

Chapter - 2

Energy Basics.

2.1 Maslow's Hierarchy of Needs

Maslow's Hierarchy of Needs is a theory in psychology proposed by ~~Ab~~ Abraham Maslow in 1943 paper "A Theory of Human Motivation".

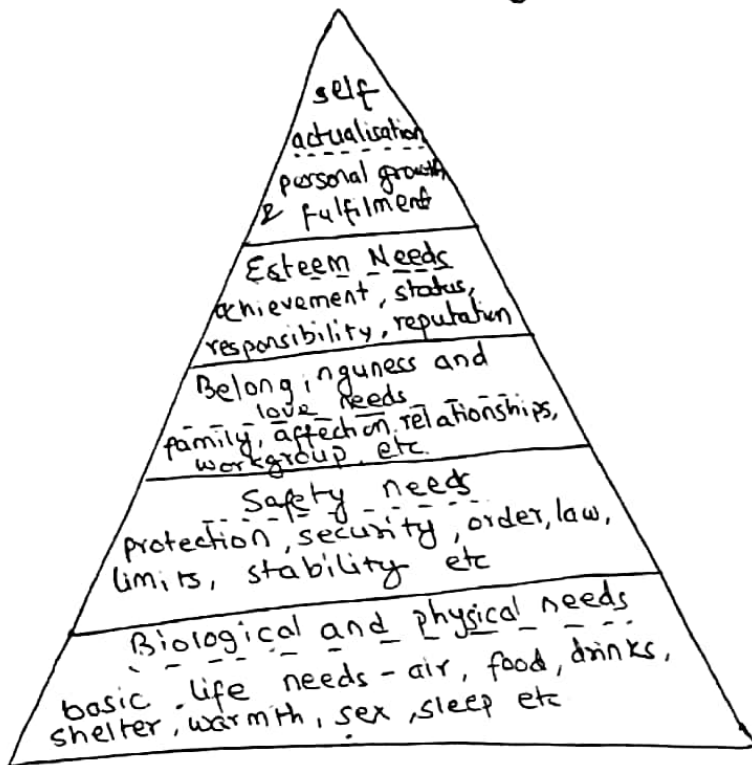


Fig: Maslow's Hierarchy of Needs.

Importance of Energy in achieving Maslow's Hierarchy of Needs.

Physiological needs: Physiological needs are the physical requirements for human survival. If these requirements are not met, the human body cannot function properly and ultimately fail.
Example: Air, food, shelter, warmth, sex, sleep.

Safety needs: Safety and security needs include:

- * Personal Security
- * Financial Security
- * Health and well-being

love and belonging:

This need is strong in childhood and it can override the need for safety as witnessed in children who cling to abusive parents.

According to Maslow, human needs to feel a sense of belonging and acceptance among their social groups, regardless whether these groups are large or small.

Example: Friendship
Intimacy
Family.

Esteem

Esteem presents the typical human desire to be accepted and valued by others. Low-self esteem or an inferiority complex may result from imbalances during this level of in the hierarchy.

Example: achievement
Reputation.

Self-actualization

"what a man can be, he must be". This quotation forms the basis of the perceived need for self-actualization. This level of need refers to what a person's full potential is and the realization of the potential. Maslow describes this level as the desire to accomplish everything that one can, to become the most that one can be.

Self-transcendence.

In his later years, Maslow explored a further dimension of needs, while criticizing his own vision on self-actualization. The self only finds its actualization in giving itself to some higher goal outside oneself in altruism and spirituality.

Transcendence refers to the very highest and most inclusive or holistic levels of human consciousness, behaving and relating, as ends rather than means to oneself, to significant others, to human beings in general, to other species, to nature and to the cosmos.

Human Development Index (HDI) ✓

Human Development Index is a composite statistic of life expectancy, education and per-capita income indicators, which are used to rank countries into four tiers of human development. A country scores higher HDI when the lifespan is higher, the education level is higher and the GDP per capita is higher.

