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1. Sustainable development from economic, social and environmental point of view
2. Sustainable development in transport
3. Current situation and future goals of sustainable development in transport
Conclusion

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Abstract

The aim of this thesis is to align the role of transportation together with sustainable development to achieve sustainable transportation. Sustainable transportation aims to provide better and healthier ways of meeting individual and community needs while reducing the environment and social impacts of current mobility practise. Negative impacts on environment, economic growth and social equity have led to governments and other organisations to come up with policies and strategies to improve current unsustainable situation such as: traffic congestion, air pollution, climate change, transport cost, accessibility etc..

Transportation is a non-separable part of society, which is why working toward a sustainable future in transportation should be a responsibility of everyone.

Key words:

Sustainability, trasportation, climate change, social equity and mobility

Název:

Doprava a udržitelný rozvoj

Anotace

Cílem této diplomové práce je zarovnat roli dopravy spolu s udržitelným rozvojem k dosažení udržitelné dopravy. Udržitelné dopravy si klade za cíl poskytovat lepší a zdravější způsoby uspokojování potřeb jednotlivce a společenství zároveň snižuje životní prostředí a sociální dopady současné praxe mobilitu. Negativní dopady na životní prostředí, hospodářský růst a sociální spravedlnosti vedl k vládám a další organizace přijít s politiky a strategie ke zlepšení současné neudržitelné situaci jako například: dopravní zácpy, znečištění ovzduší, klimatické změny, nákladů na dopravu, přístupnosti atd. Doprava je bez oddělitelná část společnosti, která je proto pracovní směrem k udržitelné budoucnosti v dopravě by měla být odpovědnost každého.

Klíčová slova:

Udržitelný rozvoj, doprava, změna klimatu, sociální spravedlnost a mobilita

Contents

Introduction

The growth of civilization and globalisation is directly associated with the development of transportation system. Looking in historical, economical and social terms its agreeable that transport is the most important industry in the world.The development of transport in the past decades has increased to the better and to the worst at the same time. Through development of transport there has been a concern of enviromental quality and threat of climate change which have converged to produce a growing interest in the concept of sustainable development.

Transportation plays a major role in today's world and is an essential extension of almost any human activity. Concerns about the role of transportation in greenhouse gas emissions, fuel resource depletion, toxic pollution, as well as issues relating to transportation costs and the equity impacts of transportation have risen up. Thus, transportation sustainability must be addressed as a logical step toward overall sustainable development.

Whilst sustainable development tries to balances environmental, social and economic objectives.Cities and government in developed coutries have taken an initiative to promote sustainable transportation. Today sustainable development is viewed as a development that improves the standard of living and quality of life at the same time protecting and enhancing the natural environment. In the bachelor thesis sustainability is defined by many authors and the most relevant one which cover all base was the Brundtland Commission.

The concept of sustainability relates to the maintenance and enhancement of environmental, social and economic resources, in order to meet the needs of current and future generations.The primary focus of the thesis is to see the chanllenges of sustainnability and and provide the solution by coming up with measurements, goals and objectives.

1. Sustainable development in economic, social and environment form.

1.1 Definitions of sustainable development

Dictionary definition of sustainability, originate from the word 'sustain' which means: to support, hold, or bear up from below, bear the weight of, as a structure, able to be maintained at a certain rate or level.

Development means growth ,progress ,transformation.[1]

The word sustainability is derived from the Latin sustinere (tenere, to hold; sus, up). The word has more meanings and the familiar ones from dictionaries are ('to support, bear, hold, endure without giving way or yielding, undergo etc.).[2]

Dr. Veiderman definition of sustainability says: "sustainability is a vision of the future that provides us with the road map and helps us focus our attention on a set of values and ethical and moral principles by which to guide our actions."[3]

Nolberto Munier defines Development as "the gradual growth of something so that it becomes more advanced, stronger, etc. "Development is sustainable if it involves a non-decreasing average quality of life." Development means advancement in every area including: Economic growth, which involves economic progress, social progress, which facilitate attaining social equity and equality of opportunity for everybody, without social discrimination and environmental

[1] Dictionary definition of sustainability (sustain) and development: [online]. 2011.02.11 [cit.2012.03.08]. Found from: http://dictionary.reference.com/browse/sustainability

[2] Onions, Charles, T. (1964). The Shorter Oxford English Dictionary. Oxford: Clarendon Press. p. 2095.

[3] Dr. Veiderman definition of sustainability[online]. 2011.02.11 [cit.2012.03.08]. Found from:: http://www.interenvironment.org/cipa/viederman.htm

protection, ensuring that resources are healthily recoverable, so they can be enjoyed by the coming generation.[4]

Brundtland Commission, Sustainable development was defined as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[5] The term refers to achieving economic and social development in ways that do not exhaust a country's natural resources.

Sustainable development has been defined as "maintaining a delicate balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend.''

1.2 Brief history of sustainable development

Around 1970 sustainability became a big issue that concerned the earth and humans. With word sustainability came along the term sustainable development. In 1970 the UN held the first international Conference on the Human Environment in Stockholm, which brought together industrialized and developing nations to discuss the right of all humans to a healthy and productive environment.

The concept of **sustainable development** emerged from the post-War environmental movement, which recognised the negative impacts of human growth and development on the environment and communities.

In 1974, the term 'sustainable' had become a central issue in a document of another international organization. At a world conference in Bucharest (Science and Technology for Human Development) the ecumenical 'World Council of Churches' (WCC) discussed a new socio-ethical guideline. Partisans of a theology of liberation and ecologically minded advocates of a

[4] MUNIER, Nolberto. Introduction to sustainability: road to a better future. Dordrecht; New York: Springer, 2005. ISBN 1-4020-3557-8

[5] Sustainable Development: From Brundtland to Rio 2012: http://www.unece.org

spirituality of creation combined their forces and replaced the old WCC-formula "responsible society" by the new term "just and sustainable society".[6]

Using the biblical term 'husbanding', the conference stated "that the future will require a husbanding of resources and a reduction of expectations of global economic growth." It demanded the transition to a global welfare society, based on 'sustainability' within the next generation. The formation of this concept was further used In 1980, the 'International Union for the Conservation of Nature', an association of national states, environmental agencies and NGOs together with UNEP, the environmental programme of the United Nations, and the World Wildlife Fund, a non-governmental organization, published their 'World Conservation Strategy'. Under the patronage of the UN-General Secretary, this declaration was simultaneously presented in 34 capital cities around the world. Its title: "Living resource conservation for sustainable development."[7]

'Sustainable development' entered the global stage during the 1992 'Earth Summit' in Rio de Janeiro. The United Nations presented it as their strategic concept for shaping and indeed saving the future of the 'blue planet'. It promised to become the key-word for describing a new balance between the use and the preservation of nature's potentials and resources.[8] The Brundtland Commission, which paved the way to the Rio summit, had defined it in 1987 as "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[9]In the last two decades, the concept of 'Sustainable Development' has made a steep career as a political and social guideline for dealing with the planet's ecological and social crisis. The concept globally was introduced in 1987 by the World Commission on Environment and Development (so called Brundtland Commission).

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[6] History of sustainable development [online]. 2011.02.11 [cit.2012.03.08]. Found from: http://sd.defra.gov.uk/what/history/

[7] The History of Sustainable Development in the United Nations [online]. 2012 [cit.2012.03.08]. Found from: http://www.uncsd2012.org/rio20/history.html

[8] United Nations Conference on Environment and Development in Rio de Janeiro in 1992[online]1992 [cit.2012.03.24]. Found from: : http://www.unece.org

[9] Definition of Sustainable development by The commission's 1987 report, Our Common Future which paved way for Brundtland Commission Rio de Janeiro in 1992

2. Sustainable development

Challenges and indicators of sustainable

Most national and international problem solving efforts focus on only one pillar at a time. For example, the United Nations Environmental Programme (UNEP), the environmental protection agencies (EPA) of many nations and environmental NGOs focus on the environmental pillar. The World Trade Organization (WTO) and the Organization for Economic Cooperation and Development (OECD) focus mostly on economic growth, thought the OECD gives some attention to social sustainability, like war reduction and justice. The United Nations focuses mostly on the economic pillar, since economic growth is what most of its members want, especially developing nations. [10]

This leaves a gap that should be filled. No powerful international organization is working on the sustainability problem as a whole, which would include all three pillars, see figure 1. Therefore solutions to the sustainability problem must include making all three pillars sustainable.

[10] World Bank module social [online] 2001 [cit.2012.03.24]. Found from: http://www.worldbank.org/depweb/english/modules/social/index.html

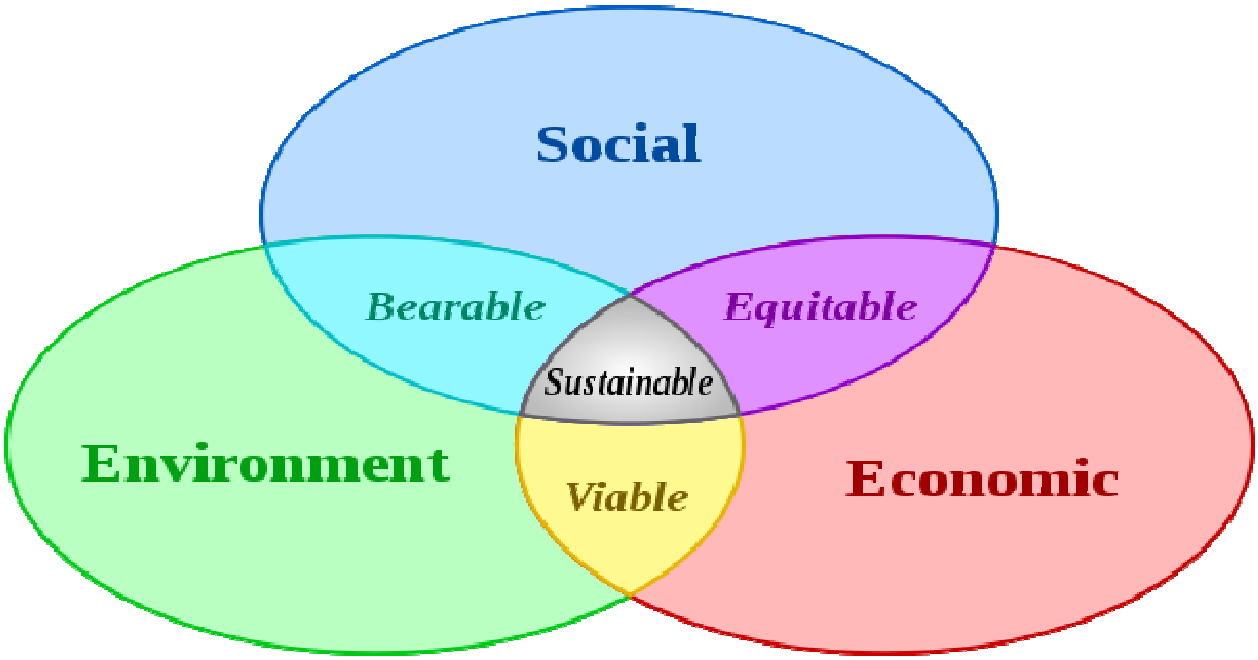

Figure 1: Three pillars of sustainability

Source [17]

2.1 Sustainable economic development /economic growth

During the industrial revolution, development was associated with economic growth through industries such as mining, factory production and large scale-farming. Industrialization began in Britain and spread to Europe, North America and Japan, all of which became known as the First World. Characteristics of First World countries are high economic growth, many job opportunities, and high incomes. Third World countries, such as those in Africa and South America, have slow if any economic growth, with high unemployment and very low incomes. In

fact, the wealth of many First World countries is founded on the exploitation of resources from Third World countries.[11]

Economic development originated in the post war period of reconstruction initiated by the US and defining it was quite a hustle as it is always linked with environmental development. Throughout the years there have been many definitions of economic development vs. economic development.[12]

2.1.1 Definitions of economic development:

Economic development has been defined as "the process by which a community creates, retains, and reinvests wealth and improves the quality of life" [13].David Dodson, MDC, Inc.

According to Prof. Meier and Baldwin; "Economic development is a process whereby an economy's real national income increases over a long period of time".[14]

Prof. Bachanan and Ellis; "Development means developing the real income potentialities of the under-developed areas by using investment to effect those changes and to argument those productive resources which promise to raise real income per person".

