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HUMAN COST AS A FACTOR USED IN THE COST-BENEFIT ANALYSIS

Summary. Cost-benefit analysis (CBA) is a prescriptive technique that is performed for the purpose of informing policy makers about what they ought to do. The paper discusses the problem of assigning a monetary value to human life (lifesaving or quality of life) as an important factor used in the CBA. Presented ideas come from the project SELCAT solved within the 6th Frame Program.

KOSZT ZASOBÓW LUDZKICH JAKO ELEMENT ANALIZY KOSZTÓW I KORZYŚCI

Steszczenie. Analiza kosztów i korzyści (CBA) jest techniką normatywną, która jest wykonywana w celu poinformowania decydentów o tym, co powinni zrobić. Artykuł omawia problem przydziału wartości pieniężnej życiu ludzkiemu (ratowanie życia lub jakość życia), jako ważny czynnik używany w CBA. Przedstawione pomysły pochodzą z projektu SELCAT realizowanego w ramach VI Programu Ramowego.

1. INTRODUCTION

Cost-benefit analysis (CBA) is a formal analysis of the impacts of a measure or programme, designed to assess whether the advantages (benefits) of the measure or programme are greater than its disadvantages (costs). By means of an economic CBA decision-makers can be informed and guided about what they ought to do. CBA is based on welfare economics and requires all policy impacts to be stated in monetary terms. Assigning a monetary value to human life (lifesaving or to quality of life) is often considered meaningless and ethically wrong, however important in CBA. It is simply to provide a guideline with respect to the amount of resources we would like to spend on prevention of accidents or injuries, given the fact that not all of our resources can be spent for this purpose. This paper was written with the motivation to present how the problem of assigning a monetary value to human life has been solved and represents findings as summarized and presented at the last meeting of Work Package 3 (WP3) of the European project SELCAT [9, 16]. SELCAT is an abbreviation for "Safer European Level Crossing Appraisal and Technologies" – a collaboration action type project.

2. METHODS FOR ESTIMATING COSTS OF TRAFFIC INJURY

CBA in transport domain started in 1960s [8]. Since that time several reviews of the costs to society of road traffic injuries have been performed. One of the major reviews was presented in 1994 by the EC: "Socio-economic cost of road accidents, final report of action COST 313" [1]. Fig.1 shows a possible typology which was introduced in that study.

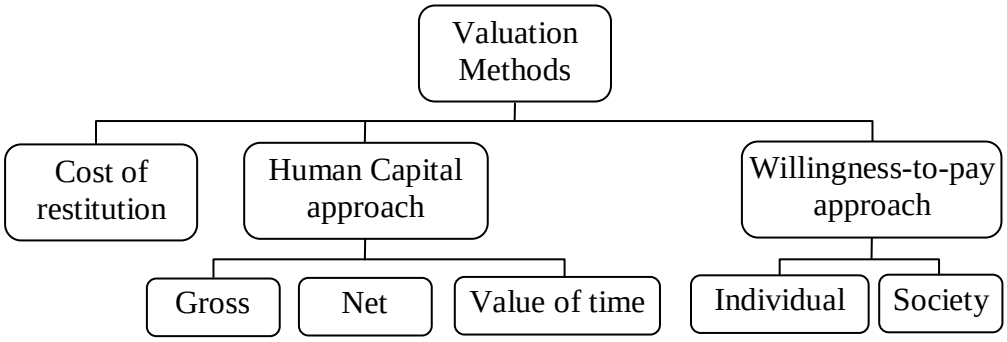

Fig. 1. Methods for estimating costs of traffic injury
Rys. 1. Metody szacowania kosztów obrażeń drogowych

2.1. The human capital approach

This method is also referred to as the "gross output method". It is based on assessing the economic consequences of road accidents, usually supplemented by a notional sum to reflect pain, grief, and suffering for those involved and also for family and friends of those killed and injured, as a proxy for accident costs. The method has been the most commonly used method in most countries over the past few decades. It is recommended for developing countries as their primary objective, increasing a country's wealth, and is thought more appropriate to their needs. Many assumptions are required in accident costing and, whenever alternative values or uncertainties present themselves, a conservative approach is recommended thus ensuring that an indisputable minimum value is obtained of road accident costs in a country. If investment can be justified on such a minimum value, it will certainly be justified on any other value.

