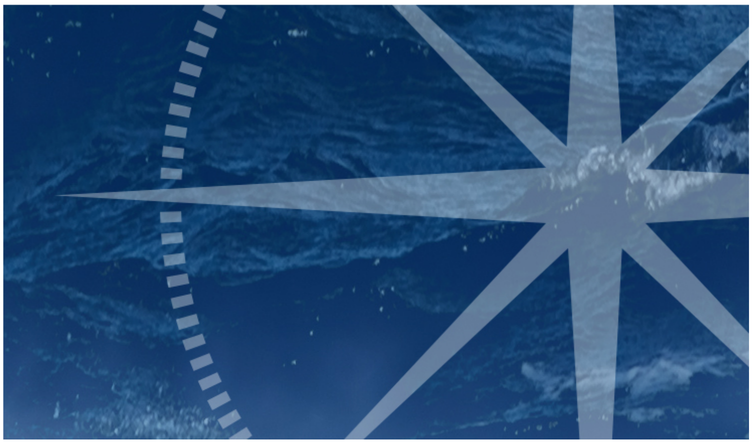

MONALISA 2.0 – Sub activity 3.5

Report on Methodology Approach to the CBA Analysis

Document No: MONALISA 2 0_D3.5.1

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ABBREVIATIONS AND ACRONYMS

ALARP	As Low As Reasonably Practicable
BAU	business as usual
CBA	Cost Benefit Analysis
DCF	Discounted Cash Flow
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
F/N	Frequency/Number of Fatalities
FNPV	Financial Net Present Value
FIRR	Financial Internal Rate of Return
IRR	Internal Rate of Return
LRMC	Long-Run Marginal Cost
NPV	Net Present Value
QALY	Quality-adjusted life year
WTP	Willingness-to-Pay

1 EXECUTIVE SUMMARY

In this document we desire define the methodology approach to evaluate correctly the safety systems proposed in the previous sub activity 3.1, 3.2, 3.3 and 3.4. The methodology approach used for the to Cost-Benefit Analysis (CBA) will be based on the “Guide to Cost-Benefit Analysis of investment projects, defined by the European Commission, Director General Regional Policy”[1]. This methodology allows setting the correct approach and aims to define the correct estimation of monetization of non-market impacts (i.e. life expectancy/quality of life prevention of fatalities/injuries). In addition to the traditional CBA methodology it will be evaluated new alternative method used in other transport context like the Swiss methodology for tunnel risk assessment, reported in “Risk concept for tunnel of national road - Methodology for identifying and assessing the risks in tunnel” (FEDRO, 2012), that proposes the use of the B/C index and the methodology suggested in the “Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule-making process (MSC/Circ.1023 - MEPC/Circ.392).

2 INTRODUCTION

The main objective of this sub-activity is to evaluate and demonstrate with the Cost Benefit Analysis the economic feasibility of the improvement systems studied in previous sub activity 3.1, 3.2, 3.3 and 3.4. Received by the other sub-activities the costs estimation to increment the safety for the large passenger vessel and the benefit generated will be done the CBA.

CBA is an essential instrument for estimating the economic benefits of projects. In principle, all impacts should be assessed: financial, economic, social, environmental, etc. During this activities will be also evaluated the benefit that can contribute the economical availability of the investment (new services for passengers, based on indoor positioning system and/or more attractiveness of the services due to higher safety and security, etc.). This data will be used to verify if it is possible to define a business plan, which will be taken into account in the CBA.

The objective of CBA is to identify and monetize all possible impacts in order to determine the costs and benefits; then the results are aggregated (net benefits) and conclusions are drawn on whether the project is desirable and worth implementing.

Costs and benefits will be carried out on incremental basis, by considering the difference between the safer ship scenario and an alternative scenario without the safer ship applications identified.

Identified the Costs and Benefits will be done an economic and financial analysis.

The main purpose of the analysis is to use the project cash flow forecasts to calculate suitable net return indicators. The indicators will be:

- The Net Present Value (NPV);
- The Internal Rate of Return (IRR), respectively in terms of return on the investment cost;

[1] Guide to Cost-Benefit Analysis of investment projects – Structural Funds, Cohesion Fund an Instrument for Pre-Accession – Final Report 16/06/2008 published by the European Commission, Director General Regional Policy.

The financial analysis will be carried out through subsequent, interlinked, accounts:

- Total investment costs;
- Total operating (yearly and periodic) and maintenance costs and revenues;
- Sources of financing;
- Financial and Economical sustainability.

