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Clarification Paper no. 3

DEFINITION AND CALCULATION OF RESIDUAL VALUE IN THE COST-BENEFIT ANALYSIS OF INVESTMENT PROJECTS FINANCED FROM ERDF AND CF

January 2012



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PROJECT CO-FINANCED BY ERDF THROUGH TAOP 2007-2013

RESIDUAL VALUE

The document was prepared by experts who supported the implementation of the contract „Development of the capacity for the Cost-Benefit Analysis”, project co-financed by ERDF through TAOP

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1. INTRODUCTION

In the context of Structural Instruments, the private and public sectors benefit of increased opportunities for accessing European Funding which gives them a better chance for improving, extending and rehabilitating the existing infrastructure networks (water and wastewater systems, waste management and roads), increasing competitiveness, for extending distribution of SME products and services on the entire European market and beyond.

One of the most important aspects for a proper realized cost benefit analysis is the calculation of the **residual value**. Gapenski (2005:592) considers the residual value "much riskier than the other flows". In this context this paper covers the most relevant literature in the field and estimates the differences between the most common methodologies used for obtaining a residual value.

The existence of several different methods for calculating the residual value and the lack of clear guidance on which method to use led to situations in which for instance, within the same open call of projects, some applicants calculated the residual value with one method, some with other or some did not calculate it at all.

Seriously overlooked, recently, the establishment of a proper residual value for a proposed investment proves to be a key element for obtaining "acceptable" values for the indicators used in the financial analysis. Opinions regarding the most suitable method have been contradictory and transformed this issue in a problematic one over the past years.



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2. THE CASE

2.1 GENERAL ELEMENTS OF THE RESIDUAL VALUE

As a short definition, residual value is the value that can be obtained from the sale of fixed assets investment by the end of the life of the investment. The residual value is positive only if the life of the investment is less than its technical duration. The impact of the residual value on Net Present Value (NPV) depends on the provisions of tax legislation in each country.

Usually, in CBA use, the differential is evaluated based on project costs and benefits differences between project scenario and an alternative scenario outside the project. However, if the project falls under a pre-existing infrastructure, income generating, implementing the differential method may prove to be difficult or even impossible. In such a situation, the Commission suggests using the historical cost financial analysis method outstanding:

- Without project scenario is that without infrastructure
- Consider the scenario with the project, on the one hand, not only the investment cost of new infrastructure element and the existing infrastructure at the current residual value and, on the other hand, all revenues generated by all infrastructure after project completion. Operating costs and revenues for all infrastructure projects considered to be those of an efficient exploitation scenario.

When appropriate, the current residual value of existing infrastructure can be calculated as the present value of payments on loans outstanding obligations.

In accounting, residual value is another name for salvage value, the remaining value of an asset after it has been fully depreciated.

The residual value derives its calculation from a base price, calculated after depreciation.

Residual values are calculated using a number of factors; generally a vehicle market value for the term and mileage is required as the start point for the calculation, followed by seasonality, monthly adjustment, and lifecycle and disposal performance.

In accounting, the residual value could be defined as an estimated amount that an entity can obtain when disposing of an asset after its useful life has ended. When doing this the estimated costs of disposing of the asset should be deducted.

Residual value is the value an asset will have after it has been depreciated or amortised. It has a slightly different meaning in the context of leases.

Under IFRS, residual value should be the value an asset should have if it were in the same condition it is expected to have at the end of its useful life, and of that age, and after leaving for the cost of selling them. Residual values should be reviewed annually (as should useful lives) and depreciation adjusted if residual values have changed.



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In theory, the residual values used for calculating depreciation should be separately considered for each asset, and even for components of an asset. For example, if a building contains lifts that have a shorter expected life than the building, they should be depreciated separately. In practice, companies are likely to simplify these complex requirements as far as possible.

Intangible assets often have a residual value of zero – expired patents have no value. This is less common with tangible assets, but many will not be resalable or may have costs associated with disposal that absorb the sales price.

