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The impact of energy consumption and production in the world on environment

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Abstract: Based on historical documents, anthropogenic environment had good consistency with the surrounding nature. Over time, with the industry development and the relevant changes, for moving developed technology, the industry is obliged to use more energy resources and the need to energy production resources was increased.
On the other hand, in current communities, living is continued with energy consumption and the basis of development requires energy resources. The evidences show that human being with the current world and unduly interferences namely with the increase of non-renewable resources can change climate model and increase fossil energy resources. This aim with the production of greenhouse gases created environmental crises at global level. The predictions show that the increasing trend of generation of these gases has created global concerns. This study evaluates the increase of energy consumption and environmental outcomes.
Keywords: Energy resources, Environment, Development, Climate, Consumption

Introduction

The climate changes based on the nature are not natural anymore by human interference and they are different in inconsistency with nature as in the current world, climate changes are created on earth. These changes namely in contemporary era, with unduly consumption of energy of fossil fuels, can generate and emit greenhouse gas. The relevant evidences in this regard are sudden and abnormal climate changes. This aim needs planning to control production and reduces energy resources consumption namely fossil fuels and increase of renewable energy resources to create a suitable living environment.

The world energy production resources

Energy exists in three main forms: Fossil fuels (oil, gas and coal), nuclear energy and renewable energy (hydroelectricity energy, solar energy, wind energy, energy of tide and ebb and energy of burning wood (bioenergy) (1)

Based on significance, at first we explain fossil fuels as non-renewable energy.

Fossil fuels (Non-renewable energy)

Now, more than 70% of energy in the world is Fossil and it includes oil, gas and coal.

A. Oil:

B. Unduly use of oil has created concerns. Above all, oil resources are minimized and the earth cannot replace it in natural cycle (2).

Oil reservoir in the world is averagely 52.9 years and based on oil use in 2012, the oil fields in central and southern America, Middle East, Northern America, Africa, Europe, Eurasia and Oceania for more than 100 years is 78.1, 38.7, 37.7, 22.4, 13.6 years, respectively. It is worth to mention that oil reservoir of all OPEC state members except Angola, Aljazeera and Qatar is more than 40 years (3).

Long-term outlook of oil global demand

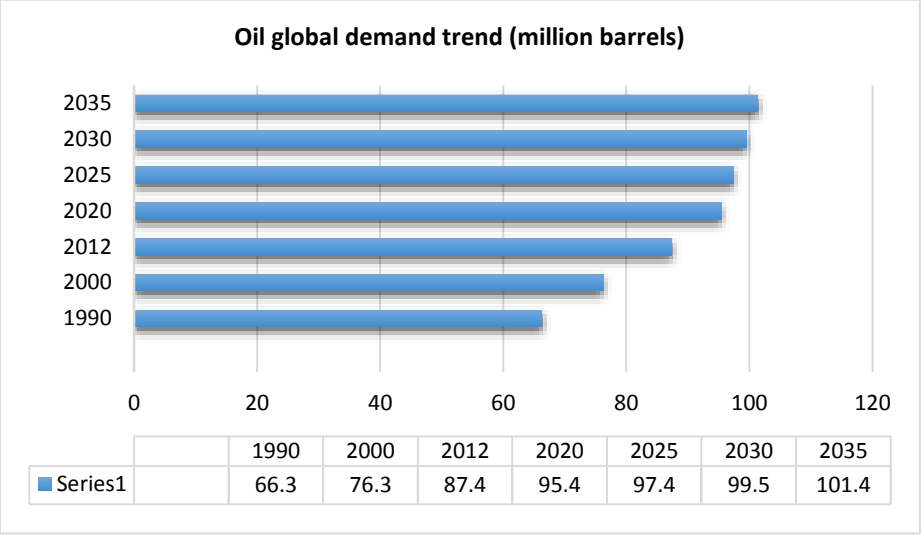
The following chart is based on IEA in 2013. It shows suitable data about global demand of oil during 1990 to 2012 and prediction by 2035. This trend during 1990 to 2020 was averagely 8 million barrels per day as increased but this trend was slower during 2020 to 2035.