3 METHODOLOGY APPROACH

The methodology approach proposed for project appraisal will be structured in the following five steps:

1. Context analysis and project objectives;
2. Project identification;
3. Feasibility & Option analysis;
4. Financial analysis (Private point of view);
5. Economic analysis (Social point of view).

Each section below will take on a strictly operational perspective and each issue will be reviewed both from the standpoint of the investment.

The choice of performing a financial analysis is the consequence to understand the private feasibility of the project. Before to analyse the benefits and costs social it is important understand if the project will be profitable without the public support. The financial analysis will be done on the direct revenue and direct cost and the debts coverage.

3.1 CONTEXT ANALYSIS AND PROJECT OBJECTIVES

The Context analysis and project objectives should be divided in the following macro area:

- Socio-economic context
- Definition of project objectives

The first stage of the project appraisal aims to understand the social, economic and context in which the project will be implemented. In fact, the possibility of achieving credible forecasts of benefits and costs often relies on the accuracy in the assessment of the macro-economic and social conditions

After the definition of the socio economic contest it is important have a clear statement of the project's objectives, essential step in order to understand if the investment has value. The broad question any investment appraisal should answer is "what are the net benefits that can be attained by the project in its socio-economic environment?" The benefits considered should not be just physical indicators but socio-economic variables that are quantitatively measurable. The project objectives should be logically linked to the investment. While a clear statement of the socio-economic objectives is necessary to forecast the impact of the project, it may often be difficult to envisage all the impacts of a given project.

3.2 PROJECT IDENTIFICATION

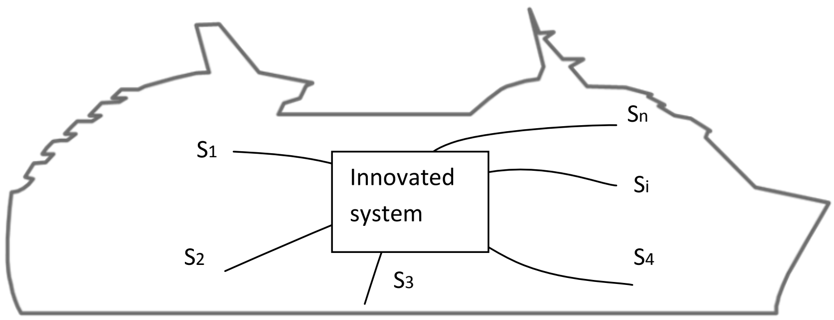
A project can be defined as an operation comprising a series of works, activities or services intended to accomplish an indivisible task of a precise economic or technical nature; one which has well defined goals.

A project is clearly identified when:

- the object is a self-sufficient unit of analysis ('half a bridge' is not a project);
- indirect and network effects are taken into account adequately;

• a proper social perspective has been adopted in terms of relevant stakeholders considered (‘who has standing?’).

The appraisal needs to focus on the whole project as a self-sufficient unit of analysis and not on fragments or sections of it.



After having identified the project, the boundaries of the analysis should be defined. The project has a direct impact on users, workers, investors, suppliers, etc. but also indirect impacts on third parties. The risk of double counting project benefits should be carefully considered.

3.3 FEASIBILITY AND OPTION ANALYSIS

The basic approach of any investment appraisal aims to compare the situations with and without the project. To select the best option, it is helpful to describe a baseline scenario. This will usually be a forecast of the future without the project, i.e. the ‘business as usual’ (BAU) forecast.

This is also sometimes labelled the ‘do-nothing’ scenario, a term that does not mean that operations of an existing service will be stopped, but simply that they will go on without additional capital expenditures.

A project is feasible when its design meets technical, legal, financial and other constraints relevant to the specific site. Feasibility is a general requirement for any project and should be checked carefully. Moreover, as mentioned, several project options may be feasible.

Typical feasibility reports should include information on:

- demand analysis[2];
- available technology;
- the production plan (including the utilisation rate of the system);
- personnel requirements;
- the project’s scale, location, physical inputs, timing and implementation, phases of expansion and financial planning;
- environmental aspects/impact.

[2] The demand analysis will be carried out as function on the context of application.

3.4 FINANCIAL ANALYSIS (PRIVATE POINT OF VIEW)

The main purpose of the financial analysis is to use the project cash flow forecasts to calculate suitable net return indicators. In this Methodological approach a particular emphasis is placed on two financial indicators: the Financial Net Present Value (FNPV) and the Financial Internal Rate of Return (FRR), respectively in terms of return on the investment cost,.