For the calculation of Human Development Index, three indices are used.

$$1) \text{ Life Expectancy Index (LEI)} = \frac{LE - 20}{85 - 20}$$

LEI is 1 when life expectancy at birth is 85 and 0 when life expectancy at birth is 20.

$$2) \text{ Education Index (EI)} = \frac{MYSI + EYSI}{2}$$

where,

$$MYSI = \text{Mean Years of schooling Index} = \frac{MYS}{15}$$

where MYS = Mean Year of schooling
15 is the projected maximum of this indicator for 2025.

$$EYSI = \text{Expected Years of schooling Index} = \frac{EYS}{18}$$

where,

EYS = Expected Years of schooling.
18 is equivalent to achieving a master's degree in most countries.

$$3) \text{ Income Index (II)} = \frac{\ln(\text{GNI}_{pc}) - \ln(100)}{\ln(75,000) - \ln(100)}$$

II, is 1 when GNI per capita is \$75,000 and 0 when GNI per capita is \$100.

inally,

$$\therefore \text{HDI} = \sqrt[3]{\text{LEI} \cdot \text{EI} \cdot \text{II}}$$

Energy Consumption.

Energy consumption is the amount of energy or power used.

Energy Consumption and HDI

- Life Expectancy: better resources available, refrigeration system to conserve medicines, lightning, heating systems, better hygiene etc.
- Education: reduced drudgery etc
- * Income: employment opportunity etc.

HDI 2003 report

S.No.	Country	HDI	Energy Consumption (kgoe/person)	Per-Capita Income
1	Iceland	0.968	11718	38,500
2	Norway	0.968	5933.6	54,200
3	Australia	0.962	5723.3	40,800
4 105	India	0.547	512.4	3700
5 111	Nepal	0.458	335.9	1300

2.1 Current Energy Trends, Demand and Supply of Energy in World and Nepal

Current Energy Trends (2016/2017)

- Oil prices stay rock bottom.
(Crude oil price benchmark fell below \$34 a barrel for the first-time since 2009).

2) The solar boom marches on.

The solar industry set record after record in markets like us in 2015. That was partly thanks to cheap solar panel prices, as well as companies capitalizing on the solar sector using new software, analytics, third party financing and marketing.

3) The continued death of coal in developed countries. Moody's Investors Service says that the coal industry's earnings in North America fell by 25% this year.

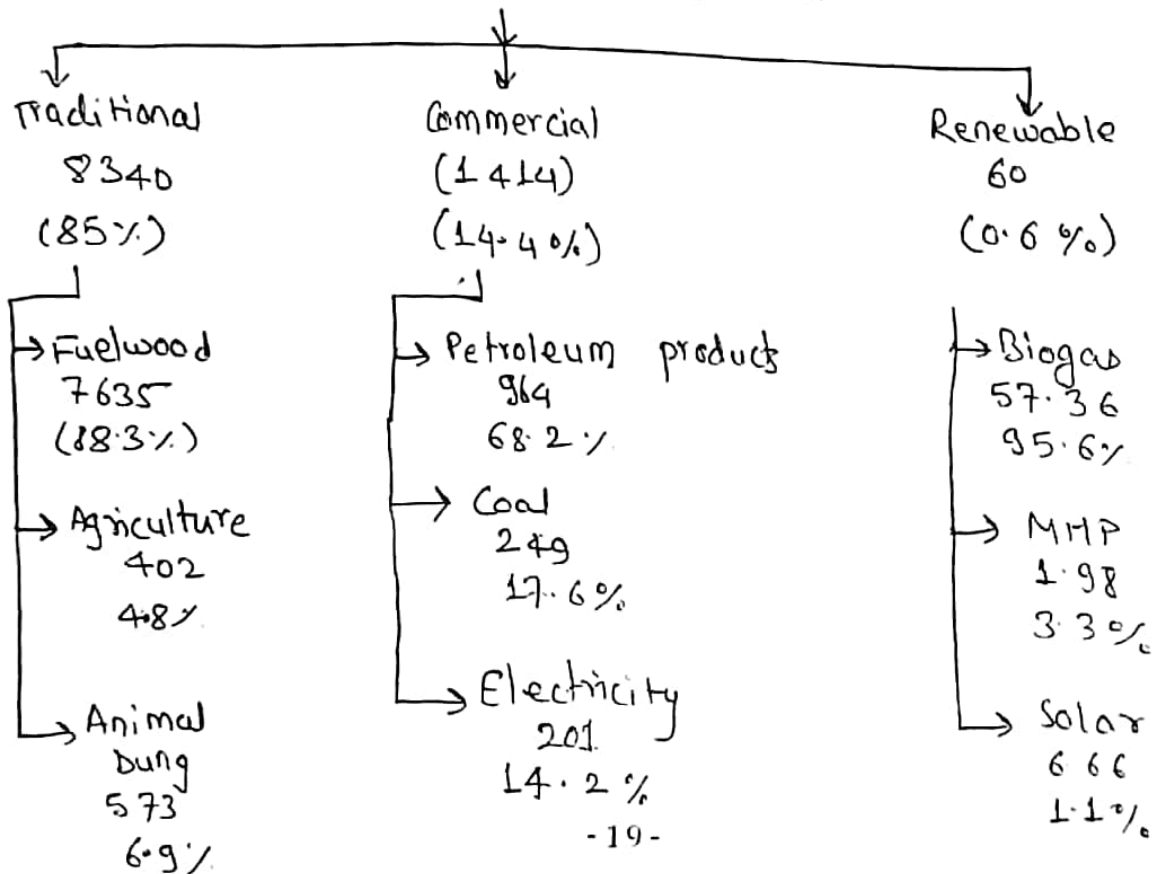
4) Tentative return of nuclear.