Table 1- The long-term vision and consumption of global demand of oil by source 4

Year	1990	2000	2012	2020	2025	2030	2035
Amount (Million barrels per day)	66.3	76.3	87.4	95.4	97.4	99.5	101.4

Based on the above chart, it is predicted that of 87.4 million barrel per day in 2012 with annual growth of 0.8%, it reached to 101.4 million barrels per day in 2035.

Chart 1- The consumption trend and global demand of oil by source 4



b. Natural gas

After oil, natural gas is a suitable and cheap fuel due to the low problems compared to oil and it enteres the global energy consumption and its consumption is developing and one of the most important features is its environmental advantages. The estimation of gas reservoir of the world is 187.3 trillion m^3 in 2012 with the life of 55.7 years. The share of various regions in the world of natural gas reservoir in the world in 2012: Middle East 43.0%, Europe and Eurasia 31.2%, Asia and Oceania 8.2%, Africa 7.7%, northern America 6.0 and southern and central America 4.1% (3).

The long-term view of global demand of gas

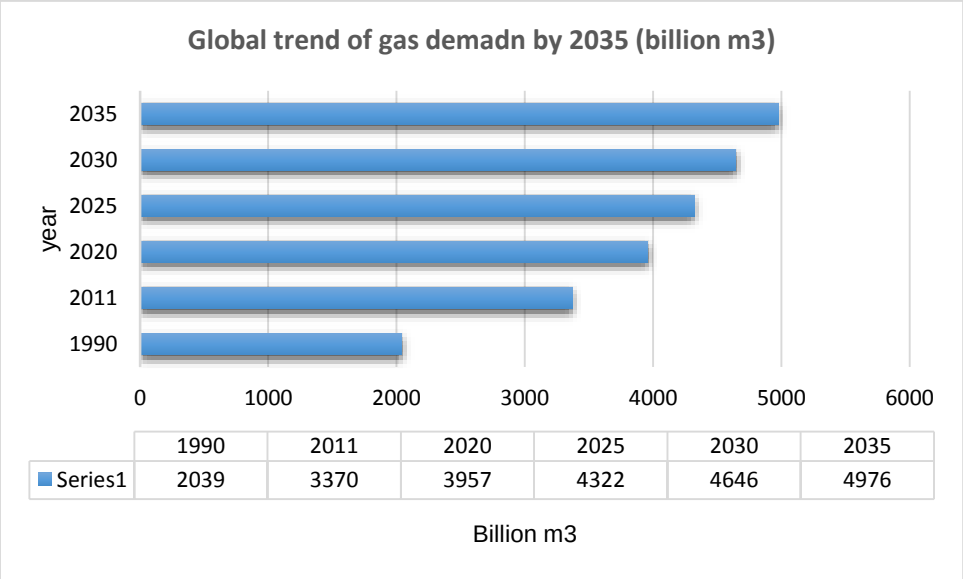
The following chart is based on IEA in 2013. Global acceptance to use gas in 1990 to 2012 and prediction to 2035 are defined. It is predicted that the ascending trend of demand and its use is continued.

Table 2- The consumption and long-term view of global demand of gas (Billion m3) by source 4

Year	1990	2011	2020	2025	2030	2035
Amount (Billion m3)	2039	3370	3957	4322	4646	4976

Gas demand during 2011 to 2035 in OECD member states incrased from 1597 billion m3 to 1885 billion m3 with growth 0.7%. The gas demand among non-OECD states with annual growth 2.3% is reached from 1773 billion m3 in year 2011 to 3086 billion m3 in 2035.

Chart 2- The consumption and long-term view of global demand of gas by source 4



c. Coal

Coal is one of fossil energy resources as used. Problems in consumption, transportation and adverse effects of environment have caused that it has little share of global fuel cycle (2).

Coal is found on the north of equator namely on north of 30degree circuit. It shows estimation of 861 billion ton coal reservoir of the world in 2012 with the life of 109 years. Almost more than 75% of coal reservoirs of the world are dedicated to five countries of US, Russia, China, Australia and India (1).

Despite limited fossil fuels resources and concern of their completion, the method and speed and high volume of consumption have led into serious environmental problems and this aim has endangered life for live creatures.