In the case of assets that are leased, the residual value is the cost of the asset less repayments of capital (i.e. payments excluding the interest component) made over the life of the lease. It is common to allow lessees to purchase leased assets at the residual value. The accounting treatment depends on whether it is a finance lease or an operating lease.

2.2 RESIDUAL VALUE CALCULATION METHOD

Financial viability of the project should be evaluated by checking if the cumulative net cash flows (which were not updated) are positive throughout the reference period considered. Net cash flows taken into account for this purpose should consider the investment costs, all financial resources (national and EU) and net income. The residual value shall not be taken into account in this situation only if capital is liquidated in the last year of analysis.

Residual value is part of Net Present Value (NPV), according to the formula:

$$NPV = (\text{discounted incomes} - \text{discounted costs related to the activity}) + \text{discounted residual value}$$

The current literature recommends **three possible methods for calculation of the residual value:**

- **Method A** - first choice is by **considering the residual market value of fixed assets, as if it were to be sold** at the end of the time horizon considered, and of remaining net liabilities¹. In this case the residual value becomes also the terminal value that reflects the estimated value of the company at that point.² This method is also based on respecting the International Valuation Standards (IVS) established by the International Valuation Standards Committee (IVSC). Also the method is accepted by the Management Authority for SOP IEC programme and is recommended to be used in 2011 SOP IEC call of proposals (Ministry of Economy, Trade and Business Environment, hence MECMA, 2011). On the other hand the method is common in Romania to the practice imposed by ANEVAR (National Association of Romanian Evaluators) which often uses this method for enterprises or mobile goods valuation.

¹ European Commission 2008:36

² This method was highlighted and analysed by several authors (Damodaran, 2002:426, Citybank 302, Livingstone and Grossman 2002:622, Kaliski et al, 2007:301, Helfert, 2001:53).



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- **Method B** - by computing **the residual value of all assets and liabilities**, based on some standard **accounting economic depreciation formula** (usually different from depreciation for the determination of capital income taxes), method recognised by European Commission(2008:36) and Citibank(1994:300) and supported by members of several professional associations from Romania (especially CECCAR – Authorised and Expert Accountants Core in Romania), but highly contested by the Romanian Management Authority for SOP IEC programme and forbidden to be used under SOP IEC starting from 2011 (MECMA, 2011). This method was one the most popular to be used, even if major project implementation specialists have drawn negative conclusions over its effectiveness. **This methods is usually accepted for those public infrastructures which are in public domain and are not allowed to be sold or privatised (roads, water mains).**
- **Method C** - by computing **the net present value of cash flows** in the remaining life-years of the project.

The method has 2 steps: first step consists on forecasting future cash-flows and the second in calculation the actualisation rate.

The forecast of the cash-flows has to take into account the correct assumptions, mainly in avoidance of the over-optimistic incomes. Usually, previous experience is valuable to assess the trend of the incomes but a recent increase has not be used further than near future related. As for example, if the increase from the last 5 years was 5% annually and in the last year the rate was 15%, a future rate of 5% or bigger will be logical. The exception could be if the last increase represents in fact the real trend. As a rule, series of future 5 years has to be predicted based on the previous 5 years performance. In addition, no business can develop continuously (last 5 years increase of 20% cannot be continued many years). In this case it commonly used the average increase for the entire industry or other demographic tendencies. This is valid mainly for a clear asset or income generator unit when the marginal incomes are impossible after a specific threshold having in view that exceptional incomes will generate a strong competition and the result will a moderation on the increase.

In accordance with International Accounting Standards - IAS 36, constant or lower rates have to be used for the future. The standard stipulates that the increase has to be in accordance with the long term sector increase rates. In addition, the cash-flow forecasts have to be related to asset as it is on the end of the project implementation without any potential further improvements on it or income taxes applied on the results.

