CHAPTER 2

SOCIO-ECONOMIC ASPECTS

Good transportation infrastructure provides many positive spin-offs and consequently, it is not predominantly negative. Transport activities are an example of the phenomenon that economic activities are accompanied by external effects which are detrimental or favourable to uninvolded third parties and not to their initiator.

On the other hand, external diseconomies of transport are pure externalities, which cannot be controlled by private activities and have to be regulated or priced by the public.

The economic aspect of enviromental impacts is difficult because[1]:

- the property rights of the environment are not defined and therefore the consumption of environmental goods is without any cost
- environmental pollution is jointly produced by different sources and damages
- there is an uncertainty about the size of future damages and the possibility of risk control in the future
- private preferences underestimate risks accosiated with low-possibilities, but with high life-threatening consequences.

The majority of economists agree that the environment can be treated like an economic good (measured or evaluated in monetary terms), while the minority take into account the social consequences together with the non-renewable environmental resources.

These two concepts can be considered as *monetary* and *non-monetary* approaches.

2.1. The environment as an economic good

The question "can the quality of the environment be treated as an economic good?" will be considered by two examples.

First example. The experience and the scientific research show that residential areas with low traffic noise have higher rents compared to those areas with high traffic noise (Fig. 2.1)[2].

Second example. Figure 2.2 shows the relationship between air quality, income and a willingness to pay higher rent for accomodation[3]. The same economic goods have different prices; in any case the environment has an economic value.

Considering the greenhouse effect, there is no immediate economic impact. We do not know the mechanism causing the greenhouse effect; furthermore we do not know about the extent of future damage.

What is today's value of the environment if we consider the life-threatening risks of the future?[4]

It is obvious that the environment is an economic but not a homogeneous good.

2.2. Economic approach of environmental value

Three ways are distinguished, when the environment is approached economically:[5]

- the resource approach
- the utitily approach
- the risk approach.

2.2.1. The resource approach

The resource approach is a direct method of evaluation, as it is based on the link between the source of disamenities and its consequences.

It is also described as an *objective* because it measures the environmental effects in terms of the social product (Table 2.1)[6].

This example shows the limits of a direct economic evaluation. At first there are different sources of pollution (industry, households, transport). Secondly, poor air quality has not only been a result of pollution today but also of pollution in the past. Thirdly, infection can be the result of other factors, such as nutrition, general health care.

The separation of one of these three levels from the others is, in many cases, impossible.

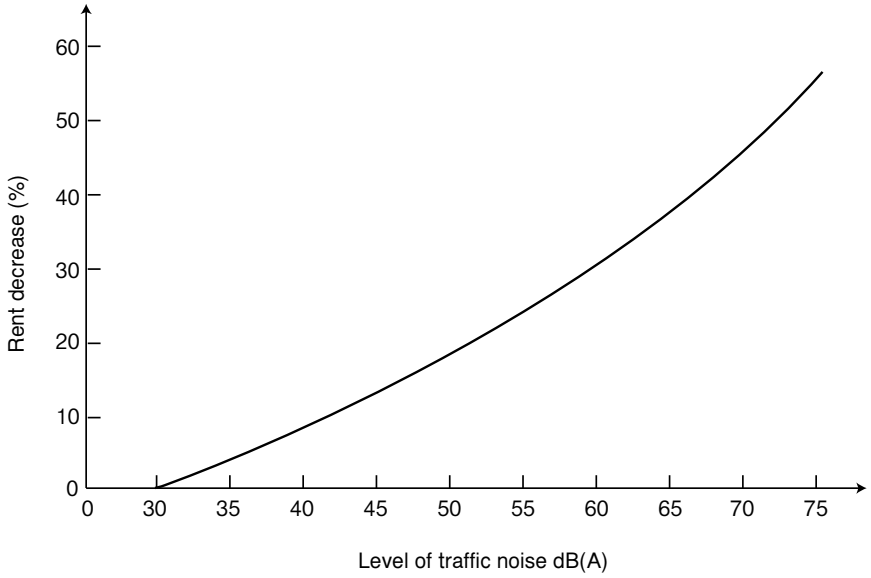

Figure 2.1. *Percentage of rent decrease related to traffic noise in Basle, 1985.*