Nuclear energy

Nuclear energy is one of the most important types of energy with wide application. Using this type of energy is increasing but there are doubtful views in the world to use it namely at political dimensions. Some believe that nuclear energy technology has passed its maturity stages and it is turned into reliable, beneficial and economic energy as applied by public. Other group has the opposite idea and refers to its adverse use and believes that it increases the risk of human destruction. The planning of some countries as England, Germany, US, Russia, Canada, India, China, Japan, Argentina, Brazil for 2050, is a plan based on complete use of nuclear energy to fulfill the need to electric energy (2).

Global crisis of energy

By increasing population of the world and limited energy resources, all countries are encountered with energy problem. Energy is of great importance for all people. Energy has penetrated into all aspects of human life and its various aspects from routine family life to global and international policy and national development plans are affected. In recent years, energy is of great importance due to a phenomenon as called global crisis of energy (1).

Effective factors on global energy crisis

a. Limited fossil fuel resources as in the early 1970.
b. High cost of new energy namely for developing countries
c. Imbalanced effect of energy crisis on community namely for developing countries compared to industrial countries (1).

Before industrial revolution, based on existing conditions, human being has applied renewable energy for their own comfort and has adjusted his architecture with climate and conditions of region but in industrial revolution, the application method was changed and artificial and mechanic systems replaced traditional systems in building and thermal comfort was changed. Thus, human being was encountered with two great crises. At first limited resources of fossil fuels and second, increase of environment pollution, it is worth to mention that along global energy vision, three institutes of international agency, OPEC secretariat and US energy information office presented valid information. According to international energy agency by 2015, demand for energy increased 25%. The energy increase consumption namely oil in all over the world is continued. Despite the wide researches and investment in all over the world to produce alternative and renewable energy, oil and gas consumption in the past years was first and economic dependence of countries on oil and gas supply is increasing. Here, natural gas consumption had rapid growth and it is predicted that consumption of this matter had the highest growth among energy carriers in the world during the 20 years. In recent years, gas is used on fuel consumption as the continuance of investment and explorations show that consumption of this type of fuel is economical beside positive environmental effects.

Energy problem

Prediction of limited reservoirs and important energy resources as oil and gas and their unduly consumption and increase of population in the future and increase of energy demand has created concerns in economic development and achieving alternative resources.

The condition of the world energy in 2011

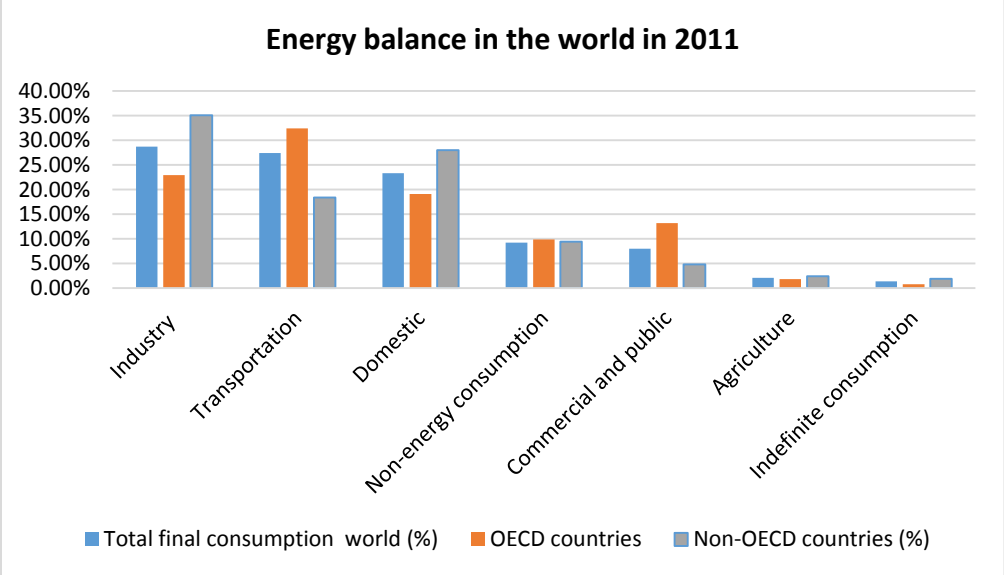
The energy balance in 2011, total supply of initial energy and total final consumption of the world compared to the previous year as 1.6, 1.7%, respectively was increased and it reached 13113.4 and 8917.5 million ton equal to crude oil, respectively. In this year, the share of industry, transportation, domestic, non-energy consumption, commercial, public, agriculture and indefinite consumption of total global consumption was 28.7, 27.4, 23.2, 9.2, 8.0, 2.1, 1.4%, respectively. In energy balance of OECD countries, the share of required sectors of final consumption is 22.9, 32.4, 19.1, 9.9, 13.2, 1.8, 0.8T%, similar figures in energy balance of non-OEC countries was 35.1, 18.4, 28.0, 9.4, 4.8, 2.4, 1.9%, respectively. In the investigated year, industry, domestic and transportation with 35.1, 28.0, and 18.4% had highest share of total final consumption of non-OECD countries. The mentioned shares for OECD countries were 22.9, 19.1, and 32.4%. The investigation of the share of energy carriers in final consumption of world shows that 40.7% of total final consumption of the world was dedicated to crude oil and oil products, 20.9% electricity and heat, 15.5% natural gas, 10.1% coal and 12.8% renewable energy and bioenergy and residuals. The investigation of this share in OECD countries and non-OECD countries shows that both groups of countries, crude oil and oil products with the share 47.8%, 31.1% were reduced and it showed replacing this energy carrier with other energy carriers. Also, electricity with 22.0% share in OECD countries and other renewable resources and combustible residuals with 19.0% share of non-OECD countries, was the second highly applied carrier (3).

