

# From PPP, EPR to Global Warming

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**Abstract:** The paper describes the process in which an institutional framework was established to regulate business activities so that the solution of the negative externality problems was internalized. The PPP and EPR have established a solid framework in which the cost of environmental protection has to be paid both by industries and consumers. However, the world now confronts the global warming problem, which seems to overrun the boundaries of business ethics, which have been set for solving PPP and EPR. What is more in need now would be the international political leadership that could guide the world opinion in the direction of carbon dioxide emission control and sustainability of atmospheric conditions.

## 1. Dawn of Business Ethics

For a period from the late 1960's to the early 1970's, when business ethics began to be taught as an independent academic discipline, it would be mainly concerned with the problems of the conflict between business activities and environmental destruction. At the 91st session (1969) of the U. S. Congress Joint Economic Committee, which was responsible for reporting the current economic problems, Kenneth Arrow officially admitted that there were negative externalities of production existing in the market economy, which could not find effective solution within the system itself (Arrow, 1969). A British economist displayed a bitter cynicism by writing: "The main body of economic thought is hopelessly ill-adapted to considering these kinds of problems. It may even be the case that the greatest service economists can render posterity is to remain silent" (Coddington, 1970).

Accused of their responsibility for the environmental destruction resulting from business activities, the business world as well as some group of economists supporting the principles of market economy reacted by assuming a somewhat defiant attitude and asserted that the social responsibility of business was to increase its profits (Friedman, 1907). Although the opinion was orthodox in view of the neoclassical economics and Friedman was cautious enough to mention that the firm should make expenditures to reduce pollution in the best interest of a corporation owned by the shareholders to such an extent as required by the laws, his article invited uproar of criticisms among theoreticians of business ethics. One of those critics christened the opinion "corporate Neandelthalism" (Donaldson, 1989: 45).

## 2. Institutionalism Evoked

The market economy turned out endogenously ineffective solving the negative externality problems within its mechanism. The Coase Theorem which argues that

the negative externalities could be corrected in the market provided that property rights are defined and the cost of transaction is negligibly small proved unrealistic in the light of the fact that property rights of such an intrinsically public good as air, water and the environment in general could not be defined as being assigned to specific individuals and also that transaction costs between “a beekeeper and a nearby farmer” was not at all negligible (Johnson, 1973). The currently dominant economic theory, Keynesian economics, was indifferent about the externality issues and these subjects were mainly analyzed by neo-classical economists. Shigeto Tsuru points out that the kind of economic thought that characterized the American Institutionalism in 1930's was regaining momentum among environmental economists. Tsuru writes:

Negative external effects were often serious enough. But in the era when the minimum requirements for the health of the workers were ignored in the interest of industrial prosperity, environmental disamenities were of secondary consideration. The doctrine of consumer sovereignty, too, one may say, was never more than a complacent rationalism by economists. (Tsuru, 1993: 85-86).

Political and legal intervention was inevitable in the process of effective solutions of negative externalities. In July 1970 the Environmental Protection Agency (EPA), endowed with political and legal power to monitor and enforce private enterprises, was established in the United States to protect human health and safeguard the natural air, water, and land. In Japan for a decade from the late 1960's to the early 1970's a series of pollution-caused illness such as Yokkaichi asthma, Minamata disease and Itai-itai (ouch-ouch) disease was the focus of the public concern.

### **3. Pollution-caused Illness**

In an industrial town near Nagoya petrochemical and oil refinery complexes, which they named “Yokkaichi Kombinato” after the name of the town, were constructed and they began 24-hour operation in 1959. Some Yokkaichi citizens began to complain breathing difficulties and scientists discovered the relationship between their bronchial asthma and airborne sulfur dioxide concentrations emitted by oil refineries and petrochemical complexes. In spite of this knowledge and the similar complaints of increasing number of Yokkaichi citizens, the Kombinato continued expansion till 1973 to become one of the largest complexes of oil refinery and ethylene production in Japan. By 1961, 48% of children under six, 30% of people over 60, and 19% of those in their twenties had breathing difficulties. In 1964, a pollution-free room had to be established in the local hospital where asthma victims could take refuge and breathe freely. In 1967 12 Yokkaichi residents who had been trying to resolve the problem through negotiation with the polluting firms finally filed a lawsuit against the firms in the Kombinato. It took 5 years for the plaintiffs to obtain the court decisions and in 1972 the judges awarded the plaintiffs a total of \$286,000 compensation which were jointly paid by the six firms for their damages in health (1975, Huddle).

