Green Controlling and Finance

Case Studies

Edited by

Cezary Kochalski

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Reviewer

Mirosław Hamrol

Authors

Paweł Chudziński (Chapters 2, 8)
Cezary Kochalski (Introduction, Chapters 2, 8, Conclusions)
Jarosław Kubiak (Chapter 4)
Grzegorz Mikołajewicz (Chapters 1, 3, 9, 10)
Andrzej Niemiec (Chapter 7)
Jarosław Nowicki (Chapters 1, 3, 9, 10)
Piotr Ratajczak (Chapter 6)
Agata Sierpińska-Sawicz (Chapter 7)
Aleksandra Szulczewska-Remi (Chapter 5)
Sławomir Zerbst (Chapter 5)

Cover design

Jan Paluch

Editing and proofreading

Michał Mażulis

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phone: +48 32 231 22 19, +48 32 230 98 63
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CHAPTER 9

Investment project appraisal with account of environmental and social aspects at Aquanet and Amica

9.1. Introductory remarks

In economic practice, there are many different methods of investment project appraisal that may be employed. This appraisal may be approached from a number of angles. The classic methodology of investment appraisal adopts the shareholder's point of view. Accounting for environmental and social determinants in the analysis of investment opportunities shifts the appraisal perspective to align it with that of the entire society[1].

The purpose of this chapter is to present the practical aspects of employment of various approaches to investment profitability appraisal and various assessment methods in the operations of enterprises such as Aquanet and Amica. The achievement of this goal dictated case studies as the research method of choice, as well as determined the layout of the chapter. First, Aquanet's approach to investment project assessment is characterized. Next, methodological solutions applied at the company in reference to business projects are presented. They are dominated by the employment of financial methods of investment appraisal. What follows is an example of evaluation of social impacts of an investment project carried out by Aquanet. This topic is then elaborated with a description of a possible approach to valuation of social impacts as part of cost-benefit analysis, illustrated with the example of traffic congestion in Poznań. Lastly, the chapter provides a characterization of methodological solutions applied in assessment of investment projects at Amica.

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[1] Different perspectives applied in investment project appraisal, as well as methods employed in the various approaches have been discussed in: [Nowicki 2016]. The classic methods used in the capital budgeting process, adopting the shareholder perspective, such as NPV or IRR, are referred to therein as financial methods of investment appraisal, while the assessment performed from the perspective of the entire society and accounting for various environmental and social aspects is performed with non-financial methods of investment appraisal.

9.2. Approach to investment project appraisal at Aquanet

Aquanet is very active in the process of analysis and performance of investment projects, which is attested to by the fact that in the years 2013-2014, it allocated PLN 473 mln as investment outlays on tasks such as: modernization of the water treatment station in Mosina, hermetization of the Central Wastewater Treatment Plant tanks, construction of a sanitary sewer in Kamionki, protection of the acquifier zone Marlewo, modernization of the wastewater treatment plant in Mosina or the construction of a trunk sewer under Al. Niepodległości in Poznań [Aquanet Investments 2016]. The company has no intention of stopping at the above investments, as it is in the process of completing the largest investment programme in the history of the enterprise [Aquanet 2015d, p. 10] and, moreover, continuous investments are in a way at the core of company's mission - the list of design documentation in progress covers 74 items [Aquanet Investments 2016].

The approach of Aquanet to the appraisal of investment projects carried out by the enterprise could be referred to as rational and deeply rooted in business reality. This is due to the fact that the decision on whether to perform an investment project appraisal and, if the answer is yes, to what extent, is driven by rational premises provided by the analysis of company's operations. From the perspective of the considerations in this chapter, investment projects pursued by the company may be divided into three groups [Aquanet 2016c]:

- investment projects related to the expansion of the water network,
- investment projects related to operations above and beyond the regular operations of this entity, but not related to the expansion of the water network (business projects),
- investment projects with a significant impact on the natural and social environment.

This division is significant owing to the scope of performed investment appraisal analyses, as, in the case of investments related to the expansion of the water network appraisals are not carried out at all; in the case of investment projects above and beyond the regular operations of the entity, such formal profitability analyses are performed for internal needs; whereas in the case of investment projects with a significant impact on the natural and social environment, analysis of this impact is considered.

The reason that the company does not perform any analyses of profitability of investment projects related to the expansion of its network is that expansion is undertaken based on premises other than their feasibility to the company. As regards this type of projects, neither the net present value nor the internal rate of return are known, since no formal profitability analysis is performed. One fitting example of this type of project is connection of a new housing estate to the water network.