The income generator units have to be grouped from basic level in order to obtain distinct cash-flows easy to be separated from other assets (this could be one department, a product line or a factory for which the result of the production and the investment on raw material, labour force or administration costs clearly identified).

IAS 36 stipulates that the income generator units have to be defined constantly on the financial period and to be properly identified to minimise or to remove the recognition of the depreciation.

Corporate assets such as administrative buildings or common equipment which do not generate distinct cash-flows have to be tested for depreciation similar with other fixed assets. For a proper



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accounting, IAS 36 stipulates that the corporate assets will be allocated to all income generator units in accordance with the annual turn-over. The reason behind is related to the objective of the enterprise to generate sufficient cash-flows to recover the investments on fixed assets allocated to operational divisions or administrative groups, the corporate assets being tested for depreciation.

Knowing the methods that can be applied for the calculation of the residual value, now we will specify next **which one of these methods is recommended to be used for a given investment sector:**

- **Regional and local transport infrastructure** – investments in this field are similar in terms of investment structure, which differs is only the general objective of investments: road, rail, water or air transport infrastructure, traffic safety, intermodal facilities, etc. The residual value will be calculated with **method B based on the residual value of all assets and liabilities** having in view that **the public infrastructures are in public domain and are not allowed to be sold or privatized**. Calculations will be done in accordance with the life time of the investments (actually these periods are reflected on HG 2139/2004).
- **Environment** – investments in this field consists in infrastructure development (water and wastewater infrastructure, waste management systems), but also addresses non-traditional fields of interventions like efficient urban heating systems, risk prevention, ecological reconstructions and Natura 2000 management plans implementation. The residual value will be calculated with **method B based on the residual value of all assets and liabilities** having in view that **the public infrastructures are in public domain and are not allowed to be sold or privatized**. Calculations will be done in accordance with the life time of the investments (actually these periods are reflected on HG 2139/2004).
- **Social infrastructure** (social services infrastructure, health and public safety, education infrastructure). The residual value will be calculated with **method B based on the residual value of all assets and liabilities** having in view that **the public infrastructures are in public domain and are not allowed to be sold or privatized**. Calculations will be done in accordance with the life time of the investments (actually these periods are reflected on HG 2139/2004).
- **Development of regional and local business environment** (development of business support structures, rehabilitation of unused industrial sites, support for microenterprises). The residual value will be calculated with **method C** - by computing **the net present value of cash flows** in the remaining life-years of the project especially if the structure is integrated. For private investments and specific investments with clear data on the real estate market available, the residual value has to be calculated with **method A by considering the residual market value of fixed assets, as if it were to be sold** at the end of the time horizon considered, and of remaining net liabilities³.
- **Tourism** (restoration of cultural and historical heritage, tourism infrastructure). The residual value will be calculated with **method C** - by computing **the net present value of cash flows** in the remaining life-years of the project especially if the structure is integrated. For private investments and specific investments with clear data on the real estate market available, the residual value has to be calculated with **method A by considering the residual market value of fixed assets, as if it were to be sold** at the

³ European Commission 2008:36



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end of the time horizon considered, and of remaining net liabilities⁴.

