ENVIRONMENTAL PROBLEMS AND SUSTAINABLE DEVELOPMENT: WITH SPECIAL REFERENCE TO INDIA ISSUES AND CHALLENGES

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There are many **environmental issues in India**. Air pollution, water pollution, garbage, and pollution of the natural environment are all challenges for India. The situation was worse between 1947 through 1995. According to data collection and environment assessment studies of World Bankexperts, between 1995 through 2010, India has made one of the fastest progress in the world, in addressing its environmental issues and improving its environmental quality. Still, India has a long way to go to reach environmental quality similar to those enjoyed in developed economies. Pollution remains a major challenge and opportunity for India.

Environmental issues are one of the primary causes of disease, health issues and long term livelihood impact for India.

I. HISTORY

Ashoka Pillar Edicts were one of earliest efforts in India that focused on respecting and preserving environment, forests and wildlife.

Yajnavalkya Smriti, a historic Indian text on statecraft and jurisprudence, suggested to have been written before the 5th century AD, prohibited the cutting of trees and prescribed punishment for such acts. Kautalya's Arthashastra, written in Mauryan period, emphasised the need for forest administration. Ashoka went further, and his Pillar Edicts expressed his view about the welfare of environment and biodiversity.

"Happiness in this world and the next is difficult to obtain without much love for the dhamma, much self-examination, much respect, much fear of evil, and much enthusiasm. [...] Beloved-of-the-Gods, King Piyadasi (Ashoka), speaks thus: Animals were declared to be protected – parrots, mainas, aruna, geese, wild ducks, nandimukhas, gelatas, bats, queen ants, terrapins, boneless fish, vedareyaka, gangapuputaka, sankiya fish, tortoises, porcupines, squirrels, deer, bulls, okapinda, wild asses, wild pigeons, domestic pigeons and all four-footed creatures that are neither useful nor edible. Also protected were nanny goats, ewes and sows which are with young or giving milk to their young, and so are young ones less than six months old. Cocks are not to be caponised, husks hiding living beings are not to be burnt, and forests are not to be burnt either without reason or to kill creatures. One animal is not to be fed to another. Our king killed very few animals."

II. ASHOKA'S SEVEN PILLAR EDICTS

British rule of India saw several laws related to environment. Amongst the earliest ones were Shore Nuisance (Bombay and Kolaba) Act of 1853 and the Oriental Gas Company Act of 1857. The Indian Penal Code of 1860,

imposed a fine on anyone who voluntarily fouls the water of any public spring or reservoir. In addition, the Code penalised negligent acts. British India also enacted laws aimed at controlling air pollution. Prominent amongst these were the Bengal Smoke Nuisance Act of 1905 and the Bombay Smoke Nuisance Act of 1912. Whilst these laws upon independence from Britain, India adopted a constitution and numerous British-enacted laws, without any specific constitutional provision on protecting the environment. India amended its constitution in 1976. Article 48(A) of Part IV of the amended constitution, read: The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country. Article 51 A (g) imposed additional environmental mandates on the Indian state.

Other Indian laws from recent history include the Water (Prevention and Control of Pollution) Act of 1974, the Forest (Conservation) Act of 1980, and the Air (Prevention and Control of Pollution) Act of 1981. The Air Act was inspired by the decisions made at Stockholm Conference. The Bhopal gas tragedy triggered the Government of India to enact the Environment (Protection) Act of 1986. India has also enacted a set of Noise Pollution (Regulation & Control) Rules in 2000.

In 1985, Indian government created the Ministry of Environment and Forests. This ministry is the central administrative organisation in India for regulating and ensuring environmental protection.

Despite active passage of laws by the central government of India, the reality of environmental quality mostly worsened between 1947 to 1990. Most of Indian economy was nationalized and owned by India, and regulations were mostly ignored by state run enterprises. Rural poor had no choice, but to sustain life in whatever way possible. The state governments of India often regarded environmental laws enacted by the central government as a mere paperwork formality. Air emissions increased, water pollution worsened, forest cover decreased.

Starting in the 1990s, reforms were introduced. Since then, for the first time in Indian history, major air pollutant concentrations have dropped in every 5-year period. Between 1992 to 2010, satellite data confirms India's forest coverage has increased for the first time by over 4 million hectares, a 7% increase.