The neurological disease called Minamata disease was first discovered in 1956 in Minamata city of Kumamoto prefecture, a city in the west coast of the southern part of Kyushu, where Chisso Corporation operated a chemical factory. The first patient was a 5-year-old girl, who manifested walking and speaking difficulties and convulsions. Two days later her sister was brought to the hospital as she suffered

from the same symptoms. House-to-house investigation revealed more such patients and the hospital doctor reported the discovery of an epidemic of an unknown disease of the central nervous system to the public health office. After conducting a series of research work, the medical team of the University of Kumamoto pin-pointed that the disease spread among those who had eaten fish and shellfish caught in the Minamata Bay. This led the researchers to believe that the disease was caused by some food poisoning with contaminated fish and shellfish.

A British physician, Archibald Douglas McAlpine, who visited Japan in 1958, suggested that Minamata symptoms resembled those of organic mercury poisoning. Investigation was focused on the mercury distribution in the Minamata Bay, mercury concentration in fish and shellfish caught in the bay and also on the mercury content in the hair of the patients. The result showed a high concentration of methyl mercury in those samples (2007, Ministry of Environment). The response by Chisso Corporation and the Ministry of Health and Welfare was slow to the scientific research result and the firm attempted to mitigate the protest of the Minamata patients through the payment of small amount of “sympathy money” and the Government ordered the firm to install a wastewater purifying system. It had been known to the firm that their plant to produce acetaldehyde acetic acid, using mercury as a catalyst, discharged methyl mercury with its industrial wastewater into the river flowing to the Minamata Bay. For a period of ten years from 1959, when the first “sympathy money” was paid and the Cyclator wastewater purifying system had been installed, till 1969, when the legal action against the firm had started, the Minamata case did not attract nation-wide attention and the case continued to be a local problem. The Cyclator wastewater treatment eventually proved ineffective and the firm continued polluting the river and the bay with discharge of methyl mercury. Finally in September 1968 the Government issued an official statement with respect to the cause of Minamata disease. It read that the disease was a central nervous system disorder caused by poisoning through long-term consumption in large quantity of fish and shellfish from Minamata Bay. The causative agent of poisoning was methyl mercury produced in the acetaldehyde acetic acid facility of Shin Nihon Chisso Minamata factory, which discharged the causative agent in the factory wastewater. It took twelve years from the discovery of the disease to the Government’s statement, which admitted the cause of the disease. It was unfortunate that the sudden change of the attitude of the Government was prompted by the spreading of the same disease in Niigata Prefecture, a northern city facing Japan Sea. The polluting factory was the one operated by Showa Denko, a chemical company producing acetaldehyde acetic acid by employing the same process as Chisso in Minamata. This was what they called “2<sup>nd</sup> Minamata disease” and it was discovered in June 1965.

In addition to Yokkaichi asthma, 1<sup>st</sup> Minamata disease, and 2<sup>nd</sup> Minamata disease, there was another pollution-related disease named “ouch-ouch disease”. The disease was named after the patients’ cry of “ouch, ouch”. It was caused by cadmium poisoning, which made the bones of the patients weak and brittle to cause acute pain. The case took place near Kamioka Mine of Toyama Prefecture, where Mitsui Mining and Smelting operated mining of lead, copper and zinc. As a large scale operation started in 1910, cadmium was released to Jintsu River in significant quantities. The water from the river was used for irrigation of rice fields and also for drinking water by those who lived in the downstream. The cadmium accumulated in the bones of those who had eaten cadmium-absorbed rice and drunken cadmium-containing water. The causes of the poisoning were not well understood and it was

thought to be a regional disease due to the lack of vitamin D or a type of bacteria. It was only in 1955 that a physician and his colleagues suspected cadmium as the cause of the disease. Toyama prefecture local government also started an investigation in 1961 to determine that the Mitsui Mining and Smelting Kamioka Mining Station had caused the cadmium pollution. In 1968 the Ministry of Health and Welfare issued a statement that Itai-itai disease had been caused by the cadmium poisoning. These diseases were called “four big pollution diseases”.