- **Innovative and eco-efficient production systems** (sustainable development of Romanian production system and enterprise development). The residual value will be calculated with **method C** - by computing **the net present value of cash flows** in the remaining life-years of the project especially if the structure is integrated. For private investments and specific investments with clear data on the real estate market available, the residual value has to be calculated with **method A by considering the residual market value of fixed assets, as if it were to be sold** at the end of the time horizon considered, and of remaining net liabilities (European Commission 2008:36).
- **Research, technological development and innovation for competitiveness** (increase the capacity for RD, stimulating cooperation between RDI institutions and enterprises and increasing enterprises' access to RDI). The residual value will be calculated with **method C** - by computing **the net present value of cash flows** in the remaining life-years of the project especially if the structure is integrated. For private investments and specific investments with clear data on the real estate market available, the residual value has to be calculated with **method A by considering the residual market value of fixed assets, as if it were to be sold** at the end of the time horizon considered, and of remaining net liabilities (European Commission 2008:36).
- **Information technology and communications for public and private sectors.** The residual value will be calculated with **method C** - by computing **the net present value of cash flows** in the remaining life-years of the project especially if the structure is integrated. For private investments and specific investments with clear data on the real estate market available, the residual value has to be calculated with **method A by considering the residual market value of fixed assets, as if it were to be sold** at the end of the time horizon considered, and of remaining net liabilities (European Commission 2008:36).
- **Increasing energy efficiency and security of supplying energy** (sustainable and efficient energy, use of renewable sources of energy, diversifying energy interconnection networks). The residual value will be calculated with **method C** - by computing **the net present value of cash flows** in the remaining life-years of the project especially if the structure is integrated. For private investments and specific investments with clear data on the real estate market available, the residual value has to be calculated with **method A by considering the residual market value of fixed assets, as if it were to be sold** at the end of the time horizon considered, and of remaining net liabilities⁵ (European Commission 2008:36).

After the determination of the residual value, the results have to be used in the calculation of the IRR/C and IRR/K as an input in contradiction with the costs of the investments which have to be diminished. For example, in case of a infrastructure investment, the value of the initial investment (including the ERDF grant) is considered to be a contribution with negative value (sign -), the values of the cash flows can be either positive or negative (depending on their real value) and the residual value is considered to bring a positive outcome of the project (sign +), since it is considered to bring additional value for the investment.

The Internal Rate of Return (IRR) is defined as the discount rate that zeroes out the net present value of flows of costs and benefits of an investment, that is to say the discount rate of the equation below⁵:

⁴ European Commission 2008:36



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$$NPV(S) = \sum [S_t / (1 + IRR_t)] = 0$$

We can draw the conclusion that the Internal Rate of Return is an indicator of the relative efficiency of an investment, with known deficiencies, and it should be used with caution. The European Commission (2008:210) brings to attention the fact that: if the sign of the net benefits, benefits minus costs, changes in the different years of the project's lifespan (for example - + - + -) there may be multiple IRRs for a single project. In these cases the IRR decision rule is impossible to implement. Another setback for using IRR can be the fact that IRR contains no useful information about the overall economic value of a project, fact recognized even by the European Commission (208:211) which encourages also the usage of the Net Present Value Method as presented below, to correct false results of the IRR method:

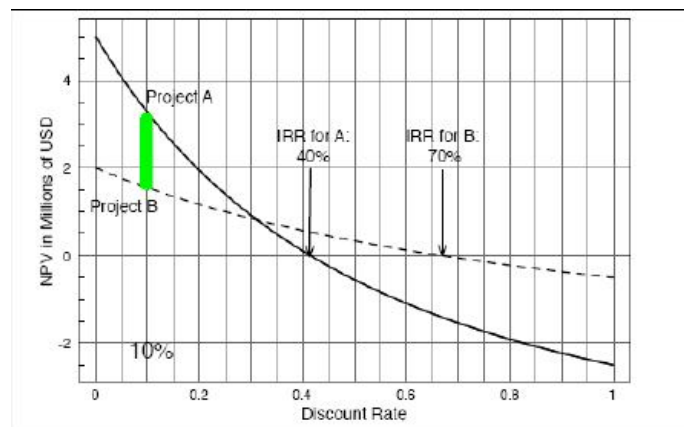


Fig. no 1 IRR and NPV of two mutually exclusive alternatives (Source: Ley, 2007)

Additionally, here below are some basic rules regarding the estimation of the residual value:

In UK, for example, the Treasury Green Book⁶ states "even where an appraisal covers the full expected period of use of an asset, the asset may still have some residual value, in an alternative use within an organization, in a second hand market, or as scrap. These values should be included". **It is thus recommended the use of residual values (as defined by TGB) for projects with finite lives less than 60 years.**

The residual value should be estimated as follows:

- Resale or scrap value of the assets in the future should be used as a proxy for the residual value. These assets include land and buildings
- Clean up costs must be explicitly shown where applicable. These should be subtracted from the final residual amount. In some cases these costs may already be factored into the resale or scrap value.