III. OBJECTIVES OF THE STUDY

1. To describe and discuss the common characteristics of health system functioning in the given socio-economic, socio-cultural, political and ecological settings.
2. To highlight and delineate crucial factors responsible for the health sector reforms and to undertake, as the most challenging endeavor, effective and efficient health management and equality health care service provisions in the community.
3. The fundamental objective is to act as a catalyst in bringing about local initiative and community participation in overall improvement in quality of life.

IV. CAUSES

Some have cited economic development as the cause regarding the environmental issues. Others believe economic development is key to improving India's environmental management and preventing pollution of the country. It is also suggested that India's growing population is the primary cause of India's environmental degradation. Systematic studies challenge this theory. Empirical evidence from countries such as Japan, England

and Singapore, each with population density similar or higher than India, yet each enjoying environmental quality vastly superior to India, suggests population density may not be the only factor affecting India's issues.

V. MAJOR ENVIRONMENTAL ISSUES

Major environmental issues are forest and agricultural degradation of land, resource depletion (water, mineral, forest, sand, rocks etc.), environmental degradation, public health, loss of biodiversity, loss of resilience ecosystems, and livelihood security for the poor.

The major sources of pollution in India include the rampant burning of fuel wood and biomass such as dried waste from livestock as the primary source of energy, lack of organized garbage and waste removal services, lack of sewage treatment operations, lack of flood control and monsoon water drainage system, diversion of consumer waste into rivers, cremation practices near major rivers, government mandated protection of highly polluting old public transport, and continued operation by Indian government of government owned, high emission plants built between 1950 to 1980.

Air pollution, poor management of waste, growing water scarcity, falling groundwater tables, water pollution, preservation and quality of forests, biodiversity loss, and land/soil degradation are some of the major environmental issues India faces today.

India's population growth adds pressure to environmental issues and its resources.

VI. POPULATION GROWTH AND ENVIRONMENTAL QUALITY

There is a long history of study and debate about the interactions between population growth and the environment. According to a British thinker Malthus, for example, a growing population exerts pressure on agricultural land, causing environmental degradation, and forcing the cultivation of land of poorer as well as poorer quality. This environmental degradation ultimately reduces agricultural yields and food availability, causes famines and diseases and death, thereby reducing the rate of population growth.

Population growth, because it can place increased pressure on the assimilative capacity of the environment, is also seen as a major cause of air, water, and solid-waste pollution. The result, Malthus theorized, is an equilibrium population that enjoys low levels of both income and environmental quality. Malthus suggested positive and preventative forced control of human population, along with abolition of poor laws.

Malthus theory, published between 1798 and 1826, has been analysed and criticised ever since. The American thinker Henry George, for example, observed with his characteristic piquancy in dismissing Malthus: "Both the jayhawk and the man eat chickens; but the more jayhawks, the fewer chickens, while the more men, the more chickens." Similarly, the American economist Julian Lincoln Simon criticised Malthus's theory. He noted that the facts of human history have proven the predictions of Malthus and of the Neo-Malthusians to be flawed. Massive geometric population growth in the 20th century did not result in a Malthusian catastrophe. The possible reasons include: increase in human knowledge, rapid increases in productivity, innovation and application of knowledge, general improvements in farming methods (industrial agriculture), mechanization of work (tractors), the introduction of high-yield varieties of wheat and other plants(Green Revolution), and the use of pesticides to control crop pests.

India's population density, in 2011, was about 368 human beings per square kilometre. Many countries with population density similar or higher than India enjoy environmental quality as well as human quality of life far superior than India. For example: Singapore (7148 /km^2), Hong Kong (6349 /km^2), South Korea (487 /km^2), Netherlands (403 /km^2), Belgium (355 / km^2), England (395 /km^2) and Japan (337/ km^2).

VII. WATER POLLUTION

India has major water pollution issues. Discharge of untreated sewage is the single most important cause for pollution of surface and ground water in India. There is a large gap between generation and treatment of domestic waste water in India. The problem is not only that India lacks sufficient treatment capacity but also that the sewage treatment plants that exist do not operate and are not maintained. The majority of the government-owned sewage treatment plants remain closed most of the time due to improper design or poor maintenance or lack of reliable electricity supply to operate the plants, together with absentee employees and poor management. The waste water generated in these areas normally percolates in the soil or evaporates. The uncollected wastes accumulate in the urban areas cause unhygienic conditions and release pollutants that leaches to surface and groundwater.

