URGENT NEEDS TO PROMOTE INDIGENOUS RESEARCH AND DEVELOPMENT IN ENVIRONMENT FRIENDLY TECHNOLOGIES FOR SOCIO-ECONOMIC DEVELOPMENT IN PAKISTAN

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Abstract

Pakistan is located in a region which is surrounded by countries like India, China, Iran and Afghanistan. Although Pakistan's contribution towards causing environmental pollution is negligible, but still it is one of the most vulnerable countries in terms of being affected by the climate change which has become a global phenomenon. Many countries of the world have focused on promotion of eco-friendly business through investing in their research and development. Japan is considered to be the country which has highly promoted eco-friendly technologies over the past decade. Toyota, Hitachi and Sanyo are the three main players in the manufacturing environment friendly products. The market size of Japan based on the OECD classifications is estimated to be 58 trillion yen by the year 2020. USA is the largest producer and consumer of eco-friendly technologies. The sector consists of various fields, such as pollution control, waste management, site remediation, and monitoring and recycling and earning billions of dollars annually. Pakistan urgently needs to concentrate on generating environmental friendly business. Government needs to provide incentives to the stakeholders involved in this industry. Through this Pakistan will generate socio-economic benefits and as a result contribute in eliminating environmental pollution and degradation, which causes Pakistan 365 billion rupees each year.

Key Words: Environmental Pollution, Vulnerable countries, Climate Change, Eco-Friendly business, Indigenous Research and Development, Eco-Friendly Technology

Introduction & Literature Review

Pakistan is located in South Asia, on its eastern side is India, Iran and Afghanistan are located on its western side and China is to northern side. The land area of Pakistan is 880, 000 kilometer, which also includes Azad Jammu and Kashmir (AJK) and Northern areas. The coastal areas along the Arabian Sea covers the 1,046 kilometers long, with 22,820 square kilometer of territorial water and an exclusive economic zone comprises about 196,000 square kilometer in the Arabian Sea. The Pakistan's leading geomorphic characteristics consist of Indus River and its tributaries. The climate of the country is arid and semi arid and more than 500 millimeters of rainfall per annum is being received by 8 percent of the area of the country. This rainfall is mainly in the form of monsoon rain which spreads across the three months of the year. This sub humid zone is especially bounded to ecologically fragile uplands, which comprising geologically mountains and foothills. The country's cultivated land cover the area of twenty two million hectare (ha) which is equal to 25 percent of total land. Out of these cultivated land 11 millions hectare (ha) is good for crop cultivation, while rest of area contain poor soils which significantly limit the crop yields.

Moreover other eight millions hectares (ha) were classified as a cultivable, but still are undeveloped because of wind erosion, water logging, salinity, sodicity and lack of quality and quantity of water used for irrigation purpose. (Government of Pakistan. 2007a. Pakistan Economic Survey 2006–2007. Islamabad: Ministry of Finance; Mian, A., and Y. Javed. 1992. NCS [National Conservation Strategy] Sector Paper on Soils. Islamabad: Government of Pakistan, World Conservation Union, and Journalists Resource Center.) The land area under forest and farmlands comprises of 4.2 million hectare (ha) in 1992, out of which coniferous forest accounted for 1.9 million hectare, and the area under the range land covers 29 million ha, of which twenty five million hectare (87%) has been subject to environmental degradation. In addition another twenty seven million hectare is barren that is not suitable for cultivation. The barren land comprising rocks, glaciers, snow, and deserts etc. Moreover 6.7 million land remain unclassified and mainly consisting of highlands which approximately above three thousand six hundred fifty square kilometers.

(Government of Pakistan. 1992. Forestry Sector Master Plan. Islamabad: Government of Pakistan, ADB, and United Nations Development Programme; Government of Pakistan. 2005. State of Environment Report (Draft). Islamabad: Ministry of Environment.) Pakistan is the sixth populous country in the world and the estimated population was 158 million in 2007 and in future will reach 229 and 295 million by 2025 and 2050. (Bongaarts, J. 2007 Alternative Demographic Futures for Pakistan. Lecture delivered at the Planning Commission, Islamabad, and 10 September)