Based on the items regarding the share of industry, domestic, non-energy consumption, transportation, commercial and public, agriculture and indefinite consumption of OECD countries and non-OECD countries, the results are as follows.

Table 3- The share of various sectors of total energy consumption of world by source 3

Consumption sector	Total final consumption of the world (%)	OECD countries (%)	Non-OECD countries
Industry	7.28	9.22	1.35
Transportation	4.27	4.32	4.18
Domestic	2.23	1.19	0.28
Non-energy consumption	2.9	9.9	4.9
Commercial and public	0.8	2.13	4.8
Agriculture	1.2	8.1	4.2
Indefinite consumption	4.1	8.0	9.1

Chart 3- The results of above table in 2011 by source 4



Future of the energy of world: In 1990, global demand of initial energy was 8769 million Ton equal oil and by 2011, it increased by 49% and it reached 13070 million Ton oil. It is predicted that initial energy demand by 2035 with annual growth 1.2% is increased 33% and in 2035, it reaches 17387 million Ton oil (4).

Table 4- Vision of initial energy demand of the world by source 5

Carrier type	1990	2011	2020	2025	2030	2035	Annual growth from 2011 to 2035
Coal	2230	3773	4202	4312	4379	4428	0.7
Oil	3231	4108	4470	4548	4602	4661	0.5
Gas	1668	2787	3273	3576	3846	4119	1.6
Nuclear energy	526	674	886	979	1053	1119	2.1
Hydroelectricity	184	300	392	430	467	501	2.2
Bioenergy	893	1300	1493	1604	1719	1847	1.5
Other Renewable energy	36	127	309	426	559	711	7.4
Total	8769	13070	15025	15877	16623	17387	1.2

Table 5- Prediction of share of initial energy demand vision in 2011 to 2035 by source 5

Carrier type	2011	2020	2025	2030	2035 %
Coal	28.86 %	27.96%	27.31%	26.34 %	25.46 %
Oil	31.43 %	29.75%	28.8%	27.68 %	26.8 %
Gas	21.32 %	21.78%	22.65 %	23.31 %	23.9 %
Nuclear energy	5.15 %	5.89%	6.16 %	6.33 %	6.43 %
Hydroelectricity	2.29 %	2.6%	2.72 %	2.8 %	2.88 %
Bioenergy	9.94 %	9.93%	10.1 %	10.34 %	10.62 %
Other Renewable energy	0.97 %	2.05%	2.69 %	3.36 %	4.08 %

Based on above Table, in 2011 oil with 31.43% had hgihest share. Coal with 28.86% in secodn rank and gas with 21.32% is in third rank and other renewable energies with 0.97% have the lowest percent.