"Economic development is a policy to ensure social well beings of people, economic growth in the form of market productivity and the rise in GDP". [15]

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[11] Economic Development Now [online]. 2012.04 [cit.2012.04.28]. Found from http://www.iedconline.org/EDNow/052112/index.html

[12] Which Way Now? Economic Journal, Vol. 93 Issue 372. Pp.745-762 [online]. 1983 [cit.2012.05.18]. Found from: http://www.jstor.org/stable/10.2307/2232744

[13] Definition of David Dodson, MDC, Inc.: [online]. 2010 [cit.2012.05.18]. Found from: http://ecdi.wordpress.com/2011/06/15/economic-development-broadly-defined/

14 Cornell University's , Definitions of economic development: www.cals.cornell.edu/cals/.../DefinitionsEconomicDevelopment.pdf

[15] A, Sen. (1983) Economic Journal.Economical jornal,Vol.93

2.1.2 Characteristics of an economically sustainable development:

- Stabilises concentrations of greenhouse gases in the atmosphere at a 'safe' level.
- Maximises the material efficiency of the economy.
- Maximises land use efficiency.
- Invests in protecting biodiversity and restoring the productivity of ecosystems.
- Measures wealth by more than just GDP, including measures such as HDI and wellbeing.
- Builds capacity for individuals to participate in the economy.
- Promotes fair terms for all global trade, in order to facilitate levels of economic equity.
- Allocates capital sustainably through financial markets.
- Promotes the equitable distribution of resources. [16]

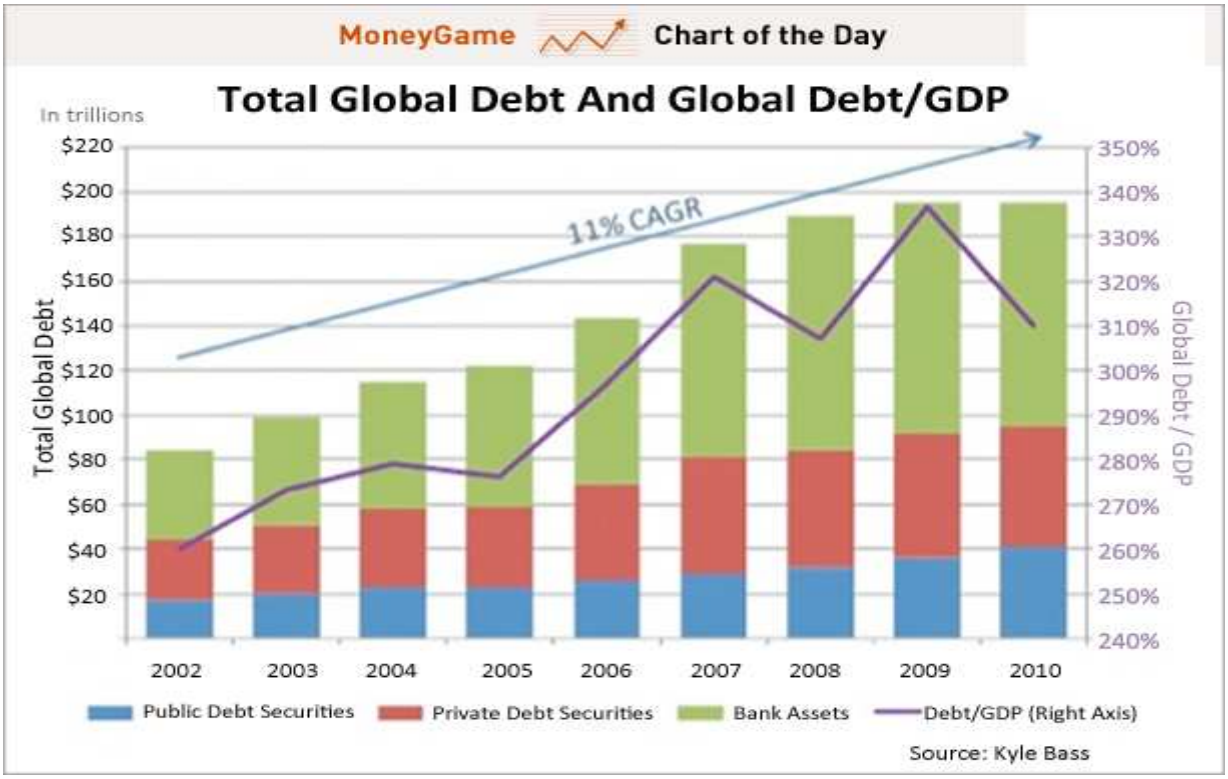

Figure 2: World Debt and GDP

Source [19]

[16] World Bank: Beyond Economic Growth Student Book [online]. 2004 [cit.2012.04.19]. Found from: http://www.worldbank.org/depweb/english/beyond/global/glossary.html#12

2.1.3 Definition of economic growth

"Economic growth is used to denote a steady and gradual change in the long run which comes through a general increase in the rate of saving and population in a dynamic economy". Schumpeter, J.A.[17] Economic growth provides people with more goods and services, measured in gross domestic product (GDP) and purchasing power parity (PPP). Economic development uses economic growth to improve living standards of countries developed and undeveloped s economy status is based on their industrialization, GDP and PPP. Economic growth is an increase in a country's productive capacity, as measured by comparing gross national product (GNP) in a year with the GNP in the previous year.[18]

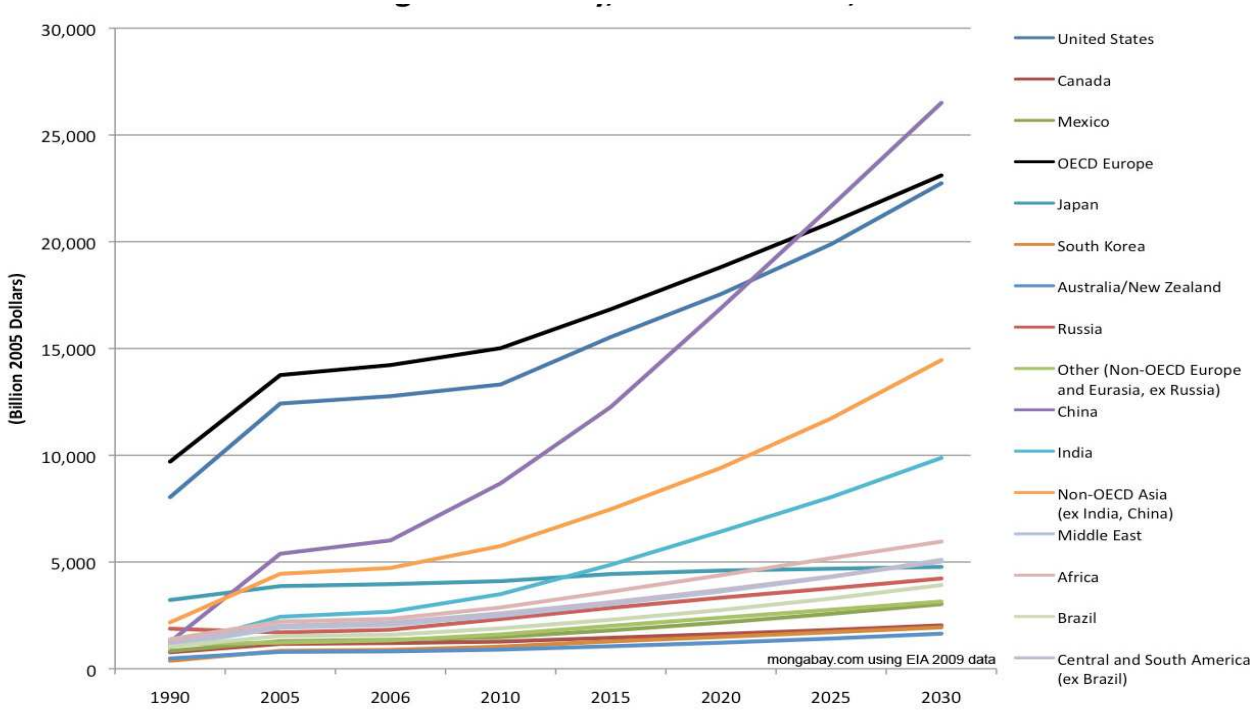

Figure 3: Graph for World PPP

Source [60]

[17] Cornell University's: Definitions of economic development [online]. 2010 [cit.2012.04.14]. Found from: www.cals.cornell.edu/cals/.../DefinitionsEconomicDevelopment.pdf

[18] World Bank: Beyond Economic Growth Student Book [online]. 2004 [cit.2012.04.19]. Found from: http://www.worldbank.org/depweb/english/beyond/global/glossary.html#12

2.1.4 Characteristics of a developed economy

Developed economy Is an economy that is characterised by the increase in capital resources, improvement in efficiency of labour, better organisation of production in all spheres, development of means of transport and communication, growth of banks and other financial institutions, urbanisation and a rise in the level of living, improvement in the standards of education and expectation of life, greater leisure and more recreation facilities and the widening of the mental horizon of the people, and so on. In short, economic development must break the poverty barrier or the vicious circle and bring into being a self-generating economy so that economic growth becomes self-sustained.

The main characteristics of developed countries are as follows significance of Industrial Sector, high Rate of Capital Formation (GDP and PPP), use of High Production Techniques and Skills and Low Growth of Population. Since we can measure economic growth by the country's GDP and PPP we should define and understand what the terms means.[19]

Gross domestic product (GDP) is the value of all final goods and services produced in a country in one year (see also gross national product). GDP can be measured by adding up all of an economy's incomes- wages, interest, profits, and rents or expenditures- consumption, investment, government purchases, and net exports (exports minus imports).

Purchasing power parities (PPPs) are the rates of currency conversion that equalise the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives which show the ratio of the prices in national currencies of the same good or service in different countries.[20]

Charles Kindleberger the historical economist says 'Economic development reflects economic growth, it is virtually impossible to contemplate development without growth because change in

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[19] World Bank: Beyond Economic Growth Student Book [online]. 2004 [cit.2012.04.19]. Found from: http://www.worldbank.org/depweb/english/beyond/global/glossary.html#12

[20] OECD: Purchasing Power Parities [online]. 2011.03 [cit.2012.04.19]. Found from: http://www.oecd.org/document/5/0,3746,en_2649_34347_45854149_1_1_1_1,00.html

function requires a change in size, until an economy can produce a margin above its food, through growth, it will be unable to allocate a portion of its resources to other types of activity.''[21]

The two terms growth and development result in sustainable economic development. Sustainable economic development means to generate substantial economic and employment growth, sustainable business and community development by demonstrating that innovation, efficiency, and conservation in the use and reuse of all natural and human resources is the best way to increase jobs, incomes, productivity, and competitiveness. In addition, Sustainable Economic Development strategies are the most cost effective method of promoting renewable energy and clean technologies, protecting the environment, and preventing harmful impacts from climate change.

One of the influential factors of economic growth/development is Globalization. Globalization is the system of interaction among the countries of the world in order to develop the global economy. Globalization refers to the integration of economics and societies all over the world. Globalization has led to competition between nations, regions, and communities to attract and retain businesses that are moving or expanding. More than half of humanity now lives in cities and that half annually produces 85% of the world's Gross Domestic Product, consumes more than 75% of the Earth's resources, and generates approximately 75% of the Earth's waste. With these results we see a growing gap between productivity and demand as one key economic development as figure 4.

[21] HERRICK, Bruce H and Charles P KINDLEBERGER. Economic development. McGraw-Hill: The University of California, 1983. ISBN: 978-0-07034-5843

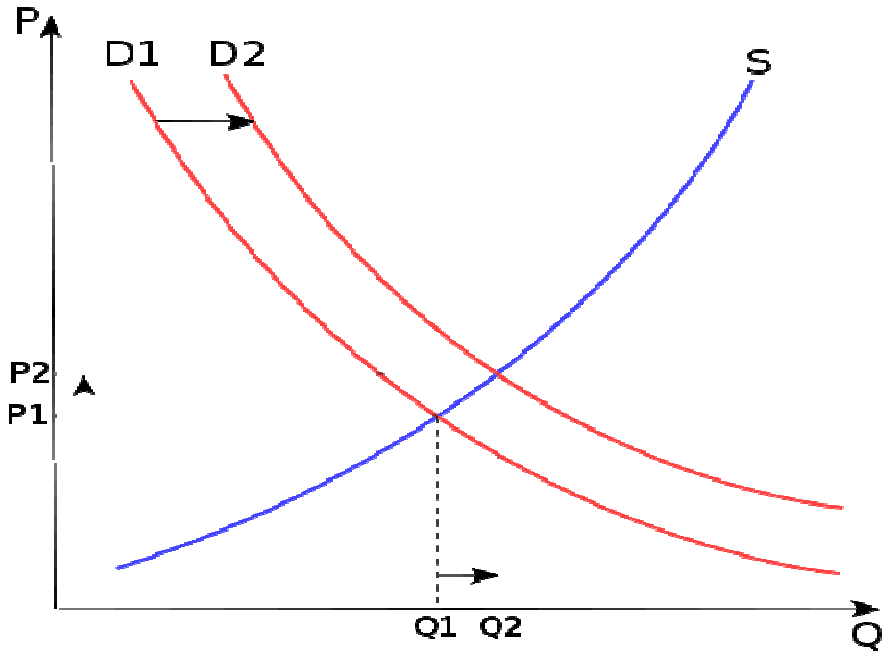

Figure 4: Production and demand
Source [24]

Growing competition makes companies to cut down jobs and salaries of employers. Technology development causes more rises to productivity meaning fewer workers are needed to satisfy demands. With this cycle continuing poor countries become poorer and rich even richer. Low income countries face challenges in economic development even if there is a rise to economic growth. For example Poor countries have too little potential to attract international investors and therefore it is dominated by richer countries. In 2010 India still had a large amount of population living below $2 a day and China with its blooming economy it has decreased people living with $2 a day by 40 % in 2010 see figure 5.