The analysis should be carried out through subsequent, interlinked, accounts (Figure 3.1and Table 3.1):

- total investment costs;
- total operating costs;
- revenues;
- financial return on investment cost: FNPV and FRR;
- sources of financing;
- financial sustainability.

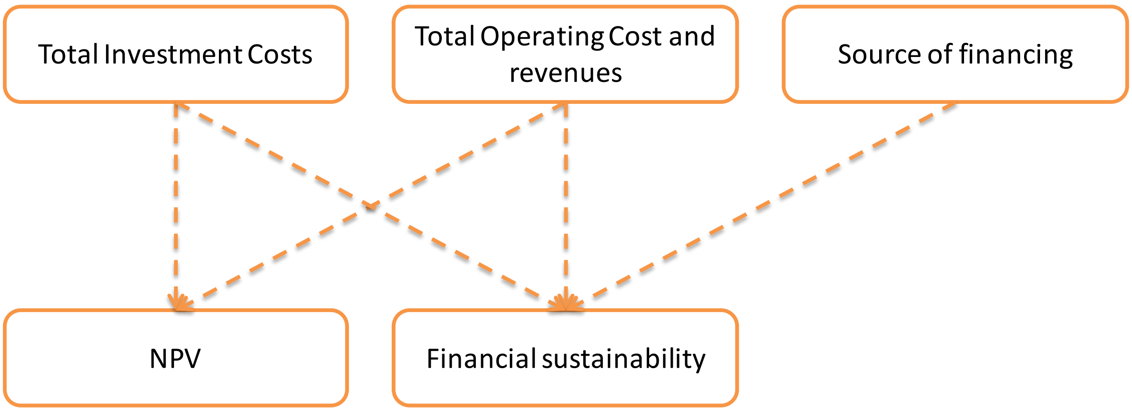


Figure 3.1: Structure of financial analysis [source D'Appolonia]]

The following table resumes a possible schematic balance sheet for the "safety measurements" that will be examined.

Table 3.1: Financial analysis at a glance

Total investment costs	
Buildings/network	-
Equipment	-
Extraordinary Maintenance	-
Licences	-
Patents	-
Other pre-operation expenses	-
Total operating costs	
Raw materials	-
Labour	-
Electric power	-
Maintenance	-
Administrative costs	-
Interest	-
Loans reimbursement	-
Taxes	-
Total operating revenues	
Output X	+
Output Y	+

3.4.1 Investment cost

The first logical step in the financial analysis is the estimation of how large the total investment cost will be. The investment outlays can be planned for several initial years and some non-routine maintenance or replacement costs in more distant years. Thus we need to define a time horizon.

By time horizon, we mean the maximum number of years for which forecasts are provided. Forecasts regarding the future of the project should be formulated for a period appropriate to its economically useful life and long enough to encompass its likely mid-to-long term impact.

For this type of investment will be used a time horizon max of 10 years.

3.4.2 The operating costs

The operating costs comprise all the data on the disbursements foreseen for the purchase of goods and services, which are not of an investment nature since they are consumed within each accounting period.

The data can be organised in a table that includes:

- the direct production costs (consumption of materials and services, personnel, maintenance, general production costs);
- administrative and general expenditures;

- sales and distribution expenditures.

These components together comprise the operating costs.

3.4.3 Revenues

The revenue will be determined by the forecasts of the quantities of services provided and their prices.

The following items will not be included in the calculation of future revenues:

- transfers or subsidies;
- VAT or other indirect taxes charged by the firm to the consumer, because these are normally paid back to the fiscal administration

3.5 ECONOMIC ANALYSIS (SOCIAL POINT OF VIEW)

The economic analysis further to taking in account the Investment cost, revenues and Operating cost defined in the previously paragraph, it will evaluate the non-market impacts, the indirect costs and the benefits.

The economic analysis will appraise the project's contribution to the economic welfare. The key concept is the use of accounting shadow prices, based on the social opportunity cost, instead of observed distorted prices.

Observed prices of inputs and outputs may not reflect their social value (i.e. their social opportunity cost) because some markets are socially inefficient or do not exist at all.

The methodology is summarised in the following steps:

- monetisation of non-market impacts;
- inclusion of additional indirect effects (if relevant);
- discounting of the estimated costs and benefits;
- calculation of the economic performance indicators (economic net present value, economic rate of return and B/C ratio).

