SUSTAINABLE STADIUM DEVELOPMENT

Increasing the benefits of stadiums for a municipality through sustainable development - A case study of Stadion Feijenoord

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Preface

This graduation thesis is the result of the last project of my Master Construction Management & Engineering at the Eindhoven University of Technology. With this project my dream comes true to work on a project about stadium development. Stadium projects have always attracted my attention because the imposing appearance of it and of the emotion that is involved in these buildings. It is not just a project for housing a single party, but it has potential to become the heart of the city. Nobody can ignore such a large project and every other week it will attract tens of thousands of people that join together to cheer for the same team. In summary, a project full of passion!

This personal drive almost broke me up, because the number potential internship companies became limited. But even a half year search ahead was not sufficient, which resulted in at start of the project in February 2013 on my own. This included the selection of a problem in this topic that was not assigned by a company or concerned party. The first problem definition about the vacancy of sporting venues after a large sports event seemed to be too comprehensive. Several other issues in the world of stadium development were considered, which resulted in the topic about the involvement of municipalities in stadium development projects. Almost every Dutch municipality hosting a professional football club is struggling with the financial risks and related benefits of a public investment in their local stadium.

An upcoming issue in stadium development is the sustainability of these highly inefficient buildings, which are usually only used two to four times a month. This also made the project interesting for KENWIB. Meanwhile, the consultancy company Draaijer+partners was prepared to support me in my project, in the person of Hylke Hellinga. The case study Stadion Feijenoord in Rotterdam was introduced, since that was a present-day example of a municipality that had to decide whether or not to invest in the new or redeveloped stadium of Feyenoord.

With the help Maarten Epema, and Ben Veenbrink, who were prepared for an interview, the support of Ferry van den Broek and Jeroen Heuvel for the data collection during City Council meetings, and Hylke Hellinga, Brano Glumac, Bart van Weenen, and Wim Schaefer as my graduation committee, I managed to successfully finish my graduation project. I want to sincerely thanks them, as well as my girlfriend Manon Bodenstaff, my friends, and my family who constantly supported me during this project.

I hope you will read this report with the same pleasure as I had in making it.

Robert Schrama

Eindhoven, August 17th, 2013

Management abstract

A majority of the Dutch municipalities with a professional football club (BVO) in their city is owner of the stadium. The apparent benefits for society and the high emotions related to football are the main reasons for the decision of municipalities to get financially involved in stadium projects. The main problem of municipalities being shareholder of a stadium is the related financial risks, which might in hindsight be too high in regard to its benefits. To increase the benefits for a municipality, their objectives should be met. These are mainly the social and economic impact of the stadium project on the city and its surrounding area. Next to this, sustainability is an increasingly important objective of most municipalities and is also an upcoming tendency in stadium development projects. Sustainable adjustments do not only improve the environmental aspects, but also affects the long-term planning and future legacy of the stadium, which are again related to the financial risks. Therefore, sustainability can play and important role in increasing the benefits of stadiums for municipalities.

Six different sustainable stadium development alternatives are selected (i.e. change of management, technical adjustments, total renovation, building a new stadium, disposing the stadium, and a passive approach), which are judged upon four main criteria (i.e. direct financial flows, economic value, social impact, and sustainability) and sixteen sub-criteria (four for each criterion). These sub-criteria are determined by interviews with stadium experts, literature study, case studies, and the BREEAM-NL environmental assessment methodology. With the Analytic Hierarchy Process (AHP) the relative importance of each sub-criterion in regard to the municipal benefits of a stadium development project is determined. A questionnaire is conducted among the City Councils of the Dutch cities with the largest stadiums (i.e. Amsterdam, Rotterdam, Eindhoven and Enschede). A total of 31 councillors completed the questionnaire. The results of this survey show that the four most important sub-criteria according to the respondents are; attracting companies (10.7%), the related financial risks (also 10.7%), enjoyment and vibrancy of the city (8.3%), and city branding (7.8%). The four sub-criteria with the lowest relative importance are the expenses of supporters during match days (2.5%), energy costs (2.7%), CO_2 emission (2.7%), and the use of natural resources (3.6%). Sustainability as a whole has a very low relative importance, from which only the long-term planning of the project has a significant impact (6.5%). It therefore can be concluded that for municipalities it is less important to focus on specific sustainability aspects in stadium development projects. Still sustainability can increase the benefits of a stadium development project for municipalities, namely with the environmental behaviour of the whole stadium development project, including long-term planning regarding the exploitation, management and maintenance of the stadium.

Next to the AHP, a case study was performed about Stadion Feijenoord in Rotterdam. The respondents gave a direct prioritization of the six development alternatives of the stadium from which the outcome is compared with the final score of the six alternatives determined by with the AHP survey. The surprising result is that the three transformation alternatives (i.e. change of management, technical adjustments and total renovation) have a very high score in the direct prioritization (respectively 22%, 26% and 20%) and the new stadium has a lower score (13%), while in the prioritization according to the AHP survey the new stadium has the highest score of all alternatives (23%). This can imply that City Councillors might underestimate the positive impact of a newly developed stadium has on society and local economy.

