How to Mitigate the Environmental Impacts of the Productive Sectors and of the Cities

Fernando Alcoforado*

Accepted 14th June 2018

Abstract

This article aims to show how to mitigate the environmental impacts of the agricultural, livestock, industrial and oil sectors, the thermoelectric, hydroelectric and nuclear power plants, the road, rail, air, waterway, maritime and pipeline transport sector and of the cities.

Keywords: Environmental Impacts of the Productive Sectors and of the Cities. How to Mitigate Environmental Impacts

1.0 Introduction

At the UN meeting (COP 22) in Marrakech, Morocco, it was negotiated the first steps of the rules of the Paris Agreement (COP 21) that brought together global efforts to curb climate change on the planet that can be catastrophic if nothing is done to mitigate it. With the objective to establish rules to formulate a model of development that does not harm the climate system, more than 190 countries concluded the so-called Paris Agreement in December 2015.

In less than a year, the document came into force after more than 55 of those nations responsible for at least 55% of global emissions, have transformed the text into national laws. Countries discussed in COP 22 ways to achieve their goals. The purpose of the conference was to detail measures that each national state will have to adopt in their territories to curb climate change. By the Agreement, each country has specific goals to meet to do their part against global warming. To achieve the success necessary in the fight against global climate change, it is necessary to mitigate the environmental impact of human activities. These environmental impacts occur:

1) in the agricultural and livestock sector;
2) in the industrial sector;
3) in the oil sector;
4) in the thermoelectric plants;
5) at hydroelectric plants;
6) in nuclear power plants;
7) in the road, rail, air transportation, waterway, maritime transport and duct transport sector; and
8) in the cities. The environmental impacts of each of the productive sectors and cities and how to mitigate them are presented in the following chapters.

2.0 Environmental Impacts of Agriculture and Livestock

The agriculture and livestock activity generates the following environmental impacts:

1) Erosion of the soil;
2) Desertification;
3) Silting of watercourses;
4) Contamination of soil and water by pesticides, fertilizers, veterinary drugs, detergents and oils, agricultural waste and other organic waste and pathogenic micro-organisms;
5) Monoculture;
6) Reduction of biological diversity;
7) Cultivation of genetically modified organisms;
8) Decrease in areas of native vegetation;
9) Deforestation;
10) Burning and CO2 emissions;
11) Overcrowding and pasture degradation;
12) Methane emission by livestock.

The environmental impacts of agricultural and livestock activities can be eliminated or minimized with the adoption of sound environmentally government policies and supervisory measures and punishment of those responsible for non-compliance.

Some waste can be reused or recycled through the reverse logistics. The main environmental impacts of agriculture and livestock that contribute to global warming and consequent climate change are deforestation, burning for pasture farming and consequent CO2 emissions and methane emission by livestock. The contribution of global agriculture to the emission of greenhouse gases is estimated at 36%. Measures should be taken to combat deforestation and fires to form pastures to prevent the emission of greenhouse gases and restrict the population growth of livestock to reduce methane emissions. Measures must be taken to combat deforestation and burning for pasture formation to prevent the emission of greenhouse gases and restrict the growth of the cattle population to reduce methane emissions.

**3.0 Environmental Impacts of Industry**

It is very varied industrial production process which creates wide variety of solid, liquid and gaseous waste. Different are industries and also the processes that they use and waste resulting. The release of waste or "not needed" product in the industry for the environment may cause pollution of air, water and soil. The industry has contributed to air pollution and improper and illegal discarded material in illegal sites that has caused considerable soil pollution and contaminating surface water and groundwater (aquifers). The contribution of the global industry to the emission of greenhouse gases is estimated at 19%. The environmental impacts of industrial activity can be eliminated or minimized with the adoption of environmentally sound government policies and supervisory measures and punishment of those responsible for non-compliance. Some waste can be reused or recycled through the reverse logistics. The environmental impacts of the mining industry waste can be eliminated or minimized by the end of this productive activity or reducing consumption of their products with the use of metal products already used and discarded based on reverse logistics which is presented in Chapter 10.