#### **4. PPP and EPR**

In Japan the Law Concerning Waste Matter and its Cleaning, which was enacted in 1954, was originally intended to facilitate the waste management of household waste and guarantee the safety and the quality of drinking water. It was hardly effective as an instrument to control the industrial waste. After the four big pollution diseases were widely publicized, pressure of the public opinion increased to replace the obsolete Law Concerning Waste Matter and its Cleaning with a new law empowered with the authority to manage and control industrial waste. The Diet Sessions in December 1970, during which the new Law Concerning Management and Cleaning of Waste Matter was enacted, was often referred to as “pollution Diet”. The new Law introduced a legal framework, which was able to enforce the industries to control all types of industrial waste, solid, liquid as well as gaseous at their cost. By this law PPP principles were established. However, the law had to be repeatedly amended and revised in order to solve the problems arising from the waste of end-of-life consumer durables. No individual household had a back yard wide enough to store abandoned vehicles and electric home appliances. The emitters of industrial waste were organized firms, who themselves were capable of managing their industrial waste or entrusting its management to a waste management firms licensed by the local authorities. Individual consumers, however, had only to rely on someone, who could remove the end-of-life vehicles and electric home appliances somewhere out of their sight. Such uncontrolled removal of end-of-life vehicles and electric home appliances resulted in another type of environmental problems. Before the 1998 revision of the Law Concerning Management and Cleaning of Waste Matter there was no specific regulation concerning the waste management for such an item as shredder dust from end-of-life vehicles as such.

In 2001 the legislation to protect environment was separated from the Ministry of Health, Labour and Welfare and the new Ministry of Environment was established. A series of legislation established the following recycling laws: 1.the Law for Recycling of Specified Kinds of Consumer Electric Goods, 2.the Law for Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources, 3. the Law for Promotion of Sorted Collection and Recycling of Containers and Packaging, 4. the Law concerning Recycling, etc. of Materials from Construction Work, and 5. End-of-Life-Vehicles Recycling Law, which started in January, 2005. Just as the Law Concerning Management and Cleaning of Waste Matter institutionalized the PPP or Polluters Pay Principles, a series of recycling laws established Extended Producers Responsibility (EPR).

Although it took three decades from the revealing of the negative externalities resulting from industrial activities and their harmful effect on the health and amenities of the people to the establishment of PPP and EPR principles, the market economy somehow managed to establish legal as well as practical foundations to save the environment from the destruction, except for global warming problems.

## 5. Global Warming

Heat is transmitted through conduction, convection and radiation. Since there is no material between the sun and the Earth, the heat from the sun is transmitted to the Earth through radiation. The Earth reflects about 30% of the incoming solar radiation and 70% is absorbed to warm the land, oceans and atmosphere. While the surface of the Earth is warmed by radiation of the sunlight, the Earth also radiates the energy from its surface back to the space and as a result equilibrium of the Earth temperature is maintained. Certain molecules in the atmosphere, reacting to the sun light, emit far-infrared rays both upward to the space and downward to the Earth surface. The downward radiation of far-infrared rays emitted by the atmosphere is referred to as “greenhouse effect” and the gaseous material, which contributes to the greenhouse effect, is called “greenhouse gas (GHG)”. The warming mechanism in a greenhouse is not the same as the warming mechanism of this downward radiation. However, the phenomenon is so named, because the metaphor is plain and easy to understand. The intensity of the downward radiation is expressed by a term “radiative forcing”, according to United Nations Environmental Programme (2007 UNEP). Among various GHG’s carbon dioxide has a relatively high value of radiative forcing, which is estimated at 1.46 (2001 Intergovernmental Panel on Climate Change =IPCC).

