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EEP 101
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Chapter #20

Energy and the Environment: The Case of India

Energy systems have problems relating to the dynamic management of renewable and nonrenewable resources and also have issues of externalities. India, for example, has severe energy problems, and economic incentives may help to alleviate them.

(1) Demand for energy is increasing due to:

- Population growth.
- Increase in standard of living.

Population controls may provide a method to reduce energy demand and environmental problems.

High rates of population growth are associated with lower levels of development, so successful development policies will lead to reduced population and contribute to reduced pollution and energy consumption. However, when development occurs, energy/person increases, so that the net effect of development policies on energy demand is not clear. Policies to reduce energy use/person will also be needed.

Population Policies

Direct control (family size regulation) involves**:**

- Marriage/age/size control.
- Forced sterilization (after a certain number of children).
- Strict sexual behavior regulation.

Financial incentives include:

- a tax on Children (after first or second).
- Sterilization subsidies.
- Birth control subsidies.

Education policies:

- Education for personal responsibilities.
- Education for environmental responsibilities.

Conservation policies:

- Aim to reduce growth of energy/person as income increases is crucial in India's energy policy development.

(2) Energy problems in the urban sector.

In India’s urban sector, there is a growing demand for electric power and gasoline.

Problems with power demand:

- Main source of power: coal.
- Coal plants are of low technical efficiency.
- Much of energy sector is publicly held and subsidized.

Energy efficiency = the proportion of a fuel converted to energy

- Fuel efficiency varies between fuel types; it is low in Indian coal.
- Modern plants have higher technical efficiency in converting heat to electricity.
- Efficiency coefficients are between .2 to .37. (Only 20% to 37% of fuel content is transformed to electric power.)

Energy efficiency can be improved by:

- Washing coal before use.
- Using imported coal with higher energy and low ash content.
- Modernization of plants.

Other Related Issues:

- The use of low quality coal with low efficiency plants also contributes to air pollution problems and global warming- increasing gases.

- The energy supply problem is also associated with local and global environmental quality problems.

Elements of solutions:

- Privatization and reduced restriction or increased supply.
- Reduction or elimination of energy subsidies (may be associated with income subsidies).
- Reduction on tariffs on imported fuel.
- CO_2 tax.
- Subsidies of modernization of plants.

The rest of the world which will be affected by global warming gases produced by India may be ready to subsidize some of the conversion to more efficient and cleaner energy production.

Economic use of alternative sources of electric power. Hydro-electric, gas, and even nuclear power should be studied.

Energy use in the urban sector of India is much below the developing world. (Electricity systems have to be expanded to improve access and reliability so the quantity of electricity may expand; policy should aim at improving efficiency in energy generation and use.

Improved efficiency in electricity use means improved efficiency of <u>appliances</u>. It can be achieved by:

- Reducing subsidies to electricity.
- Reducing taxation in electric appliances.

Electric power generation can be improved by reducing convergence losses. That may be a result of privatization and can reduce regulation. Firms will invest in developing infrastructure for energy generation as long as it is profitable.

Demand for Gasoline

Increases in the standard of living and population will lead to increase in demand for gasoline. This can be mitigated by:

- Improved public transportation.
- Reduced need for car.
- Improved energy use for vehicles.

These activities can be induced by incentives: gas tax, CO_2 tax, subsidy of replacing older cars with new ones, discriminatory taxation of cars based on fuel efficiency, etc.

(3) Energy problems in rural sectors.

- Electricity is used for irrigation pumping:

- It is subsidized and sometimes cost zero. That leads to a queuing system.
  - Queuing does not have incentives to conserve, uses inefficient pumps, and overirrigates.
  - Queuing gets unreliable or no supply of water.

- Real pricing of electricity for pumping—including user cost—is needed to achieve efficiency.

- Rural electrification is not complete. Many villages are not connected to grids. In many villages with electricity, it is only available on a limited basis.

- Wheeling costs a limited dimension of electric grid. Lack of electricity for consumption activities reduces the quality of life. Rural electrification is a priority. It will increase energy production but will improve welfare.

- Renewable resources (solar biomass) may be economical for small electric power generation facilities in remote locations.

- Heavy reliance of organic fuels and wood for cooking and heating. Cooking is done in inefficient stoves with low energy efficiency).
  - Forests and plants can be cut and sold for energy production.
  - Markets are in organic fuels and equipment to use them are limited.
  - Shortages of fuels for cooking and heating ("India can feed itself but not cook the food").
  - Energy shortages lead to deforestation and destruction of soils.

Solutions

- Establish property rights of wood resource—charge for woods from public lands.
- Establish markets in biofuel.

- Support biofuel industries through research extension and land availability.
- Provide incentives and means to adopt efficient stoves—credit, subsidies, and taxation on inefficient ones.
- Support introduction to alternatives technologies—solar energy for cooking and heating.

The Dilemma of Government Responsiveness

Another important element in development economics involves the degree of foreign aid a country such as the U.S. may contribute. The desirable level of Foreign aid also involves political factors, such as the type of government in the country. For the case of India, there is not much political instability, while, in other countries, dictatorships and autocratic forms of government often exist that may make foreign aid less effective.

People always complain that government moves too slow and can never get anything promptly completed. I will now show you why a slow degree of Government responsiveness can actually be beneficial.

Say the U.S. Government announces that foreign aid in the form of food and supplies will be given to a country at some point in time, t'.

- The government currently has a dictatorship and one of the stipulations may be that the dictator step down from power by time t'.

When time t' arrives, say the dictator has not stepped down from power.

- The Government still wishes to help the poor residents of the country, because the people are still starving
    - Government may wish to deviate from its announced policy
- Yet deviating from announced policy will send a message out to other dictators that the U.S. Government makes **non-credible threats**.
    - Thus, deviating from the chosen policy may help inspire other countries to be overtaken by dictators.

Having a sluggish Government in a Foreign Aid context can be beneficial by removing the ability of government to deviate from announced plans. When the government makes a choice to provide aid at some time, t=0, that involves an optimal trajectory of aid through time, but then wishes to deviate from the optimal path at some time t=t', this is called **Dynamic Inconsistency**. Dynamic Inconsistency is an important quality for government to avoid, since the entire credibility of the Nation depends on the government to do what it announces it will. Therefore, sluggish responses may be an important element of government credibility and may thus be welfare enhancing.