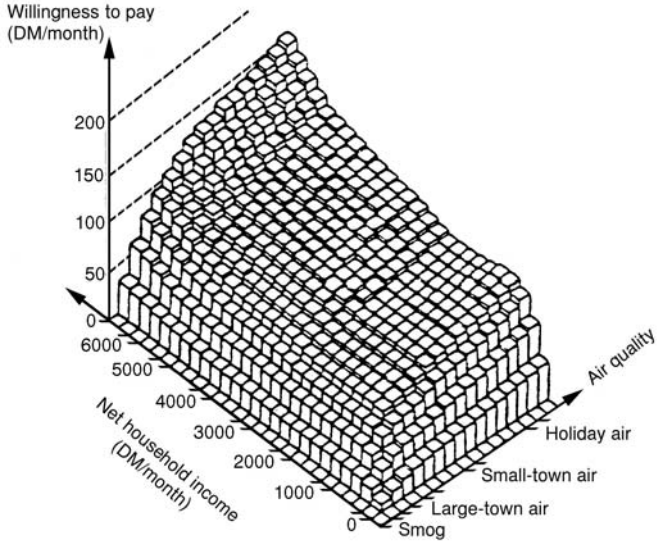

Figure 2.2. *Air quality, willingness to pay and income.*

Table 2.1. Costs of diseases of the respiratory organs (million DM)

Nature of illness	Cost			Cost of permanent loss of resources	
	Incapacity to work	Inpatient treatment	Outpatient treatment	Death of individuals at working age	Early retirements
Tumors	12.5	43.3	0.6	1852.7	552.6
Other diseases	4113.9	862.5	378.5	990.7	2885.6

2.2.2. The Utility approach

The utility approach is founded on the individual value estimates of those concerned. The central hypothesis postulates the rational behaviour of *homo-economicus.* An individual is capable of consistent evaluation (order of preferences, utility function) in all possible economic circumstances. The individual's notion of utility is expressed in his demand behaviour, so that this behaviour provides the basis for measuring changes in utility.

This form of monetarized utility was introduced by Marshall (1920) and it was further developed by Hicks (1940/41) and Henderson (1940/41).

The main difficulties in applying this theory are:

- the environmental factor is considered separatively from other factors
- the behavioural inertia of households, which manifests itself in the relative unwillingness to leave a rented or a privately-owned house.

2.2.3. The Risk approach

The relationship between transport activities and environmental impacts is stochastic in character as every trip is not linked to the certainty of a loss but *merely* increases the risk that a loss may occur.

The risk approach is primarily concerned with the future. The risk approach manages the losses with a strategy, which comprising diversification, insurance and prevention are all combined.

2.3. Social impacts

The social impacts are important, they cover a wide range of the social activities and are followed by important economic results.

These impacts influence both community and personal life. The general perception is that social impacts are invariably negative. Such perception is a great

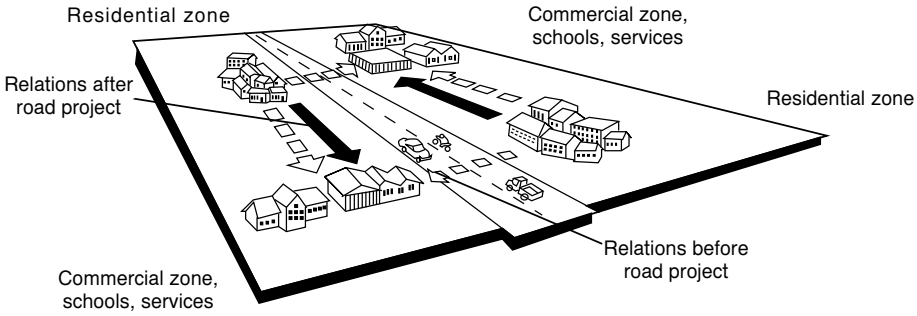

Figure 2.3. *Changes in community life.*

distortion.