It is rather surprising to note that the discovery of greenhouse effect was much older than common-sense-wise imagined. The discovery of the phenomenon can be traced back to the beginning of the 19<sup>th</sup> century. Joseph Fourier, a French mathematician well known for his discovery of Fourier Transform, wrote in an essay published in 1827 that the atmosphere might increase the surface temperature of the Earth. He established the concept of energy equilibrium of the Earth, i.e., the Earth receives energy from the sun that causes temperature to increase and the Earth also loses energy by the infrared radiation outward. Equilibrium is reached between heat gain and heat loss. Beginning with work by Joseph Fourier, scientists had understood that gases in the atmosphere might trap the heat received from the sun. Although the theories and data which were available to 19<sup>th</sup> century scientists were too poor to allow an accurate calculation, the physics straightforwardly showed that a bare rock on the Earth, which is 147 million kilometer distant from the sun, should be far colder than it actually is. Svante Arrhenius\*, Swedish scientist, was attracted by the riddle of the prehistoric ice ages. In 1896 Arrhenius completed a numerical computation which suggested that cutting the amount of carbon dioxide in the atmosphere by half could lower the temperature in Europe 4 to 5 degree Celsius, i.e., to an ice age level (2003, Weart:3-2).

Almost half a century elapsed since Arrhenius attempted to measure the quantitative relationships between warming effect of carbon dioxide and its concentration in the air, an English engineer, Guy Stewart Callendar, took up the subject and evaluated the past measurements of atmospheric carbon dioxide concentrations. He concluded that over the past hundred years the concentration of the gas had increased by about 10%. This rise, Callendar pointed out, could explain the global warming trend, which had already been observed in those days.

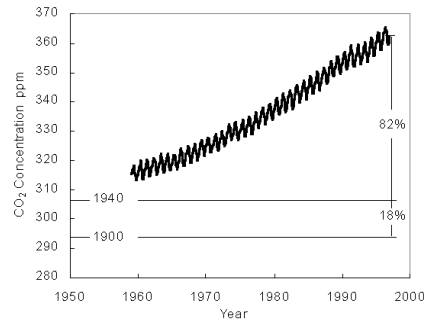
(2007,Weart). More recent scientific contribution to this subject would be the one by Roger Revelle, who proposed and designed new scientific experiments to collect samples of the carbon dioxide concentrations high in the Earth’s atmosphere from various locations every day for many years. Revelle took advantages of International Geophysical Year to begin in 1957 and established the research station at Mauna Loa, 4169m above sea level

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\* Svante Arrhenius won the Nobel Prize in Chemistry in 1903 for his contribution to the discovery ion of particles.

volcano in the island of Hawaii, which has been recording the carbon dioxide concentration since 1958. Revelle is a scientist with particular importance as he has strongly influenced a world leading political figure, Al Gore (2006, Gore: 38).

The carbon dioxide concentration measured in terms of PPM at Mauna Loa is shown in the following figure:



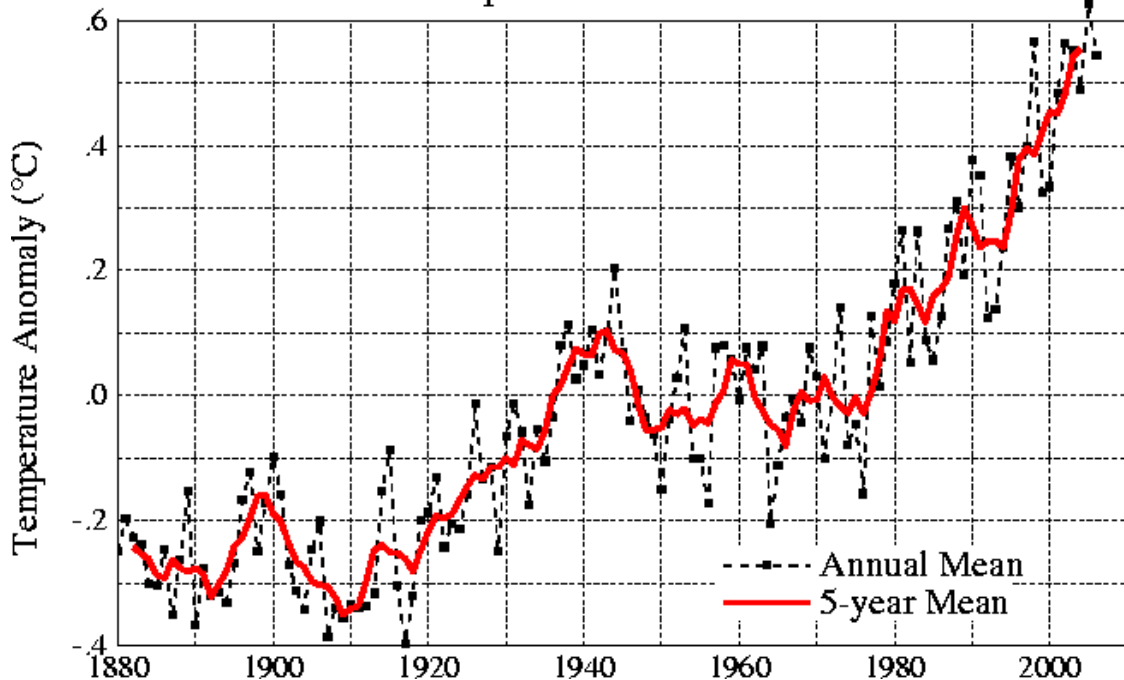
Source: 2006, Gore: 36-37 and <http://www.oism.org/pproject/s33p36.htm> (last visited June, 2007)