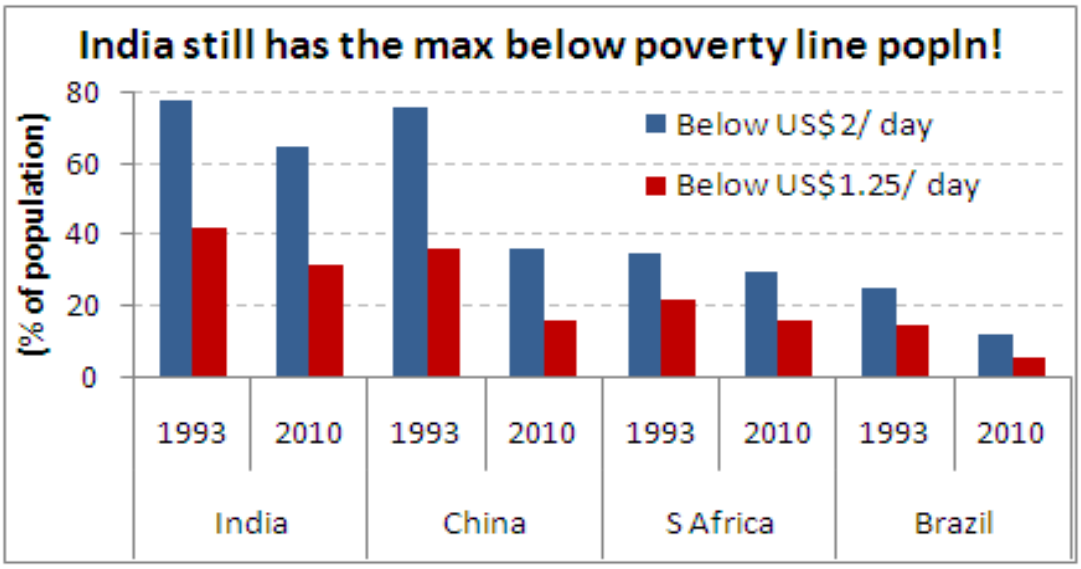

Figure 5: India population living under poverty line

Source [40]

People in poor countries end up having problems such as:

- Citizens not getting access to adequate basic education and health care, clean drinking water and sanitation,
- Households not having minimum income that will enable them to provide in their basic subsistence needs, i.e., food, clothing and shelter.
- No job creation and access to means of production
- Not having good government and effective aid

2.1.5 Economic development goals

Communities differ in their geographic and political strengths and weaknesses. Each community will have a unique set of challenges for economic development, but the main goal in the broadest sense, economic development encompasses three major areas:

- Policies that government undertakes to meet broad economic objectives including inflation control, high employment and sustainable growth.

- Policies and programs to provide services including building highways, managing parks and providing medical access to the disadvantaged.
- Policies and programs explicitly directed at improving the business climate through specific efforts, business finance, marketing, neighbourhood development, business retention and expansion, technology transfer, real estate development and others.[22]

2.2 Sustainable environmental development

The spectrum of environment and development hazards has changed considerably over the years of human existence. Over the past years environment has been degrading all over the world. The problem now is that it's happening at a very fast rate and not leaving the environment to recover and regenerate. (Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife).

The greater demands placed on the environment by an ever increasing human population and production combined with unsustainable consumption patterns places increasingly severe stress on the life-supporting capacities of our planet is putting and it is draining on the earth's limited natural resources. Rapidly growing cities, unless well-managed, face major environmental problems. The increase in both the number and size of cities calls for greater attention to issues of local government and municipal management.[23]

Leaders and experts from around the world over the past years had meetings and conferences to come up with strategies and plans to save the earth and its environment. The Earth Summit influenced all subsequent UN conferences, which have examined the relationship between human rights, population, social development, women and human settlements and foreseen the need for environmentally sustainable development was necessary.

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[22] UN Economic development [online]. 2012 [cit.2012.04.14]. Found from: http://www.un.org/un60/60ways/ec_dev.shtml

[23] Environment for Development [online]. 2010 [cit.2012.04.15]. Found from: http://www.unep.org/PDF/FinalMTSGCSS-X-8.pdf

The earth summit in Rio defined 'Environmental sustainability as the process of making sure current processes of interaction with the environment are pursued with the idea of keeping the environment as pristine as naturally possible and sometimes referred to as meeting human needs without compromising the health of ecosystems.

To sustain the environment, problems that threaten the environment have to be identified so that strategies and future plans can come in to action. Factors such as pollution, growing population, economic growth, poverty, and globalization have a negative effect on the environment.[24]

2.2.1 Factors affecting environment

Pollution is the introduction of contaminants into a natural environment that causes instability, disorder, harm or discomfort to the ecosystem i.e. physical systems or living organisms. Environmental pollution consists of five basic types of pollution, namely, air, water, soil, noise and light:[25]

Air pollution

Combustion of fuel is one of the major causes of air pollution in urban areas. Burning of fossil fuels such as natural gas and gasoline leads to the emission of carbon dioxide and other gases, which deteriorate the quality of air, making it polluted. Increased level of carbon dioxide in the atmosphere is one of the prime causes of air pollution which causes Global warming. Power plants exhaust fumes of automobiles, airplanes and other human activities involving the burning of gasoline and natural gas are related to the emission of this greenhouse gas. The chlorofluorocarbons (CFCs), a class of synthetic chemicals used in refrigerants and aerosol propellants, have caused hole in Earth's ozone layer. Sulphur dioxide is one of the components of smog, which is related with contamination of the Earth's atmosphere. This synthetic chemical is the prime cause of acid rain. Air pollution is partially caused by the particulates formed by a

[24] Environment for Development [online]. 2010 [cit.2012.04.15]. Found from: http://www.unep.org/PDF/FinalMTSGCSS-X-8.pdf, http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163

[25] UNEP: Environmental problems [online]. 2010 [cit.2012.04.19]. Found from: http://www.unep.org

variety of substances, such as dust, pollen and other organic materials. Increased road and air traffic is another reason related to the high level of air pollution. [26]

Figure 6: Industrial air pollution
Source [31]

Examples of countries affected by air pollution, China, as it can be seen in figure 8, it has highest annual incidence of premature deaths triggered by air pollution in the world, according to a new study. A World Health Organization (WHO) report estimates that diseases triggered by indoor and outdoor air pollution kill 656,000 Chinese citizens each year, and polluted drinking water kills another 95,600. [27]

[26] Air pollution: How does air pollution affect our environment? [online]. 2009.10 [cit.2012.04.15]. Found from: http://pollutionarticles.blogspot.cz/2009/11/how-does-air-pollution-affects-our.html

[27] Research Group on the Global Future [online]. 2007.03.08 [cit.2012.03.22] Found from:

http://news.nationalgeographic.com/news/2007/07/070709-china-pollution.html

Figure 7: China threatening air pollution
Source [42]

Land pollution

Is characterized by the contamination of Earth's surface, where humans and other creatures live. Increase in urbanization is one of the major causes of land pollution. Construction uses up forestland. This leads to the exploitation and destruction of forests. There is more demand for water. Reservoirs are built resulting in the loss of land. The disposal of non-biodegradable wastes, including containers, bottles and cans made of plastic, used cars and electronic goods, leads to the pollution of land.

Agricultural wastes including the waste matters produced by crop, animal manure and residues of the farm land are one of the major causes of land pollution. The pesticides and fertilizers used by farmers to increase the crop yield, leaches into the nearby land areas and pollutes them.

The process of mining leads to the formation of piles of coal and slag. When these wastes are not disposed through proper channel, they are accumulated and contaminate the land.

Industrial wastes are major contributors of land pollution. Dumping of toxic materials such as chemicals and paints makes the areas surrounding the industries, look very filthy.

Improper treatment of sewage leads to the accumulation of solids, such as biomass sludge. These solid wastes overflow through the sewage, making the entire area look dirty. Burning of solid fuels leads to the formation of ashes, which is yet another cause of land pollution. Although domestic and industrial wastes are collected and recycled or burnt in incinerators, a large amount of rubbish is left untreated. These are then dumped into grounds, leading to land pollution. Garbage dumped by people makes the streets unhealthy, unfit and dirty to reside in. The waste matter usually consists of leftover food, fruit and vegetable peels and other non-decomposable solid materials such as glass, cloth, plastic, wood, paper etc. .[28]

Water pollution

Water pollution is the result of human activities. Waste water is problem that has been there since the beginning of industrial era. Waste water are different chemicals discharged mainly by factories, of which much gets pumped untreated into rivers, oceans, and other water bodies.[29] The eco-system of rivers, streams, lakes, seas and oceans is also getting deteriorated due to the contamination of water, through various sources. Dumping of industrial wastes, containing heavy metals, harmful chemicals, by-products, organic toxins and oils, into the nearby source of water is one of the visible causes of water pollution. Another cause for the contamination of water is the improper disposal of human and animal wastes. Effluents from factories, refineries, injection wells and sewage treatment plants are dumped into urban water supplies, leading to water pollution.[30]

[28] Land pollution: How does air pollution affect our environment? [online]. 2009.10 [cit.2012.04.15]. Found from: http://pollutionarticles.blogspot.cz/2011/09/soil-pollution-facts.html

[29] Water pollution http: [online]. 2009.10 [cit.2012.04.15]. Found from: //pollutionarticles.blogspot.cz/2008/09/water-pollution-waste-water-and-sewage.html

[30] Causes and effects of water pollution [online]. [cit.2012.04.15] Found from: http://lifestyle.iloveindia.com/lounge/causes-and-effects-of-water-pollution-4515.html

Figure 8: Water pollution in India
Source[43]

Population growth

Human population growth is at the root of virtually all of the world's environmental problems. Although the growth rate of the world's population has slowed slightly since the 1990s, the world's population increases by about 77 million human beings each year. As the number of people increases, crowding generates pollution, destroys more habitats, and uses up additional natural resources. The Population Division of the United Nations (UN) predicts that the world's population will increase from 6.23 billion people in 2000 to 9.3 billion people in 2050. The UN estimates that the population will stabilize at more than 11 billion in 2200. Other experts predict that numbers will continue to rise into the foreseeable future, to as many as 19 billion people by the year 2200.

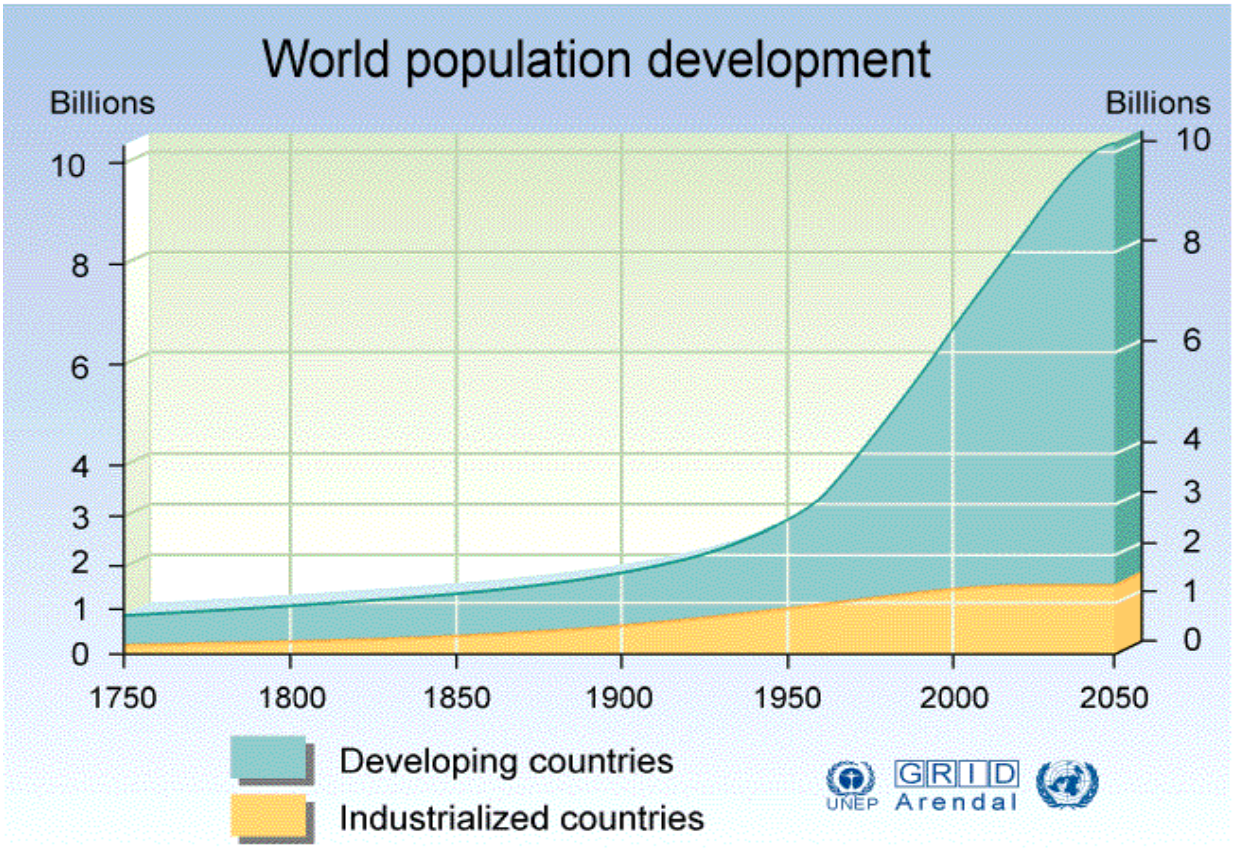

Figure 9: World population development

Source [44]