According to a World Health Organization study, out of India's 3,119 towns and cities, just 209 have partial sewage treatment facilities, and only 8 have full wastewater treatment facilities. Over 100 Indian cities dump untreated sewage directly into the Ganges River. Investment is needed to bridge the gap between 29000 million litre per day of sewage India generates, and a treatment capacity of mere 6000 million litre per day.

Other sources of water pollution include agriculture run off and small scale factories along the rivers and lakes of India. Fertilizers and pesticides used in agriculture in northwest have been found in rivers, lakes and ground water. Flooding during monsoons worsens India's water pollution problem, as it washes and moves all sorts of solid garbage and contaminated soils into its rivers and wetlands.

VIII. WATER RESOURCES

According to NASA groundwater declines are highest on Earth between 2002 and 2008 in northern India. Agricultural productivity is dependent on irrigation. A collapse of agricultural output and severe shortages of potable water may influence 114 million residents in India. In July 2012, about 670 million people or 10% of the world’s population lost power blame on the severe drought restricting the power delivered by hydroelectric dams.

A rural stove using biomass cakes, fuelwood and trash as cooking fuel. Surveys suggest over 100 million households in India use such stoves (chullahs) every day, 2–3 times a day. It is a major source of air pollution in India, and produces smoke and numerous indoor air pollutants at concentrations 5 times higher than coal. Clean burning fuels and electricity are unavailable in rural parts and small towns of India because of poor rural highways and limited energy generation infrastructure.

Air pollution in India is a serious issue with the major sources being fuelwood and biomass burning, fuel adulteration, vehicle emission and traffic congestion. Air pollution is also the main cause of the Asian brown cloud, which is causing the monsoon to be delayed. India is the world's largest consumer of fuelwood, agricultural waste and biomass for energy purposes. Traditional fuel (fuelwood, crop residue and dung cake)

dominates domestic energy use in rural India and accounts for about 90% of the total. In urban areas, this traditional fuel constitutes about 24% of the total. Fuel wood, agri waste and biomass cake burning releases over 165 million tonnes of combustion products into India's indoor and outdoor air every year.These biomass-based household stoves in India are also a leading source of greenhouse emissions contributing to climate change.

The annual crop burning practice in northwest India, north India and eastern Pakistan, after monsoons, from October to December, are a major seasonal source of air pollution. Approximately 500 million tons of crop residue is burnt in open, releasing smoke, soot, NOx, SOx, PAHs and particulate matter into the air. This burning has been found to be a leading cause of smog and haze problems through the winter over Punjab, cities such as Delhi, and major population centers along the rivers through West Bengal. In other states of India, rice straw and other crop residue burning in open is a major source of air pollution.

Vehicle emissions are another source of air pollution. Vehicle emissions are worsened by fuel adulteration and poor fuel combustion efficiencies from traffic congestion and low density of quality, high speed road network per 1000 people.

On per capita basis, India is a small emitter of carbon dioxide greenhouse. In 2009, IEA estimates that it emitted about 1.4 tons of gas per person, in comparison to the United States' 17 tons per person, and a world average of 5.3 tons per person. However, India was the third largest emitter of total carbon dioxide in 2009 at 1.65 Gt per year, after China (6.9 Gt per year) and the United States (5.2 Gt per year). With 17 percent of world population, India contributed some 5 percent of human-sourced carbon dioxide emission; compared to China's 24 percent share. The Air (prevention and control of pollution) Act was passed in 1981 to regulate air pollution and there have been some measurable improvements. However, the 2012 Environmental Performance Index ranked India as having the poorest relative air quality out of 132 countries.

IX. SOLID WASTE POLLUTION

Trash and garbage is a common sight in urban and rural areas of India. It is a major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. Street corners are piled with trash. Public places and sidewalks are despoiled with filth and litter, rivers and canals act as garbage dumps. In part, India's garbage crisis is from rising consumption. India's waste problem also points to a stunning failure of governance.

In 2000, India's Supreme Court directed all Indian cities to implement a comprehensive waste-management programme that would include household collection of segregated waste, recycling and composting. These directions have simply been ignored. No major city runs a comprehensive programme of the kind envisioned by the Supreme Court.