**4.0 Environmental Impacts of the Oil Sector**

The oil sector accounts for 75% of carbon dioxide released to the atmosphere, 41% of lead, 85% of sulfur emissions and about 76% of nitrogen oxides. The consumption of petroleum products by the transport sector (cars and trucks) is the one with the largest contribution to the degradation of the environment at local and global level. It is estimated that 50% of the hydrocarbons emitted in urban areas and approximately 25% of the total emissions of all carbon dioxide generated in the world, result from activities with transportation systems One of the most complex and larger impacts of the oil sector emissions are global problems related to climate change. The accumulation of gases such as carbon dioxide in the atmosphere, accentuates the natural greenhouse effect of terrestrial ecosystem to the point of breaking weather patterns that affect human life, animals, fish, agriculture, vegetation, etc. The environmental impacts of the oil industry can be eliminated or minimized by reducing the consumption of oil products that must involve the use of substitutes for gasoline and diesel in the transport sector and fuel oil in the industry. Among the substitutes for gasoline and diesel in the transport sector can be mentioned ethanol and biodiesel in the short term and hydrogen in the medium and long term. The substitute of fuel oil the most appropriate would be natural gas because it is the cleanest fossil source of the fossil fuels. All these measures can contribute decisively to reducing the emission of greenhouse gases and minimizing global warming and consequent climate change.

**5.0 Environmental Impacts of Thermal Power Plants**

The production of electricity in thermal power plants worldwide is about one-third of carbon dioxide anthropogenic emissions, followed by emissions from transport and industry. The main fuel used in the world are coal, petroleum and, increasingly, natural gas. There are other types of power plants that burn waste biomass (wood, bagasse) and even urban waste. It is also worth noting that there has been a lot of progress with respect to increasing the efficiency of power plants by introducing cogeneration technologies and gas turbines. The coal gasification facility, wood and agricultural residues offer new opportunities for more efficient power plants and with less impact on the environment than conventional. The environmental impacts of thermoelectric power plants can be eliminated or minimized by replacing fossil fuels with biomass and power plants by hydroelectric and wind power plants. All these measures can contribute decisively to reducing the emission of greenhouse gases and minimizing global warming and consequent climate change.

**6.0 Environmental Impacts of Hydropower Plants**

Often reference is made to hydroelectricity as a "clean" source and low environmental impact. Although the construction of reservoirs, large or small, has brought huge benefits to several countries, helping to regulate floods, promote irrigation and navigability of rivers, they also bring irreversible environmental impacts. This is especially true concerning large reservoirs. There are problems with changes in the chemical composition and properties of water, changes in temperature, sediment concentration, and other modifications which cause problems for the maintenance of large ecosystems downstream reservoirs. These hydropower plants, even well-controlled, have had impacts on maintaining the diversity of species (fauna and flora) and affected the density of fish stocks, changing reproduction cycles. The dams can also contribute to forest destruction, as well as affecting populations living in areas subject to flooding. The environmental impacts of hydropower plants can be eliminated or minimized with the implementation of hydroelectric plants of small and medium size distributed over several rivers and the use of renewable energy sources (solar, wind and biomass) in the generation of electricity.

**7.0 Environmental Impacts of Nuclear Power Plants**

Nuclear power plant is one that more has drawn attention with their impacts on the environment and human health. There are three main environmental problems of this energy source. The first is the handling of radioactive material in the nuclear fuel production process and in nuclear reactors, with risks of spills and accidents. The second problem is related to the possibility of illegal deviations of nuclear material for use in weaponry, for example, enhancing proliferation of nuclear risk. Finally, there is the serious problem of storage of radioactive waste from power plants. There have been substantial progress in the development of
technologies that reduce the risk of radioactive contamination by accident with nuclear reactors, considerably increasing the safety level of this type of plant, but do not have yet satisfactory and acceptable solutions to the problem of final disposition of nuclear waste. The environmental impacts of nuclear power plants can be eliminated by replacing it with hydroelectric, wind and thermal power plants using biomass.

8.0 Environmental Impacts of Transport Sector

There are six modes transport:

1) Highways;
2) Railways;
3) Air transport;
4) Waterways;
5) Maritime transport;
6) Transport by ducts.

Worldwide, the transport sector is responsible for 23% of global greenhouse gas emissions. Gas emissions in the transportation sector are increasing more than those of other sectors related to energy consumption, with cargo transport increasing more than the passengers. 90% of goods are transported by the oceans. Navigation contributes less than 10% of transport sector emissions.