Globalization

The dictionary definition: Globalisation is the "process enabling financial and investment markets to operate internationally, largely as a result of deregulation and improved communications. In the late 1980s and early 1990s, the business model termed the "globalised" financial market, came to be seen as an entity that could have more than just an economic impact on the parts of the world it touched.[31]

[31] Globalization [online]. 2012 [cit.2012.04.28]. Found from: //en.wikipedia.org/wiki/Globalization

Globalisation came to be seen as more than simply a way of doing business, or running financial markets, it became a process. From then on the word took on a life of its own. Centuries earlier, in a similar manner, the techniques of industrial manufacturing led to the changes associated with the process of industrialisation, as people migrated to the cramped but booming industrial cities to tend the new machines.[32]

The relationship between industrialization and its effects on the environment has captured the serious attention of national governments and international organizations, especially in light of increasing globalization. Sustainability in products, processes, and services has been increasingly emphasized by placing environment at the centre of some industrial transformations.

The final significant effect of globalization is the difficulty of competition. With globalization, trade between the countries has been started to remove limits. This situation of enterprises has prepared the ground to be in constant competition with not only national competitors but also international competitors. Therefore, business requires being in a more rigorous and challenging competitive atmosphere to maintain continuity and development. Rising of monopole companies and trough among production costs are the main effects of this hard competition in business. As pointed in Global Policy Forum, undeveloped countries choose to use foreign capital for their improvement however it disposes the equality and stability instead.

Unemployment, social degeneration and difficulty of competition are the killer disadvantages on people's lives that based on globalization.[33]

Resources depletion

Today's global society is economically, socially and culturally dependent on minerals and metals. Production patterns are driven by the consumption of mineral resources, which continues to rise in middle- to high-income countries, and is reaching unprecedented levels in low-income countries, whose appetite for the world's minerals reflects their rapid development.

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[32] Globalisation shakes the world [online]. 2007.01.21 [cit.2012.04.28]. Found from: http://news.bbc.co.uk/2/hi/business/6943975.stm

[33] The guardian UK: What is globalisation? [online]. 2002.10.31 [cit.2012.05.18]. Found from: http://www.guardian.co.uk/world/2002/oct/31/globalisation.simonjeffery

In 2011 the United Nations Environment Programme reported that, if nothing changes, humanity will demand 140 billion tons of minerals, ores, fossil fuels and biomass every year by 2050. This is three times our current rate of resource consumption, and far beyond what the Earth can supply.[34]

Climate change

Climate change refers to general shifts in climate, including temperature, precipitation, winds, and other factors. Global warming is often misunderstood to imply that the world will warm uniformly. In fact, an increase in average global temperature will also cause the circulation of the atmosphere to change, resulting in some areas of the world warming more, others less.[35]

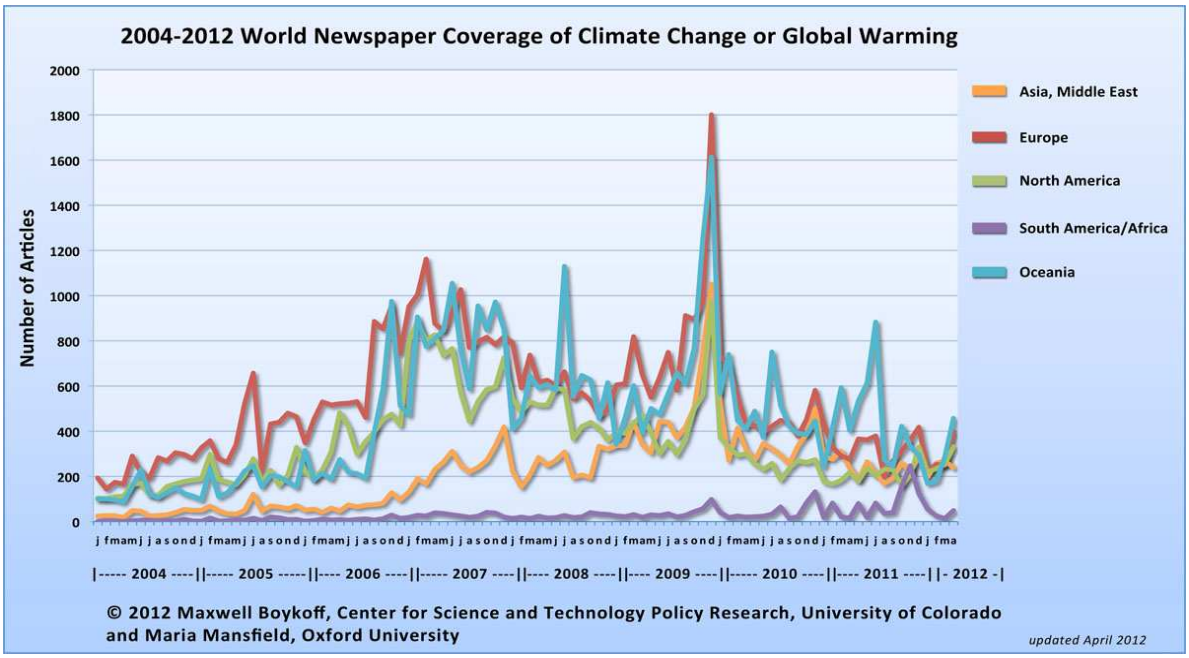

Figure 10: Climate change and Global warming
Source [50]

[34] Depletion and the changing geopolitical landscape [online]. 2012.01.19 [cit.2012.04.15]. Found from: http://oilprice.com/Geopolitics/International/Natural-Resource-Depletion-and-the-Changing-Geopolitical-Landscape.html

[35]UNEP: Environmental problems [online]. 2010 [cit.2012.04.19]. Found from: http://www.unep.org, http://www.unep.org/climatechange/

2.3 Sustainable social development

Koning (2001:9) suggests that social sustainability refers to "a society that is just, equal, without social exclusion and with a decent quality of life, or livelihood, for all".

Social sustainability occurs when the formal and informal processes, systems, structures and relationships actively support the capacity of current and future generations to create healthy and liveable communities.

Social sustainability is 'a life-enhancing condition within communities, and a process within communities that can achieve that condition', and that this condition has the following features:

2.3.1 Sustainable social development characteristics

- Equity of access to key services (including health, education, transport, housing and recreation)
- Equity between generations, meaning that future generations will not be disadvantaged by the activities of the current generation
- A system of cultural relations in which the positive aspects of disparate cultures are valued and promoted when it desired by individuals and groups
- Widespread political participation of citizens not only in electoral procedures buy also in other areas of political activity, particularly at a local level
- A system for transmitting awareness of social sustainability from one generation to the next
- A sense of community responsibility for maintaining that system of transmission
- Mechanisms for a community to collectively identify its strengths and needs.

The goal of sustainable development is to improve living standards and the quality of people's lives, both now and for future generations. Social issues are an important piece of the development "puzzle."

The need for social services is universal. All people in a society must have access to certain basic goods and services in order to lead healthy, fulfilling and productive lives. Education and training must be available, so that everyone has the chance to earn a decent living and learn new skills.

Girls must have the same opportunity as boys to go to school or to get jobs. Women must have access to basic family planning services and adequate health care and nutrition for themselves and their children.

The elderly must receive the medical care, social security and pensions they need to support themselves as they grow older. Ensuring fair access to basic services is an essential task of governments around the world. A socially sustainable community must have the ability to maintain and build on its own resources and have the resiliency to prevent and/or address problems in the future.[36]

2.3.2 The need for social services

Social sustainability can be understood to be made up of three required components and four guiding principles. The three components of social sustainability are (1) basic needs, (2) individual or human capacity and (3) social or community capacity. [37]

1. Basic needs of residents can continue to be met through:

- Appropriate, affordable housing, with flexibility to meet changing needs - the needs of those on low and moderate incomes, the needs of those with special circumstances such as physical and mental illness, and the needs of all as they age
- Appropriate, affordable health care available in the community
- Locally produced, nutritious food that is affordable
- Jobs that enable people to be productive and utilize their skills and abilities
- Sufficient income for people to be able to financially support themselves and their families
- Safe communities and workplaces

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[36] Policy report social development [online]. 2005.05 [cit.2012.04.18]. Found from: http://vancouver.ca/ctyclerk/cclerk/20050524/documents/p1.pdf

[37] World Bank module social [online]. 2001 [cit.2012.03.24]. Found from: http://www.worldbank.org/depweb/english/modules/social/index.html

2. Individual or human capacity can be maintained and enhanced through:

- Opportunities to develop and upgrade skills variety of local employment opportunities throughout the region
- Opportunities to develop and make use of creativity and artistic expression
- Appropriate, affordable formal and informal life-long learning
- Appropriate, affordable recreation, leisure and cultural facilities and programs
- A range of opportunities for individuals to contribute to the health and well-being of the community

3. Social or community capacity can be maintained and enhanced through:

- Support and encouragement for community economic development
- Community "identity" is reflective of community diversity
- Involvement in public processes and their results, and in government
- Opportunities and places for social interaction throughout the community
- Opportunities, resources and venues for a variety of arts, cultural and community activities
- Support and encouragement for community organizations and networks

While many people have better access to productive, physical and human assets, many more are excluded from these ere sources because of income, gender, ethnic, religious, health or educational differences. For example a country likes Sierra Leone

It was one of the world's poorest countries when the civil war began in 1991. In spite of its remarkable strides and reforms since the war ended in 2002, problems of poor infrastructure -- including roads and energy low capacity, youth unemployment, high maternal and infant mortality, widespread rural impoverishment, impact of the global economic downturns, and lapses in public financial management and governance still persist. There is also the daunting challenge of enhancing transparency in managing the country's vast natural resources.

About 70% of Sierra Leone's population lives under the poverty line, and more than half of the country's gross domestic product are from agriculture. Many citizens of Sierra Leone make their

living by subsistence farming. This sector is especially vulnerable to poverty and inequality: one bad crop can threaten the health of a whole family. [38]

Globalization, the process that induces more societies and increased interdependence and integration of economies and societies around the world, has opened up new opportunities in terms of increased trade, wider markets, foreign investment, new technologies, expanding media and Internet connections and cross-border flows of people and knowledge. The "HDI" human development index ranks the relative "development" of the world's countries based on three indicators: longevity, as measured by life expectancy at birth; educational attainment, measured by a combination of adult literacy rate (two thirds weight) and combined gross primary, secondary and tertiary enrolment in schools (one third weight); and standard of living, as measured by GDP per capita - PPP (purchasing power parity) US$.[39]

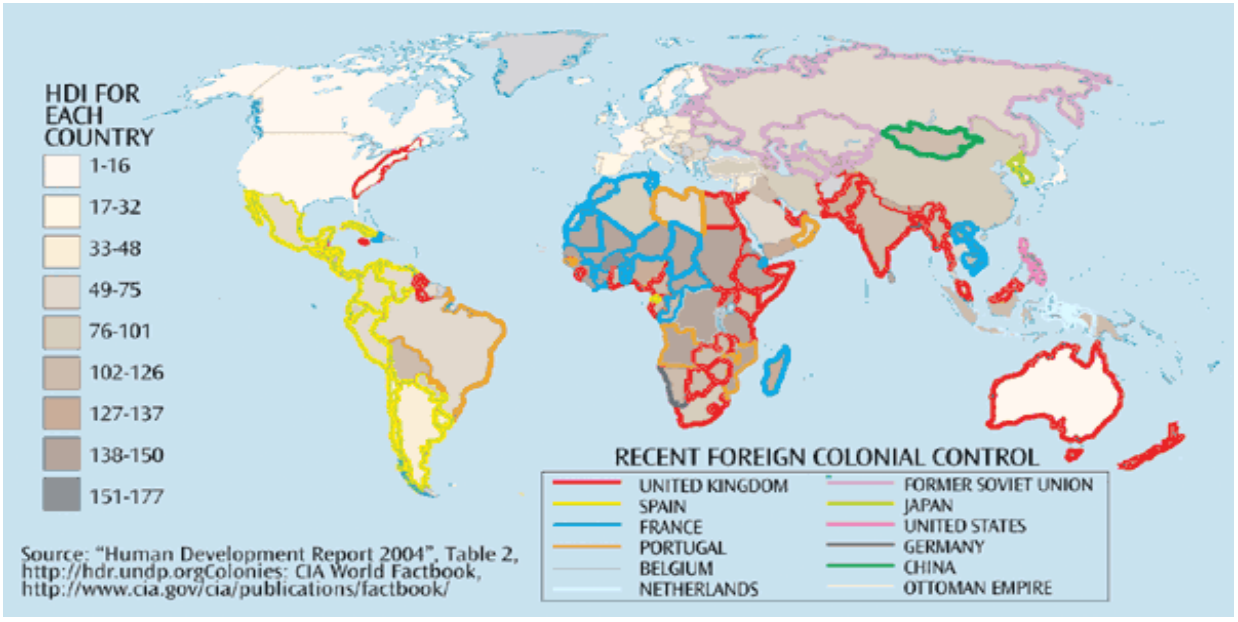

Figure 11: Human development index

Source [45]

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[38] Sustainable Development in Sierra Leone [online]. 2012.03 [cit.2012.03.24]. Found from: http://www.umcor.org/UMCOR/Resources/News-Stories/2012/March/Sustainable-Development-in-Sierra-Leone

[39] Human development [online]. 2004 [cit.2012.04.14]. Found from: http://www.theglobaleducationproject.org/earth/human-conditions.php

3. Sustainable Development in Transport

What is sustainable transportation?