3.5.1 Monetisation of non-market impacts

The first step of analysis is to include in the appraisal those project impacts that are relevant for society, but for which a market value is not available.

The CBA should check that these effects (either positive or negative) have been identified, quantified, and given a realistic monetary value.

Appropriate conversion factors applied to the financial values of the operating revenues should already capture the most relevant non-market benefits a project may generate. However, if conversion factors have not been estimated or the project is non-revenue generating, alternative approaches can be used to assess non-market benefits. The most frequently used method is the willingness-to-pay (WTP) approach, which allows the estimation of a money value through users' revealed preferences or stated preferences. In other words, users' preferences can be observed either indirectly, by observing consumers' behaviour in a similar market or directly, by administering ad hoc questionnaires (but this is often less reliable). For the evaluation of some outputs, when the WTP approach is not possible or relevant, long-run marginal cost LRMC) can be the default accounting rule. Usually WTP is higher than LRMC in empirical estimates, and sometimes an average of the two is appropriate.

Furthermore, in function of the benefit to monetise it will be taken into account the possibility of using the values determined by the insurance companies. The insurance companies estimate the values do not habitually monetised from usual market, for example the value of a human.

3.5.2 Inclusion of indirect effects

Indirect effects are defined as quantity or price changes occurring in secondary markets. To better understand whether indirect effects can be ignored or not when conducting a CBA, it is important to distinguish between efficient and distorted secondary markets. A distorted secondary market is a market in which prices do not equal social marginal opportunity costs. The existence of monopoly power is the main cause of distortion of a market.

3.5.3 Discounting of the estimated costs and benefits

Costs and benefits occurring at different times must be discounted. The discount rate in the economic analysis of investment projects - the discount rate reflects the social view on how future benefits and costs should be valued against present ones. It may differ from the financial discount rate when the capital market is inefficient (for example when there is credit rationing, asymmetric information and myopia of savers and investors, etc.). More details are reported in the paragraph 3.6.

3.5.4 Calculation of economic performance indicators

After the correction of price/wage distortions and the choice of an appropriate social discount rate, it is possible to calculate the project's economic performance using the following indicators:

- Economic Net Present Value (ENPV): the difference between the discounted total social benefits and costs;
- Economic Internal Rate of Return (ERR): the rate that produces a zero value for the ENPV;
- Benefit-Cost ratio (B/C ratio), i.e. the ratio between discounted economic benefits and costs.

The ENPV is the most important and reliable social CBA indicator and should be used as the main reference economic performance signal for project appraisal

The methodology used in this Methodology Approach for the determination of the financial return is the Discounted Cash Flow (DCF) approach. This implies some assumptions:

- only cash inflows and outflows are considered (depreciation, reserves and other accounting items which do not correspond to actual flows are disregarded);
- the determination of the project cash flows should be based on the incremental approach, i.e. on the basis of the differences in the costs and benefits between the scenario with the project (do-something alternative) and the counterfactual scenario without the project (BAU scenario) considered in the option analysis;
- the aggregation of cash flows occurring during different years requires the adoption of an appropriate financial discount rate in order to calculate the present value of the future cash flows

3.6 FORMULAS ASSUMPTION

The indicators needed for testing the project performance are:

- the net present value of the project (NPV), and
- the internal rate of return (IRR);
- Benefit-Cost ratio (B/C ratio), i.e. the ratio between discounted economic benefits and costs

The net present value is defined as the sum that results when the expected investment and operating costs of the project (suitably discounted) are deducted from the discounted value of the expected revenues:

$$NPV = \sum_{t=0}^{n} a_t \, S_t \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \ldots \frac{S_n}{(1+i)^n} \tag{1}$$ [3]

where:

- S_t is the balance of cash flow at time *t*;
- A_t is the discount factor chosen for discounting at time *t;*
- *i* discounted rate 5%

The internal rate of return is defined as the discount rate that produces a zero NPV:

$$NPV = \frac{\sum S_t}{(1+IRR)^t} = 0 \tag{2}$$ [4]

[3] This formula will be used for the calculation of FNPV and ENPV

[4] This formula will be used for the calculation of FRR and ERR

The calculation of the financial return on investment measures the capacity of the net revenues to remunerate the investment cost.

The discount rate reflects the opportunity cost of capital, defined as 'the expected return forgone by bypassing other potential investment activities for a given capital'. There are many theoretical and practical ways of estimating the reference rate to use for the discounting of the financial analysis. In this regard, it is helpful to refer to a benchmark value. The European Commission, in 2013, recommends that a 5% real rate is considered as the reference parameter for the opportunity cost of capital in the long term. Values differing from the 5% benchmark may, however, be justified on the grounds of the Member State's specific macroeconomic conditions, the nature of the investor (e.g. PPP projects) and the sector concerned.