Environmental Impacts of Highways:

1) Large polluting effect of the gases released from the tailpipes of cars and trucks;
2) Withdrawal and transfer of huge amounts of land;
3) Deforestation;
4) Changes in the form of water drainage;
5) Siltation of rivers;
6) Construction of bridges for crossing biomes; and,
7) Urban expansion.

The environmental impacts of highways can be minimized with the production of more efficient vehicles, use of electric car, the replacement of gasoline and diesel oil by alcohol, biodiesel and hydrogen in vehicles, the route of highway projects less harmful to the environment and their replacement by railways and waterways where is possible to reduce the consumption of diesel fuel and combat global warming. All these measures can also contribute decisively to reducing the emission of greenhouse gases and minimizing global warming and consequent climate change.

Environmental Impacts of Railways:

1) Deforestation;
2) Land removal for leveling the rails;
3) Changes in the form of water drainage;
4) Devastation of areas already benefited for agriculture and livestock; and,
5) Building of bridges for crossing biomes.

The environmental impacts of railways can be minimized with the use of more efficient locomotives and powered with electricity, elaboration of rail projects less harmful for agriculture and livestock and to the environment and deployment of waterways where is possible because it is the most economical alternative as transport modal.

Environmental Impact of Air Transport:

1) The environmental impact of aviation is because aircraft engines emit noises, particles and gases that contribute to climate change;
2) The aviation industry also contributes to emissions from internal vehicles used in operation of airports and those used by passengers and staff who go and come back to airports, as well as the emissions generated by the production of energy used in buildings of airports, aircraft manufacturing and construction of airport infrastructure;
3) The airline industry accounts for about 2% of carbon dioxide emissions in the world, with forecast that this figure will grow to 3% by 2050; and,
4) The greenhouse gas emissions from aviation increased by 87% between 1990 and 2006.

The environmental impacts of aircraft can be minimized with the project design of more efficient aircraft and powered by solar energy and by hydrogen, more efficient motor vehicles that use alcohol and biodiesel for use in operation of airports and by passengers in their movements and projects of airport infrastructure away from urban areas to minimize noise impact and that uses renewable energy (solar, wind and biomass). All these measures can also contribute decisively to reducing the emission of greenhouse gases and minimizing global warming and consequent climate change.

Environmental Impacts of Waterways:

1) Risk of injury to the vessel;
2) Transport of dangerous goods; and,
3) Outpouring of fuel (oil products and alcohol) and chemical loads in waterways that cause major environmental impacts and immeasurable damage to the ecosystems of the spill area of influence, besides endangering human health through contamination of soil and of water.

The environmental impacts of waterways can be minimized by making more efficient vessels and powered by biodiesel to replace diesel that can also contribute to reducing the
emission of greenhouse gases and minimizing global warming and consequent climate change.

**Environmental Impacts of Maritime Transport:**

1) Transport of dangerous goods;
2) Outpouring of fuels and chemical loads;
3) Ballast water spill;
4) Hydrocarbons and spill of oily water;
5) Wastewater Spill;
6) Spillage of water ashes;
7) Solid waste; and,
8) emissions from engines (CO2, NOx, SO2 and particulate matter).

The environmental impacts of maritime transport can be minimized by taking measures that minimize problems with the transport of dangerous goods, avoid the spillage of liquid substances and wastes with the operation of ships and ensure the collection, transportation and final destination of solid waste from the operation of ships and by making more efficient vessels powered by biodiesel to replace diesel. These measures can also contribute to reducing the emission of greenhouse gases and minimizing global warming and consequent climate change.

**Environmental Impacts of the Transport by Ducts:**

1) Land movement caused by making cuts and embankments;
2) Removal of vegetation, implementation of construction sites, trench digging, cutting and construction of embankments, landslides;
3) Generation of various waste;
4) Interferences on Forest Remnants;
5) Interferences on Wildlife;
6) Siltation of Water Bodies;
7) Intensification of Erosive Processes;
8) Increase Potential Geotechnical Risk;
9) Changing of Land Use Due to Constraints of Use of Duct Ranges;
10) Interferences on Hydraulic Infrastructure, Energy and Road; and,
11) Interferences on Road Flow of Municipalities of the Hinterlands. The pipelines enable the transport of 1) Oil and its derivatives (oil pipelines); 2) Natural gas (gas pipelines);
3) ore, cement and grains (mineral pipelines or polyducts); 4) Coal and solid waste (mineral pipelines); 5) Wastewater - wastewater (sewage ducts); and, 6) Drinking Water (water pipes). The environmental impacts of pipelines can be minimized by the development of pipelines projects less harmful to the environment.