Just like other sustainable terms, sustainable transportation does not formally have one universally accepted definition. The following definitions are used to define sustainable transportation: "Transportation that does not endanger public health or ecosystems and meets mobility needs consistent with the use of renewable resources at below their rates of regeneration and the use of non-renewable resources at below the rates of development of renewable substitutes" (Organization for Economic Co-operation and Development, 1997).[40]

"Allows the basic access needs of individuals and societies to be met safely, and in a manner consistent with human and ecosystem health, and with equity within and between generations; is affordable, operates efficiently, offers choice of transportation mode, and supports a vibrant economy; limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, reuses and recycles its components and minimizes the use of land and the production of noise" (Centre for Sustainable Transportation, 2005).[41]

"One in which fuel consumption, emissions, safety, congestion, and social and economic access are of such levels that they can be sustained into the indefinite future without causing great or irreparable harm to future generations of people throughout the world" (Victoria Transport Policy Institute, 2004).

[40] Towards a Sustainable Transport System [online]. 2007 [cit.2012.03.24]. Found from: http://www.oecd.org/dataoecd/28/54/2396815.pdf

[41] Defining sustainable transportation [online]. 2007 [cit.2012.03.24]. Found from http://cst.uwinnipeg.ca/documents/Defining_Sustainable_2005.pdf

An environmentally sustainable transport system:[42]

- allows generally accepted objectives for health and environmental quality to be met, for example, those concerning air pollutants and noise proposed by the World Health Organization
- is consistent with ecosystem integrity, for example, it does not contribute to exceeding of critical loads and levels as defined by WHO for acidification, eutrophication, and ground-level ozone; and
- does not result in worsening of adverse global phenomena such as climate change and stratospheric ozone depletion

3.1 Sustainable transport

Consistent with the broad definition of sustainable development (WCED, 1987), the specification for a sustainable transport system requires that the movement of people and goods is provided in an environmentally, socially, and economically viable way; mobility for any purpose is to be considered as a means rather than an end.

A sustainable transportation system is one that:

- allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations;
- is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy;
- limit emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

[42] Defining sustainable transportation [online]. 2007 [cit.2012.03.24]. Found from http://cst.uwinnipeg.ca/documents/Defining_Sustainable_2005.pdf

3.1.1 Sustainable transport goals

Transport system diversity: travellers can choose from various modes, location and pricing options, particularly those that are resource efficient, affordable, healthy, and accommodate non-drivers.[43]

System integration: the various components of the transport system are well integrated, such as pedestrians and cycling access to transit, and integrated transport and land use planning.

Affordability: transport services provide affordable options so lower-income households spend less than 20% of their budgets to access basic goods, services and activities.

Resource (energy and land) efficiency: Transport planning encourages energy and land efficiency.

Efficient pricing and prioritization: Road, parking, insurance and fuel are priced to encourage efficiency, and facilities are managed to favour higher value trips and more efficient modes.

Land use accessibility (smart growth): Policies support compact, mixed, connected, multi-modal land use development in order to improve land use accessibility and transport options.

Operational efficiency: Transport agencies, service providers and facilities are managed efficiently to minimize costs and maximize service quality.

Comprehensive and inclusive planning: Planning is comprehensive (considers all significant objectives, impacts and options), integrated (decision-making), and inclusive (affects all people).

[43] Sustainable Transport Goals [online]. 2012.05.25 [cit.2012.04.14]. Found from: http://www.vtpi.org/wellmeas.pdf

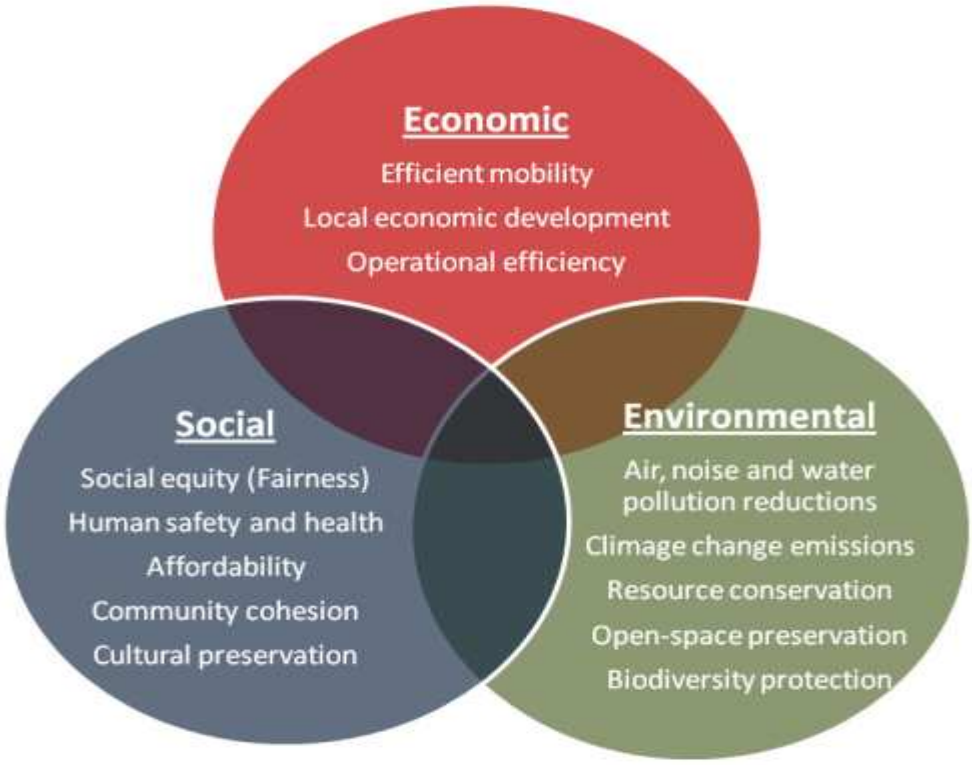

Figure 12: Sustainable transport goals using three pillars of sustainability

Source [46]

3.2 Unsustainable transport factors that affect sustainable development

Accessibility

Accessibility (or just access) refers to the ability to reach desired goods, services, activities and destinations (collectively called opportunities).Access is the ultimate goal of most transportation, except a small portion of travel in which movement is an end in itself (jogging, horseback riding, pleasure drives), with no destination. This perspective assumes that there may be many ways of improving transportation, including improved mobility, improved land use accessibility (which

reduce the distance between destinations), or improved mobility substitutes such as telecommunications or delivery services.[44]

Providing access for an ageing population: The ECE population above 64 years of age has increased by about 20 million over the last two decades. Providing access for individuals with special needs: 3% of the world's population are severely and about 12 % moderately disabled.

Efficient international transport links and border crossings:

Participation in global supply chains International transport by value dominated by sea: Special attention to land-locked countries. Road transport is the most dominant mode of motorized transport in Africa, accounting for 80 per cent of the goods traffic and 90 per cent of the passenger traffic on the continent. African countries together have about 2.06 million km of roads in 2001, resulting in a road density of 6.84 km per 100sq.km. Whereas the average road-to-population ratio for the whole continent is 26 km per 10,000 inhabitants, there is a large sub regional variation.

Central Africa and Southern Africa have the highest road distribution, with 49.5 km and 56.3 km, respectively, for every 10,000 population. In 2005, only 580,066 km or 22.7 per cent of the total African road network was paved. [45] Most African countries face huge costs associated with transportation. In accessing foreign markets, on average, Africa's transport and insurance costs represent 30 per cent of the total value of exports, which compares unfavourably with 8.6 per cent for all developing countries. Although most share the problem of high transport costs, landlocked countries face the most excessive transport costs recorded on the continent.

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[44] Critical issues in transportation [online]. 2009 [cit.2012.05.18]. Found from: http://www.trb.org/Publications/PubsCriticalIssuesinTransportation.aspx

[45] The transport sector in Africa [online].2009.10 [cit.2012.05.19]. Found from: http://www.un.org/esa/dsd/csd/csd_pdfs/csd-18/rims/AfricanReviewReport-on-TransportSummary.pdf

Figure 13: Accessibility of different modes of transportation
Source [47]

Congestion

The 21st century may be called the era of congestion. Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing. Although estimates are not precise, congestion costs Americans roughly $78 billion per year in today's dollars and wastes 2.9 billion gallons of gasoline. Improved transportation system operations, high occupancy vehicle lanes, expanded public transit, and many other transportation demand management strategies have hardly slowed the rate of increasing congestion. [46]

New road capacity will be needed in the rapidly growing metropolitan areas that are expected to accommodate tens of millions of new inhabitants in the next three to four decades. As the population continues to grow, transit becomes more cost-effective as population densities

[46]Transport and sustainability [online]. 2009 [cit.2012.05.19]. Found from: http://people.hofstra.edu/geotrans/eng/ch6en/conc6en/ch6c4en.html

increase. Metropolitan areas may comprise the land use plans of the government agencies that regulate development are rarely coordinated with investment decisions about transportation facilities. Businesses suffer because of congestion. Longer travel times increase transport costs, and the lack of reliable delivery compels firms to hold more inventory or to add extra time for shipments.

Figure 14: Traffic congestion in the US

Source [48]

Affordability

A passenger transportation system dominated by the automobile generates challenges for those with limited incomes or physical disabilities or for those who do not drive. The cost of transportation is growing, in the past decade, the percentage of income devoted to transportation increased by almost 9 %, which has placed a burden on those with the lowest incomes. Low income households are more dependent on public transport than high income households. Public transport is becoming relatively more expensive.

Lack of affordable transport, is a burden to education, employment, medical services, cultural activities and leisure social exclusion. Transport affordability also include the paying of parking costs, tickets fines, toll gates cost. [47]According to a report from Ward's Auto released, the global number of cars exceeded 1.015 billion in 2010, jumping from 980 million the year before. Not surprisingly, China led the way in vehicle growth, with the number of cars on Chinese roads increasing by 27.5 per cent, amounting to half the entire global growth.[48]

That gives China the world's second largest car population, with 78 million vehicles. But the United States still constitutes by far the largest vehicle population in the world, with 239.8 million cars, the Ward's study reported.

While the world is filling up with cars, places like Angola (Africa) vehicle ownership per 1000 people is only 40. Africa has the highest transport costs in the world. Transport services are unaffordable to many African citizens as transport costs are high compared to the average incomes of the citizens. Travel costs in African cities have a share of 21.7 per cent of GDP. Freight costs in Africa are significantly higher than the average cost in Asia. The already high transport costs have been exacerbated in the last few years by the energy crisis associated with high and volatile oil prices. Factors, including limited skills of managerial and operational staff as well as poor transport facilitation, play significant roles in the high transport costs in Africa.