KEY ENVIRONMENTAL ISSUES AND CHALLENGES

Pakistan has achieved economic growth at the cost of the environment due to the fact that most of the production and manufacturing processes make use of scarce ecosystems. The key environmental issues and challenges that are faced by Pakistan include water as a resource, water pollution, loss of biodiversity, energy, and waste management (World Bank. 2006. Pakistan, Strategic Country Environmental Assessment. Washington, DC: World Bank. Government of Pakistan (2005) Government of Pakistan. 2006). Pakistan Millennium Development Goals Report 2006. Islamabad: Planning Commission). All major indicators suggest an overall declining situation of Pakistan's environment scenario. All main types of pollution i.e. water, air, and land are having a huge impact on health of the citizens and overall environment. The efforts on part of Government, private sector, and civil society have not been effective enough to tackle the challenges with some exceptions. Pakistan is ranked amongst the most water-scarce countries in the world. Tarbela, Mangla and Chashma are the three major water reservoirs in Pakistan having a storage capacity of about 15.6 MAF of water, currently reduced to 12.8 MAF. The United States has 5,000 cubic meters of storage capacity per capita while Pakistan has only 150 cubic meters of storage per capita. Likewise, India can store up to 220 days requirements of its river water. By contrast Pakistan can store only 30 days of water in the Indus Basin.

Even this capacity is rapidly being depleted as the dams silt up. Inadequate per capita water availability has already reached critical levels. As almost 90% of the water is used by the agriculture sector, human populations suffer greatly due to shortages of water and high differential pricing (Pervaiz Amir, Climate Change, Water vulnerabilities in Pakistan, IUCN & Ministry of Environment). Pakistan is contributing very little to greenhouse gas emissions and global climate change. Pakistan's energy related carbon dioxide emissions are nearly 100 million t, of which 46% are oil-related emissions, 45% gas, and 9% from coal. On a per-capita basis, this is equal to 0.7 t, compared with an average of 25 tons for the USA, Australia, and Canada; 11 tons for European Union (EU) countries, and 2.1 tons for developing countries on average (Herzog, T., Pershing J., and Baumert, K. A.. 2005) Navigating the Numbers: Greenhouse Gas Data and International Climate Policy. Washington, DC: World Resources Institute. Although Pakistan's contribution in the overall environmental pollution and climate change of the world is very little but is amongst those countries which are affected most by this. The International Food Policy Research Institute states in its 2009 report, "South Asia will be the most severely impacted by climate change.

By 2050 it could lose 50% of its wheat productivity. Maplecroft of the UK puts Pakistan at 28th amongst those that will be most severely affected. Since, 22 of those countries are in Africa, Pakistan is ranked amongst the top ten outside Africa. By virtue of sharing a highly porous border with Afghanistan (ranked No. 4) and being a neighbor to the emerging economies of China and India, Pakistan is being squeezed from all sides. (Pervaiz Amir, Climate Change, Water vulnerabilities in Pakistan, IUCN & Ministry of Environment). Moreover the environmental degradation costs the country at least 6 percent of GDP, or approximately Rs.365 billion per year, and these costs fall disproportionately upon the poor. The most significant causes o f environmental damage identified and estimated are (i) illness and premature mortality caused by air Pollution (indoor and outdoor), (almost 50 percent o f t he total damage cost); (ii) di arrhoeal diseases and typhoid due to inadequate water supply, sanitation and hygiene (about 30 percent of the total), and (iii) reduced agricultural productivity due to soil degradation (about 20 percent of the total). (Pakistan Strategic Environmental Assessment Report (Volume -1 August 21, 2006).

Pakistan is facing serious issues of air pollution mainly caused by hazardous gas emissions and solid waste. These are having serious health repercussion. The main sources of air pollution in Pakistan are industrial and thermal power plants, but more significant are the vehicular emissions. The quality of the air both in rural and urban areas has been worsened. In 2001, concentrations of suspended particulate matter in Lahore, Rawalpindi, and Islamabad were four to seven times higher than levels recommended by the World Health Organization. Even higher levels of fine particulate matter were measured in Gujranwala and Faisalabad in 2003 and in Quetta in 2006. A substantial increase in the number of vehicles on urban roads continues to drive up levels of urban air pollution. Common gases emitted by vehicles include carbon monoxide, nitrous oxides, and ozone, and are dangerous to human health beyond certain levels.

Poly-aromatic hydrocarbons released by diesel-powered vehicles are known carcinogens, while smoke from diesel engines has aggravated already elevated levels of airborne soot. (Qadir, F. N. 2002. Air Quality in Urban Areas in Pakistan vs. Transport Planning: Issues and Management Tools. Draft paper prepared for ADB under Regional Technical Assistance 5937). Therefore, environmental degradation should not be ignored, but it must include in priority list for socio-economic development in the country. Now days in all over the world the environmental friendly business appreciated, either it may be carbon trading that's market approaching 150 billion dollar the world fast growing market or in the form of eco-business. But, unfortunately the share of Pakistan is in global environmental friendly technology is negligible. The Asian Productivity Organization seems to be very conscious in the environmental issues. Therefore, they are arranging seminars, conferences for tackling the current environmental challenges. The aim of these conferences was to promote sustainable development and combat the adverse impacts of climate change through dissemination and adoption of eco-products and green technologies in member countries. Pakistan is also member of Asian productivity organization, but unfortunately Indigenous Research & Development in environmental friendly technologies has not been promoted and simple air/water pollution equipments are being imported.