Social impacts are positive and negative.

A road construction is followed by development, e.g. new jobs can be created (positive impact). On the contrary, a new construction or the improvement of an existing local road, can disturb the community life (negative impact) (Fig. 2.3)[7].

An overview of what is included under the term social impacts follows:

- local - non local labour market
- agricultural activities
- tourism
- life style (including quality of life)
- public services (health, education, transport etc.)
- social problems (key facilities such as shops, churches)
- modification of travel pattern (journey length, pedestrians, cyclists)
- land acquisition
- population resettlement
- changes in amenities.

2.4. Categorization of social impacts

2.4.1. Severance

Severance of communities occurs when roads cut traditional lines of travel and communication, and often have greater effect on the poor people (Fig. 2.4)[8].

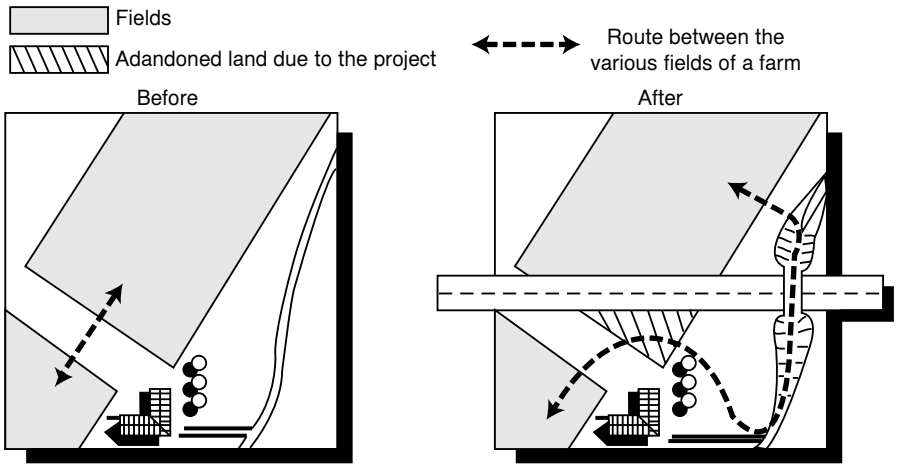

Figure 2.4. *Changes in travel routes.*

2.4.2. Encroachment

The term encroachment includes local community activities such as kiosks, stores, small business-like cafes, uncontrolled stops, unregulated parking etc.

2.5. Economic effect of social impacts and their mitigation

Table 2.2 summarizes the economic effect and possible mitigation actions.

Table 2.2. Economic effect and mitigation actions

Effect	Action
Loss of house and land (all or part)	Resettle proprietor in new area or restore home, compensate for land loss
Loss of house; rental	Assist with housing in old or new area
Loss of all land but not house	Restore land within a reasonable distance from home; otherwise restore home and land in a new area
Loss of home-based business or home	Reconstruct home in the original or a new area; compensate for lost income during relocation process
Loss of business site	Provide alternative location with equal or better access, services and business potential

Source[9]

It is obvious that the mitigation process is a complex process. Many times, monetary compensation is related to people who are not able to change their livelihood. Compensation can also be provided through alternative facilities, new resources or other development activities.

In any case, the information, consultation and participation of the community is of great importance.

2.6. Economic evaluation of non-social impacts

The economic evaluation of enviromental impacts has focused on noise and air pollution. The impacts refer to flora, especially forest damages, to agricultural production and ecosystems.

2.6.1. Air pollution monetary values

2.6.1.1. General theories of evaluation

Two theories have been applied in order to evaluate the environmental impacts due to air pollution.

a. The Damage Value Method (DVM)[10]

This method direclty estimates monetary value damages. This method involves the following steps:

- identify emission sources
- estimate emissions
- simulate pollutant concentrations
- estimate the extent to which humans or the human environment is exposed to air pollutant concentration
- identify physical effects on humans and the human environment
- evaluate physical effects
- calculate emission values.