[47]Affordability [online]. 2011.06 [cit.2012.05.19]. Found from: http://www.vtpi.org/affordability.pdf

[48] The Huffington Post Canada, Daniel Tencer [online]. 2011.08.23 3:19 [cit.2012.05.18]. Found from: http://www.huffingtonpost.ca/2011/08/23/car-population_n_934291.html

Safety

WHO REGION	HIGH-INCOME	MIDDLE-INCOME	LOW-INCOME	TOTAL
AFRICAN REGION[b]	—	32.2	32.3	32.2
REGION OF THE AMERICAS[c]	13.4	17.3	—	15.8
SOUTH-EAST ASIA REGION[b]	—	16.7	16.5	16.6
EASTERN MEDITERRANEAN REGION	28.5	35.8	27.5	32.2
EUROPEAN REGION	7.9	19.3	12.2	13.4
WESTERN PACIFIC REGION	7.2	16.9	15.6	15.6
GLOBAL	**10.3**	**19.5**	**21.5**	**18.8**

Figure 15: Road traffic injury fatality rates (per 100 000 populations)

Source [29]

Nearly 1.3 million people are killed on the world's roads each year, and 50 million more people are injured, with many of them disabled for life.[49] 90 % of road deaths occur in developing countries. If nothing is done to make roads safer, traffic crashes could double by 2030, overtaking AIDS, tuberculosis and lung cancer as the world's fifth leading cause of premature death Part of the problem is the explosive growth in the number of vehicles from cars to motorcycles exacerbated by high speeds and a lack of regulation. Children and young people are the most at risk: Road traffic injuries are the number one cause of death among people aged 10-24 years. Pedestrians, cyclists and motorcyclists are also especially vulnerable.[50]

Low-income and middle-income countries have the highest burden and road traffic death rates Most (91%) of the world's fatalities on the roads occur in low-income and middle-income countries, which have only 48% of the world's registered vehicles. Approximately 62% of reported road traffic deaths occur in 10 countries which in order of magnitude are India, China,

[49] Road safety around the world [online]. 2009 [cit.2012.03.02]. Found from: http://www.who.int/violence_injury_prevention/road_safety_status/report/state_of_road_safety_en.pdf

[50] Decade of Action for Road Safety [online]. 2011.05.11 [cit.2012.05.18]. Found from: http://www.embarq.org/en/news/11/05/11/embarq-responds-launch-decade-action-road-safety

the United States, the Russian Federation, Brazil, Iran, Mexico, Indonesia, South Africa, and Egypt – account for 56% of the world's population.[51]

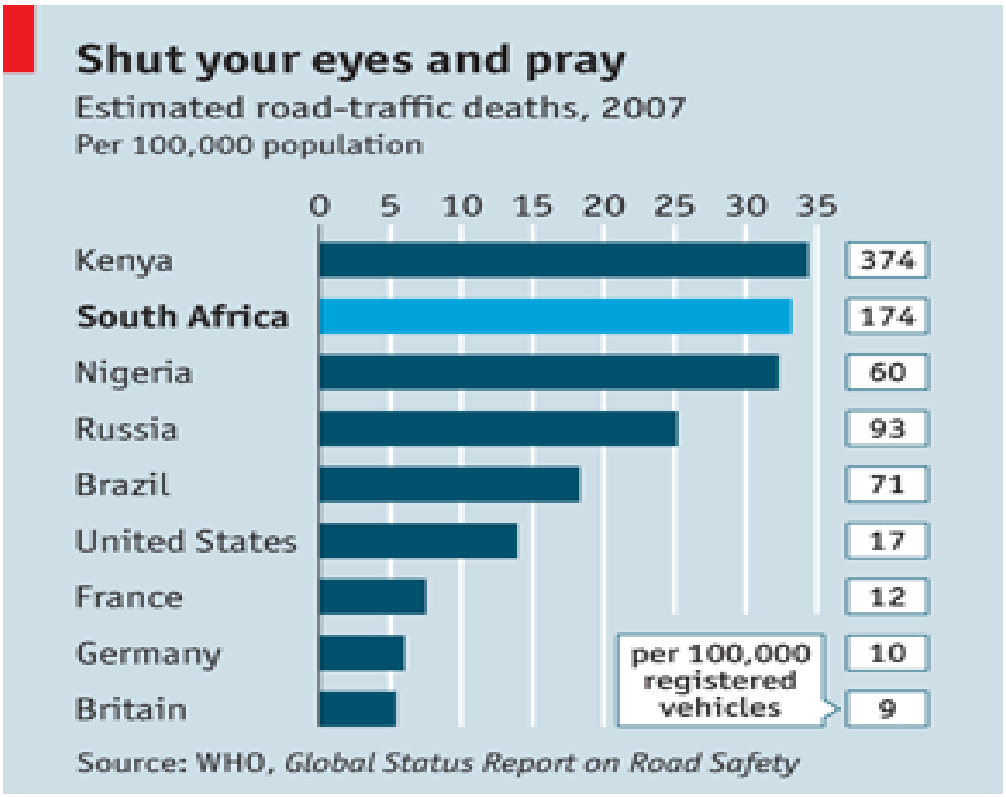

Figure 16: Global traffic accident

Source [49]

3.3 Environmental challenges by transport

The environmental challenges facing industrial companies and governments throughout the world are numerous and complex. Most governments and industrial companies now clearly realize and embrace the paradigm that environmental issues are intertwined with social/ cultural and

[51]Road safety around the world [online]. 2009 [cit.2012.03.02]. Found from: http://www.who.int/violence_injury_prevention/road_safety_status/report/state_of_road_safety_en.pdf

socioeconomic issues. In fact, social and cultural concerns may far outweigh all other factors as industry and government make critical decisions regarding environmental issues.[52]

3.3.1 Climate change

Due to uncertainties about future emissions and concentrations of greenhouse gases, their net warming effect in the atmosphere, and the response of the climate system, estimates of future temperature change are uncertain. A greenhouse gas (GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapour, carbon dioxide, methane, nitrous oxide, and ozone.

With these caveats in mind, the IPCC made the following projections of future warming (IPCC, 2007): The average surface temperature of the Earth is likely to increase by 1.1 to 6.4°C by the end of the 21st century, relative to 1980-1990, with a best estimate of 1.8 to 4.0°C. The average rate of warming over each inhabited continent is very likely to be at least twice as large as that experienced during the 20th century.

Warming will not be evenly distributed around the globe. Land areas will warm more than oceans in part due to water's ability to store heat. High latitudes will warm more than low latitudes in part due to positive feedback effects from melting ice. Most of North America; all of Africa, Europe, northern and central Asia; and most of Central and South America are likely to warm more than the global average. Projections suggest that the warming will be close to the global average in south Asia, Australia and New Zealand, and southern South America. The warming will differ by season, with winters warming more than summers in most areas.[53]

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[52] UNEP: Environmental problems [online]. 2010 [cit.2012.04.19]. Found from: http://www.unep.org/climatechange/

[53] Climate change [online]. 2012.04 [cit.2012.04.14]. Found from: http://epa.gov/climatechange/

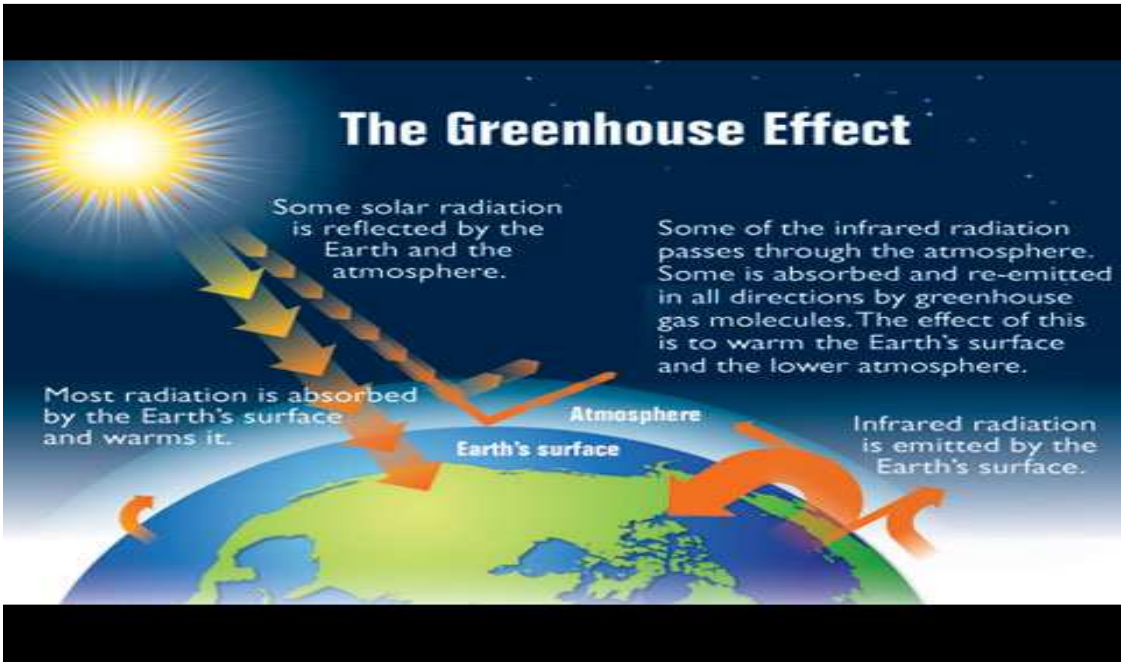

Figure 17: Greenhouse gas effect

Source: [50]

3.3.2 Air pollution

Pollution is created from incomplete carbon reactions, unburned hydrocarbons or other elements present in the fuel or air during combustion. These processes produce pollutants of various species, including carbon monoxide, soot, various gaseous and liquid vapour hydrocarbons, oxides of sulphur and nitrogen, sulphate and nitrate particulates, ash and lead. These primary pollutants can, in turn, react in the atmosphere to form ozone, secondary particulates, and other damaging secondary pollutants. Combustion also produces carbon dioxide, the primary greenhouse gas.[54]

Transport is one of the main sources of air pollution, for which evidence on direct effects on mortality as well as on respiratory and cardiovascular disease is firmly established. About 100

[54]Transport and sustainability [online]. 2009 [cit.2012.05.19]. Found from: http://people.hofstra.edu/geotrans/eng/ch6en/conc6en/ch6c4en.html

000 premature adult deaths attributable to air pollution occur each year in the WHO European Region. Emissions from road traffic account for a significant share of this burden. Some 40 million people in the 115 largest cities in the European Union (EU) are exposed to air exceeding WHO air quality guideline values for at least one pollutant.[55] Children living near roads with heavy-duty vehicle traffic have twice the risk of respiratory problems as those living near less congested streets. Indirect effects, such as the wide range anticipated from climate change, are becoming increasingly evident.

The unabated increase in motorized transport and the concentration of vehicles in urban areas has seriously affected the air quality in several cities in the world. It is expected, however, that provision of wide streets, reasonably fast-flowing traffic, well-developed traffic plans and automated traffic control, and the introduction of unleaded gasoline in most of the ESCWA member States will help to reduce the impact of vehicle-generated pollution. The pollutants emitted during transport activities have a variety of environmental impacts; inter alia, global warming, acid rain, chronic health problems and damage to vegetation.[56]

3.3.3 Noise

Traffic noise has severe impacts on health and quality of life not only in cities, but anywhere near major transport infrastructure. Exact figures on the extent to which the population is affected by traffic noise are currently very limited even in Europe. Excessive traffic noise is one of the most common complaints among American residents. Millions of people are affected by constant traffic noise in their own home. In fact, traffic noise impacts more people than any other environmental noise source. Traffic noise can affect the ability to work, learn, rest, relax, sleep, etc. Excessive noise can lead to mental and physical health problems.[57] If your home is near a

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[55]Reducing emission from transport [online]. 2011.01 [cit.2012.04.18]. Found from: http://ec.europa.eu/clima/policies/transport/index_en.htm

[56] Air pollution from ground transportation [online]. 2002 [cit.2012.04.18]. Found from: http://www.un.org/esa/gite/csd/gorham.pdf

[57] United Nations: Sustainable Transport Evaluation [online]. 2011 [cit.2012.05.19]. Found from: http://www.un.org/en/

major road or you are experiencing problems with traffic noise, you may be able to limit the impact on yourself and your family. Noise levels during the day in a noisy urban area are frequently as high as 70 to 80 dBA. Noise levels above 110 dBA become intolerable and then painful; levels higher than 80 dBA over continuous periods can result in hearing loss.[58]

3.3.4 Habitat fragmentation and land consumption

Transport infrastructure is a major cause for the partition of ecosystems and/or habitats of plant and animal populations into smaller, more isolated units. Disturbance and killing of animals is a common concern, but in the long run even essential ecosystem processes can be influenced as populations of individual species become separated. In addition, the land consumption of transport infrastructure is an increasing problem especially in urban areas.[59] [60]The huge area taken up by roads and rails already reduces valuable urban space otherwise available for living, recreation and businesses.

