

The Bounty of Nature and Boundaries of Human Avaracity

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SYNOPSIS

Natural Resources are available in plenty and widely spread over different regions of the world, some of them discovered and many still to be discovered. Man is impatient to consume the available natural resources without counting the cruelty and consequences of doing so. World over natural resources are depleting, and there is inadequate perception and very little action to prevent such irresponsible act. There is a very urgent need to create awareness among countries and people about the depleting resources and the need to prevent over consumption and depletion of resources. The efforts to regenerate natural resources are lacking and before long human beings will realize their folly – but will it be too late? World over politics has taken over the destiny of humans and the commonsense has become most uncommon among the people of this planet. The present research paper is to focus attention on this important human problem with the fond hope that creative solutions will be forthcoming from all parts of the planet for the benefit of human civilization. For the purpose of the current research paper specific objectives have been identified to have a better focus.

KEY WORDS---*Depleting natural resources and the irresponsible nature of human beings, credible solutions – need of the hour to reverse this trend.*

I. INTRODUCTION

Natural resources are available in plenty all round the world in different forms but their indiscrete consumption without allowing for replenishment causes misery to human population. Depletion of natural resources occurs when resources are consumed at a faster rate than they are replaced. Natural resources are those resources that are available in nature the world over, without human actions and they can either be renewable or non-renewable. Natural Resource Depletion is a terminology commonly used mainly with reference to water wastage, farming, fossil fuel consumption, fishing, and mining. A resource that is rare on earth due to depletion has a higher value than a natural resource which is in abundance. Due to the increasing global population, colonization by powerful countries and their unscrupulous consumption, their greed, wastage, and the levels of natural resource degradation are also increasing.

Some of the world's most successful agricultural areas are wetlands which have been drained and converted to farmland for large-scale agriculture. Large-scale draining of wetlands also occurs for real estate development and urbanization. In contrast in some cases wetlands are also flooded to be

converted to recreational lakes or hydro-power generation. In some countries ranchers have also moved their property onto wetlands for grazing due to the nutrient rich vegetation. Humans benefit from wetlands in indirect ways as well. Wetlands act as natural water filters, when runoff from either natural or man-made processes pass through, wetlands can have a neutralizing effect. If a wetland is in between an agricultural zone and a freshwater ecosystem, fertilizer runoff will be absorbed by the wetland and used to start the slow processes that occur, and by the time the water reaches the freshwater ecosystem there won't be enough fertilizer to cause destructive algal blooms that poison freshwater ecosystems.



Figure 1: wet land in Bramiana



Figure 2: De-Forestation

Deforestation is the removal of a forest or stand of trees from land; the wood is harvested as a resource for production of consumer products and firewood for heat. The land is then either left to recover and then will be replanted or is converted to non-forest land used as agricultural land or development of urban areas.

The 1760 industrial revolution saw large-scale mineral and oil exploration and the practice has been steadily growing, leading to more and more natural oil and mineral depletion. With the advancements in technology, exploitation of minerals has become easier and humans are digging deeper to access different ore. The increased exploitation of different minerals has led to some of them entering into a production decline. An increase in population is a major contributor to

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the discharge of pollutants into the natural environment and the natural environment is gradually exposed to degradation. The soil, air, lakes, and seas are being contaminated with sewage, radioactive, materials, and toxic chemicals and other pollutants. Uncontrolled release of carbon monoxide, nitrous oxide, sulfur oxide, and carbon dioxide, for example, have resulted in the degradation of the ozone layer and global warming –with their resultant depletive impacts on different natural habitats. Millions of different animal and plant species have thus lost their natural habitats and are on the verge of extinction. The present-day world is increasingly becoming industrialized as more and more countries make major technological breakthroughs. As a result, the by-products and toxic materials alter natural habits such as aquatic systems and wildlife. Examples of the impacts include acidic lakes, dead zones, and the death of wildlife as well as aquatic life. Groundwater is considered to be a non-renewable resource because less than six percent of the water around the world is replenished and renewed on a human timescale of 50 years. People are already using non-renewable water that is thousands of years old, in areas like Egypt they are using water that may have been renewed a million years ago which is not renewable on human timescales. Of the groundwater used for agriculture 16 to 33% is non-renewable. It is estimated that since the 1960s groundwater extraction has more than doubled, which has increased groundwater depletion. Due to this increase in depletion, in some areas use of groundwater for irrigation has become impossible or cost prohibitive.