As regards other investment projects above and beyond the regular activities of the entity, formal profitability appraisals, focusing on the assessment of financial feasibility[2], are prepared for internal needs. The relevant decision on performance or rejection of an investment project is made based on the outcome of this analysis and the resultant recommendation. For example, investment projects of this type considered in 2015, entailed [Aquanet 2015g]:

- Left-bank Wastewater Treatment Plant (LWTP), bioreactors - replacement of current compressors and blowers with more energy-efficient equipment,
- Water Treatment Station (WTS) Wiśniowa - electrical and heat energy supply (heat pumps, power generation unit, replacement of piping),
- decommissioning of the wastewater treatment plant in Chludowo,
- WTS Mosina - carbon filters washings recirculation,
- construction of a secondary disinfection point on the eastern main in Czapury,
- the option to supply water to Zielątkowo, Golęczewo, Chludowo and Rokietnica from the Poznań Water Network System (PWNS),
- LWTP - replacement of positive displacement pumps with rotary pumps in the sludge recirculation system,
- construction of an installation to transfer post-filtration sludge from WTS Mosina to the Central Wastewater Treatment Plant (CWTP),
- electrical energy supply for the Water Intake Promienko,
- LWTP - construction of a CNG fuelling station.

As regards investment projects with a significant impact on the social and natural environment, the company considers performance of a social and environmental impact analysis, which would represent a case of application of non-financial methods of investment appraisal. In such a situation, analysis results are taken into account in the decision-making process. One example of such a project is the construction of the right-bank trunk sewer II in Poznań.

However, even in the case of investment projects for which a formal analysis of social or environmental impacts is not performed, Aquanet naturally, owing to the profile of its operations, puts great emphasis on environmental and social issues. Moreover, the financing of a considerable share of investment outlays incurred by the company from the EU Cohesion Fund under the Infrastructure and Environment Programme [Aquanet and EU 2016] forces the company to achieve the so-called environmental effect [Aquanet 2015d, p. 49]. Therefore, environmental and social aspects are significant determinants in Aquanet's making of investment decisions

[2] The division of investment profitability appraisal methods into financial and non-financial methods is discussed in [Nowicki 2016].

[Lasocka-Gomuła 2008, pp. 8-11]. What follows are examples of investment projects with a significant impact on the social and natural environment [Aquanet 2015d, pp. 37-49]:

- modernization of the Wastewater Treatment Plant in Mosina (pro-social and pro-environmental project),
- modernization of the Water Treatment Station in Mosina (pro-social and pro-environmental project),
- construction of a combined trunk sewer with storm overflow beneath Al. Niepodległości in Poznań (project of significant social impact - an important communication route in downtown Poznań, under custody of the Municipal Office of Heritage Preservation, archeological works),
- modernization of the sanitary sewer in the Sołacz residential estate in Poznań (pro-environmental project),
- new building of the 100-years-old 'Garbary' Wastewater Pumping Plant (strict custody of the Municipal Office of Heritage Preservation),
- construction of the Junikowo trunk sewer (pro-social project with a plan of compensation planting),
- construction of the Umultowo-Suchy Las trunk sewer (pro-social project),
- works on sludge management and generation of energy from biogas (pro-environmental project),
- introduction of co-digestion to company's plants (pro-environmental project),
- odour reduction programme at Aquanet SA (among others, hermetization of sedimentation tanks at wastewater treatment plants - pro-environmental and pro-social project).

9.3. Business investment project appraisal at Aquanet

Financial appraisal of profitability is performed for investment projects that go beyond and above the regular operations of the entity, other than expansion of the water network. The financial methods of investment appraisal employed at the company include [Aquanet 2015a, 2015b, 2015c, 2015e, 2015f]:

- net present value (NPV),
- internal rate of return (IRR),
- net present value ratio (NPVR),
- payback period (PP),
- discounted payback period (DPP).

The modified internal rate of return, or MIRR, is not calculated in the analyses, and neither is the modified net present value, MNPV.

Moreover, the appraisal based on the net present value is performed according to two methodological approaches:

- in reference to the detailed forecast period only,
- in reference to the detailed forecast period with account of the investment value after the lapse of this period (residual value).

Investment appraisal reports at Aquanet typically involve the following elements [Aquanet 2015a, 2015b, 2015c, 2015e, 2015f]:

- definition of the purpose and object of analysis,
- discussion of analyzed variants,
- indication of data sources,
- description of the main technological and financial assumptions,
- description of the material scope and of investment outlays,
- presentation of a time schedule,
- discussion of changes in revenues and costs (savings, additional operating costs),
- presentation of analysis results,
- summary, which is finalized with a recommendation as to the advisability of the analyzed investment endeavour.