In practice, the necessary assumptions and simplifications, as well as the tremendous uncertainties involved in each step, diminish the effectiveness of the method. The detailed method is described in the references[11,12,13].

b. Control Cost Method (CCM)

Estimates are based on the assumption that ideal emission or air quality standards have established that the marginal damage of pollution is equal to the marginal cost of controlling pollution.

The method involves two major steps:

- determination of marginal measures

- estimation of monetary values control costs for decided control measures.

Compared to the DVM, the CCM does not involve so many estimating steps and assumptions. However, unrealistic assumptions also exist, like quality standards, which are decided by technical and/or political criteria and not by financial ones.

Details of the method, which is also known as *revealed preference methods*, can be found in the references[14,15].

2.6.1.2. Case studies

The case studies which follow are based on various evaluation approaches, and they cover different countries.

a. case study I (USA)[16]

Table 2.3 presents values estimated by using both DVM and CCM methods, for areas of the USA.

Table 2.3. Estimated values according to DVM and CCM methods (in $)

Area	Pollutant							
	NO_x		SO_x		PM_{10}		CO	
	DVM	CCM	DVM	CCM	DVM	CCM	DVM	CCM
Atlanta	4330	9190	2720	6420	5170	3460	N/A	2280
Chicago	5380	7990	3600	9120	10840	4660	N/A	2440
Houston	6890	17150	2910	3590	5190	2780	N/A	2680
Washington DC	4900	9190	3070	5320	6260	3340	N/A	3010

It must be noted that:

- the values present a significant dispersion
- the estimated DVM values are lower than the estimated CCM values.

b. case study II (Finland)[17]

Table 2.4 presents the cost of air pollution due to different pollutants.

Table 2.4. Cost of environmental impacts from emissions (in million finnish marks for 1989)

Impact	Pollutant	
	NO_x	CO_2
Diseases	68	–
Forest	114	–
Agricultural production	112	–
Climate	–	1500

c. Case study III

This case study summarizes the cost estimates of air pollution due to traffic in various countries. The estimation is expressed as percentage of GNP (Table 2.5)[18].

Table 2.5. Summary of cost estimates of air pollution

Country	Netherlands[1]	Germany[1]	France 1978	UK	USA 1981	EC[2]
GNP (%)	0.15-0.2	0.4	0.07-0.17	0.16	0.3	0.5

1: evaluation of damage
2: evaluation of costs of emission reduction

2.6.2. Noise impact evaluation

Noise evaluation is more difficult in comparison with air pollution because of the subjective impression of noise annoyance. Table 2.6 presents the results of a study in different countries.

Table 2.6. Summary of cost estimates of traffic noise

Country	USA 1981	France	Netherlands	Norway	Germany
GNP (%)	0.06-0.12	0.20	0.02-0.10	0.06	1.00

Source[19]

2.7. Political issues

The important relationship between road engineering and environmental factors, especially on social impacts, leads society to be involved in the planning process of roads.

Subjects, like the timing of involvement, representation of citizens, technique of involvement etc., look for answers.

Fig. 2.5 shows a simplified organization of a multi-disciplinary approach.

Decision Group: authorities
Citizens' Group: civil, business, community representatives, non-governmental organizations
Multi-disciplinary Group: economists, sociologists, planners, highway engineers

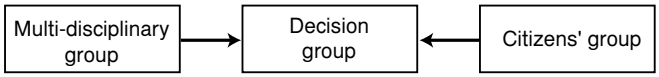

Figure 2.5. *A simplified organization of public involvement.*

The involvement procedure can be analysed in[20]:

– Communication:	information disclosure
	information gathering
	consultation
– Participation:	beneficiaries
	potential losers
	local or national authorities
	non-governmental organizations
– Consultation techniques:	establish the rules of the game
	provide information
– Information:	interview surveys
	public meetings
	individual / group discussions
	on-site consultations
– Presentation:	oral
	written reports, newsletters, leaflets
	audio-visual aids

It is obvious that the political aspect is a very important part of the environmental design procedure.

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