ECO-FRIENDLY BUSINESS IN WORLD'S PERSPECTIVE

Japan is one country which has made stunning advancements in the environmental market, perhaps due to the presence of strict environmental laws. The major advancements relate to providing services like that of controlling air and water pollution, waste disposal & recycling, improvement of soil and environmental consulting are still expanding. The fact of the matter is that the Japanese industry is doing so well but at the same time following the Kyoto Protocol (Under the Kyoto Protocol, Japan has committed to reducing greenhouse gas emissions in the first commitment period by 6% below 1990's base year level (MoE, 2005), and to directives relating to reducing pollution in the EU, a key market. We observe a concerted effort on the part of automobile industry, electronics companies and industrial firms which are setting new standards in the area of eco-business and promoting eco-friendly technologies. These include including fuel cells, solar cells, energy-saving building materials and methods for cleaning up water pollution. (The Economist, 2005). Ministry of Environment in Japan believes that after having an Industrial and IT revolution the world can move towards an Environment revolution. (MoE, 2004) The goal of Japan is to lead the world as an environmentally advanced nation. (MoE, 2005)

The GDP growth has been climbing since 2002 and following a positive trend since then (Global Watch, 2006). These impressive figures and a quickly expanding environment market of Japan makes it one of the leaders in promoting environment friendly technologies. The USA stands as the world's biggest producer and user nation of environment technologies. The technologies include goods and services that promote sustainable development and develop processes that are environmentally friendly. The sector consists of various fields, such as pollution control, waste management, site remediation, and monitoring and recycling. The U.S. government in 1994 introduced a strategy to enhance the competitiveness of USA in environment technologies and boost its exports. The most emphasis of the strategies and policies will be related to reducing water and air pollution, treatment of water and wastewater, sanitation, and clean and efficient energy.

ECO- FRIENDLY TECHNOLOGIES IN WORLD'S PERSPECTIVE

Over the last few decades Japan has made substantial progress in the development of environmental technology, this includes significant improvements in the monitoring and control of pollution and carbon emissions. The environmental technology laws are followed by Japan and are contributing towards sustainable development. It is important to highlight the law, which was brought in April 2001 related to purchasing green technologies, making it necessary for government and other organizations to acquire eco-friendly goods and services, (JETRO, 2006). Japan also has also introduced energy conservation law that defines energy efficiency standards on a broad range of products, e.g. automobiles and home and office appliances. There are many Japanese companies that give prime importance to consider environmentally conscious considerations and/or social responsibility as one of their core business strategies. These companies' commitments on the environmental arena are therefore not limited to observance of the law, but driven by other factors. Due to a large number of Japanese companies, making the national competition fierce, the in-house standards are also often found to be more progressive than national environmental legislation (Ahlner, 2006).

TOYOTA

Toyota is the leading automobile company founded in 1937. The company employs a large number of employees and has a huge annual sale. Toyota is recognized worldwide as the first company to have introduced hybrid vehicles which are a blend of gasoline engines and re-chargeable batteries. The focus of Toyota is on fuel economy and alternative fuels, hence, reducing the emissions.

Hybrid technologies are considered to be an important technology for the development of the ultimate eco car, based on different combinations of various alternative fuels and various technologies.