3.3.5 Transportation demand management (TDM)

Transportation demand management also called Mobility Management refers to various strategies that change travel behaviour (how, when and where people travel) in order to increase transport system efficiency and achieve specific planning objectives. TDM is increasingly used to address a variety of problems. A sustainable transport plan consists [61]of the following:

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[58]Traffic noise [online]. 2012[cit.2012.04.14]. Found from: http://www.wsdot.wa.gov/Environment/Air/TrafficNoise.htm

[59] United Nations: Sustainable Transport Evaluation [online]. 2011 [cit.2012.05.19]. Found from: http://www.un.org/en/

[60] UNECE Transport Division: Transport for Sustainable Development in the ECE region [online]. 2011.05.11 [cit.2012.05.18]. Found from: http://www.unece.org

[61]Transportation Plan [online]. 2008.04.18 [cit.2012.04.14]. found from: http://www.cnv.org/server.aspx?c=3&i=426

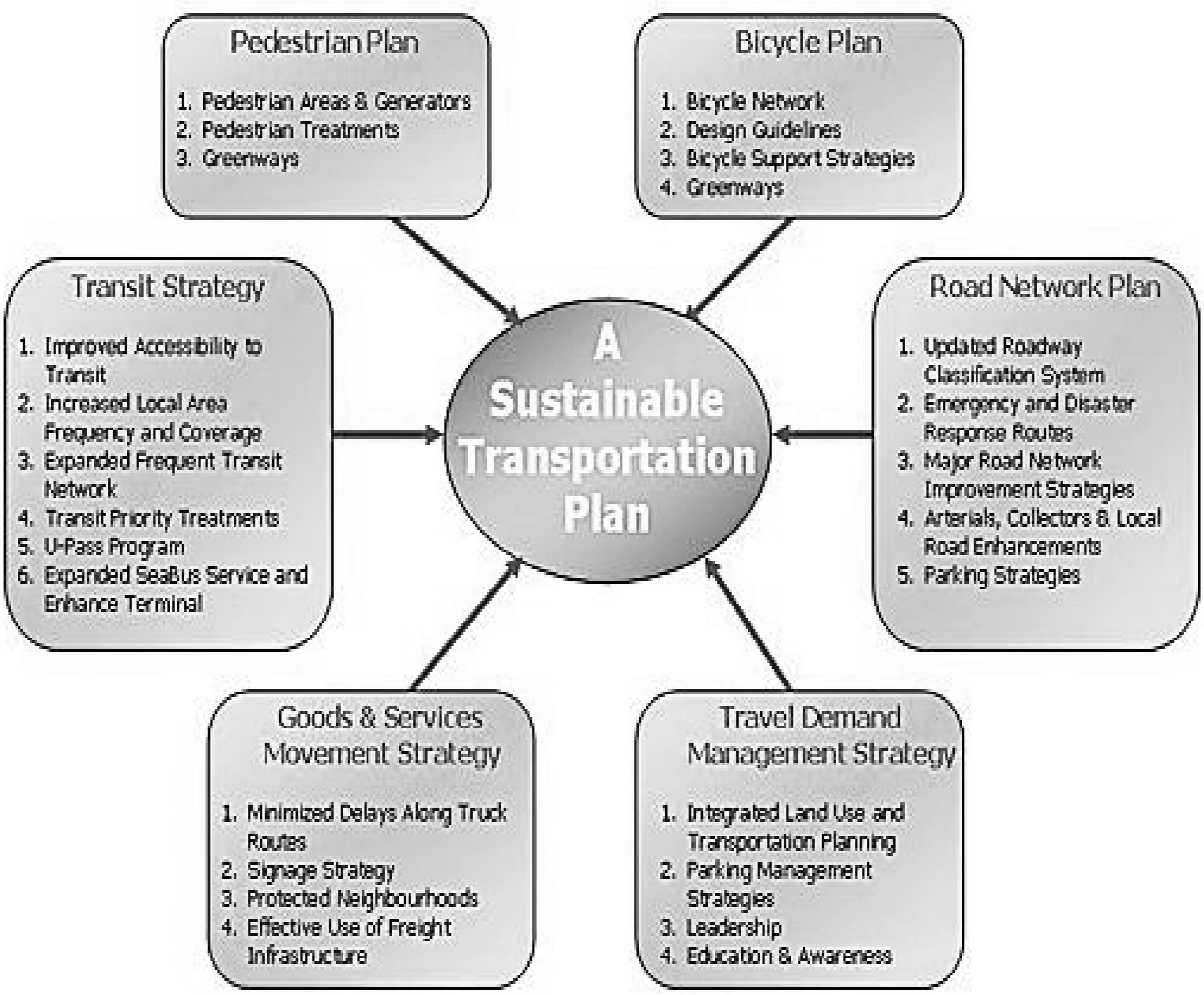

Figure 18: Transport sustainability plan and strategy

Source [51]

Overall aim to develop sustainable transportation is to provide and archive the goals illustrated on the figure above. Accessibility concepts are increasingly acknowledged as fundamental to understand the functioning of cities and urban regions. In particular, accessibility instruments are able to provide a framework for understanding the reciprocal relationships between land use and mobility. Such a framework has important potential advantages when transferred to the realm of urban planning. However, despite the large number of instruments available, they are not widely used to support urban planning practices.

Figure 19: Illustration of Sustainable transportation plans

Source [51]

Sustainable transportation Plan helps to achieve:

- A transportation system with more travel choices for residents and workers
- people-oriented, accessible and vibrant community
- Reduced local greenhouse gas emissions
- A healthy local economy supported by efficient movement of goods and services
- A more efficient road network that safely and effectively accommodates all modes
- Sense of place through great places, streetscapes and paths for people to interact

4. Current situation, goals and future plans

The Goals represent human needs and basic rights that every individual around the world should be able to enjoy freedom from extreme poverty and hunger, quality education, productive and decent employment, good health and shelter; the right of women to give birth without risking their lives; and a world where environmental sustainability is a priority, and women and men live in equality. Leaders also pledged to forge a wide-ranging global partnership for development to achieve these universal objectives.

Meeting the goals is everyone's business. Falling short would multiply the dangers of our world from instability to epidemic diseases to environmental degradation. But achieving the goals will put us on a fast track to a world that is more stable, more just, and more secure.

4.1 White paper (sustainable transportation goals)

A white paper is an authoritative report or guide that helps solve a problem. White papers are used to educate readers and help make decisions, and may be a consultation as to the details of new legislation.[62]

4.1.1 Preparing transport area for the future

Urban mobility plans establish procedures and financial support mechanisms at European level for preparing urban mobility Audits, as well as Urban Mobility Plans, and set up a European Urban Mobility Scoreboard based on common targets. Examine the possibility of a mandatory approach for cities of a certain size, according to national standards based on EU guidelines.

New technologies for vehicles and traffic management will be considered as key to lower transport emissions in the EU as in the rest of the world.

Infrastructure shapes mobility. Transport infrastructure investments have a positive impact on economic growth, create wealth and jobs, and enhance trade, geographical accessibility and the

[62] White paper [online]. 2011.03.28 [cit.2012.05.28]. Found from: http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm

mobility of people. It has to be planned in a way that maximises positive impact on economic growth and minimises negative impact on the environment.

Using transport and infrastructure more efficiently through use of improved traffic management and information systems (e.g. ITS, SESAR, ERTMS, Safe Sea Net, RIS), advanced logistic and market measures such as full development of an integrated European railway market, removal of restrictions on cabotage, abolition of barriers to short sea shipping, undistorted pricing

Promoting more sustainable behaviour

Promote awareness of the availability of alternatives to individual conventional transport (drive less, walk and cycle, car sharing, park & drive, intelligent ticketing etc.). Vehicle labelling for CO_2 emissions and fuel efficiency

Multimodal freight corridors for sustainable transport networks

Create in the context of the 'core network' multimodal freight corridor structures to synchronise investments and infrastructure works and support efficient, innovative and multimodal transport services, including rail services over medium and long distances.

Getting prices right and avoiding distortions

Transport charges and taxes should be restructured. They should underpin transport's role in promoting European competitiveness, while the overall burden for the sector should reflect the total costs of transport in terms of infrastructure and external costs. Reassess transport taxation where necessary, namely by linking vehicle taxation to environmental performance, reflecting on possible way forward to review the current VAT system concerning passenger transport, and revising company car taxation to eliminate distortions and favour the deployment of clean vehicles.

Phase in a mandatory infrastructure charge for heavy-duty vehicles. The scheme would introduce a common tariff structure and cost components such as the recovery of wear and tear, noise and local pollution costs to replace the existing user charges. Proceed with the internalisation of external costs for all modes of transport applying common principles while taking into account the specificity of each mode.

Service quality and reliability

Assemble common principles applicable to passengers' rights in all transport modes, notably the 'right to be informed', and further clarify existing rights. At a later stage, consider the adoption of a single EU framework Regulation covering passenger rights for all modes of transports. Improve the quality of transport for elderly people, passengers with reduced mobility and for disabled passengers, including better accessibility of infrastructure. Complete the established legislative framework on passenger rights with measures covering passengers on multimodal journeys with integrated tickets under a single purchase contract as well as in the event of transport operator's bankruptcy.

Acting on transport safety

Harmonise and deploy road safety technology such as driver assistance systems, (smart) speed limiters, seat-belt reminders, eCall, cooperative systems and vehicle infrastructure interfaces as well as improved road worthiness tests including for alternative propulsion systems.

- Develop a comprehensive strategy of action on road injuries and emergency services, including common definitions and standard classifications of injuries and fatalities, in view of adopting an injuries reduction target.
- Develop a Safety Management System at EU level that incorporates safety performance targets and measurements in order to identify the risks and to achieve continued improvement in safety levels.
- Develop SafeSeaNet into the core system for all relevant maritime information tools needed to support maritime safety and security and the protection of the marine environment from ship-source pollution.

Secure Transport

Cargo security**:** Implement the Action Plan on Strengthening Air Cargo Security; define new rules on Air Cargo screening as necessary and enhanced security of cargo in ports.

Passengers: Promote improved screening methods, fully respecting fundamental rights; such methods should underpin development of a 'Check point of the future' such as security corridors which would allow a high number of passengers being controlled with minimum hassle and intrusion.

They should also support security provision in other vulnerable areas such as major transport interchanges. Promote, also through funding, the development of more effective and privacy friendly technologies (scanners, detectors of new explosives, smart chips, etc.) as well as more privacy friendly solutions in existing technologies. Integrate potential effects of terrorist and criminal attacks in the preparation of mobility continuity plans Pursue international cooperation in the fight against terrorism and other criminal activities like piracy. Increase the level of security along the supply chain without impeding the free flow of trade. 'End-to-end' security certificates should be considered taking into account existing schemes. Joint Security Assessment covering all modes of transport.

4.1.2 A vision for sustainable transport system

Focus on accessibility

In a society in which transportation is sustainable, people have at least as much access to goods, services, and social opportunities as they have today, particularly people who are economically disadvantaged or who face unusual physical challenges. But the ways in which this access is achieved may be quite different. The introduction of a correct pricing system will help in better factoring transport costs into location decisions; even so, however, there is a risk that transport costs are not properly taken into account by planners and that the availability of cheap transport solutions is taken for granted

Non-motorized transportation

Much more of the access depends on widespread use of no motorized means of transport for persons, particularly in urban areas. This is possible because living and working arrangements have become much more compact. Walking, bicycling, rollerblading, and other non-motorized modes have become much more acceptable and agreeable.

Motorized transportation by current means: Some access depends on motorized transportation systems that are similar to those of the early 2000's but use very much less energy and pollute much less. There is more public transport, because it is encouraged by the layout and design of urban regions and because owning and using a car costs much more.

Motorized transportation by potential means: New transport patterns must emerge, according to which larger volumes of freight and greater numbers of travellers are carried jointly to their destination by the most efficient (combination of) modes. Individual transport is preferably used for the final miles of the journey and performed with clean vehicles.

Some access depends on the use of quite different technologies from those in common use today. They might include fuel cells using renewable resources such as hydrogen produced with solar energy, intelligent transportation systems, automated highways, maglev rail services, and airship technologies. Together they provide cleaner, more conserving, and safer movement of people and goods. The movement of goods utilizes modes of transport appropriate to the size and distance of shipment and to the minimization of resulting emissions. Shippers and carriers include environmental as well as financial goals in selecting the timing and mode of shipping.

Less need for movement of people and goods: Whatever the mode, journeys made by motorized transport are shorter on average than in early 2000's , for the movement of both people and goods in part because urban areas are more compact and have a good mix of uses. More access is achieved through telecommunications, with less movement of people or goods.

Little or no impact on the environment and on human health: The net result is dramatically lower local and global impacts of transportation on the environment. The impacts are so low they no longer provide reason for concern about people's health or any part of the natural environment, in the present or the future. In particular, emissions of carbon dioxide and other greenhouse gases from transportation are less than one fifth of the total of such emissions in the 1990s.

Methods of attaining and sustaining the vision: As well as changes in urban areas that facilitate collective transportation, bicycling, and walking, there has been and continues to be rigorous application of the full costs of transportation, supported by appropriate incentives and also by enforcement of standards for vehicles, fuels, and infrastructure

Non-urban areas: While the opportunities for achieving sustainable transportation in rural areas may be different and perhaps more limited when compared to urban areas, Canadians living in rural areas can make a positive contribution towards transportation sustainability.

Like sustainable development, sustainable rural development tends to be seen as socially and politically constructed (Sonnino 2004) and, at the same time, as an on-going and evolving process that requires constant reappraisal.