2.2. The willingness-to-pay method

This method estimates the amount of money people affected by a particular measure would pay to avoid an accident and produces a much higher valuation of accident costs. Since the late 1980s it has increasingly been applied for accident costing in industrialized countries. Two varieties of the willingness-to-pay approach are normally used:

a) The individual willingness-to-pay approach: information about willingness-to-pay is obtained from individuals, either by studying behaviour in situations where reduced risk must be traded off against other commodities or by means of questionnaires;

b) The social willingness-to-pay approach: society's willingness-to-pay for reduced risk is inferred from the valuation implicit in public decisions like setting speed limits.

2.3. Cost of restitution

Some other methods exist for road accidents costing [14], based on assessing a monetary value for restitution. They are utilised within life insurance contracts, court awards etc.

More information on different valuation methods is given for example by Wesemann [17] and de Blaeij et al [3].

3. ROAD ACCIDENT COST COMPONENTS

Knowledge of accident costs allows safety impacts to be economically justified. The key components that need to be considered relate largely to various cost components. These can be classified according to Fig.2, into casualty-related costs, accident-related costs and accident data, [14].

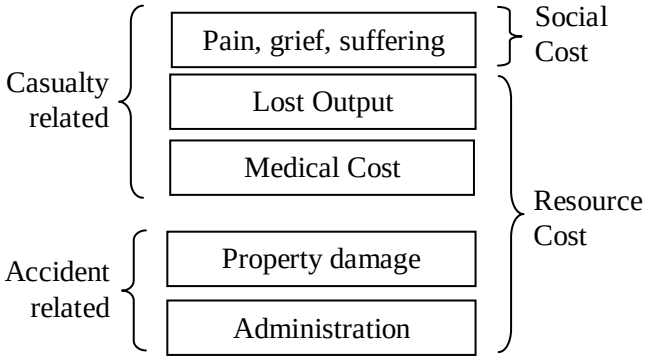

Fig. 2. Road accident cost components
Rys. 2. Części składowe kosztów wypadków drogowych

3.1. Pain, grief and suffering (PGS)

Early estimates of road accident costs focused exclusively on the direct economic costs and did not attempt to consider PGS. At present, it is also included in the road accident costs (for example, in the UK the PGS values have been increased several times since 1970s and ended at 38% of resource costs of a road traffic accident death, 100% of a serious injury, and 10% of a slight injury; according to [15] the human costs defined by the willingness to pay method were almost twice the resource costs in the UK).

3.2. Lost output

The values of “Lost output” from the figure above refer to the contribution victims were expected to make to the economy with future earning weighted to present values (with an inflation rate currently in use in the country). It is usually measured by the average earnings plus any non-wage payments (e.g. national insurance contribution or rent subsidy).

3.3. Medical costs

Medical costs include emergency medical services, both inpatient and outpatient care, prescription costs, service fees (X-rays and operations), and rehabilitation costs. They rarely account for more than 5% of accident costs.

3.4. Property damage costs

Property damage costs should cover all damages (e.g. street furniture, guard-rails, walls, vehicles etc.). However, vehicle damages are often the only property item valued (especially in developing countries), including insurance claims, surveyor fees, business lost due to the vehicle being out of commission.

3.5. Administration costs

Administration costs are incurred by the police and the insurance companies. (Using UK example: they are assumed to represent 0.2% of the total resource costs in a fatal accident, 4% of serious accidents, 14% of slight accidents, and 10% of damage-only accidents).

Example values for some of mentioned cost components are given in Table 1.

Table 1

Example: Average value of prevention per casualty by severity and element of cost [12]

Injury Severity	Lost output	Medical and ambulance	Human costs	Total
Fatal	€640.057	€1.102	€1.220.751	€1.861.895
Serious	€24.639	€14.941	€169.626	€209.221
Slight	€2.607	€1.102	€12.424	€16.133

Note: values from GB (Department for Transport, 2003), converted to Euro

To calculate total accident costs, the number of accidents and casualties by severity must be known. While the internationally accepted definition of a road accident death includes all related deaths within 30 days of the accident, many countries report only deaths occurring at the scene or within a few days. This causes problems when making international comparisons. Serious injuries are defined as those that require hospitalization (at least one night) while slight injuries require medical treatment but no overnight stay in hospital. Damage-only accidents are even less well documented than injury accidents.

4. HUMAN COST VALUES

This chapter shows the recommended values as presented in official documents of several studies.