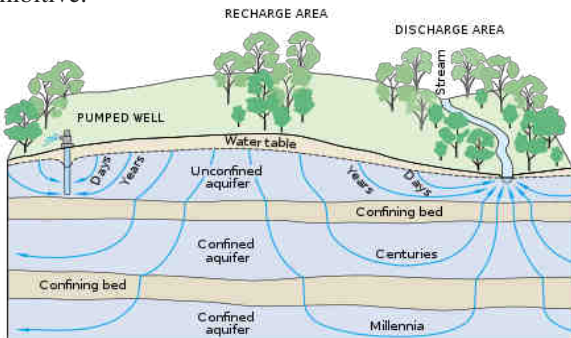


Figure 3: Ground water system

Groundwater flow paths vary greatly in length, depth and travel time from points of recharge to points of discharge in the groundwater system. People need to be educated on how their daily practices put a strain on the scarce natural resources and their individual contributions to the preservation of natural resources. The main purpose of creating awareness would be to encourage people to preserve and restore the natural environment by getting involved in conservation efforts.

II. OBJECTIVES AND METHODOLOGY

When resources are available in plenty in nature we tend to take them for granted and are not aware of the difficult days to come when shortages loom at large and threaten to make our existence difficult or impossible. Today the natural resources available for human consumption has depleted considerably and an alarming situation is at our door step. The natural resources which we consume without any futuristic planning include water, petroleum products, some scarce minerals precious stones and particularly timber and other forest

products. When resources are consumed at a faster rate than they can be replenished by natural processes it leads to shortages. Mostly these shortages are due to overconsumption of resources and not allowing enough time for their replenishment in nature or finding other resources which can be substituted for the current resources. Human greed has no limits and some multinational companies and individuals hold the key for such unnatural consumption of natural resources by making a huge profit by exploiting other individuals in society. With these thoughts in mind it was decided to find answers to the following research questions:

1. A brief status review of natural resources
2. How the resources are consumed and they become scarce.
3. Samples from all over the world to illustrate the above.
4. Future Projections and plans for consumption.
5. How to regulate and control consumption to save the planet.
6. Future outlook and suggestions

For arriving at a suitable methodology for collecting information with respect to the above research objectives, several alternatives were considered, including a dedicated field survey. But it was soon found on a preliminary analysis of different data sources that adequate information can be collected and collated to form a data base for arriving at suitable conclusions on the above research questions. On a preliminary survey and birds-eye view of the project it became clear that adequate information is available and can be collected and collated from published sources which could form the basis for further Analysis of data. The challenges came in the form of collecting and collating the required information which needed a systematic approach to data search, collection and Analysis. Due to availability of several published sources (acknowledged through the Bibliographic section in print and web sources). Such information has been collected and collated and summarized for the purpose of arriving at suitable conclusions which can be seen in the following pages. The author wishes to acknowledge the contributions from various previous researchers on similar and allied subjects and request that this research paper should be considered as individual acknowledgement of their achievements of their contribution.

III. REVIEW OF LITERATURE

For a research paper such as this the availability of information from various sources as cited has been a critical issue. This has been resolved adequately. Natural resources are generally classified as renewable resources and non-renewable resources (see also mineral resource classification). Use of either of these forms of resources beyond their rate of replacement is considered to be resource depletion. The value of a resource is a direct proportional of its availability in nature and the cost of extracting the same, the more a resource is depleted the more the value of the resource becomes. There are several types of resource depletion the most known being depletions in aquifer (natural source of drinking water due to over consumption or wastage!), deforestation, mining for fossil fuels and minerals. Pollution or contamination of

resources, slash-and-burn agricultural practices, Soil erosion, and overconsumption, excessive or unnecessary use of resources are some of the common causes.

Natural resource management relates to managing the way in which people and natural landscapes interact and co-exist. It encompasses land use planning, water management, biodiversity conservation, and the future sustainability of industries like agriculture, mining, tourism, fisheries and forestry. It recognizes that people and their livelihoods rely on the health and productivity of our natural resources, and their actions as safe keepers of the land play a critical role in maintaining this health. Natural resource management specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources which are available in nature. Environmental management is also similar to natural resource management. In academic contexts, the sociology of natural resources is closely related to, but distinct from, natural resource management.