Prediction of demand of energy carrier share

Chart 4- The display of share of energy carriers of total initial demand in 2011 and prediction by 2035 by source 4

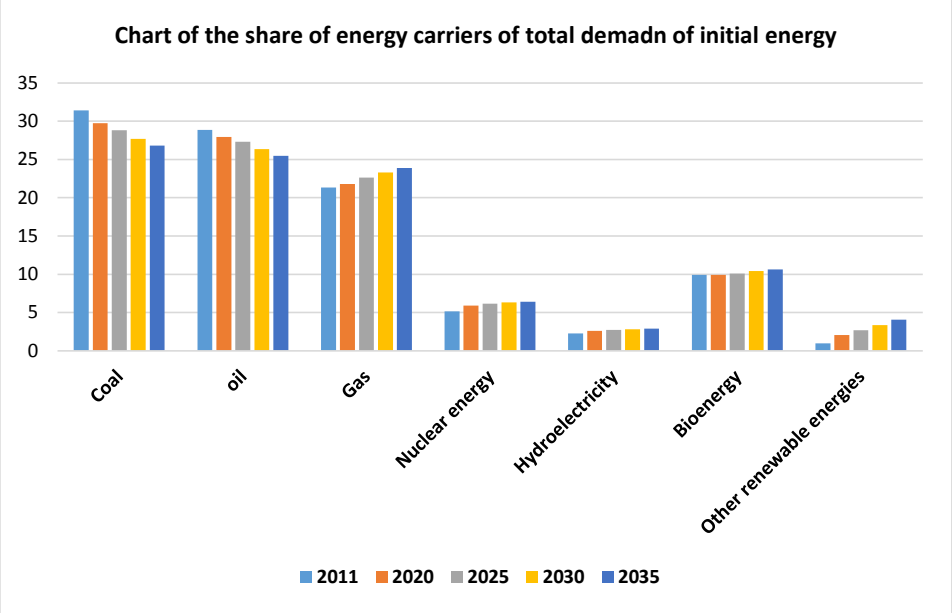
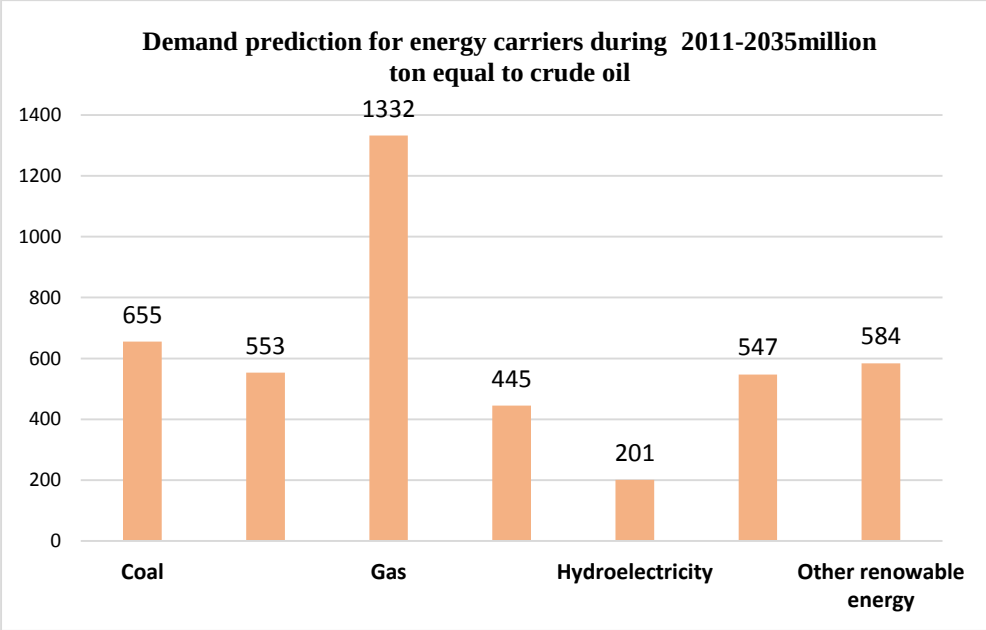


Table 6-Demand prediction for energy carriers during 2011-2035 (million ton crude oil), author by source 5

Energy carrier	Coal	Oil	Gas	Nuclear energy	Hydroelectricity	Bioenergy	Other renewable energies
Demand	655	553	1332	445	201	547	584

Based on the comparison of table of energy carriers during 2011-2035 to predict demand of energy carriers as coal, oil, nuclear energy, electricity, hydroelectricity energy and other renewable energy, the following chart is plotted to define this difference well.