List of abbreviations

AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
BREEAM	Building Research Establishment Environmental Assessment Method
BVO	Betaald Voetbal Onderneming (*Professional Football Venture*)
CI	Consistency Index
CR	Consistency Ratio
EBIT	Earnings Before Interest and Taxes
FIFA	Fédération Internationale de Football Association (*International Federation of Association Football*)
MCDM	Multiple Criteria Decision Making
MCDA	Multiple Criteria Decision Analysis
MREM	Municipal Real Estate Management
GPR	Gemeentelijke Praktijk Richtlijn (*Municipal Practical Guideline*)
KNVB	Koninklijke Nederlandse Voetbal Bond (*Royal Dutch Football Association*)
LEED	Leadership in Energy and Environmental Design
RI	Random Consistency Index
SMART	Specific, Measurable, Acceptable, Realistic, Time-phased
SWOT	Strengths, Weaknesses, Opportunities and Threats
UEFA	Union des Associations Européennes de Football (*Union of European Football Associations*)

1. Introduction

1.1 Context

"Stadiums combine culture, art and sport, and play a social and cultural role in all host cities. They can help to shape our towns and cities more than almost any other building type in history, and at the same time put a community on the map." (*John, Sheard and Vickery, 2007*) A description by three British sports architects about the value of modern stadiums for cities. There statement is strengthen by the fact that the Wembley Stadium in London (built in 2007), the Beijing National Stadium (2008), and the Allianz Arena in Munich (2005) are respectively the 21st, 33rd, and 37th most-visited landmarks in the World (*Travel+Leisure, 2012*). Furthermore, according to CNN, sports stadiums and arenas are the most popular check-in places on Facebook in the USA in 2012. This increase of popularity of stadiums does not only counts for the fanatic sports fans, but also for political diplomacy purposes and city branding (*Thompson, 2005; Hong & Xiaozheng, 2010; Beard, 2011; Will, 2011*).

Next to tendency, professional sports (and especially football) is playing an increasingly large role in Dutch society. Since the mid-eighties the average attendance at the highest Dutch football league is increased from 7,000 to 19,500 spectators per match last season (*EFS, 2013; VI, 2013*). An increase in stadium attendance of 179%, while the total Dutch population only increased with 17% in the same period of time (*Wereldbank, 2013*). Since the international success of Dutch football clubs in the eighties was better compared to the performances in European competitions nowadays (*UEFA, 2013*), and the average reference ticket price for Dutch football matches even increased (*CBS, 2013; Voetbalstats, 2013*), it has to be something else that changed the minds of thousands or even millions of Dutch citizens.

Also here, stadiums are the key. According to Jansma (*2000*) traditional Dutch football fans changed from fanatics who wanted to witness every success and disappointments of their team, regardless the weather conditions and other circumstances, to families and friends who want to experience a sports event in a state-of-the-art stadium with a roof, seats and enough modern facilities. Since the Heizel-tragedy, during the European cup final of 1985 in Brussels, where 39 people died because of a riot on the stands (*NAi, 2000*), new stadiums have to be provided with seats, good emergency escapes and other facilities for the comfort and safety of the spectators.

These changes played an important role in making municipalities aware of the added value of football and stadiums in their city. Despite the endless studies to the benefits and disadvantages for municipalities, public parties invested more and more in professional football in their city. Municipalities began to consider football as a social event and started to give loans for the construction or renovation of stadiums in their cities (*Metze e.a., 2011*). They even became (co-)initiator in stadium development projects (e.g. Amsterdam, Groningen and The Hague), which made them (partly) owner of the stadium. However, the most comprehensive public investments in stadiums were those of municipalities who wanted to help their local professional sports club by purchasing their stadium. This resulted in the current situation that from the 41 Dutch stadiums that were used by professional football clubs since the 90's, only six stadiums are fully owned by private parties, from which four are realized with money or a loan from the municipality (*Metze e.a., 2011*).

1.2 Problem definition

Dutch professional football organisations (BVOs) often have a unhealthy financial management, which cannot be compared with regular competitive companies (*Hellinga, 2013)*. The amounts of money they pay for players, salaries and sometimes even stadiums are often disproportional to the revenues that is obtained with it. The management of a BVO often takes too high risks, where regular competitive companies should not take these risks in the same situation. A crucial difference lies in the fact that if a competitive company makes too much mistakes in their financial management they will probably go bankrupt, while BVOs in the same situation are often saved by external parties (e.g. Roda JC, PSV, AC Milan, Real Madrid, etc.). This is because BVOs have thousands of supporters who are emotionally concerned with the club (*Van den Broek, 2013*). Because the stadium often will become useless after bankruptcy of the using BVO, since it is an obsolete real estate object, a municipality that is shareholder or investor in the stadium will not just abandon the club in order to protect its own investment. Also local companies often benefit from the club or stadium in their city, but since saving a BVO is usually not beneficial for a single private company, impending bankruptcies are often avoided by the municipality (*appendix 1+2*).