5) storing energy (Batteries) will still be hot.

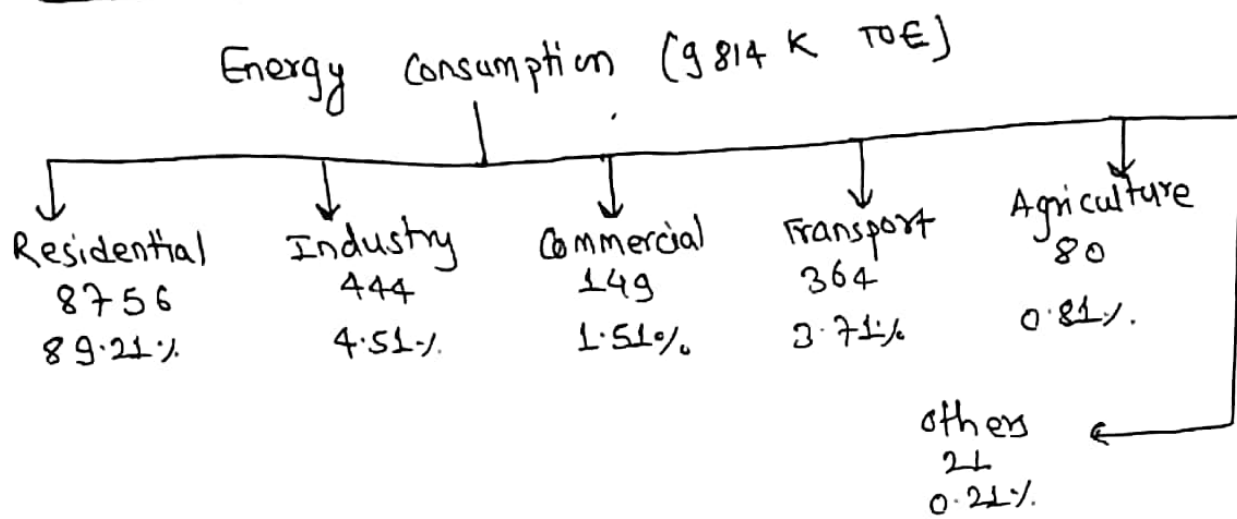
(shrinking cost of lithium-ion batteries) Batteries will increasingly be used to power electric cars, manage the power grid, and store energy for building.

Supply of Energy in Nepal

Energy Supply
(Total 9,814 thousand TOE)



Nepal Estimated Energy Supply Demand Balance
 2007/08 (FY 2064/065)
 Estimated in 000 TOE



2.3 Introduction to Global warming clean Development Mechanism and Sustainability Issues.

Global Warming

Global warming is a term used for observation of century-scale rise in the average temperature of the Earth's climate system.