⁵ European Commission, 2008:212

⁶ TGB paragraph 5.22



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- Derivation of the residual value at the beginning of appraisal should take account of the 'residual value risk (the uncertainty to what the residual value will prove to be in the future), and adjustments made accordingly.

2.3 THE RESIDUAL VALUES IMPACT IN CBA RESULTS

One of the most important parameters with direct impact in CBA results and, furthermore, in selecting criteria during assessment of investment projects under European funding, is the residual value. The financial selecting criteria in evaluation grids, for all types of projects, is related to financial internal rate of return of the project, along with financial net present values based on the discounted cash flow (DCF). In the following part the assumptions and the methodology of developing DCF is presented, with focus on residual value of the project.

For major investment projects (transport infrastructures, environment) the residual value has an important role for establishing the dimension of European intervention (funding gap rate). For other type of projects (social infrastructures, business environment development, tourism infrastructure) the financial ratios has impact in the process of selecting the applications (each MA of the existing sectoral programme developed own procedures in this respect).

The residual value of project assets at the end of the project life is included in the benefit-cost analysis as a negative cost (or benefit). Among the revenue items at the final year considered, there is the residual value of the investment (e.g., standing debt, standing assets, such as buildings and machinery, etc.), which represents the residual value item, taking into account investment items. It is important to mention that all items are investment costs (outflows) and the residual value must be included with the opposite sign (negative if the others are positive) because it is an inflow. In the next table (financial sustainability or calculation of FRR/K) it is considered with a positive sign because it is included in the revenues.

The residual value is considered in the sustainability table only if it corresponds to a real inflow for the investor.

It is always considered for the calculation of FRR/C and FRR/K.

The residual value of the project infrastructure is entered as a cash- inflow in the last year of the period of analysis (even if the infrastructure is not liquidated). In the case of pre-existing infrastructure (i.e. extension projects), the residual value of existing infrastructure is entered in the first year.

Step 1. Find the funding-gap rate (R):

$$R = \text{Max EE/DIC}$$

where

Max EE is the *maximum eligible expenditure* = DIC-DNR (Art. 55.2)

DIC is the *discounted investment cost*



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DNR is the *discounted net revenue* = discounted revenues – discounted operating costs + discounted residual value

Step 2. Find the “decision amount” (DA), i.e. “the amount to which the co-financing rate for the priority axis applies” (Art. 41.2):

$$DA = EC * R$$

where

EC is the eligible cost.

Step 3. Find the (maximum) EU grant:

$$EU \text{ grant} = DA * Max \text{ CRpa}$$

where

Max CRpa is the maximum co-funding rate fixed for the priority axis in the Commission’s decision adopting the operational programme (Art. 52.7).

FRR/C measures the capacity of the project to provide an adequate return on the investment, regardless the way it is funded. As discussed above, FRR/C is calculated from a cash flow projection that covers the project’s economic life and includes initial investment, replacement costs for the project short-life equipments, operation and maintenance costs as outflows and receipts from project revenues and project residual value at the end of its economic life as inflows. These estimates are made gross of taxes.

For items whose technical lifespan equals the reference period, and beyond, the values above shall only be considered, *pro rata temporis*, for the calculation of the residual value (in case of technical life equal to the reference period the residual value is zero).

In the last year of the time horizon an appropriate residual value is calculated as a percentage of the investment costs. This represents the potential income flows that the project will still be capable of generating even after the time horizon considered. It can be assimilated into the liquidation value of the project.

The residual value is strictly correlated to the technical lifespan of equipments and works which will be took into consideration in the investment project.