Figure 4: The Tongass National Forest in Alaska is managed by the United States Forest Service

In many countries the management of natural resources (like forests) has become a national priority. In the United States, the most active areas of natural resource management are often associated with ecotourism and range land management. In Australia, water sharing, such as the Murray Darling Basin Plan and catchment management are also significant.

Natural resource management approaches can be categorized according to the type and rights of stakeholders of natural resources:

- State property: Ownership and control over the use of resources is in the hands of the state. Individuals or groups may be able to make use of the resources, but only with the permission of the state. National forest, National parks and military reservations are some US examples.



Figure 5: US Managing natural resources

- Private property: Any property owned by a defined individual or corporate entity. Both the benefit and duties to the resources fall to the owner(s). Private land is the most common example.

- Common property: It is a private property of a group. The group may vary in size, nature and internal structure e.g. indigenous neighbors of village. Some examples of common property are community forests.
- Non-property (open access): There is no definite owner of these properties. Each potential user has equal ability to use it as they wish. These areas are the most exploited. It is said that "Everybody's property is nobody's property". An example is a lake fishery. Common land may exist without ownership, in which case in the UK it is vested in a local authority.
- Hybrid: Many ownership regimes governing natural resources will contain parts of more than one of the regimes described above, so natural resource managers need to consider the impact of hybrid regimes. An example of such a hybrid is native vegetation management in NSW, Australia, where legislation recognizes a public interest in the preservation of native vegetation, but where most native vegetation exists on private land.

The total global population is more than seven billion people. Still, there is a consistent increase in the overall population and this has been a critical factor in accelerating the depletion of natural resources. An increase in population expands the need for resources and conditions necessary to sustain it. In addition, it contributes to increased ecological contamination. Research further indicates that developing countries are using more and more resources to industrialize and support their ever-increasing population. Hence, the depletion of natural resources will continue as long as the world population increases.

Humans are causing a lot of stress to land resources due to the food production for daily nutritional requirements. Poor irrigation practices for example, is a key contributing factor to Salinization and alkalization of the soil that sustains plant growth. The use of heavy machinery and farming equipment also destroy the soil structure making it unsuitable for plant growth. Some farming practices such as excessive use of pesticides, fungicides, and herbicides equally kill important soil micro-organisms that are essential for replenishing nutrients in the soil. The World Bank reported that the net loss of global forest between 1990 and 2016 was 1.3 million square kilometers. On the same note, tropical deforestation is estimated to occur at a rate of one percent annually, especially in Latin America regions. Through deforestation, the planet not only loses trees but also thousands of animals and due to the destruction of their natural habitats. Moreover, increased logging activities lead to soil erosion that degrades natural soil minerals.

The present-day world is incessantly becoming industrialized as more and more countries make major technological breakthroughs. But as technological advancements continue, there is similarly a considerable growth in industries that release toxins and chemical by-products which are eventually deposited in lakes, soils, and lands. As a result, the by-products and toxic materials alter natural habits such as aquatic systems and wildlife. Examples of the impacts include

The Bounty of Nature and Boundaries of Human Avaricity

acidic lakes, dead zones, and the death of wildlife as well as aquatic life. Industrial and technological advancements have also driven the demand for virgin materials for research, development, and production. More resources are hence being used to satisfy the industrial demands, increasing the rate of natural resource depletion.

Poor farming practices, deforestation, and pollution are major causes of water resource depletion due to contamination, wastage, and the destruction of natural water catchment areas. As of today, approximately one billion people lack access to clean water because of the effects of deforestation and contamination of water sources and groundwater. Water shortage further contributes to famine and food insecurity. Oil is a non-renewable resource that accounts for approximately 40 percent of the total energy used globally. Research by EIA's International Energy Outlook in the year 2013 had shown that due to the high rate of oil exploitation, the amount of oil remaining would last for only 25 years. Oil is an essential commodity in manufacturing, planting, mining, and transportation among many activities, and its depletion would be devastating. The adverse effects of oil depletion include fall of business, high cost of living in developing countries, and uncertainty in the transport sector.