4.1. Recommended values of safety

Official monetary valuation of a road accident fatality in selected countries is shown in Fig.3 (according to [8]). The values are determined by two main factors:

a) The method used for estimating them. Values based on the willingness-to-pay approach tend to be about twice as high as values not based on the willingness-to-pay approach.

b) The level of real income in a country. Generally speaking, lower values are found in countries that have a relatively low gross domestic product per capita, higher values are found in the richer countries.

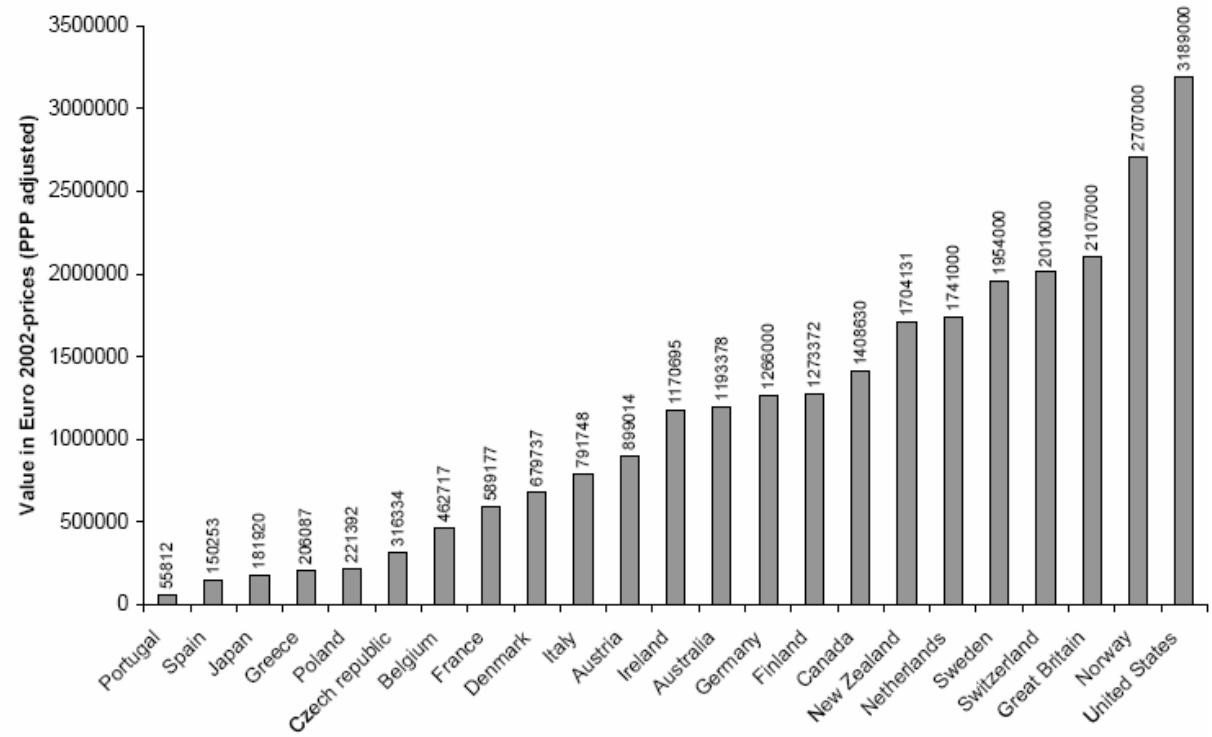

Fig. 3. Official monetary valuation of a road accident fatality in selected countries

Rys. 3. Oficjalna finansowa ocena śmiertelnych wypadków drogowych w wybranych krajach. Koszty w Euro na 2002 r.

Similar results of the monetary valuation of road safety (however slightly different from the previous one) can be found in the report from the HEATCO project (Developing Harmonised European Approaches for Transport Costing and Project assessment), [2]. They are presented in Table 2.