Although this is not expressly stated in Aquanet's investment appraisal reports, the analysis of financial models of individual investment endeavours shows that the detailed method of formulating discounted cash flows is the free cash flow to equity, or FCFE method[3], although in the case of investment projects for the analytical needs of which the company assumed financing from equity, without the use of debt, these cash flows are identical to those under FCFF method.

The analysis of Aquanet's investment appraisal reports indicates that the main decision-making criteria are the net present value and the discounted payback period. This, and especially the focus on NPV in the decision-making process, is in line with the most universal recommendations on making investment decisions to be found in the literature of the subject.

[3] This is one of the two most frequent methods of defining cash flows subject to discounting, besides the free cash flow to firm (FCFF) method. More on this subject: [Nowicki 2016].

9.4. Example of evaluation of social impacts of an investment project at Aquanet

The project of construction of the right-bank trunk sewer II in Poznań, executed in 2010-2012, may be used as a fitting example of an investment project with a significant impact on the social environment. At the pre-investment stage, Aquanet, fully aware of the significant repercussions of this project for the social environment, decided to perform an analysis of its social impacts. This task was commissioned to an external company, and the final outcome was the report drafted in June 2008 [Grontmij 2008].

This endeavour was to consist in the construction of a 4 km-long sanitary trunk sewer with a diameter of 1.8-2.4 m, in the section from Główna Street to the intersection of Milczańska and Bolesława Krzywoustego Streets in Poznań, as well as of a 1 km-long storm water trunk sewer with a diameter of 1.2 m beneath Berdychowo Street. The purpose of this project was to relieve the sewer system in the right-bank part of Poznań. It was planned that, upon completion, the right-bank trunk sewer II would deliver wastewater to the Central Wastewater Treatment Plant, among others from the areas of Łacina, Szczepankowo, Starołęka, Żegrze and Swarzędz, while the storm water trunk sewer was to act as an outlet for precipitation from the non-connected part of Łacina and regions of Rataje [Right-bank trunk sewer II 2016]. Owing to the considerable size of the trunk sewer and its planned location, the endeavour was to cause road nuisances to the residents, even though a part of works was to take place by way of microtunneling, it was not possible to avoid the open-excavation method as well [Right-bank trunk sewer II 2016].

Considering the above, the aim of the analysis was to determine the lower limit of social costs [Grontmij 2008, p. 4]. The objective associated with this and resulting from the analysis, was to find justification for signing a time incentive contract with the contractor, which would contain a financial incentive for the quickest possible completion of works, thus leading to reduction of the social costs [Grontmij 2008, pp. 17, 19].

The performed social costs analysis was based on the methodology of cost-benefit analysis (CBA). The analysis used the notion of willingness to pay (WTP) and methods of monetization of unquantified external effects such as [Grontmij 2008, s. 4-5][4]:

- travel cost method,
- benefit transfer method,
- productivity analysis method.

[4] The fundamentals of cost-benefit analysis have been discussed, among others, in: [Nowicki 2016]. The work also provides a brief characterization of the key methods of monetization of unquantified external effects in the economic appraisal of investment projects [Nowicki 2016].

The analysis provides an explanation on why the following methods were not applied [Grontmij 2008, p. 5]:

- hedonic pricing,
- contingent valuation method.

In the course of the performed analysis, it was possible to quantify the following social costs [Grontmij 2008, pp. 10-14]:

- increased costs of vehicle operation,
- cost of the increased commute time in passenger and freight car transportation,
- costs of the increased emission of exhaust fume components,
- cost of the decreased recreational attractiveness of the Malta Lake and its surroundings,
- potential cost of losing the chance to host the World Rowing Cup.

Besides, the analysis lists social costs which could not be successfully expressed as a monetary value, such as [Grontmij 2008, p. 14]:

- cost of the increased time of tram commutes,
- delay or suspension of other investment projects located close to the construction site of the right-bank trunk sewer II,
- temporary loss of value of real estate in the vicinity of the trunk sewer construction,
- costs of accidents,
- difficulties with traffic coordination/telematics systems of the City of Poznań,
- slowdown of car traffic on streets in the vicinity of the trunk sewer construction,
- decrease in numbers of customers of the nearby Galeria Malta shopping mall in the investment period.