Approximately 18 million acres of forest cover is destroyed annually. This means that half of the world's natural forest cover has already been cleared. Furthermore, studies indicate an increase in deforestation in the past three decades has resulted in 12% to 17% rise of greenhouse gases globally. Other devastating effects of deforestation include soil erosion, an increase in the greenhouse gases leading to global warming, loss of biodiversity, increased flooding, and drought. There has been an increase in the exploitation of minerals such as phosphorus, gasoline, copper, and zinc among others to sustain the seven billion people on earth. Studies by Global Phosphorus Research Institute, for example, shows that the earth could run out of phosphorus – an essential element for plant growth, in the next 50 to 100 years.

Studies by the United States Geological Survey also indicate that there is an increase in non-renewable resources consumption of natural minerals and construction materials such as copper, sand, gravel, and stone. Due to the changes in the living conditions of animals as a result of resource overexploitation and habitat degradation, some species may go extinct. Forested regions are known to be a habitat for thousands of animals but deforestation is progressively destroying forest habitats. Practices such as overfishing and pollution have similarly led to a drastic reduction in the number of marine species such as the tuna fish.

Programs aimed at checking deforestation such as REDD (Reducing Emissions from Deforestation and Forest Degradation) created by the World Bank, the New York Declaration on Forests, and the United Nations are initiatives that could help reducing the depletion of natural resources. The initiatives may also act as incentives for encouraging the general public to conserve forests as these are the habitat and protectors of some of the world's unique plant/animal species and water sources respectively. Sustainability programs that aim to educate people about the importance of conserving natural resources should also be enacted as a way of focusing on the long-term risks associated with environmental degradation.

The story of American bison is very interesting. It clearly shows the intentions and after effects of colonization. Photograph from 1892 of a pile of American bison skulls waiting to be ground for fertilizer. Burton Historical Collection, Detroit Public Library.



Figure 6A: The American Bison skulls waiting for exports!

1500s	An estimated 30-60 million bison roam North America, mostly on the great plains.
1830	Mass destruction of the bison begins.
1860	Construction of the railroad accelerates human settlement and killing of bison.
1870	An estimated 2 million are killed on southern plains in one year.
1872-1874	An average of 5000 bison were killed every day of these three years. That's 5.4 million bison killed in 3 years.
1884	The bison population reaches its lowest point. Around 325 wild bison are left in the United States – including 24 in Yellowstone.
1910	Due to conservation efforts, bison increase to 1,000 in the US.
2017	Today there are 500,000 bison in the US, including 5,000 in Yellowstone.

Last year, the bison was chosen as America's first national mammal, joining the bald eagle as a symbol of America. I started writing this post with only a mild interest in bison. But the more I learned, the more I want to learn, and this blog post took on a life of its own. The bison have a fascinating history, unique appearance, and they present complex challenges in the present day. They are a symbol of the untamed West. Their near-extinction is a testament to the self-centeredness of "civilized" men and their resurgence shows that we can learn from and try to correct our mistakes.

Why did people nearly push the bison to extinction?

To settle the West, early settlers needed to conquer the Native Americans, and the bison were everything to the Natives. The bison provided meat for food and hides for tepees. So the US Army launched a campaign to kill the bison so they could control the Native Americans. Without this sad and complicated part of our history, many of us would not live in the homes we live in today. We live here at the expense of the people and the animals that used to call this home.

Figure 6B: History of the American Bison (A Time line)

Colonialists saw "new" territories as places with unlimited resources to exploit, with little consideration for the long-term

impacts. The present environmental crisis in human history, including a “biological annihilation” of wildlife and dire risks for the future of human civilization is due to Colonialization. The scale of environmental devastation has increased drastically in recent years. To understand our current ecological catastrophe, described as “a world of worsening food shortages and wildfires, and a mass die-off of coral reefs as soon as 2040”, we need to look at the role of colonialism. This exploration is not a debate over whether colonialism was “good” or “bad”. Instead, it is about understanding how this global process created the world we currently inhabit.

Since the 15th century British colonialists transformed the Malaya into a plantation economy to meet the needs of industries in Britain and America. This included the expanding demand for cheap rubber during the industrial revolution. Exploitative colonial policies in Singapore and the peninsula limited the economic options of poor Malays, Indians and Chinese. These workers were increasingly forced to clear vast areas of rainforest to literally carve out a living for themselves at the expense of local ecosystems. Meanwhile, more than half a century after the end of colonial rule in the Malaya peninsula, the over-exploitation of local resources through extensive logging continues unabated. Once numerous, Malayan tigers are now classified as a critically endangered species due, in part, to habitat loss from logging and road development. Deforestation in Malaysian Borneo also continues to accelerate, mainly due to the ongoing global demand for palm oil and lumber. In Myanmar (formerly Burma), trade in raw commodities goes back centuries. Under colonial rule, the export of minerals, timber and opium expanded enormously, placing unprecedented strain on local resources.

motivation for direct colonial occupation. New transportation technologies and economic growth fuelled by the industrial revolution created a global demand for African exports, including gemstones and minerals that required extensive mining operations to extract.