Indeed, forget waste segregation and recycling directive of the India's Supreme Court, the Organisation for Economic Cooperation and Development estimates that up to 40 percent of municipal waste in India remains simply uncollected. Even medical waste, theoretically controlled by stringent rules that require hospitals to operate incinerators, is routinely dumped with regular municipal garbage. A recent study found that about half of India's medical waste is improperly disposed of.

Municipalities in Indian cities and towns have waste collection employees. However, these are unionized government workers and their work performance is neither measured nor monitored.

Some of the few solid waste landfills India has, near its major cities, are overflowing and poorly managed. They have become significant sources of greenhouse emissions and breeding sites for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests.[38]

In 2011, several Indian cities embarked on waste-to-energy projects of the type in use in Germany, Switzerland and Japan.[39] For example, New Delhi is implementing two incinerator projects aimed at turning the city's trash problem into electricity resource. These plants are being welcomed for addressing the city's chronic problems of excess untreated waste and a shortage of electric power. They are also being welcomed by those who seek to prevent water pollution, hygiene problems, and eliminate rotting trash that produces potent greenhouse gas methane. The projects are being opposed by waste collection workers and local unions who fear changing technology may deprive them of their livelihood and way of life.

Along with waste-to-energy projects, some cities and towns such as Pune, Maharashtra are introducing competition and the privatisation of solid waste collection, street cleaning operations and bio-mining to dispose the waste. A scientific study suggests public private partnership is, in Indian context, more useful in solid waste management. According to this study, government and municipal corporations must encourage PPP-based local management through collection, transport and segregation and disposal of solid waste.

X. NOISE POLLUTION

The supreme court of India which is in New Delhi gave a significant verdict on noise pollution in 2005. Unnecessary honking of vehicles makes for a high decibel level of noise in cities. The use of loudspeakers for political purposes and for sermons by temples and mosques makes noise pollution in residential areas worse.

In January 2010, Government of India published norms of permissible noise levels in urban and rural areas.

XI. LAND OR SOIL POLLUTION

In March 2009, the issue of Uranium Poisoning in Punjab attracted press coverage. It was alleged to be caused by fly ash ponds of thermal power stations, which reportedly lead to severe birth defects in children in the Faridkot and Bhatinda districts of Punjab. The news reports claimed the uranium levels were more than 60 times the maximum safe limit. In 2012, the Government of India confirmed that the ground water in Malwa belt of Punjab has uranium metal that is 50% above the trace limits set by the United Nations' World Health Organization. Scientific studies, based on over 1000 samples from various sampling points, could not trace the source to fly ash and any sources from thermal power plants or industry as originally alleged. The study also revealed that the uranium concentration in ground water of Malwa district is not 60 times the WHO limits, but only 50% above the WHO limit in 3 locations. This highest concentration found in samples was less than those found naturally in ground waters currently used for human purposes elsewhere, such as Finland. Research is underway to identify natural or other sources for the uranium.

XII. ENVIRONMENTAL ISSUES AND INDIAN LAW

Since about the late 1980s, the Supreme Court of India has been pro-actively engaged in India's environmental issues. In most countries, it is the executive and the legislative branches of the government that plan, implement

and address environmental issues; the Indian experience is different. The Supreme Court of India has been engaged in interpreting and introducing new changes in the environmental jurisprudence directly. The Court has laid down new principles to protect the environment, re-interpreted environmental laws, created new institutions and structures, and conferred additional powers on the existing ones through a series of directions and judgments.

The Court's directions on environmental issues goes beyond the general questions of law, as is usually expected from the highest Court of a democratic country. The Supreme Court of India, in its order, includes executive actions and technical details of environmental actions to be implemented. Indeed, some critics of India's Supreme Court describe the Court as the *Lords of Green Bench* or *Garbage Supervisor*. Supporters of India's Supreme Court term these orders and the Indian bench as pioneering, both in terms of laying down new principles of law, and in delivering environmental justice.

The reasons for the increasing interjection of India's Supreme Court in governance arenas are, experts claim, complex. A key factor has been the failure of government agencies and the state owned enterprises in discharging their Constitutional and Statutory duties. This has prompted civil society groups to file public interest complaints with the Courts, particularly the Supreme Court, for suitable remedies.

Public interest litigation and judicial activism on environmental issues extends beyond India's Supreme Court. It includes the High Courts of individual states.