From the methodological perspective, it should be noted that the authors of the analysis have limited themselves to the valuation of social costs of the considered investment project in search for a justification of proposing a time incentive contract to the investment contractor. The analysis points out possible social benefits of the investment, but no attempts were made to quantify them [Grontmij 2008, pp. 17-18]. As a result, it was not possible to perform a global assessment of the social costs and benefits generated by the investment endeavour in question. What must be considered a shortcoming of the performed valuation is the fact that the social costs account was provided in nominal values for the expected period of works estimated at 24 months, and so the time value of money was not accounted for. The analysis did not employ any of the non-financial methods of investment appraisal, which are the crowing of the economic analysis conducted under the CBA, such as:

- economic net present value (ENPV),
- economic rate of return (ERR),
- benefit-cost ratio (B/C ratio)[5].

This is, in a way, understandable, given the clearly stated objective of the report [Grontmij 2008, p. 19], as well as the absence of profitability appraisal in the financial analysis, which should normally be the basis for the economic analysis, accounting for social benefits and costs. Without a financial model of the investment project, without quantification of social benefits and without the application of the discount account, the calculation of ENPV, ERR or of the B/C ratio was not possible.

9.5. Costs of traffic congestion in Poznań as an example of valuation of certain social impacts under cost-benefit analysis

The cost-benefit analysis (CBA) accounts for various social and environmental aspects of investments that are not incorporated into the traditional financial profitability analysis[6]. External effects of investments include, among others, increase/decrease of noise, of pollution emissions, of waste, deterioration/improvement of health or of the living conditions of the local community, etc. Since these are non-tangible effects, it is difficult to measure them.

One of the examples of measuring social aspects and their evaluation is the opportunity cost analysis, which is the method presented below on the basis of traffic congestion analysis in Poznań, as provided in the 'Report on Traffic Congestion in 7 Largest Cities of Poland. Warsaw, Wrocław, Kraków, Poznań, Gdańsk, Łódź, Katowice' by Deloitte and Targeo.pl [2016]. This is due to the fact that time spent in traffic jams is not used productively, and it could be devoted to work or rest depending on individual preferences.

Table 9.1. presents information on monthly delays caused by rush-hour traffic congestion in Poznań in the years 2011-2015 [hours:mins]

Table 9.1. Monthly delays caused by rush-hour traffic congestion in Poznań in the years 2011-2015 [hours:mins]

List	2015	2014	2013	2012	2011
Morning rush-hour	03:41	03:11	03:29	03:19	04:03
Afternoon rush-hour	04:28	03:43	03:54	04:17	04:09
Total	**08:09**	**06:54**	**07:23**	**07:36**	**08:12**

Source: [Deloitte and Targeo.pl 2016, p. 19]

[5] Non-financial methods of investment appraisal have been described in: [Nowicki 2016].

[6] More on the topic of cost-benefit analysis in: [Nowicki 2016].

As indicated by the data in the table, the average monthly delay caused by traffic congestion[7] in Poznań in 2011-2015 amounted to over 7.5 hours, with the highest values in the extreme years of the analysis (over 8 hours), and the lowest in the year 2014 (below 7 hours). The delay is distributed fairly equally between the morning and afternoon rush hours. The latter was responsible for, on average, 54% of the total delay in the analyzed period.

Delay data, in turn, was used to determine the costs of traffic congestion in Poznań, based on the following assumptions [Deloitte and Targeo.pl 2016, pp. 52, 53]:

- the opportunity cost for the time lost in traffic congestion is work for remuneration, whose value has been set at the amount of average monthly gross remuneration in the entrepreneurial sector in Poznań (commuters from the suburban areas were not taken into account),
- only working persons were accounted for; the number of workers commuting daily to/from work (individual transportation) was estimated on the basis of information from Municipal Transit Authorities on the use of public transportation in the city,
- the drivers use a statistical vehicle, that is Fiat Panda with a 1.1 l gasoline engine,
- the price of gasoline applied in the model is the annual average for the entire country.

The costs of traffic congestion in Poznań are presented in table 9.2.

Table 9.2. Costs of traffic congestion in Poznań[8]

Year	Annual cost of traffic congestion per driver (in PLN)	Annual cost of traffic congestion per driver as a percentage of average monthly gross remuneration in the city	Annual cost of traffic congestion in Poznań for the economy (in PLN million)
2015	3,350	74%	456
2014	2,848	64%	367
2013	3,055	71%	390
2011	3,050	74%	383
2010	3,236	80%	398
Average:	**3,108**	**73%**	**399**

Source: own elaboration on the basis of [Deloitte and Targeo.pl 2016, pp. 53, 55, 56]

[7] Delay caused by traffic congestion is calculated against free flow without any difficulties, outside of the rush hours [Deloitte and Targeo.pl 2016, p. 5].

[8] Calculations for 2012 were not available.