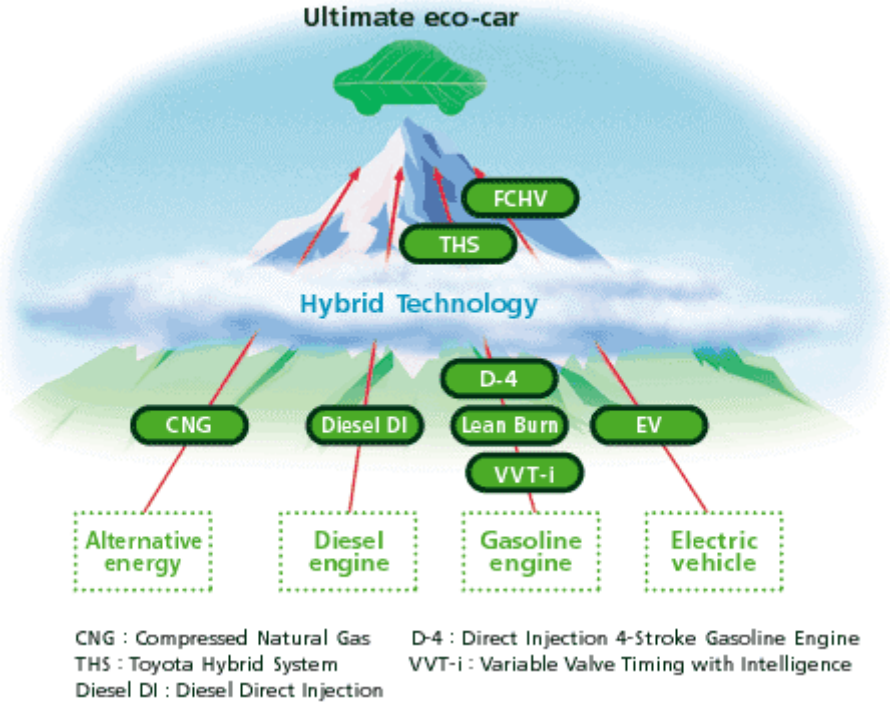


Illustration of the Ultimate Eco-car (Toyota, 2005) (TOYOTA 2005)

HITACHI

The group mainly is associated with IT and telecommunication systems, Electronic devices, Power and industrial systems, Digital media & Consumer products, High functional materials and components, Logistics, services and others and Financial services. The full life cycle of any product is estimated while considering its environmental impact. Few examples of eco-products are (Hitachi Group, 2005),

• Room Air Conditioner, a price-winning appliance using a double accelerator system delivering dramatic energy efficiency and heating capabilities, also, purification of room air is realized through a combination of new technologies

• Eco-cute, heat pump for homes

• Software management systems, "eco-assist" (Taketani & Nishi 2006) Eco Assist, helping companies acquire environmental ISO certification, and part of Hitachi's growing ecology service operations supporting the networking of social infrastructure systems with a high public component

• Magnetocardiograph System, a device that is used for the examination of the heart activity without using X-rays, ultrasound or strong magnetic fields, but instead measures the faint magnetic fields naturally generated by the electrophysiological activity of the heart. The key environmental feature is the improvement of insulation to reduce helium evaporation, up to 50% compared to earlier models. System size was also reduced by 41%.

SANYO

Sanyo Electric Co. manufactures and provides a broad range of electric products and services, which are grouped into four business segments: consumer, commercial, components and others. The various products are; refrigerators and freezers, package-type air conditioners, gas-engine heat pump air conditioners, LSI devices (Large Scale Integration), LCD panels, transistors, LEDs, optical pickups, solar cells and rechargeable batteries for hybrid automobiles.

Sanyo was the first company in the world to successfully industrialize the production of amorphous (non-crystalline) silicon solar cells in the 1980's. During that period of time most of the solar cells used single crystalline silicon. In comparison, amorphous silicon had slightly lower conversion efficiencies but its outstanding absorption of light enabled it to generate electricity in low-intensity ambient lighting. (Sanyo, 2005).