India's judicial activism on environmental issues has, some suggest, delivered positive effects to the Indian experience. Proponents claim that the Supreme Court has, through intense judicial activism, become a symbol of hope for the people of India. As a result of judicial activism, India's Supreme Court has delivered a new normative regime of rights and insisted that the Indian state cannot act arbitrarily but must act reasonably and in public interest on pain of its action being invalidated by judicial intervention.

Judicial activism in India has, in several key cases, found state-directed economic development ineffective and a failure, then interpreted laws and issued directives that encourage greater competition and free market to reduce environmental pollution. In other cases, the interpretations and directives have preserved industry protection, labour practices and highly polluting state-owned companies detrimental to environmental quality of India. Proactive measures should be taken to conserve the depleting environment.

XIII. FORESTS AND CONSERVATION

Ecological issues are an integral and important part of environmental issues challenging India. Poor air quality, water pollution and garbage pollution all affect the food and environment quality necessary for ecosystems.

India is a large and diverse country. Its land area includes regions with some of the world's highest rainfall to very dry deserts, coast line to alpine regions, river deltas to tropical islands. The variety and distribution of forest vegetation is large. India is one of the 12 mega biodiverse regions of the world.

Indian forests types include tropical evergreens, tropical deciduous, swamps, mangroves, sub-tropical, montane, scrub, sub-alpine and alpine forests. These forests support a variety of ecosystems with diverse flora and fauna.

Until recently, India lacked an objective way to determine the quantity of forests it had, and the quality of forests it had.

13.1 These laws did not have the effect they intended:

In 1985, India created the Ministry of Environment and Forests. This was followed by a National Forest Policy and the major government reforms of the early 1990s.

Over the last 20 years, India has reversed the deforestation trend. Specialists of the United Nations report India's forest as well as woodland cover has increased. A 2010 study by the Food and Agriculture Organisation ranks India amongst the 10 countries with the largest forest area coverage in the world (the other nine being Russian Federation, Brazil, Canada, United States of America, China, Democratic Republic of the Congo, Australia, Indonesia and Sudan).[4] India is also one of the top 10 countries with the largest primary forest coverage in the world, according to this study.

From 1990 to 2000, FAO finds India was the fifth largest gainer in forest coverage in the world; whilst from 2000 to 2010, FAO considers India as the third largest gainer in forest coverage.

13.2 National Forest Commission and India's a Forestation Programme

In 2003, India set up a National Forest Commission to review and assess India's policy and law, its effect on India's forests, its impact of local forest communities, and to make recommendations to achieve sustainable forest and ecological security in India.[57] The report made over 300 recommendations including the following:

- India must pursue rural development and animal husbandry policies to address local communities need to find affordable cattle fodder and grazing. To avoid destruction of local forest cover, fodder must reach these communities on reliable roads and other infrastructure, in all seasons year round.
- The Forest Rights Bill is likely to be harmful to forest conservation and ecological security. The Forest Rights Bill became a law since 2007.
- The government should work closely with mining companies. Revenue generated from lease of mines must be pooled into a dedicated fund to conserve and improve the quality of forests in the region where the mines are located.
- Power to declare ecologically sensitive areas must be with each Indian state.
- The mandate of State Forest Corporations and government owned monopolies must be changed.
- Government should reform regulations and laws that ban felling of trees and transit of wood within India. Sustainable agro-forestry and farm forestry must be encouraged through financial and regulatory reforms, particularly on privately owned lands.

What we can do for the protection of environment:

1. Educate the students about the pollution problem and the harmful effects of pollution
2. We should minimize the use plastic cover for different purposes.
3. Buy only environment friendly products i.e. the products which are not reducing the natural resources.
4. Not to waste water for various purposes.
5. To plant and grow trees in the house garden
6. To motivate research on different measures to be taken to solve environmental problems.
7. To support the initiates taken by the central and state government in protecting our environment.

REFERENCES

[1]. Jump up^ "The Little Green Data Book". The World Bank. 2010.

[2]. Jump up^ "Environmental Assessment, Country Data: India".The World Bank. 2011.

[3]. Jump up^ "The Edicts of King Ashoka (also, see other translations)". Buddhist Publication Society. 1994.

[4]. ^ Jump up to:[a] [b] [c] "Global Forest Resources Assessment 2010" (PDF). FAO. 2011.