As follows from the data presented in the table, the average annual cost of traffic congestion per driver in Poznań amounts to ca. PLN 3,108, which represents nearly 73% of the average monthly gross remuneration in this city. The highest costs were observed in the extreme years of the analysis, especially in 2010, when they reached PLN 3,236, i.e. 80% of the average gross monthly remuneration at that time. The lowest values were observed in 2014, amounting to PLN 2,848 and 64% respectively.

The presented calculation also accounts for the annual cost of traffic congestion in Poznań for the Polish economy, which is the difference between costs to drivers (fuel and opportunity cost) and revenues to the state budget (from VAT and fuel excise tax) [Deloitte and Targeo.pl 2016, p. 56]. The average cost on account of this in the analyzed period amounted to nearly PLN 400 million, and it turned out to be the highest in 2015 (PLN 456 million).

According to the authors of this research [Deloitte and Targeo.pl 2016, p. 53], 'data and assumptions adopted in our calculations seem conservative, it is therefore highly probable that the economic assessment of opportunity costs of traffic congestion in cities is underestimated'.

This happens for a number of reasons. Firstly, the costs of traffic congestion in this model only adopt conservative premises, such as those regarding the statistical vehicle driven by working persons or the price of gasoline, which has been established at the annual average for the entire country (while in cities these prices can be higher), and, secondly, the model does not incorporate environmental and health costs (such as exhaust fumes, noise, etc.).

9.6. Investment project appraisal at Amica group

Owing to the group's dynamic development, it pursues a number of investment projects in various areas of activity. The performed investment projects may be divided into the following categories [Amica 2016]:

- investments to increase production capacities and to further the development of new technologies,
- investments oriented on product development,
- IT projects,
- other investments.

The company has a formalized system for investment project appraisal, which is a part of the project management system [Amica 2016]. Each year, the corporate group drafts a development plan which defines the expected investment outlays. Annual development plans must be in line with the longterm investment plan drawn up in the course of setting the company strategy. At that stage, the proposed investment projects

were scored according to criteria such as project profitability, level of strategy support, risk level [Amica 2016]. Prior to the performance of a project, it is thoroughly assessed in terms of profitability. A report from this appraisal is performed for the internal decision-making needs of the company. Investment appraisal at Amica focuses on the financial issues, and the primary methods applied by the company are net present value (NPV) and the internal rate of return (IRR) [Amica 2016]. Non-financial methods of investment appraisal are not employed at the company [Amica 2016].

The cohesion and consistency of Amica, reflected in the compliance between declared objectives of company's operations and the applied methods of investment appraisal, are noteworthy. Since the declared objective of the company is to create value for shareholders [Rutkowski 2015, p. 1; Amica 2015, p. 18, 27-28; Amica 2014, p. 8], the most fitting method of investment appraisal is the one based on net present value, a measure fully aligned with thus formulated objective of operations.

The fact that Amica considers the financial methods of investment appraisal to be decisive, does not mean that it does not account for environmental and social aspects in its investment operations. These are incorporated on many different planes. For example, in the case of investment projects aiming to increase production capacities and to further the development of new technologies, the company places great emphasis on ensuring that the implemented technology will reduce energy intensity of production [Amica 2016]. Moreover, investment projects oriented on product development focus also on endeavours meant to increase their energy class [Amica 2016]. Also under projects not related to the core operations of the company, Amica takes the mentioned aspects into consideration, as was the case with, for example, the construction of a workplace kindergarten [Amica 2016].

9.7. Final remarks

The purpose of this chapter was to present the practical aspects of employment of various approaches to investment profitability appraisal as well as various appraisal methods. The objective was fulfilled by the case study analysis of solutions applied at Aquanet and Amica.

The objective of the chapter has been reached. It characterizes the approach of Aquanet to investment project appraisal, indicating the rationale behind performing investment appraisal only for those projects, which the company will decide to pursue or reject based on the outcome of the analysis. The chapter also shed light on methodological solutions applied at Aquanet in relation to business projects, where the investment decisions are made based on the outcome of financial methods of investment appraisal. As regards environmental and social aspects accounted for in investment appraisal, the chapter presented an example of Aquanet's social impacts evaluation of

an investment consisting in the construction of the right-bank trunk sewer II in Poznań. This topic was then elaborated with a description of a possible approach to valuation of social impacts as part of cost-benefit analysis, illustrated with the example of traffic congestion in Poznań. Lastly, the chapter provided a characterization of methodological solutions applied in the appraisal of investment projects at Amica. Each of the subchapters offered a commentary on the practical solutions employed at the discussed enterprises.