**9.0 Environmental Impacts of Cities**

Environmental impacts of cities:

1) Noise Pollution;
2) Visual pollution;
3) Air pollution;
4) Deforestation;
5) Excessive water consumption and waste;
6) Pollution of water sources due domestic and industrial waste;
7) Frequent vehicle congestion;
8) Disorderly occupation of urban land; and,
9) Building skyscrapers.

Environmental impacts in the cities can be eliminated or minimized with the adoption of effective public policies to eliminate the 9 environmental impacts described above as well as urban planning based on the principles of sustainable cities that assumes the rational reorganization of spaces, the elimination of diseconomies of agglomeration, obtaining energy savings in buildings, industries and transport in general and greater efficiency in motor vehicles and equipment for domestic and industrial uses, replacing gasoline with ethanol and diesel in motor vehicles, the use of electric cars, getting lighting economy, cooling and heating in buildings, modeling of industries in order to require a minimum of energy resources and raw materials, including for energy self-generation using waste of the production processes, use of new transportation alternatives from the bike to those high capacity based on railways as the VLT and subway, among other initiatives, combat the pollution of land, air and water in cities, reducing waste with recycling of materials currently used and discarded based on reverse logistics and reducing social inequalities.

These measures can also contribute to reducing greenhouse gas emissions from cities that are responsible for the emission of 75 to 80 percent of all greenhouse gases from human activities and to minimize global warming and consequent climate change.

**10.0 The Reverse Logistics for Recycling of the Materials Used and Discarded**

Every human enterprise generates environmental impact to a greater or lesser extent, being in its implementation and in its operation. Among the environmental impacts, include...
the waste disposal during implementation and operation of the projects described below:

- Highways, railways, ports, airports, oil pipelines, gas pipelines, mineral ducts, trunks collectors and sewage outfalls
- Plants for electricity generation, whatever the source of primary energy, including the installation of wind farms
- Electric power transmission lines
- Hydraulic works for sanitation purposes, drainage, irrigation, course correction water, transposition of basins, navigation channels, dams, dikes
- Fossil fuel extraction (oil, shale, coal, natural gas) and mining on land and at sea
- Air transport, maritime transport, road, rail, waterway and pipeline
- Landfills, processing and disposal of toxic or dangerous waste
- Complexes and industrial plants (petrochemical, steel, chlorochemicals) and agribusiness (alcohol distilleries, coal, extraction and cultivation of water resources)
- Industrial Districts and strictly industrial zones
- Agroindustry production
- Economic exploitation of wood or firewood
- Urbanistic projects

The discarded products and waste from these projects can be solid, liquid and gaseous. To combat pollution of land, air and water in the city and in the countryside, it is necessary to make the recycling of products currently used and discarded and of waste. In this perspective, the products currently used and discarded when used in various applications, should be primarily recycled to form a new product using the reverse logistics (RL), second, burnt in order to extract all containing energy, especially in the case of gaseous waste, and only ultimately must be removed to a landfill in the case of solid waste and thrown into lakes, rivers and ocean after proper treatment in the case of liquid waste.

10.1 The Concept of Logistics

Logistics is a branch of Management whose activities are focused on planning for storage, circulation (land, sea and air) and product distribution. One of the most important goals of logistics is to create mechanisms to deliver the products to the final destination in the shortest possible time, helping to reduce costs. For this, should be studied circulation routes, means of transport, storage sites (deposits) and other factors that influence the logistics.

With the globalization of capital, especially since the Industrial Revolution, logistics has become increasingly important for companies in a competitive market. This occurred because the amount of produced and consumed goods rose sharply, as well as world trade. Today, with the globalization of the economy, logistics knowledge is of fundamental importance for companies. In recent years, the Business Logistics is undergoing constant evolution, and is considered one of the main elements used in the preparation of strategic planning, and is often responsible for huge generation of competitive advantage of companies.