From 1930 to 1961, the diamond industry in Sierra Leone played a crucial role in shaping and defining colonial governmental strategies and scientific expertise throughout the region. But American slave traders and politicians saw the republic primarily as a solution to limit the “corrupting influence” of freed slaves on American society. To “help” Liberia get out of debt to Britain, the U.S.-based Firestone Tire and Rubber Company extended a \$5 million loan in 1926 in exchange for a 99-year lease on a million acres of land to be used for rubber plantations. This loan was the beginning of direct economic control over Liberian affairs.

Our understanding of colonialism is often limited to simple ideas about what we think colonialism looked like in the past. These ideas impede our ability to identify the complex ways that colonialism shaped and continues to shape the uneven power structures of the 21st century, as anthropologist and historian Ann Laura Stoler argues in her book, *Duress*. Unequal power relations between and within developed and developing countries continue to define the causes and consequences of climate change. A clearer understanding of where these problems came from is a necessary first step towards solving them. People in prosperous countries are often unaware that the garbage they throw out every day often gets shipped around the world to become somebody else’s problem. While people debate whether climate change should be taken seriously from the comfort of their air-conditioned homes, hundreds of thousands of people are already suffering the consequences.

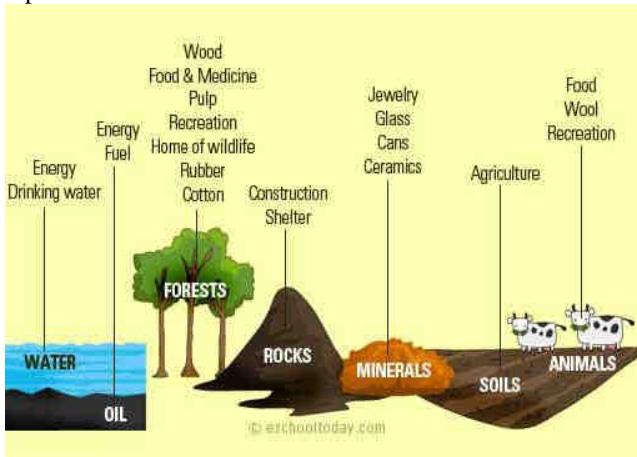


Figure 7: A diagram showing Natural Resources

The human cost of the diamond trade in West and South Africa is relatively well-known. Less known are the devastating effects on Africa’s environment that the stripping of natural resources such as diamonds, ivory, bauxite, oil, timber and minerals has produced. The intensive mining operations required for delivering diamonds and other precious stones or minerals to world markets degrades the land, reduces air quality and pollutes local water sources. The result is an overall loss of biodiversity and significant environmental impacts on human health. As European powers carved up the continent in the so-called “scramble for Africa” during the late 19th century, commercial exports came to replace slavery as the primary economic

IV. FINDINGS AND CONCLUSION

As the human population increases and economies develop, we are using more natural resources, materials that the earth provides which enable economic gain. These substances include minerals, forests, water, fertile soil and more. In many cases, we’re using these resources faster than nature can replenish them. While the day when the earth will be completely dry and desolate is probably still far off, we’re already seeing some of the effects of resource overuse. We need to act now to protect our planet for ourselves and future generations for a better life.

We consume natural resources such as coal, natural gas and water falls to produce electricity that we use in homes, offices, stores and markets. We can also conserve some of that energy by turning things off and unplugging them when not in use. We can also use more energy efficient appliances. We can also use renewable sources of energy such as solar light, wind power etc. In 2016 the production of plastics all over the world was approximately 335 million Tons and half of that quantity was used to make single use products as per Earth Day network. Reducing usage of plastic bags can contribute to less harming the environment. Gasoline and petroleum can be conserved by making use of car pools or avoiding them by walking or cycling and keeping better health! Re-cycling can also help reduce wastage of natural resources. Better Agricultural production methods using less water and other natural resources, and avoidance of pesticides and fertilizers can contribute further.