Global warming is defined as the rise in temperature of earth's surface due to greenhouse gases such as carbon-dioxide, methane and nitrous oxide. It has adverse affect on climate change. Global warming should be limited to well below 2.0°C (3.6°F) relative to pre-industrial levels, with efforts made to limit warming to 1.5°C (27°F).

Clean Development Mechanism

The clean Development mechanism (CDM) is one of the Flexible Mechanisms defined in the Kyoto Protocol that provides for emission reduction projects which generate Certified Emission Reduction units which may be traded in emission trading schemes.

It is a scheme to support greenhouse gas (GHG) emission reduction through co-operation between developed countries (Annex I parties to the United Nations Framework Convention on climate change (UNFCCC)), which are committed to certain GHG emission reduction targets under the Kyoto Protocol, and developing countries (non-Annex I parties), which do not have any commitments to reduce GHG emission.

Objectives of CDM

- to assist parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the UNFCCC, which is to prevent dangerous climate change
- to assist parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments.

Kyoto mechanisms consist of followings other than CDM

- ⇒ Emission trading - Article 17 of the protocol.
- ⇒ Joint implementation (JI) - Article 6 of the protocol.

Kyoto Protocol

Kyoto Protocol is an international treaty which extends the 1992 United Nations Framework Convention on climate change (UNFCCC) that commits state parties to reduce greenhouse gas emissions, based on the premise that global warming exists & human-made CO₂ emissions have caused it.

It was adopted in Kyoto, Japan on 11 December 1997 and entered into force on 16 February 2005. There are currently 192 parties on the protocol. The major feature of the Kyoto Protocol is it sets binding targets for 37 industrialized

Countries and the European community for reducing greenhouse gas (GHG) emissions. These amount to an average of 5% against 1990 levels over the 5-year period 2008-2012.

Article 12 of Kyoto Protocol

*** Article 12 of Kyoto Protocol is attached hereby.

Major Feature of Kyoto Protocol

The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community (Annex I parties) for reducing greenhouse gas (GHG) emissions. These amount to an average 5% against 1990 levels over 5 year period 2008-2012.

④.

* Committed target for reducing GHG emissions of major countries.

EU - 8%

Japan, Canada - 6%

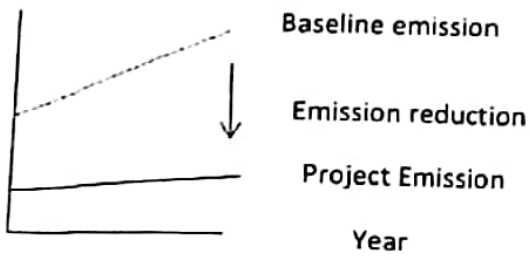
Russia - 0%

Baseline

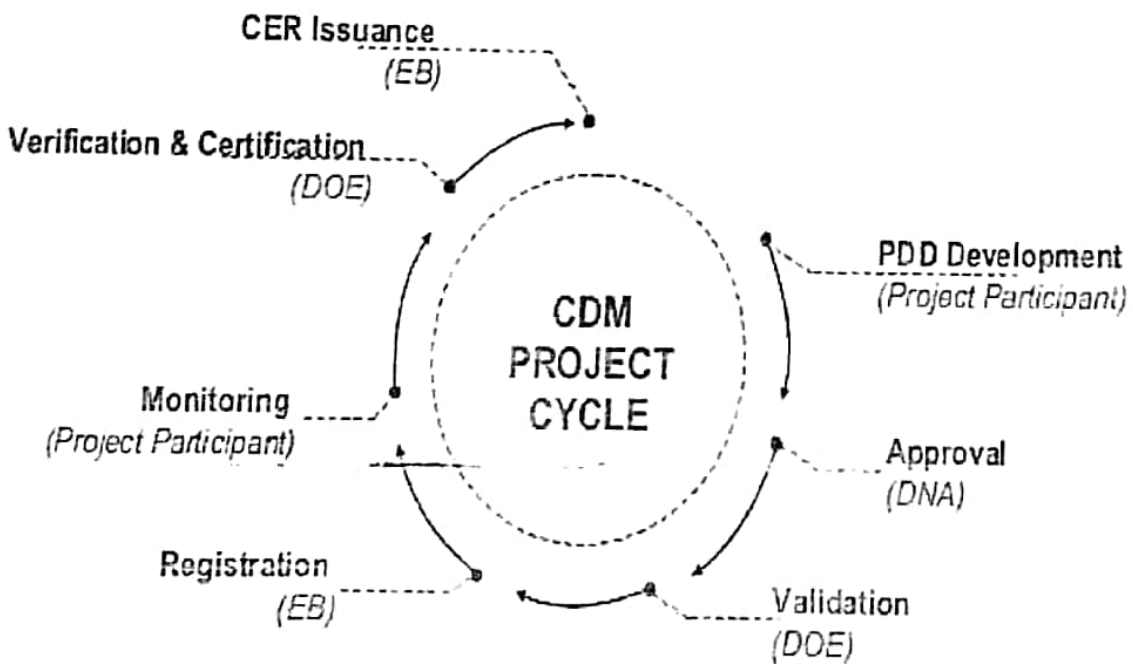
The baseline is defined as "the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity."