10.2 the Concept of Reverse Logistics

From the 1990s, with the constant concern about the use of natural resources and the accumulation of industrial wastes in large cities, large companies have been blamed by society for this problem. Large organizations now have a new concern. How might be possible to solve this problem without generating higher costs and expenses? With the advent of this scenario came the concept of Reverse Logistics.

It is defined as reverse logistics, the area that plans, operates and controls the flow and logistics of information corresponding to the return of goods after-sales and post-consumer business cycle or the production cycle through the Distribution Channels reverse, adding value to them of various kinds: economic, ecological, cool, competitive, corporate image, among others.

While Traditional Logistics deals with the flow of manufactured products to the customer, Reverse Logistics is the return of products, materials and parts from the final consumer to the production process of the company. Due to severe existing environmental legislation and also the great influence of society and non-governmental organizations, companies are adopting the use of a higher percentage of recycled material to its production process, and also began to adopt procedures for the proper disposal of products which cannot be reused or recycled.

The RL is the area of logistics, that is, so the return of products, packaging or materials to their production center, as is shown in Figure 1 below. The RL in the recycling process causes the material to return to different production centers in the form of raw material. Reverse logistics management activities provide for the reuse and removal of waste and management of returns.

In many companies, it has been shown that a small investment in the management of reverse logistics results in substantial savings. The Reverse Logistics is the last frontier in cost reduction. Reverse logistics applies to all physical flows reverse, ie from the consumption point to the origin or deposition in site safe of packaging, product at end of life, returns, etc., having the most varied application areas.

The reverse of physical flows are linked to new industries of product reuse or materials in end of life cycle, such as waste and debris, processing of certain types of waste, damaged goods or claim object and consequent return, return used packaging and to recycle, vehicles and other equipment at end of life.

Businesses encouraged by ISO 14000 and concerned with environmental management, also known as "green logistics", began to recycle materials and disposable packaging such as...
10.3 Applications of reverse logistics

The main issue of Reverse Logistics is the feasibility of the return of goods through its reintegration into the production cycle or business and for this to occur, it is necessary to develop in first step the analysis of post-sale of goods and post-consumer in order to define the status of these assets and determine the process which must be submitted. Materials can return to the supplier or may be resold if they are still appropriate marketing conditions. In addition, goods can be reconditioned or recycled. Therefore, a product is only disposed in the latter case.

Reverse Logistics After Sales is the Reverse Logistics area of activity that is concerned with addressing and operation of the physical flow and related logistics information after sales of goods unused or little use that for different reasons return to different links in the direct distribution chain, which constitute a part of the Reverse channels through which flow these products. Its strategic goal is to add value to a logistics product that is returned for commercial reasons, errors in the processing of claims, warranty given by the manufacturer, defects or malfunctions in the product, breakdowns in transportation, among other reasons.

In turn, the Reverse Logistics Post-consumption is a practice area of reverse logistics that equates and operationalize the physical flow and related information post-consumer goods discarded by society in general returning to the business cycle or the cycle production by specific reverse distribution channels. constitute post-consumer goods products in end of life or used with possibility of use and industrial waste in general. Its strategic goal is to add value to a logistics product consisting of unserviceable property to the original owner, or that still have conditions of use, for products discarded because they have reached the end of life and industrial waste. These post-consumer products may be originated from durable or disposable goods and flow of reverse channel reuse, dismantle, recycling to final disposal.

10.4 Benefits of Reverse Logistics

Financial and logistical gains are just some of the benefits that reverse logistics is able to provide. There are also gains to the institutional image of the organization to adopt an environmentally friendly attitude, attracting attention and preference not only of customers, but also the final consumers. Initiatives related to reverse logistics have brought considerable returns for companies. Savings with the use of returnable packaging or the reuse of materials for production have brought gains to encourage more and more new initiatives.

The reuse of materials is one of the processes that are part of the dynamics of reverse logistics, and is one of the aspects that have potential to add value to reusable materials in the reverse process. The use of reverse logistics as a means of competitive advantage is very important for the company. Obtaining competitive advantage is one of the main factors that lead organizations to implement the reverse process of distribution.

References


8. ROMEIRO, Ademar Ribeiro, REYDON, Bastiaan, LEONARDI, Maria Lucia, (org.) Economia do meio ambiente, Campinas, Instituto de Economia.