Avoiding Food wastage by consuming what is required only and storing them properly can also help. The natural resources of Forests and their ecosystem is valued at about \$ 33 trillion annually. About 25 % of the world population depend of forests to make a living and the human greed is destroying them at the rate of about 60 acres a minute! Water for drinking has become scarce because of industrial wastage and discharge of water without treatment. Our propensity to create more and more waste and improper usage of available resources has to be controlled.

With approximately 4 billion trees being cut down annually to satiate the world's need for paper alone, preventing the depletion of forests continues to be an important priority. There are many opportunities in your daily life to use less paper, from using more cloth towels and less paper towels to switching to an online-only subscription of your favorite newspaper. For those of you that boat along the coast, make sure you find out where coral reefs in the area are located. Reefs are sensitive to disturbances and should be approached with care and respect. For those people diving or snorkeling around a reef, a good rule of thumb is "take only pictures, leave only bubbles." You can take steps to help preserve and restore the natural world. Contact your representatives at the national, state and local level to support laws and programs that protect the environment. Make sure your local school systems, at all levels, are offering curricula to introduce students to natural systems and the importance of their preservation.

Oil-rich countries together with the World Bank, states, and consumables' regulatory bodies should join hands towards a common international objective of discussing how oil and mineral consumption as well as exploitation can be reduced. Manufactures can, for instance, be trained on lean manufacturing (recycling, re-use, and reducing wastage) while consumers sensitized on how to adopt re-use, reducing wastage, and recycling techniques. Renewable sources such as solar and wind power can be explored more and utilized to reduce the dependency on fossil fuel, which is a major cause of environmental pollution, climate change, global warming, and destruction of natural habitats.

Wetlands are regions saturated with groundwater that serve a significant role in sustaining vegetation cover. The coastal and wetland ecosystems are thus vital in sustaining the food chain as they replenish water sources and avail minerals and nutrients for primary producers (green and flowering plants), essential for maintaining plant and animal biodiversity. Also when coastal ecosystems are protected, they aid in controlling marine overfishing and protect coral reefs. Whatever damage has been done, cannot be reversed. But in Future, all developing and developed countries can together shape economic policies for the welfare of human population, irrespective of country of origin!