Further the B/C ratio is the present value of project benefits divided by the present value of project costs:

$$BCR \quad = \frac{PV(I)}{PV(O)} \tag{3}$$

where (*I)* are the inflows and O the outflows. If *B/C* >1 the project is suitable because the benefits, measured by the Present Value of the total inflows, are greater than the costs, measured by the Present Value of the total outflows.

Like the IRR, this ratio is independent of the size of the investment, but in contrast to IRR it does not generate ambiguous cases and for this reason it can complement the NPV in ranking projects where budget constraints apply. In these cases the B/C ratio can be used to assess a project's efficiency.

The main problems with this indicator are:

- it is sensitive to the classification of the project effects as benefits rather than costs. It is relatively common to have project effects that can be treated both as benefits and as cost reductions and vice versa. Since the Benefit- Cost ratio rewards projects with low costs, considering a positive effect as a cost-reduction rather than a benefit would only result in an artificial improvement of the indicator;
- it is not appropriate for mutually exclusive projects. Being a ratio, the indicator does not consider the total amount of net benefits and therefore the ranking can reward more projects that contribute less to the overall increase in public welfare.

The appropriate case for using the BCR is under capital budget constraints. The following table provides an example of project ranking given a budget constraint of 100.

Table 3.1: Benefit-Cost Ratio under budget constraints

	PV (O)	PV(I)	NPV	PV(I)/PV(O)
Case 1	100	200	100	2
Case 2	50	110	60	2.2

Case 3	50	120	70	2.4

Looking at NPV, the preferred Cases is 1 and the ranking is 1, 3, 2. But looking at the ratios between PV(I) and PV(O), 3 is the favourite project. Since the budget constraint is 100 and the PV(O) of case 3 is 50, project 2, the second in the ranking, could also be undertaken. The resulting NPV (NPV(2)+NPV(3)) is 130, which is higher than the NPV of Case 1.

4 ALTERNATIVE METHOD TO EVALUATE THE SAFETY MEASURES

In addition to the classic CBA approach, in the following paragraph we want try to rearrange a precedent study used in the road tunnel risk "Risikokonzept für Tunnel der Nationalstrassen (Risk concept for tunnel of national roads), Methodik zur Ermittlung und Bewertung der Risiken in Tunneln (Methodology for identifying and assessing risks in tunnels), (FEDRO, 2012).

The following method will be useful to have another point of view on the feasibility for the safety measures studied.

This alternative method is much more direct compared to traditional CBA and B/C ratio. The alternative approach suggested takes into account the direct relationship between injuries and costs of safety system, establishing a threshold of acceptability.

The acceptance of safety measures is calculated considering the relationship of convenience between benefits and costs according to the equation (4).

$$M_{AKT} = \frac{M_{NU} \cdot MRS}{M_{Ko}} \tag{4}$$

where:

- M_{AKT} is the efficiency of a safety measure;
- M_{NU} is the variation of the number of injuries and fatalities obtained by the application of an additional safety measure in the tunnel;
- MRS is the marginal cost considered for the preservation of one human life. This cost is presently equal to 4.041.000 Euro[5];
- M_{KO} is the cost for the application of an additional safety measure.

[5] D. Helbing, Traffic dynamics new physical modeling concepts, Berlin, Germany. Springer, 1997