In the following table it is presented the lifespan of a various part for complex investment:



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Asset type	Roads	Railways	Airports	Sea ports	Water/Waste
Earthworks/ drainage	100	100	100	up to 50	N.A
Pavement	20 to 25	N.A.	10 to 15	N.A.	N.A
Road surface	10	N.A.	N.A.	N.A.	N.A
Track	N.A	14 to 40	N.A.	N.A.	N.A
Bridges/tunnels	up to 100	up to 100	up to 100	N.A.	N.A
Signalling	N.A	10 to 50	N.A.	N.A.	N.A
Electrification	N.A	33	N.A.	N.A.	N.A
Telecomms	N.A	7 to 40	N.A.	N.A.	N.A
Buildings	50	30 to 40	up to 60	up to 50	40
Equipment	12	N.A.	4 to 20	2 to 30	
Access ways	N.A	N.A.	N.A.	N.A.	40
Treatment plants	N.A	N.A.	N.A.	N.A.	40
Pumping station	N.A	N.A.	N.A.	N.A.	15
Transport pipes	N.A	N.A.	N.A.	N.A.	40
Supply pipes	N.A	N.A.	N.A.	N.A.	40
Water reservoirs	N.A	N.A.	N.A.	N.A.	40
Mechanical and electromechanical equipment	N.A	N.A.	N.A.	N.A.	15
Connections	N.A	N.A.	N.A.	N.A.	40

Source: Author's assessment based on performed CBAs

In appraisal, the aim is to capture the full economic benefits of the project and we would aim to do this, where possible, by appraising over the expected lifetime of the longest lived asset. So in the straightforward



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case of a bridge project, the starting point would be the engineering life of the bridge. This could be, for example, 80 years.

However, the appraisal period is also limited by the time period over which demand can confidently be foreseen. In other words, a project is expected to yield a stream of services that are useful to the population, and this stream of services is subject to uncertainty. In the longer term, the many sources of uncertainty include: potential economic instability; energy prices; shifts in land-use patterns; political risk; and supply side risks over the continued maintenance and operation of the asset itself. Given the vulnerability of projects to these risks, it is common practice even in politically- and economically- stable countries to curtail the appraisal period at around 25-40 years, even for a long-lived asset.

2.4 CASE STUDY

Investment costs include initial investments to implement the project, replacement investments during the life of the project, and the residual value of investment assets at the end of the project. Initial investments are generally broken down into subcategories, such as land preparation, buildings and construction, equipment, vehicles, and other costs included in the initial investments, such as environmental mitigation and monitoring. Physical contingencies included in the initial investments for economic analysis should be allocated to these different categories. The initial investments may be concentrated in a single project year, or more generally scheduled over more than one year according to the project phasing and implementation schedule.

Associated with each subcategory of investment is a replacement period in years. On the assumption of normal maintenance activities, this replacement period indicates when the relevant assets will be worn out and will therefore need replacing. Replacement investments are entered in the project statement in the last year of use of the current assets, when commitments to new resources have to be made.

The whole project statement will be drawn up to cover the implementation period of major investments and a certain number of operating years. The number of operating years to include in the statement can be determined by

- the market life of the project the years over which the project benefits will occur or the output is demanded;
- the technical life of the major investment assets and the number of years of normal operation before the assets are fully worn out;
- the economic life of the same assets the number of years after which it is worth reinvesting to obtain the benefits of reduced operating and maintenance costs even if the assets are not fully worn out.

For some major economic infrastructure projects with particularly long lives, such as dams or railways, the project period may include 20-25 years of operation with the remaining life of assets represented by a residual value.



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Different types of investment asset have different replacement periods. For whatever project period is decided upon, some assets will not be fully worn out at the end of the project period. The remaining value of the assets their residual values entered as a negative investment cost at the end of the project. It is calculated as the proportion of the replacement period still remaining for a particular subcategory, times the value of the assets concerned. If it is envisaged that the remaining assets would be sold when operations cease, this would take some time and the residual value is entered in the year after the last operating year. If it is envisaged that the project will continue in some form at the end of the project period, the residual value is entered in the last operating year, to represent a stream of further benefits discounted to the end of the present project.