REFERENCES

- [1] Adams, W.M. (2006). The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century. Report of the IUCN Renowned Thinkers Meeting, 29–31 January 2006 (PDF).
- [2] Boyd, James (15 March 2007). "Nonmarket benefits of nature: What should be counted in green GDP?" *Ecological Economics*. 61 (4): 716–723.
- [3] Banzhafa, Spencer; Boyd, James (August 2007). "What are ecosystem services? The need for standardized environmental accounting units". *Ecological Economics*. 63 (2–3): 616–626.
- [4] Butler, Rhett A. "Impact of Population and Poverty on Rainforests". *Mongabay.com / A Place Out of Time: Tropical Rainforests and the Perils They Face*
- [5] Bardi, U; Höök, M.; Feng, L.; Pang, X. (2010). "Development of oil formation theories and their importance for peak oil" (PDF). *Depletion and Conservation of Natural Resources: The Economic Value of the World's Ecosystems — How Much is Nature Worth? The Role of Forests and Habitat Marine and Petroleum Geology*. 27 (9): 1995–2004.
- [6] Vincent, Jeffrey (February 2000). "Green accounting: from theory to practice". *Environment and Development Economics*. 5: 13–24.
- [7] West, J (2011). "Decreasing metal ore grades: are they really being driven by the depletion of high-grade deposits?" *Journal of Industrial Ecology*. 15 (2): 165–168.
- [8] Drielsma, Johannes A; Russell-Vaccari, Andrea J; Drnek, Thomas; Brady, Tom; Weihed, Pär; Mistry, Mark; Perez Simbor, Laia (2016). "Mineral resources in life cycle impact assessment—defining the path forward". *International Journal of Life Cycle Assess.* 21 (1): 85–105.
- [9] Meinert, Lawrence D; Robinson, Gilpin R Jr; Nassar, Nedal T (2016). "Mineral Resources: Reserves, Peak Production and the Future". *Resources*. 5 (14): 14.
- [10] Alicia; Valero, Antonio (2010). "Physical geonomics: Combining the energy and Hubbert peak analysis for predicting mineral resources depletion". *Resources, Conservation and Recycling*. 54 (12): 1074–1083. .
- [11] Jenkin, G. R. T.; Lusty, P. A. J.; McDonald, I; Smith, M. P.; Boyce, A. J.; Wilkinson, J. J. (2014). "Ore Deposits in an Evolving Earth" (PDF). *Geological Society, London, Special Publications*. 393: 265–276. .
- [12] Hitzman, M. W.; Reynolds, N. A.; Sangster, D. F.; Allen, C. R.; Carman, C. F. (2003). "Classification, genesis, and exploration guides for Nonsulfide Zinc deposits". *Economic Geology*. 98 (4): 685–714.
- [13] Bowie, N. (1988) The moral obligations of multinational corporations. In: Luper-Foy (Ed.), *Problems of International Justice*. Boulder: West view Press, pp. 97–113.
- [14] Billgrena, C., Holme, H. (2008) 'Approaching reality: Comparing stakeholder analysis and cultural theory in the context of natural resource management,' *Land Use Policy*, vol. 25, pp. 550–562
- [15] Buanes, A., et al. (2004) 'In whose interest?' ' An exploratory analysis of stakeholders in Norwegian coastal zone planning,' *Ocean & Coastal Management*, vol. 47, pp. 207–223
- [16] Bartley, T Andersson, K, Jager P and Van Laerhoven 2008 The contribution of Institutional Theories for explaining Decentralization of Natural Resource Governance. *Society and Natural Resources*, 21:160-174
- [17] Brosius, J.; Peter Tsing; Anna Lowenhaupt; Zerner, Charles (1998). "Representing communities: Histories and politics of community-based natural resource management". *Society & Natural Resources*. 11 (2): 157–168.
- [18] Brooks, Jeremy S.; Waylen, Kerry A.; Mulder, Monique Borgerhoff (26 December 2012). "How national context, project design, and local community characteristics influence success in community-based conservation projects". *Proceedings of the National Academy of Sciences*. 109 (52): 21265–21270.
- [19] Black, Iain R.; Cherrier, Helene (2010). "Anti-consumption as part of living a sustainable lifestyle: daily practices, contextual motivations and subjective