The serrate line is due to the result of annual seasonal cycles of carbon dioxide absorption and emission by the plants. During summer plants more absorb than emit carbon dioxide and during winter *vice versa*.

According to the Fourth Assessment Report issued by IPCC on May 4, 2007 (2007 IPCC), GHG, namely, carbon dioxide, methane and nitrous oxide have increased markedly as a result of anthropogenic activities. The report shows a long term trend since 1750. The gas concentration of the 18<sup>th</sup> century is measured from the air trapped in the ice core sample cut from the Antarctic. The amount of carbon dioxide in the atmosphere in 2005 was 379 ppm, which exceeds by far the natural range of the last 650,000 years, which was 180 to 300 ppm. The primary source of the increase in carbon dioxide is fossil fuel consumption.

Scientifically observed data clearly show that the Earth surface temperature has been steadily increasing with the increasing concentration of carbon dioxide. The following figure shows global annual mean surface temperature change since 1880.

## Global Temperature: Land-Ocean Index



Source: NASA Goddard Institute for Space Studies, New York, NY

<http://data.giss.nasa.gov/gistemp/graphs/> (last visited June, 2007)

The Fourth Assessment Report issued by IPCC on May 4, 2007 (2007 IPCC) continues that warming in the last 100 years has caused about 0.74 degree Celsius increase in global average temperature. The urban heat island effects were determined to have negligible influence and the ocean has been absorbing more than 80% of the heat added to the climate system and that ocean temperatures have increased to the depth of at least 3000m. Losses from the land-based ice sheets of Greenland and Antarctica have contributed to sea level rise between 1993 and 2003 with more than 90% probability. There has been an increase in hurricane intensity in the North Atlantic since 1970's and that increase correlates with increases in sea surface temperature. Hurricane intensity will be increased during the 21<sup>st</sup> century with probability of more than 66%. Ocean warming causes seawater to expand and it will contribute to sea level rising. Sea level rose at an average rate of about 1.8mm per year during the years 1961 to 2003 and the rise in sea level during 1993 to 2003 was at an average rate of 3.1mm per year. It is not clear whether this was a long-term trend or just variability. The Antarctic sea ice shows no significant overall trend, consistent with a lack of warming in that region.

A large area of heavily populated regions will be inundated by rising sea water level and the global warming will affect the world vegetation to distort food supply conditions causing large scale famine. Both phenomena will be serious enough as the potential causes of armed conflicts on the planet. According to the data provided by Carbon Dioxide Information Analysis Center (2007 CDIAC) the annual emissions of carbon dioxide by region in terms of the weight of carbon are estimated for 2000 as follows:

Region	
USA and Canada	1600
Western Europe	900
China	800
Eastern Europe and Russia	800
India and South East Asia	700
Australia, Japan and Pacific	400
Unit: million metric tons	
Year: 2000	