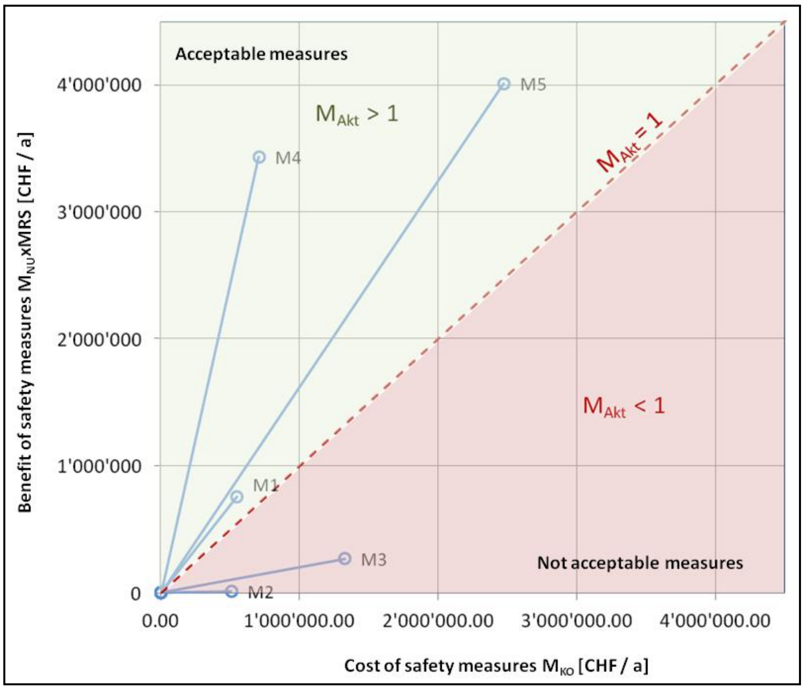


Figure 4.1: Efficiency of Safety Measures (FEDRO, 2012b)

The acceptability of a safety measure is verified when the efficiency M_{AKT} is greater than 1. A example of graph concerning the efficiency of several measures (M1 to M5) is reported in the Figure 4.1, where the limit line of efficiency is shown (M_{AKT}=1). In this case, the measures M4, M5 and M1 are the acceptable, having efficient greater than 1. The measurement M4 is that having greater efficiency.

The M_{NU} is calculated considering the annual variation of the number of injuries and fatalities obtained by the application of an additional safety measure compared to the current configuration of ship. The uniformity between the number of victims and injuries is calculated with the following Equation (5):

$$M_{NU} = \Delta F_{vic.} + \frac{\Delta F_{inj.}}{31} \tag{5}$$

where:

- $\Delta F_{vic.}$ is the variation of number of fatalities;
- $\Delta F_{inj.}$ is the variation of number of injuries.

The cost M_{KO} for the application of an additional safety measure in a tunnel is calculated adopting the Equation (6):

$$M_{KO} = A \cdot M_{Inv} + T \cdot M_U \tag{6}$$

where:

- T is a factor concerning the annual inflation;
- A is a factor concerning the annual interest rate;
- M_{Inv} is the cost of investment for the application of a safety measure in a tunnel;
- M_U is the cost of maintenance of a safety measure.

The factors A and T permit to actualize the cost of investment and maintenance of a safety measure. In this regard, the methodology provides the values of these factors as a function of inflation and the annual interest rate as shown in Table 4.1

Table 4.1: Factor Concerning Annual Inflation and Interest Rate

N(1)	n=10	n=15	n=20	n=25	n=30	n=35	n=40	n=50	n=80
T(2)	1,045	1,069	1,094	1,118	1,143	1,167	1,191	1,238	1,372
A(2)	0,111	0,078	0,061	0,051	0,045	0,04	0,037	0,032	0,025
Note: (1) N is the number of years (2) Factor calculated considering annual inflation of 2% and annual interest rate of 1%.									

The costs of investment and maintenance concerning the application of a safety measure in a tunnel shall be adopted considering the information found on technical manuals and documentations published by FEDRO, such as: specialist handbooks 20 001-0001 in accordance with applicable policies, guidelines and standards ventilation of road tunnels. System selection, dimensioning and equipment.

4.1 SELECTION OF OPTIMUM COMBINATION OF SAFETY MEASURES

The verification of the combinations of safety measures is considering two separate cases:

- when the fatality rate (FR), in the current configuration, is greater than G_I;
- when the fatality rate (FR), in the current configuration, is greater than G_{II}.

In the first case (G_{II}>FR>G_I), after performing the following activities:

- the identification of additional safety measures to be technically practicable;
- the calculation of risk reduction;
- the evaluation of acceptance of any additional safety measure;
- the identification of possible combination of safety measures;

the most advantageous safety measure combination is necessary to determinate with the objective of reducing the risk level below the tolerable level (G_I).

The combination of safety measures is realized selecting those involving the greatest benefit respecting the criteria of overall efficiency. The measures with greater efficiency are chosen first.