- values". *Journal of Consumer Behaviour*. 9 (6): 437–453. .
- [20] Beddoea, R.; Costanza, R.; Farleya, J.; Garza, E.; Kent, J.; Kubiszewski, I.; Martinez, L.; McCowen, T.; Murphy, K.; Myers, N.; Ogden, Z.; Stapleton, K.; Woodward, J. (2009). "Overcoming systemic roadblocks to sustainable health". *Proceedings of the National Academy of Sciences*. 106 (28): E80,
- [21] Buchenrieder, G., und A.R. Göltenboth, 2003: Sustainable freshwater resource management in the Tropics: The myth of effective indicators, 25th International Conference of Agricultural Economists (IAAE) on "Reshaping Agriculture's Contributions to Society" in Durban, South Africa.
- [22] Brown, James H. (2015). "The Oxymoron of Sustainable Development". *Bio Science*. 65 (10): 1027–1029.
- [23] Chung, Emily. "Most Groundwater is Effectively a Non-renewable Resource, Study Finds". *CBC News*.
- [24] Clarkson, M.B.E. (1995) 'A stakeholder framework for analyzing and evaluating corporate social performance,' *Academy of Management Review*, vol. 20, Issue. 1, pp. 92–117
- [25] Cooney, R (2004). *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management (PDF)*. IUCN Policy and Global Change Series.
- [26] Davidson, Nick C. (January 2014). "How much wetland has the world lost? Long-term and recent trends in global wetland area". *Marine and Freshwater Research*. 60: 936–941 – via Research Gate.
- [27] Dandy, N. et al. (2009) 'Who's in and why? A typology of stakeholder analysis methods for natural resource management,' *Journal of Environmental Management*, vol. 90, pp. 1933–1949
- [28] Dale, VH, Brown, S, Hawuber, RA, Hobbs, NT, Huntly, Nj Naiman, RJ, Riebsame, WE, Turner, MG & Valone, TJ 2000, 'Ecological guidelines for land use and management', in Dale, VH & Hawuber, RA (eds), *Applying ecological principles to land management*, Springer-Verlag, NY
- [29] Foley, Jonathan A; DeFries, Ruth; Asner, Gregory P; Barford, Carol; et al. (2005). "Global Consequences of Land Use". *Science*. 309 (5734): 570–574.
- [30] Freeman, E.R. (1999) 'The politics of stakeholder theory: some further research directions,' *Business Ethics Quarterly*, vol. 4, Issue. 4, pp. 409–421
- [31] G. R. van der Werf, D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz and J .T. Randerson, (2009), CO2 emissions from forest loss, *Nature Geoscience*, Volume 2 pp. 737–738
- [32] Grimble, R., Wellard, K. (1997) 'Stakeholder methodologies in natural resource management: a review of principles, contexts, experiences and opportunities.' *Agricultural Systems*, vol. 55, Issue. 2, pp. 173–193
- [33] Gray, JS (1997). *Marine biodiversity: patterns, threats and conservation needs (PDF)*.
- [34] Holling C.S. and Meffe, G. K. 2002 'Command and control and the Pathology of Natural Resource Management. *Conservation Biology*. vol.10. issue 2. pages 328–337, April 1996
- [35] Kachur, Torah (2017). "Don't drain the swamp! Why wetlands are so important", *CBC*
- [36] Keddy, Paul A. (2010). *Wetland Ecology: Principles and Conservation*. Cambridge University Press.
- [37] Konikow, Leonard F.; Kendy, Eloise (2005-03-01). "Groundwater depletion: A global problem". *Hydrogeology Journal*. 13 (1): 317–320.
- [38] Kellert, S; Mehta, J; Ebbin, S; Lichtenfeld, L. (2000). *Community natural resource management: promise, rhetoric, and reality (PDF)*. *Society and Natural Resources*, 13:705-715.
- [39] Lee, Derek E.; Bond, Monica L. (2018). "Quantifying the ecological success of a community-based wildlife conservation area in Tanzania". *Journal of Mammalogy*. 99(2): 459–464.
- [40] Lee, Derek E. (2018). "Evaluating conservation effectiveness in a Tanzanian community wildlife management area". *The Journal of Wildlife Management*. 82 (8): 1767–1774.
- [41] "Major Causes of Wetland Loss and Degradation". *NCSU*..
- [42] Measham TG (2007) Building capacity for environmental management: local knowledge and rehabilitation on the Gippsland red gum plains, *Australian Geographer*, Vol 38 issue 2, pp 145–159
- [43] Magee, Liam; Scerri, Andy; James, Paul; Thom, James A.; Padgham, Lin; Hickmott, Sarah; Deng, Hepu; Cahill, Felicity (2012). "Reframing social sustainability reporting: towards an engaged approach". *Environment, Development and Sustainability*. 15 (1): 225–243
- [44] Pearce, David W (2001). "The Economic Value of Forest Ecosystems". *Ecosystem Health*. 7 (4): 284–296.
- [45] Prell, C., et al. (2007) *Stakeholder Analysis and Social Network Analysis in Natural Resource Management*. Leeds: Sustainability Research Institute, University of Leeds, pp. 1-21
- [46] Shackleton, S; Campbell, B; Wollenberg, E; Edmunds, D. (March 2002). *Devolution and community-based natural resource management: creating space for local people to participate and benefit? (PDF)*. ODI, Natural Resource Perspectives. Retrieved 27 October 2014.
- [47] Thakadu, O. T. (2005). "Success factors in community based natural resources management in northern Botswana: Lessons from practice". *Natural Resources Forum*. 29 (3): 199–212.
- [48] Twyman, C 2000. *Participatory Conservation? Community-based Natural Resource Management in Botswana*. *The Geographical Journal*, Vol 166, No.4, December 2000, pp 323-335
- [49] Wada, Yoshihide; Beek, Ludovicus P. H. van; Kempen, Cheryl M. van; Reckman, Josef W. T. M.; Vasak, Slavek; Bierkens, Marc F. P. (2010). "Global depletion of groundwater resources" (PDF). *Geophysical Research Letters*. 37 (20):
- [50] Zhang, Stephen X.; Babovic, Vladan (2012). "A real options approach to the design and architecture of water supply systems using innovative water technologies under uncertainty". *Journal of Hydroinformatics*. 14 (1): 13–29. .

WEB REFERENCES

www.euforic.org/gb/stake1.html
Legislation.nsw.gov.au.
www.globalfootprints.org