Source: 2007 CD IAC

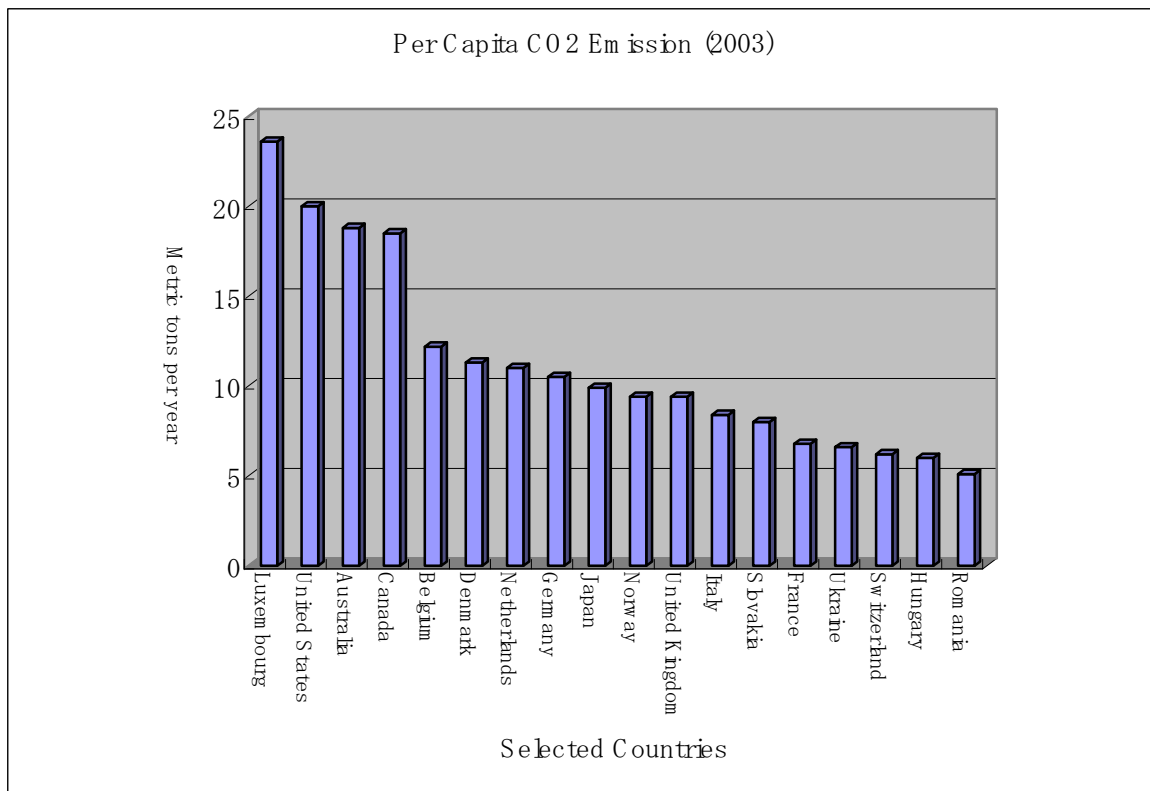
The CDIAC data are detailed and converted into country by country per capita basis and such conversion is publicized on internet (2007 United Nations Statistics Bureau).

The following table shows time series data of per capita carbon emissions of selected countries for a period from 1990 to 2003.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
USA	18.9	18.7	18.4	19.3	19.5	19.3	19.4	20.2	19.8	19.9	20.4	20.1	20	19.8
Aust	16.2	15.4	15.8	16.0	16.3	16.5	17.4	17.2	17.8	18.4	18.3	19.1	18.2	18
Canada	15.0	14.7	14.8	15.1	14.3	15.3	15.3	16.2	15.3	15.6	16.2	16.0	17.1	17.9
Japan	8.7	8.8	8.9	8.7	9.1	9.1	9.3	9.3	8.9	9.2	9.5	9.4	9.5	9.7
U.K.	10.0	11.3	9.9	9.6	9.5	9.5	9.9	9.3	9.2	9.2	9.5	9.6	9.3	9.4
France	6.4	6.8	6.3	6.2	5.7	6.0	6.4	5.9	6.4	6.1	6.0	6.3	6.2	6.2
China	2.1	2.2	2.2	2.3	2.5	2.6	2.7	2.7	2.5	2.2	2.2	2.3	2.7	3.2

Unit: metric tons

A graphic presentation of the selected countries on a basis of the above table for 2003 is shown under.