Table 2

Recommended values of safety (2006) [2]

Country	Fatality	Severe injury	Slight injury	Fatality	Severe injury	Slight injury
	(€$_{2002}$, factor prices)			(€$_{2002}$ PPP, factor prices)		
Austria	1760000	240300	19000	1685000	230100	18200
Belgium	1639000	249000	16000	1603000	243200	15700
Cyprus	704000	92900	6800	798000	105500	7700
Czech Republic	495000	67100	4800	932000	125200	9100
Denmark	2200000	272300	21300	1672000	206900	16200
Estonia	352000	46500	3400	630000	84400	6100
Finland	1738000	230600	17300	1548000	205900	15400
France	1617000	225800	17000	1548000	216300	16200
Germany	1661000	229400	18600	1493000	206500	16700
Greece	836000	109500	8400	1069000	139700	10700
Hungary	440000	59000	4300	808000	108400	7900
Ireland	2134000	270100	20700	1836000	232600	17800
Italy	1430000	183700	14100	1493000	191900	14700
Latvia	275000	36700	2700	534000	72300	5200
Lithuania	275000	38000	2700	575000	78500	5700
Luxembourg	2332000	363700	21900	2055000	320200	19300
Malta	1001000	127800	9500	1445000	183500	13700
Netherlands	1782000	236600	19000	1672000	221500	17900
Norway	2893000	406000	29100	2055000	288300	20700
Poland	341000	46500	3300	630000	84500	6100
Portugal	803000	107400	7400	1055000	141000	9700
Slovakia	308000	42100	3000	699000	96400	6900
Slovenia	759000	99000	7300	1028000	133500	9800
Spain	1122000	138900	10500	1302000	161800	12200
Sweden	1870000	273300	19700	1576000	231300	16600
Switzerland	2574000	353800	27100	1809000	248000	19100
UK	1815000	235100	18600	1617000	208900	16600

There are two sets of values. The first set, denoted factor prices, is based on national currencies. The second set of values denoted PPP; factor prices are adjusted for differences in purchasing power and are therefore intended to be more directly comparable across countries than the first set of values, since the PPP adjusted values account for differences in income and prices between countries.

In many European countries, studies have been made to assess willingness-to-pay (WTP) for improved road safety. The results of these studies are, however, not always strictly applied in the official monetary valuation of road safety in all countries. Thus, WTP-studies have been made in Belgium [5], Denmark [11], France [7], Great Britain [10], Greece [18], the Netherlands [4] and Sweden [13], all showing considerably higher figures for the willingness-to-pay for road safety than the official valuations used in these countries. Although the official valuations of road safety in most of these countries are based on the willingness-to-pay principle, the valuations represent a very conservative interpretation of the results of the studies that have been made.

An example of practical use of safety cost values can be found for example in the study [6] which objective was to assess the introduction of 21 vehicle safety technologies was based on existing literature, data and knowledge. It was initiated by the Directorate-General Energy and Transport of the European Commission (DG TREN) in August 2005. The study brought the benefit/cost-ratio values

for 13 of the 21 technologies. For additional 4 technologies data was only estimated and for the last 4 technologies no cost-benefit data was available.

4.2. Country specific values versus EU-averaged values

The values applied in the national frameworks vary considerably across countries. For example, the values used for a fatality lies between approx. €200,000 and approx. €1,650,000 and great differences between regions can be observed. In the north/west region of the EU, all countries use values which are above €1,100,000 per fatality, while in the east the values lie between €210,000 and €840,000 (averaging approx. €540,000 - less than half of the average in the north/west region). In the southern countries the values are even lower, with an average of €330,000, [6]. The significant differences in the values used for the countries in the EU raise the question of whether to use country specific value or EU-averaged values:

a) Country specific values: the results of the CBA will be more acceptable and easier to understand for domestic stakeholders when the values used derive directly from the national context. On the other side, specific unit values may not exist or be of poor quality for individual countries within the EU and the valuation of identical impacts using different local values may be considered to be morally indefensible (e.g. differences in the values of human lives or values of reduced fatalities between countries may not be acceptable to decision-makers). Another disadvantage results from the lack of good quality data covering all member states.

b) EU-averaged values: a set of common EU values for individual impacts might simplify the appraisal process and increase transparency. It may be more politically acceptable on the basis of perceived equity. On the other side, they do not fully reflect differing preferences and resource costs. In addition, they are in conflict with the values which are supplied in some countries by national level ministers

5. CONCLUSIONS

The paper deals with the problem of assigning a monetary value to human life and represents a survey of currently known methods and approaches as well as examples of recommended values coming from different studies. The task to get all facts about this problem rose when solving the SELCAT project of the 6th FP where some human cost values were needed to perform the cost/benefit analysis for implementation of different technical equipment at European level crossings (presentation of this CBA is out of the scope of this paper but can be discussed during the presentation of the paper).

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