Chart 5- Demand prediction for energy carriers by source 4



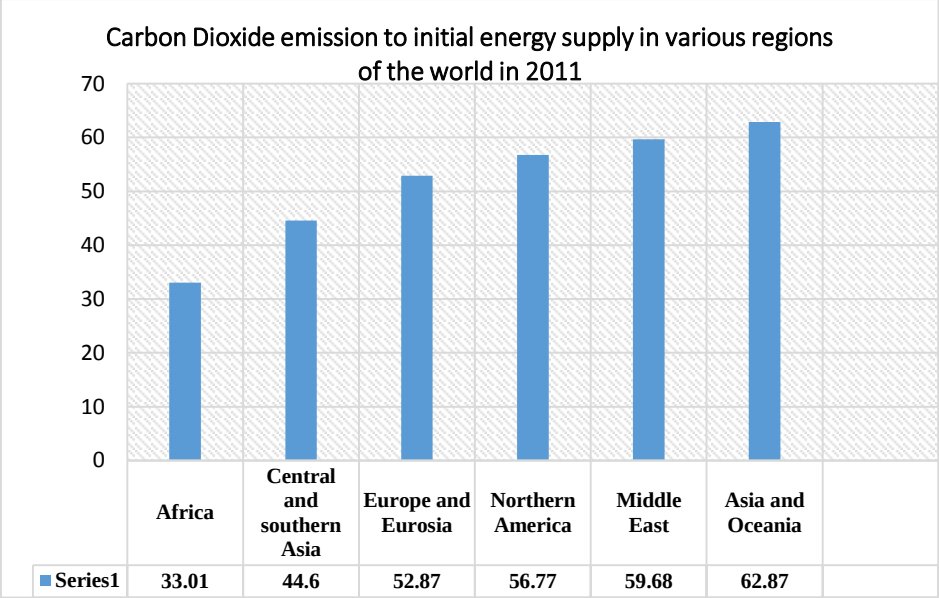
The above chart shows that based on the information, during 2011-2035, it is predicted that highest demand for natural gas with 1332 million ton crude oil and coal with 655 million ton crude oil and then crude oil with 553 million ton. In next stages, demand for renewable energies is considerable. Based on the above Tables and charts, we can say demand for initial energy by 2035 is increasing and fossil energy of oil and gas and coal have high share in initial energy demand. Based on the policies by developed countries as the majority of fossil fuels are consumed and to determine standards of vehicle fuel and increase of using biological fuels (plant), reduction of consumption growth of these types of energy are used. The share of fossil fuels of global demand of initial energy is reduced from 82% in 2011 to 76% in 2035 but it has dominant share.

Global consumption of energy and pollution of pollutant gas emission in environment

The relationship between demand increase for energy and gases as CO2: The industrial revolution and technology progress in the early 19th century and development of industrial activities, global population growth, economic growth and increase of energy consumption as generated by economic development and consumption of different fossil fuels as oil, coal and natural gas and increased gases as CO2. Since industrial revolution, industrial activities of human being caused that greenhouse gases emitted the atmosphere. The main element of this increase of greenhouse gases is carbonic gas arising from combustion of fossil fuels (9).

The following charter shows that initial energy supply in all over the world in 2011 and carbon dioxide emission is compared.

Chart 6- Carbon dioxide emission by source 4



The impact of energy consumption and production on environment

The most important achievement of industrial era with three centuries of its governance is unduly energy consumption and environment destruction arising from greenhouse gas emission to atmosphere and it leads to final product of environmental pollution. Autonomous technology of this era has arranged a world full of problems as it can give solution in its own environment, the solutions guiding human being to unavoidable places. The contemporary human being is involved in misfortune of industry; he produces, consumes and destroys to be alive. Most of these attacks are based on combinational use of fossil energies as human being doesn't know their value and false use of the energies can destroy human being life (7). The most important outcome of production and consumption of energy in the world is increase of CO2 gas of combustion of fossil fuels, basic changes under climate conditions, increase of heat and increase of pollutants in the earth. Indeed, these pollutions have considerable effect on health of live creatures, economic and social issues and the statistics of valid global resources can be used. For example, we can refer to the statistics in energy balance 2012 of Iran. In this balance regarding pollutants, it is said that carbon dioxide concentration in the world in 2012 compared to century 18, increased 40%. The considerable increase was occurred regarding other greenhouse gases as CH4, N2O. In 2011, global emission of carbon dioxide was 313 giga Ton and compared to 2000, it had increasing trend as 2.7% and compared to 2010, it had reducing trend as 2.0% and its main reason was financial crisis in the world in this year. The share of energy sector regarding human activities in greenhouse gas emission in this year was estimated about 83%, of which 93.0, 6.0 and 1.0% was dedicated to carbon dioxide emission, CH4, N2O. Other sectors as agriculture (husbandry and rice plantation) were responsible about emission of other greenhouse gas and namely CH4, N2O. In other words, energy sector has highest share in greenhouse gas global emission namely carbon dioxide in the world (3).