IMPORTANT DRIVERS FOR ENVIRONMENTAL TECHNOLOGY DEVELOPMENT IN THE US

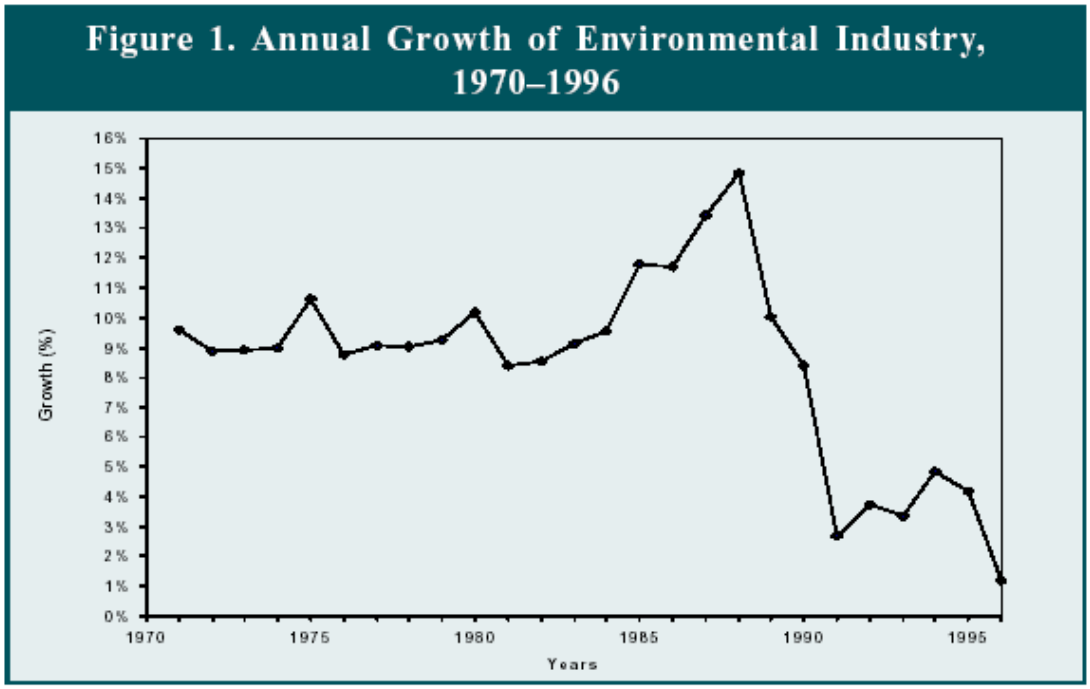
The rise of the US environmental industry

USA currently has the largest environment industry in the world. The major emphasis of the environmental industry in the USA during 1800's was on water delivery, sanitation engineering and waste management. Environmental protection Agency (EPA) and the Council for Environmental Quality were established in the 1970's. The legal framework for its mission was initially the National Environmental Policy Act. This legislation was soon followed by

• The Clean Air Act (1970)
• The federal Water Pollution Control Act more commonly known as the Clean Water Act (1972)

A need was observed to follow the new regulations in formation of new types of products and services and was followed with the establishment of numerous environmental technology and service companies. Huge private business activity emerged such as, air pollution control equipment, environmental consulting and engineering services, sophisticated environmental instrumentation and testing services, hazardous waste management and remediation services. During this period environmental priorities were identified based on the problems people could face in the future. Solutions to these problems usually involved large capital projects and central public-sector involvement (LoGerfo 2005). A new era of environmental policy development focused on sometimes unseen toxic and hazardous waste was launched in the 1980s. The most important legislation during this period was

• Resource Conservation and Recovery Act (RCRA)
• Comprehensive Environmental Resource Compensation and Liability Act (CERCLA) generally called the Superfund Act (1980)



Annual growth of environmental industry 1970-1996 (Source: Berg, US Department of Commerce, 1998)

EXPORTS OF ENVIRONMENTAL TECHNOLOGIES

The global environmental market

The global environmental market is vast and rapidly growing. Environmental Technologies exports are an important part of a global trend of economic development combined with strong ecological concerns. The size of the global environmental market, with the 0definition used by Environmental Business International Inc. (EBI), was for 2004 estimated to 629 billion USD (about 4600 billion SEK10) with the U.S. counting for 38 % and Japan for 16 % of the total market (EBI 2006)

Global environmental market by region

USA	37%
Western Europe	28%
Japan	16%
Rest of Asia	6%
Mexico	1%

Source: The global environmental market divided by regions (Source EBI)

NEEDS TO TAKE STEPS IN ENVIRONMENTAL FRIENDLY TECHNOLOGY FOR SOCIO-ECONOMIC DEVELOPMENT IN PAKISTAN

The Adam motor company Ltd of Pakistan was an automobile manufacturer based in Karachi Pakistan. They were notable for producing the Revo, which was Pakistan's first indigenously designed car. Production ceased in 2006 and their assets were put up for sale. Initially Adam Motor was involved in assembling light trucks from Chinese components, followed by a four-wheel drive sports utility vehicle. Therefore, it is strongly need to restart the Adam motor for sharing their environmental friendly product in the international market for socio-economic development in the country. Although, the Asian Productivity Organization has promoted eco-products and technologies through eco-products international fair since 2004, where more than 300 top companies and organizations participating and looking for eco-friendly products/ services business. The environmentally friendly products, technologies and services have become central issues in developing and developed countries to mitigate climate change and in revenue generation. Therefore, it is very important for policy makers, industry leaders and environmental friendly communities to be aware of these central issues, and enforce Government to give permission Adam Motors to manufacture the environment friendly products. In this way global market monopoly of well known companies will be overcome and will able to export our products in international market and get socio-economic benefits. In USA thousands of companies are working for the promotion of environment friendly industries in areas including equipment, services and resources.

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