Date of attainment

Achieving the level of sustainability in transportation described above is believed to be achievable by about 2035. This does not preclude the possibility that much or all of transportation could be sustainable at an earlier date. In any case, setting and meeting performance milestones in the short and mid-term will be essential parts of the attainment of sustainable transportation in the longer term.

Alternative fuels

Another issue regarding transport, that would be particularly beneficial for global warming mitigation, is the use of alternative fuels such as biofuels. Since biofuels are of biogenic origin, the emissions from their combustion are considered to be a part of the natural carbon cycle and thus not contributing to global warming. However, the emissions from production of biofuels and other issues such as land use occupation and competition with food production have given ground for a controversy regarding the benefits of biofuels.

Conventional gasoline- and diesel-powered vehicles will become much more efficient over the coming decades. However, these gains will not be enough on their own to meet government targets. As a result, conventional vehicles, which today are about 98 % of the global fleet, will drop to about 50 % of the fleet and only 35 % of new-car sales by 2040.

Improving the energy efficiency, will help performance of vehicles across all modes. Developing and deploying sustainable fuels and propulsion systems will optimise the performance of multimodal logistic chains, including by making greater use of inherently more resource-efficient modes, where other technological innovations may be insufficient (e.g. long distance freight);

GHG emission reduction target

Halve the use of 'conventionally-fuelled' cars in urban transport by 2030, phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030. Low-carbon

sustainable fuels in aviation to reach 40% by 2050, also by 2050 reduce CO_2 emissions from maritime bunker fuels by 40% (if feasible 50%).

EU has called for, and the international community agreed, on the need to drastically reduce world greenhouse gas emissions, with the goal of limiting climate change below 2ºC. Overall, the EU needs to reduce emissions by 80-95% below 1990 levels by 2050, in the context of the necessary reductions of the developed countries as a group, in order to reach this goal. Commission analysis shows that while deeper cuts can be achieved in other sectors of the economy, a reduction of at least 60% of GHGs by 2050 with respect to 1990 is required from the transport sector, which is a significant and still growing source of GHGs. By 2030, the goal for transport will be to reduce GHG emissions to around 20% below their 2008 level. Given the substantial increase in transport emissions over the past two decades, this would still put them 8% above the 1990 level, since the first big oil crisis 40 years ago.

Enable rail to compete effectively

Rail, especially for freight, is sometimes seen as an unattractive mode. Examples in some states prove that it can offer quality service. The challenge is to ensure structural change to enable rail to compete effectively and take a significantly greater proportion of medium and long distance freight. Considerable investment will be needed to expand or to upgrade the capacity of the rail network. New rolling stock with silent brakes and automatic couplings should gradually be introduced.

The aviation

The maritime and aviation sectors are inherently global. Improving the efficiency of aircraft and traffic management operations has to be pursued in the air sector. Airport capacity needs to be optimised and, where necessary, increased to face growing demand for travel to and from third countries and areas of Europe otherwise poorly connected, which could result in a more than doubling of EU air transport activities by 2050. In other cases, (high speed) rail should absorb much medium distance traffic. The EU aviation industry should become a frontrunner in the use of low-carbon fuels to reach the 2050 target.

4.1.3 The strategy of sustainable transportation (what needs to be done)

1. The objective for the next decade is to create a genuine Transport Area by eliminating all residual barriers between modes and national systems, easing the process of integration and facilitating the emergence of multinational and multimodal operators. A vigilant enforcement of the competition rules across all transport modes will complement the Commission's actions in this area. A higher degree of convergence and enforcement of social, safety, security and environmental rules, minimum service standards and users' rights must be an integral part of this strategy, in order to avoid tensions and distortions.

2. The need to address the full cycle of research, innovation and deployment in an integrated way through focusing on the most promising technologies and bringing together all actors involved. Innovation can also play a role in promoting more sustainable behaviour.

3. Transport infrastructure policy needs a common vision and sufficient resources. The costs of transport should be reflected in its price in an undistorted way.

4. Setting the framework for safe transport is essential for the citizen. A Strategy for civil aviation safety will be developed, which includes adaptation to new technologies and, obviously, international cooperation with main partners.

5. In maritime transport, passenger ship safety needs to be proactively addressed. The Vessel Traffic Monitoring and Information System SafeSeaNet will become the core of all relevant maritime information tools supporting maritime transport safety and security, as well as the protection of the environment from ship-source pollution. For rail transport, the harmonisation and supervision of safety certification are essential in a Single European Railway Area. In these three transport sectors, the European aviation, maritime and rail safety agencies which were set up in the last decade play an indispensable role.
6. The EU's comprehensive approach of policy, legislation and monitoring of air and maritime transport security should be further consolidated and strengthened through cooperation with major international partners. For passenger security, screening methods

need to be improved in order to ensure high security levels with minimum hassle. A risk based approach to the security of cargo originating outside the EU should be considered.

7. The quality, accessibility and reliability of transport services are important. Attractive frequencies, comfort, easy access, reliability of services, and intermodal integration are the main characteristics of service quality. The availability of information over travelling time and routing alternatives is equally relevant to ensure seamless door-to-door mobility, both for passengers and for freight.
8. Core network of corridors needs to be developed to carry large and consolidated volumes of freight and passengers traffic with high efficiency and low emissions. Thanks to the extensive use of more efficient modes in multimodal combinations and the wide application of advanced technologies and supply infrastructure for clean fuels.

4.2 Legislation for sustainable transportation

4.2.1 Legislation for emission reduction

Regulation (EC) No 443/2009 of the European parliament and of the council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles.[63]

- The objective of this Regulation is to set emission performance standards for new passenger cars registered in the Community, which forms part of the Community's integrated approach to reducing CO_2 emissions from light duty vehicles while ensuring the proper functioning of the internal market.
- The United Nations Framework Convention on Climate Change, which was approved on behalf of the European Community by Council Decision 94/69/EC of 15 December 1993,

[63]Legislation summaries [online]. 2010.07.07 [cit.2012.05.28]. Found from: http://europa.eu/legislation_summaries/transport/index_en.htm

requires all parties to formulate and implement national and, where appropriate, regional programmes containing measures to mitigate climate change. In this respect, the Commission proposed in January 2007 that, in the context of international negotiations, the European Union should pursue the objective of a 30 % reduction of greenhouse gas emissions by developed countries by 2020 (compared to 1990 levels) and that the Union itself should make a firm independent commitment to achieve at least a 20 % reduction of greenhouse gas emissions by 2020 (compared to 1990 levels), irrespective of reductions achieved by other developed countries. This objective was endorsed by the European Parliament and the Council.

Measures: No more conventionally-fuelled cars in cities. 40% use of sustainable low carbon fuels in aviation and at least 40% cut in shipping emissions. 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport. Overall 60% cut in transport emissions by the middle of the century.

4.2.2 Act: Directive 2008/96/EC of the European parliament and of the council (road safety)

The purposes of this Act is to provide for safe, efficient and equitable road use, to set out the general obligations of road users in relation to responsible road use, to improve and simplify procedures for the registration of motor vehicles and the licensing of drivers, to prevent the re-birthing of stolen vehicles and to ensure the equitable distribution within the community of the costs of road use.

In its White Paper of 12 September 2001 ‘European transport policy for 2010: time to decide’ the

Commission expressed the need to carry out safety impact assessments and road safety audits, in order to identify and manage high accident concentration sections within the Community. It also set the target of halving the number of deaths on the roads within the European Union between 2001 and 2010.

Objective: to encourage road users to improve their behaviour through stricter compliance with the existing legislation, while harmonising the penalties at EU level, having continuous training

for private and commercial drivers, improving police checks and promoting education and road user awareness campaigns.

The failure of drivers to comply with basic road safety legislation is the main cause of serious accidents. The Commission will give priority to education and awareness campaigns aimed at encouraging the use of crash helmets and seat belts and discouraging speeding and alcohol consumption. At the same time, the Commission will take action to amend the Directive on driving licences in order to set minimum requirements as regards driving ability.

Main measures: to encourage the general use of crash helmets by cyclists and by all two-wheel motor vehicle users, continue specific work on young drivers, harmonise the penalties for international hauliers, establish the appropriate classification and labelling of medicines which affect driving ability, and develop best practice guidelines as regards police checks, etc.

4.2.3 Act: Directive 2011/92/EU of the European Parliament and of the Council (Environmental Impact Assessment)

The new EIA (Environmental Impact Assessment) Directive requires an assessment to be carried out by the competent national authority for certain projects which have a physical effect on the environment. The assessment must identify the direct and indirect effects of a project on the following factors: man, fauna, flora, soil, water, air, climate, landscape, material assets and cultural heritage, and the interaction between these various elements. The assessment is obligatory for projects such as large transport infrastructure, and other projects may be subject to a case-by-case basis or according to thresholds, certain criteria, location and potential impact.

The Directive is amending Directive 1999/62/EC and aims at reducing pollution from road freight transport as well as improving the traffic flow by introducing levying tolls that factor in the cost of air and noise pollution due to traffic.[64] The level of tolls will be dependent upon the emissions of the vehicle, the distance travelled, as well as the location and time of the road use.

[64]Legislation summaries [Online]. 2010.07.07 [cit.2012.05.28]. Found from: http://europa.eu/legislation_summaries/transport/index_en.htm

While the former framework directive was limited to trans-European roads, the new rules may now be extended to cover all motorways. Hybrid and electrical heavy goods vehicles are exempted from the measure, but an “external cost charge” can be applied to Lorries. The differentiated tolls are intended to stimulate the transition to transport patterns which are more environmentally friendly.

4.2.4 Act: Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport

The aim of this Directive is to establish a framework in support of the coordinated and coherent deployment and use of Intelligent Transport Systems (ITS) within the Union, in particular across the borders between the Member States, and sets out the general conditions necessary for that purpose. Priority areas for the development and use of specifications and standards include notably: optimal use of road, continuity of traffic and freight management ITS services; ITS road safety and security applications. To be transposed by 27 February 2012.

Intelligent Transport Systems (ITS) are advanced applications which without embodying intelligence as such aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated and "smarter" use of transport networks.[65]

[65] Legislation summaries [Online]. 2010.07.07 [cit.2012.05.28]. Found from: http://europa.eu/legislation_summaries/transport/index_en.htm

Conclusion

The importance of sustainability is acknowledged globally but local perceptions vary on what does sustainability mean? What does it mean in social, context? How does it relate to norms and values? What is to be sustainable, for how long and where? We all know the famous "first definition" of sustainable development by the Brundtland Commission: "development, which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Many more definitions have appeared since, and their points to the complexity of the issue. The definition of sustainability is inherently a definition of values and of the future of the society.

Sustainability has been proven to be much more than a handful of influential policies. It should be a guiding principle in all that we do: for government, for business and for everyone as citizens making everyday choices meaning Governments together with citizens must also practise and promote a sustainable liveable world. World leaders together with expects are working towards sustainable future to retain and prevent the loss of resource and the environment. While it is , perhaps difficult, these changes will ensure we can maintain and improve quality of life for all.

Governments and NGOs over the years had conferences and meetings to discuss the possible solutions of the unsustainable world we live in. First and for most before planning the objective and goals of sustainability, there has to be a realisation of global problems of today for example: Climate change, environment deterioration by pollution, economic crisis, growing population, unsustainable transportation etc.. United Nations is sorely a very committed organisation of finding solution for a sustainable future where the needs of the present will be meet without compromising the ability of future generations.

The thesis has showed the implication of transport and the challenges of transport sustainability. Transport sustainability is mostly archived in first world countries where mobility and trends of transportation is easy and costs and accessibility is reliable. There is still a big gap to be covered between poor countries which I have mentioned above and first world countries to be on the same level. With no funds and no technology in poor countries it is twice as hard to gather necessary information so that it may be possible to plan for the future, while rich countries like US are exhausting the world's minerals it's a somehow a losing battle to archive sustainability goals.

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Table of figures

List of abbreviations

OECD:	Organisation for Economic Co-operation and Development
WCC:	World Council of Churches
CFCs:	chlorofluorocarbons
UN:	United Nations
UNEP:	United Nations Environment Programme
EPA:	Environment Protection Authority
NGOs:	Non-government organisations
WTO:	World Trade Organization
WHO:	World Health Organization
GDP:	Gross Domestic Product
PPP:	Purchasing Power Parity
GNP:	Gross National Product
UNECE:	United Nations Economic Commission for Europe
HDI:	Human Development index
WCED:	World Commission on Environment and Development
IPCC:	Intergovernmental Panel on Climate Change
HIV/AIDS:	Human Immune Deficiency virus/Acquired immune deficiency syndrome
ESCWA:	United Nations Economic and Social Commission for Western Asia
TDM:	Transport demand management
$CO_{2:}$	Carbon Dioxide
ITS:	Intelligent Transport Systems

US$: United State Dollar

SSN: Safe Sea Net

dBA: Decibel (sound or acoustic level)