## 5. An Ethical Analysis of PPP, EPR and Global Warming

The negative externalities of industrial activities have been solved to a certain extent through the institutionalization of PPP and EPR. The global warming, however, still remains as a serious ethical challenge and the world indeed confronts an Inconvenient Truth (Gore 2006). The boundaries of such negative externalities as have prompted PPP and EPR were limited. Compensation for damages could be argued in terms of the relationship between the victims and those who caused injury. In this respect the Coase Theorem could still be applicable if modified to evaluate the loss of clean air, for example, at the value high enough to force the manufacturer to develop a technology which reduces contamination of the air.

In the global warning the whole human beings are the victims and the injurers at the same time. There are no payers or payees of compensation. We are held at bay and yet we must make decisions. Decisions are not matters of science, but of ethics. Before going into an ethical argument, let us have a look at the two principal theories, namely, consequentialism and deontology. In terms of consequentialism, before we decide, we must consider harms and benefits of our actions. The reduction of harms will be possible, provided that the level of technology and scientific knowledge remains as it does, only through the reduction of the present manufacturing, agricultural, extracting, fishing and other industries. The reduction of production level will force the level of consumption to be lower and this will reduce the benefits. This means that harms can be reduced only at the sacrifice of benefits. Furthermore, we must take into consideration that our actions will constrain the choices of our descendants. Carbon dioxide lasts for a long time in the atmosphere. Heat added to the ocean will remain for centuries. How could we convince the people that production and consumption must be reduced in order to realize a sustainable world? The reduction of consumption means lowering their standard of living. A crisis is approaching but the majority of the world optimistically thinks that it is still far away. A

boat slowly is moving toward a waterfall, but the rowers do not hear yet the roar of water falling down the cascade.

A possible solution would be found only when higher level of science and technology make it possible to manufacture an electric generator, which emits less carbon dioxide. Nuclear power plants would one solution. France is the lowest emitter of carbon dioxide among industrial countries, because the nation derives 75% of electricity from nuclear power stations. A hybrid car emits much less carbon dioxide and its fuel efficiency is much higher than ordinary gasoline car. Less energy consuming type machines, both in productive equipment and consumer durables will reduce the load on power plants, which are the major emitters of carbon dioxide. A change in life style, such as less frequent long distance travel, will reduce fuel consumption of airliners. More use of mass transportation than passenger cars will contribute to less consumption of energy. An American web-site called "Carbon Footprint" offers an on-demand data table to tell the people how one can contribute to reducing carbon dioxide emission by changing his life style. The site defines "global warming" plainly and simply as follows: "Global warming is the name given by scientists for the gradual increase in temperature of the Earth's surface that has worsened since the industrial revolution." \*

All in all the role of opinion leaders, especially of those who are politically in power is getting increasingly more important. Those leaders must address the public opinion of the world that we are held at bay and decisions and actions must be now taken in the direction of less carbon dioxide emission. This paper will be concluded with the following quotation from Al Gore:

I had the opportunity, as a member of the Clinton-Gore administration, to pursue an ambitious agenda of new policies addressing the climate crisis.....In 1997 I helped achieve a breakthrough at the negotiations in Kyoto, Japan, where the world drafted a groundbreaking treaty whose goal is to control global warming pollution. But then I came home and faced an uphill battle to gain support for the treaty in the U.S. Senate. In 2000 I ran for president. It was a long and hard-fought campaign that was ended by a 5-4 decision on the Supreme Court to halt the counting of votes in the key state of Florida. This was a hard blow. I then watched George W. Bush get sworn in as president. In his first week in office, President Bush reversed a campaign pledge to regulate CO<sub>2</sub> emissions---a pledge that had helped persuade many voters that he was genuinely concerned about matters relating to the environment. Soon after the election, it became clear that the Bush-Cheney administration was determined to block any policies designed to help limit global-warming pollution. They launched an all-out effort to roll back, weaken, and ---wherever possible---completely eliminate existing laws and regulations. Indeed, they even abandoned Bush's pre-election rhetoric about global warming, announcing that in the president's opinion, global warming wasn't a problem at all. (Gore, 2007: 8-9)

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