kaveri

RIVERS IN SUSTAING LIFE:

- Rivers provide us with fresh drinking water. It is one of the biggest source of fresh water. Around 96% of the water body consists of saline water which cannot be consumed by humans. As a result we need to rely heavily upon the rivers for drinking water. Hence if we don't have a good amount of it, life on earth will come to an end.
- There are various civilizations formed around rivers. Some of the earliest valleys includes the Nile River Valley, the Indus River Valley, the Yellow River Valley etc. These civilizations started near rivers because river plains had fertile soil which helps in cultivation. Moreover they also helped in transportation

CULTIVATION NEAR RIVER BED

- Rivers are also a source of energy. It helps in creating electricity. In the hilly areas, rivers have a lot of current in it. This energy can be harnessed through various machines and can be converted into electricity. Hydroelectric plants are built in rivers for the creation of electricity. Various dams are also created for harnessing electricity such as the Bhakra Nangal Dam.

- Rivers have been used for navigation for thousands of years. The earliest evidence of navigation is found in the Indus Valley Civilization, which existed in north western India around 3300 BC. Riverine navigation provides a cheap means of transport, and is still used extensively on most major rivers of the

world like the Amazon, the Ganges, the Nile, the Mississippi, and the Indus. Since river boats are often not regulated, they contribute a large amount to global greenhouse gas emissions, and to local cancer due to inhaling of particulates emitted by the transports.

- Rivers are not only important for human beings but also serves a great purpose to the animals and trees as well. There are various aquatic animals which breed in rivers. Moreover, various plants also grow in the rivers. They form a part of the ecosystem which is very important to maintain the balance in the food chain.
- Eighty percent of neotropical migrant species (mostly songbirds) depend on riparian areas for nesting or migration. And, eighty percent of all vertebrate wildlife in the Southwest depend on riverside areas for at least half of their life. Rivers also connect ecosystems to one other and affect landscapes far beyond the apparent surface of the water. For example, wetlands provide breeding areas for many migratory birds, and rivers provide corridors for wildlife to move within and migrate as American landscapes become increasingly fenced off and fragmented.

FRESH WATER ECOSYSTEM

THANK YOU