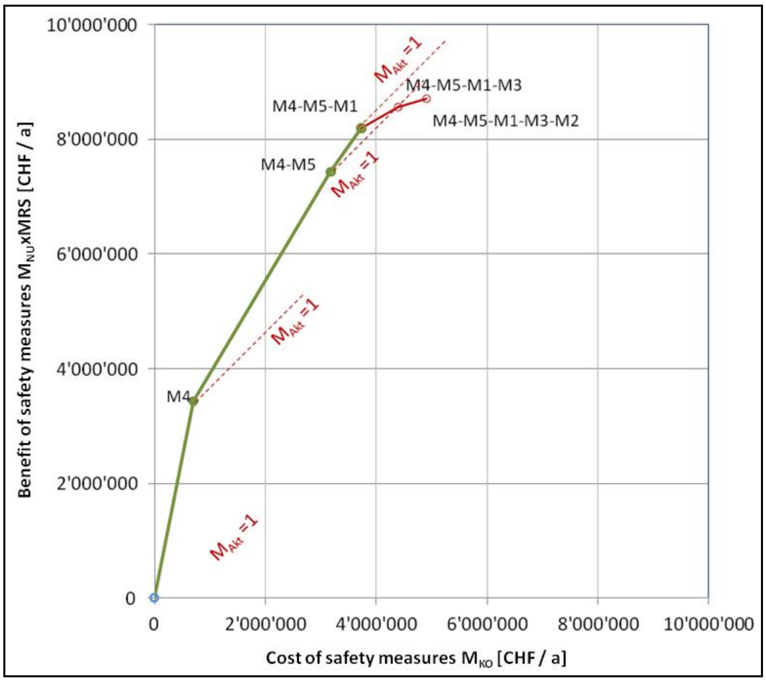


Figure 4.2: Combination of Safety Measures (G_{II}>FR>G_I) (FEDRO, 2012b)

An example of graph concerning the combination of several measures (M1 to M5) is reported in the Figure 4.2. In this case, the optimal combination is constituted by M4-M5-M1; in fact, this combination presents the greatest benefit with efficiency greater than 1. The combination M4-M5-M1-M3 is characterized by efficiency less than 1, respect the combination M4-M5-M1, although this combination is characterized by lower benefit.

In the second case (FR>G_{II}), after performing the following activities:

- the identification of additional safety measures to be technically practicable;
- the calculation of risk reduction;
- the evaluation of acceptance of any additional safety measure;

the combination of safety measures should be determined, with the objective of reducing the risk level below the maximum tolerable level (G_{II}). The measures with greater efficiency are chosen first.

An example of graph concerning the combination of several measures (D1 to D5) is reported in the Figure 4.3. In this case, the combination able to reduce the risk level below the maximum tolerable level (G_{II}) is constituted by D4-D5-D1-D3.

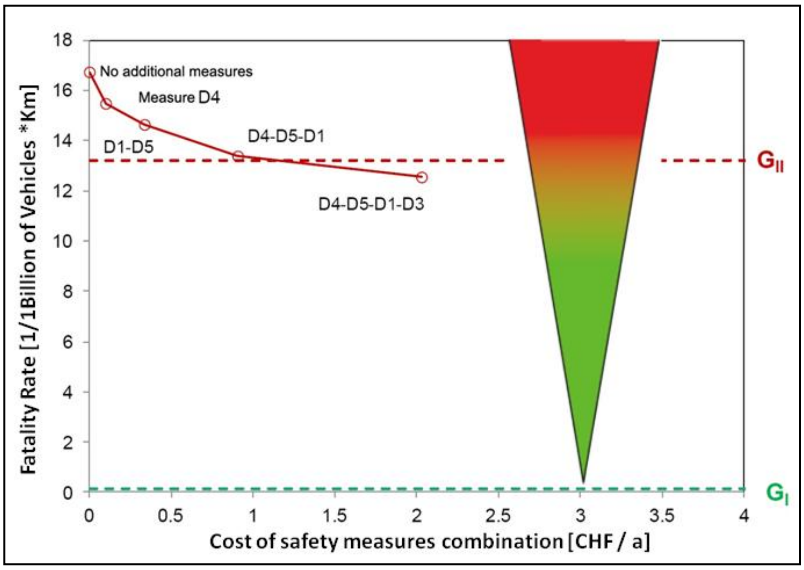


Figure 4.3: Combination of Safety Measures (FR>G_{II}) (FEDRO, 2012b)

When the risk is reduced below the maximum tolerable level (G_{II}>FR>G_{I}), the further safety measures are selected in order to reduce the level of risk. In this case, the selection of combination is realized to reach the maximum benefit respecting the criteria of overall efficiency, as reported in the first case.