[5]. Jump up^ Henrik Urdal (July 2005). "People vs. Malthus: Population Pressure, Environmental Degradation, and Armed Conflict Revisited". *Journal of Peace Research* 42 (4): 417–434. doi:10.1177/0022343305054089.

[6]. Jump up^ Environmental Issues, Law and Technology – An Indian Perspective. Ramesha Chandrappa and Ravi.D.R, Research India Publication, Delhi, 2009, ISBN 978-81-904362-5-0

[7]. ^ Jump up to:[a] [b] Ganguly et al. (2001). "INDOOR AIR POLLUTION IN INDIA – A MAJOR ENVIRONMENTAL AND PUBLIC HEALTH CONCERN" (PDF). Indian Council of Medical Research, New Delhi.

[8]. Jump up^ Milind Kandlikar, Gurumurthy Ramachandran (2000). "2000: India: THE CAUSES AND CONSEQUENCES OF PARTICULATE AIR POLLUTION IN URBAN INDIA: A Synthesis of the Science". *Annual Review of Energy and the Environment* 25: 629–684.doi:10.1146/annurev.energy.25.1.629.

[9]. ^ Jump up to:[a] [b] "Drowning in a Sea of Garbage". The New York Times. 22 April 2010.

[10]. Jump up^ Steve Hamnera; Tripathi, Anshuman; Mishra, Rajesh Kumar; Bouskill, Nik; Broadaway, Susan C.; Pyle, Barry H.; Ford, Timothy E. et al. (2006). "The role of water use patterns and sewage pollution in incidence of water-borne/enteric diseases along the Ganges river in Varanasi, India". *International Journal of Environmental Health Research* 16 (2): 113–32. doi:10.1080/09603120500538226. PMID 16546805.

[11]. Jump up^ Klement Tockner and Jack A. Stanford (2002). "Riverine flood plains: present state and future trends". *Environmental Conservation* 29 (3): 308–330.doi:10.1017/S037689290200022X.

[12]. Jump up^ Sushil and Batra; Batra, V (December 2006). "Analysis of fly ash heavy metal content and disposal in three thermal power plants in India". *Fuel* 85 (17–18): 2676–2679.doi:10.1016/j.fuel.2006.04.031.

[13]. Jump up^ "India: Country Strategy paper, 2007–2013" (PDF). European External Action Service, European Union. 2007.

[14]. Jump up^ Simon J.L. 1981. *The ultimate resource*; and 1992 *The ultimate resource II*.

[15]. Jump up^ Antony Trewavas: "Malthus foiled again and again", in *Nature* 418, 668–670 (8 August 2002), retrieved 28 December 2008

[16]. Jump up^ Maureen Cropper; Charles Griffiths (May 1994). "The Interaction of Population Growth and Environmental Quality" (PDF). *The American Economic Review* 84 (2): 250–254.

[17]. Jump up^ Selden Thomas M. and Song Daqing (1994). "Environmental Quality and Development: Is There a Kuznets Curve for Air Pollution Emissions?" (PDF). *Journal of Environmental Economics and Management* 27 (2): 147–162. doi:10.1006/jeem.1994.1031.

[18]. ^ Jump up to:[a] [b] "Evaluation Of Operation And Maintenance Of Sewage Treatment Plants In India-2007" (PDF). CENTRAL POLLUTION CONTROL BOARD, Ministry of Environment & Forests. 2008.

[19]. Jump up^ World Health Organization (1992), Our Planet, our Health: Report of the WHO Commission on Health and Environment, Geneva

[20]. Jump up^ National Geographic Society. 1995. Water: A Story of Hope. Washington (DC): National Geographic Society

[21]. Jump up^ "Status of Sewage Treatment in India" (PDF). Central Pollution Control Board, Ministry of Environment & Forests, Govt of India. 2005.

[22]. Jump up^ "Buddha Nullah the toxic vein of Malwa". *Indian Express*. May 21, 2008.

[23]. Jump up^ Decade of drought: a global tour of seven recent water crises Guardian 12.6.2015

[24]. Jump up^ Atmanand et al. (2009). "Energy and Sustainable Development-An Indian Perspective"(PDF). World Academy of Science.

[25]. Jump up^ David Pennise and Kirk Smith. "Biomass Pollution Basics" (PDF). The World Health Organisation.