The difference between the baseline emissions and GHG emissions after implementing the CDM project activity is emission reductions as shown in figure.

GHG Emission



CDM PROJECT CYCLE



Article 12 of Kyoto Protocol

1. A clean development mechanism is hereby defined.
2. The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.
3. Under the clean development mechanism:
 - (a) Parties not included in Annex I will benefit from project activities resulting in certified emission reductions; and
 - (b) Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol.
4. The clean development mechanism shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Protocol and be supervised by an executive board of the clean development mechanism.
5. Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of:
 - (a) Voluntary participation approved by each Party involved;
 - (b) Real, measurable, and long-term benefits related to the mitigation of climate change; and
 - (c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.
6. The clean development mechanism shall assist in arranging funding of certified project activities as necessary.
7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, elaborate modalities and procedures with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities.
8. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall ensure that a share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.
9. Participation under the clean development mechanism, including in activities mentioned in paragraph 3(a) above and in the acquisition of certified emission reductions, may involve private and/or public entities, and is to be subject to whatever guidance may be provided by the executive board of the clean development mechanism.
10. Certified emission reductions obtained during the period from the year 2000 up to the beginning of the first commitment period can be used to assist in achieving compliance in the first commitment period.

Sustainability Issues.

- Resource scarcity is the most controversial topic
- climate change has dropped to No. 9 and it is very gender-specific.
- Business pay much more attention to scarcity of resources than climate change/ Natural disasters.

2.4 Conventional and Non-Conventional/Renewable Energy Sources.

Conventional Energy sources

These sources of energy are also called non-renewable sources. These sources of energy are in limited quantity except hydro-electric power.

- (a) Coal and lignite
- (b) Oil and Natural gas.
- (c) Electricity
 - Thermal power
 - Hydro-electric power
 - Nuclear-power
- (d) Fuel wood, straw and dried dung.

Non-conventional Energy Sources.

These are also called renewable sources of energy.

- (a) Solar Energy
- (b) Wind Energy
- (c) Tidal Energy
- (d) Bio Energy
 - Bio-Gas
 - Bio-mass
- (e) Energy from Urban wa-25-

5 Conventional Energy Sources.

Fossil Fuel

Fossil fuel sources burn coal or hydrocarbons fuels, which are the remains of the decomposition of plants and animals. There are three main types of fossil fuels. They are:

- a) coal
- b) Petroleum
- c) Natural gas.

Fossil fuels are based on the carbon cycles and thus allow stored energy to be recycled today. In 2005, 81% were of the world's energy needs met from fossil sources.

Nuclear Energy.

Nuclear power or nuclear energy is the use of exothermic nuclear processes to generate useful heat and electricity. The term includes nuclear fission, nuclear decay and nuclear fusion. Presently the nuclear fission of elements in the actinide series of the periodic table produce the vast majority of nuclear energy in the direct service of humankind with nuclear decay processes, primarily in the form of geothermal energy and radioisotope thermoelectric generators in niche uses making up to rest. Nuclear (fission) power stations, excluding the contribution from naval nuclear fission reactors, provided about 5.7% of the world's energy and 13% of the world's electricity in 2012.