After industrial revolution, the world has been encountered with the increase of greenhouse gas. These gases are based on uncontrolled use of fossil fuels. Based on the existing statistics, carbon dioxide gas emission in 1999 was about 31% compared to that of pre-industrial revolution. Carbon dioxide gas in 1800 was 570 million ton but in 1999, it reached 760 million Ton. The interference of various sectors on greenhouse gas was different. Transportation 21%, industry 36%, building 33% and other items as 10% in increase of these gases (2).

Energy consumption in the present world and carbon dioxide production

In 2011, 44.0% of carbon dioxide emission was due to combustion of coal, 35.3% oil and 20.2% gas fuel. In this year, share of carbon dioxide emission of coal with 4.9% increase reached 13.7giga ton. Carbon dioxide emission of oil combustion with 0.6% was increased was estimated as 11.1gigaton and it is predicted that by increasing demand in transportation, emission reached 12.5gigaton in 2035. Carbon dioxide emission of gas combustion in this year reached 6.3giga ton and it increased 1.7% compared to the past year and it is predicted that this emission by 2035 was increased by 9.1 Giga Ton. In this year, almost 2.3 of global emission of carbon dioxide

from 10 countries in the world as China and US with the share 25.4 and 16.9% had highest share. These two countries produced 13.2 Giga Ton carbon dioxide in the world. In 2011, electricity production, heat and transportation were responsible regarding the emission of 2.3 of carbon dioxide in the world. The electricity generation and heat with production 42% carbon dioxide had highest share in emission in the world. Transportation sector was responsible for 22% of carbon dioxide in the world (3).

With the current trend by 2100, earth temperature is increased 3.7 to 4.8℃ and sea level is increased 26 to 82cm and it is catastrophic according to experts. Experts believe that to keep the goal, carbon dioxide mission and greenhouse gas to 2100 should be zero but in current trend in 2100, earth is filled with greenhouse gas two or three times more than the current amount (10).

Energy statistics show two important issues with the increase of human being need in the world to energy, the first is increase of demand for energy based on existing resources shortage and second is increase of environmental pollution in using present energy resources.

Conclusion

In the present world, the survival of life and global development depends upon energy consumption and production. Generally, energy is found as three main forms as fossil fuels, nuclear energy and renewable energies. For the first time, in the early 1970, energy crisis was created with industrial revolution and industrial systems instead of traditional systems and the change in using method. Two big crises of limited fossil fuel sources and increase of environment pollution were raised. Since then, the major concern is economic development and achieving alternative resources as in the energy global outlook, all countries are involved with low energy and resources namely fossil fuels and the world is encountered with population increase and increase of energy demand and prediction of limited reservoirs of energy as oil and gas and their unduly consumption. This demand and energy consumption created energy crisis in daily life, family, country, global and international policies, national and international development plans. The existing statistics and predictions for future show that initial energy demand and economic growth and population growth in development countries are rapid than that of developed countries. This leads to high energy consumption and increase of greenhouse gases. The most important outcome of production and consumption of energy in the world is increase of CO2 gas of combustion of fossil fuels, basic changes in weather conditions, increase of heat and pollutants in the earth. Now, electricity and heat generation and transportation emit carbon dioxide into atmosphere all over the world. With these climate changes and greenhouse gases emission, the life of creatures is endangered and basic review regarding energy consumption namely fossil energy and replacing renewable energy resources is considered. Thus, now energy production and consumption are critical in the world and they have adverse effect with the fossil fuel consumption in energy generation for environment and life condition of live creatures is endangered.

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