5 FORMAL SAFETY ASSESSMENT (FSA) FOR USE IN THE IMO RULE-MAKING PROCESS

The purpose is to identify and compare benefits and costs associated with the implementation of each Risk Control Options (RCO) identified and defined in other sub activities. A CBA may consist of the following stages:

- consider the risks assessed, both in terms of frequency and consequence, in order to define the base case in terms of risk levels of the situation under consideration;
- arrange the RCOs,, in a way to facilitate understanding of the costs and benefits resulting from the adoption of an RCO;
- estimate the pertinent costs and benefits for all RCOs;
- estimate and compare the cost effectiveness of each option, in terms of the cost per unit risk reduction by dividing the net cost by the risk reduction achieved as a result of implementing the option; and
- rank the RCOs from a cost-benefit perspective in order to facilitate the decision (e.g. to screen those which are not cost effective or impractical).

5.1 EXAMPLE OF CALCULATION OF INDICES FOR COST EFFECTIVENESS

The estimates given refer to Gross Cost of Averting a Fatality (Gross CAF) and Net Cost of Averting a Fatality (Net CAF).

Their definitions are:

$$Gross\ CAF = \Delta C / \Delta R \qquad (7)$$

And

$$Net\ CAF = (\Delta C - \Delta B) / \Delta R \qquad (8)$$

where:

ΔC is the cost per ship of the risk control option.

ΔB is the economic benefit per ship resulting from the implementation of the risk control option (this may also include pollution prevented).

ΔR is the risk reduction per ship, in terms of the number of fatalities averted, implied by the risk control option.

6 CONCLUSIONS

Investment decisions are at the core of any development strategy. Economic growth and welfare depends on productive capital, infrastructure, human capital, knowledge, total factor productivity. All of these development ingredients imply - to some extent - taking the hard decision to sink economic resources now, in the hope of future benefits, betting on the distant and uncertain future horizon.

The methodology approach, explained in this document, will be the basis for a correct CBA and therefore a good basis for assessing possible investments. .

The analysis will be articulated in the following steps:

- context analysis and project objectives;
- project identification;
- feasibility and option analysis;
- financial analysis (private point of view);
- economic analysis (social point of view);
- Innovative evaluation

The CBA will be done for each system studied in the previously sub-activities it and for a Hypothetical business case that involves all systems.

In the worst case where the data will not available by the other sub-activities we will proceed to estimate the benefits and costs using similar cases study in similar contest, supported by a qualitative analysis based on the 'expert judgment' of the sector.

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ANNEX 1: INPUT FORM

The scope of this annex is identify a standard CBA's inputs form to submit to the other subactivities.

INPUT		
TOTAL INVESTMENT COSTS		
Buildings/network	€	-
Equipment	€	-
Extraordinary Maintenance	€	-
Licences	€	-
Other pre-operation expenses	€	-
Other investment costs		-
TOTAL OPERATING COSTS		
Raw materials	€	-
Labour	€	-
Electric power	€	-
Maintenance	€	-
Administrative costs	€	-
Other operation Costs	€	-
REVENUES		
Sales revenues	€	+
Other revenue (advertising)	€	+
BENEFIT		
Number of deaths prevented,	Unit	+
Accident/injuries reduction,	Unit	+
Damages reduction	€	+
Euro saved	€	+
Other benefits		+

39 partners from 10 countries taking maritime transport into the digital age

By designing and demonstrating innovative use of ICT solutions MONALISA 2.0 will provide the route to improved

SAFETY - ENVIRONMENT - EFFICIENCY

Swedish Maritime Administration ◦ LFV - Air Navigation Services of Sweden ◦ SSPA ◦ Viktoria Swedish ICT ◦ Transas ◦ Carmenta ◦ Chalmers University of Technology ◦ World Maritime University ◦ The Swedish Meteorological and Hydrological Institute ◦ Danish Maritime Authority ◦ Danish Meteorological Institute ◦ GateHouse ◦ Navicon ◦ Novia University of Applied Sciences ◦ DLR ◦ Fraunhofer ◦ Jeppesen ◦ Rheinmetall ◦ Carnival Corp. ◦ Italian Ministry of Transport ◦ RINA Services ◦ D'Appolonia ◦ Port of Livorno ◦ IB SRL ◦ Martec SPA ◦ Ergoproject ◦ University of Genua ◦ VEMARS ◦ SASEMAR ◦ Ferri Industries ◦ Valencia Port Authority ◦ Valencia Port Foundation ◦ CIMNE ◦ Corporacion Maritima ◦ Technical University of Madrid ◦ University of Catalonia ◦ Technical University of Athens ◦ MARSEC-XL ◦ Norwegian Coastal Administration

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