Total investments (ths. EUR)										
Type	y1	y2	y3	y4	y5	y...	y...	Y29	Y30	Y31
	8354									
1.2. Main Works	4									
1.3. Plant and machinery	9799									
1.5. Maintenance					3000					
1.9 Other expenses		800		400				800		
1.10. Pre-production expenses			1200							
	0	800	0	0	0	0	0	0	0	0
A. Investment costs	9334		1200							
	3	800	0	400	3000	0	0	800	0	0
1.12. Cash	240	1300	1500	1500	1500	1500	1500	1500	1500	1500
1.13. Clients	700	7500	8000	8000	8000	8000	8000	8000	8000	8000
1.14. Stocks	5000	8800	8800	8800	8800	8800	8800	8800	8800	8800
1.15. Current liabilities		1750	1700	1700	1700	1700	1700	1700	1700	1700
	5500	0	0	0	0	0	0	0	0	0
1.16. Net WOC	440	100	1300	1300	1300	1300	1300	1300	1300	1300
B. Variations in WOC	440	-340	1200	0	0	0	0	0	0	0
1.18. Replacement of short life equipment					3000					
1.19. Residual value										3515
										7
C. Other investment items					3000					3515
										7



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Total investment costs	9334	1200								3515	-
	3	800	0	400	3000	0	0	800	0	7	

Due to the fact that for most investment projects the prognosis period is higher than 15 years, it is rather difficult to accurately estimate the residual value. A much more difficult approach is when projects have different components and is implemented in many communities in the same period of time.

Below, we would like to illustrate the effects residual value has on funding gap calculation for a large infrastructure investment project.

We consider the following base scenario, in which we consider first, that there is no residual value for replacement investment, and then we consider having a residual value for all replacement investment. The impact on indicators is significant. For this example we propose to apply the methodology B (presented in previous chapter) for 30 years time horizon of the project. Residual value calculation		
Initial Investments		
Main works	Mill. Euro	83.544
Plant and machinery	Mill. Euro	9.799
Depreciation		
Main works	40	55.889
Plant and machinery	15	9.799
Residual value initial investment, out of which:		27.655
Main works	Mill. Euro	27.655
Plant and machinery	Mill. Euro	0.000
Replacement investment - Plant and machinery		
Depreciation - Plant and machinery	40	2.297
Residual value-replacement investments	15	7.501
Total residual value		35.157

STEPS IN DETERMINING THE EU GRANT 2007-2013 PROGRAMMING PERIOD

Step 1. Find the funding-gap rate (R):

$$R = \text{Max EE/DIC}$$

where

Max EE is the *maximum eligible expenditure* = DIC-DNR (Art. 55.2)

DIC is the *discounted investment cost*

DNR is the *discounted net revenue* = discounted revenues – discounted operating costs + discounted residual value



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Step 2. Find the "decision amount" (DA), i.e. "the amount to which the co-financing rate for the priority axis applies" (Art. 41.2):

$$DA = EC * R$$

Where EC is the eligible cost.

Step 3. Find the (maximum) EU grant:

$$EU \text{ grant} = DA * \text{Max CRpa}$$

where

Max CRpa is the maximum co-funding rate fixed for the priority axis in the Commission's decision adopting the operational programme (Art. 53.6).

Model of calculation for the following investment:

75% - co-financing rate

R = 5%

Investment costs = 93343

Eligible costs = 80000

Year	Investment Costs	Discount	Operation costs	Discount	Incomes	Discount	Residual Value	Discount	Net Cash - Flow		Conversion Factors
1	93343	8889,10	0	0,00	0	0,00	0	0,00	93343	88898,10	0,95
2	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,91
3	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,86
4	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,82
5	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,78
6	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,75
7	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,71



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8	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,68
9	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,64
10	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,61
11	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,58
12	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,56
13	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,53
14	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,51
15	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,48
16	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,46
17	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,44
18	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,42
19	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,40
20	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,38
21	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,36
22	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,34
23	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,33
24	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,31
25	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,30
26	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,28
27	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,27
28	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,26
29	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,24



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30	0	0,00	3200	3047,62	3400	3238,10	0	0,00	200	190,48	0,23
31	0	0,00	3200	3047,62	3400	3238,10	35157	33482,86	35357	33673,33	0,22
Total	93343		96000		102000		35157		52186		
Discounted		88898,10		91428,57		97142,86		33482,86		-49701	

	Discounted Values	Values
Total Investment Costs		93343
Eligible Costs		80000
Discounted Investment Costs	88898,1	
Discounted net revenue	41157	

Effective calculations:

Step 1. Find the funding-gap rate (R):

$$EE = DIC - DNR = 88898,10 - 41157,00 = 47741,10$$

$$R = EE / DIC = 47741,10 / 88898,10 = 54\%$$

Step 2. Find the "decision amount" (DA), i.e. "the amount to which the co-financing rate for the priority axis applies" (Art. 41.2):

$$DA = EC * R = 80000 * 54\% = 43200$$

Where EC is the eligible cost.

Step 3. Find the (maximum) EU grant:

$$EU \text{ grant} = DA * \text{Max CRpa} = 43200 * 75\% = 32400$$

where

Max CRpa is the maximum co-funding rate fixed for the priority axis in the Commission's decision adopting the operational programme (Art. 53.6).

Based on the method used the residual value may be very different. If the residual value is bigger the amount of the calculated grant is smaller.



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Special remark:

It is a general tendency from public institutions to increase artificially the residual value in order to obtain a better value for economic return and for private companies to decrease it in order to increase the EU grant value. Because both cases are not acceptable, the guidelines for applicants have to decide the method to be used for residual value in order to assure proper evaluation of the entire scheme (equal treatment and objective judgment).

The example took into consideration shows that the residual value has an important effect on funding gap and all financial indicators of an investment project. We consider this example as most suitable for understanding the impact of residual value in assessment process of applications for major investment project.



3. CONCLUSIONS

The main conclusion of the paper is that there is no single method in order to determine the residual value for all projects undertaken in all programs/domains.

The main methods recommended to be used, as presented in the paper, are synthesized in the following table:

Type of investment	Recommended approach
Regional and local transport infrastructure	Method B
Environment	Method B
Social infrastructure	Method B
Development of regional and local business environment	Method C / Method A
Tourism	Method C / Method A
Innovative and eco-efficient production systems	Method C / Method A
Research, technological development and innovation for competitiveness	Method C / Method A
Information technology and communication	Method C / Method A
Energy supply and energy efficiency	Method C / Method A

It is very important to make the distinction between beneficiaries, which is that a private company will benefit from a rapid amortization (residual value almost equal to 0), while a public beneficiary is implementing complex projects, with long life time period for investment items.

In case of investment projects with a mixed set of assets (a major transport infrastructure project which usually includes the creation of a mixed set of assets), some of these assets will require replacement when they reach the end of their useful life, during the prognosis period. The replacement costs must be included in the stream of future costs in the appraisal, in the year they will be incurred.

Each Management Authority should clearly specify the desired methodology for computing residual value, according to the types of investment projects. Moreover, for those investment projects with a prognosis made for more than 15 years, due to market volatility, macroeconomic uncertainty, exchange rate sensitivity, denomination, etc, the Beneficiaries should have the possibility to adjust the residual value (as a



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monetary item) when market conditions changed dramatically. As it was mentioned before, the residual values have impact in values of financial and economic ratios from CBA (including funding gap rate) and we recommend to fix most suitable methodology for the next period (2014-2020) taking into account the project' type.



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