As mentioned, Dutch municipalities recognize the positive social and economic impact of professional football, hence they have an interest in keeping the club in their city (*Hellinga, 2013; Municipality of Eindhoven, 2010; WVB marketing, 2007; Miller, 2005; Santo, 2005; Baade, 1994; Baade & Dye, 1988*). However, financially supporting a private company is prohibited for a public party according to European Commission's regulations (*European Union, 2013*). A solution for this is that municipalities can become shareholder of a stadium or co-founders of a stadium project. In that case they do not directly financially support the club. This resulted in the fact that over 75% of the stadiums of Dutch BVOs are officially (partly) owned by the municipality (*appendix 1*) and most of the other stadiums are realized with financial support of the concerning municipality (*Metze e.a., 2011*). This trend is automatically causing a financial involvement of municipalities in the business of the stadiums or BVOs. This again results in the undesirable situation that when the BVO again gets financial problems, the municipality will be problem owner too, since they will not recoup their investment when the BVO will go bankrupt (*Encorys, 2012*). The municipality is then in some way forced to offer financial support to the BVO or stadium again as a result of a simple cost-benefit analysis, which is a common used decision making tool for as well public as private parties (*Damart & Roy, 2009*). This process will continue, until a municipality decides they have invested enough money in the BVO or stadium without any prospect of improvement. The BVO then has to look for other sources of financial support, like local companies or wealthy supporters. In most cases these private parties are not able to provide enough money, so the clubs will go bankrupt and the municipality eventually has to take its loss (e.g. HFC Haarlem, 2010; RBC Roosendaal, 2011; AGOVV Apeldoorn and SC Veendam, both 2013). Despite these example, municipalities keep investing in stadium projects (*appendix 3*).

The problem in this research can be state as follows:

The financial risks for a municipality due to investments in stadium projects turn out to be higher than expected, resulting in an undesirable financial situation for the municipality.

1.3 Assumptions

It is possible that municipalities accept the risks of investments in stadium projects, because the gained benefits are worth it. The problem is however, that the aftermath of these investments can require new commitments or risks, causing an unbalanced ratio between the financial risks and the benefits of the investment. The future has turned out that most European municipalities do not reconsider made real estate investment decisions, which is causing them unnecessary high costs (*Deloitte, 2011*).

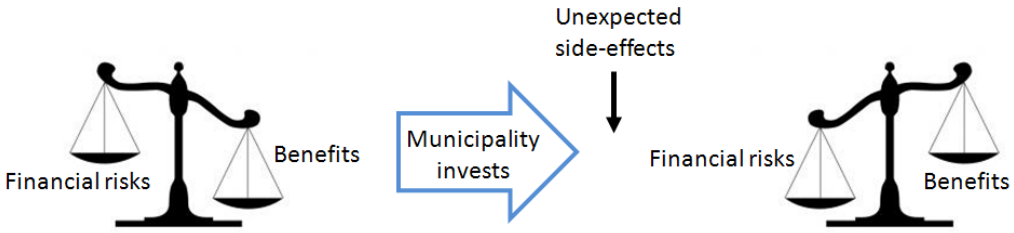


Figure 1.1 | *A possible and quite common outcome of public investments in stadium projects*

This problem has a dual cause. Firstly, a stadium is a very unpredictable real estate object regarding its exploitation. The potential economic and social (indirect) benefits from a stadium are very high, as well as the potential direct profitability of a stadium. But with wrong management or an unpredictable change, like the relegation of the using sports club or even the interest rate for mortgages, the whole situation can change (*Sapotichne, 2012*). The whole business plan of most stadiums is based on the permanent use by the concerning sports club. Without the club, the stadium is an obsolete real estate object, since it can only be used for a few purposes (e.g. sports and music concerts). Secondly, professional football clubs (BVOs) often have financial problems due to irresponsible financial management. Healthy companies or sports clubs should reserve at least 10% of their budget on housing costs (*Hellinga, 2013*). According to their financial reports, most BVOs are below this guideline. Most money goes to salaries and transfer costs, while these investments are very unpredictable as well. A player bought for € 10,000,000.- can be worth nothing when his contract expires. Looking at the numbers it can be concluded that the continuity of a BVO is far from assured, which makes an investment in stadium projects also very unpredictable.

To solve the second cause of the problem, all Dutch BVOs should change their financial management and their view on managing professional sports in general. But changing the exorbitant salaries and transfer fees of players which are common in professional football is almost impossible, especially in the short-term future. And if only Dutch BVOs changes their financial management, they will fall behind compared to other European BVOs. This will have a very negative impact on their income and attraction to (international) sponsors, which can result in the end of professional football in the Netherlands (*Van Oostveen, 2012*). This is why changing the financial management of Dutch BVOs is not a realistic solution for the nearby future.

Therefore it is assumed that the solution of the stated problem lays in changing the exploitation of the stadiums itself. By redeveloping the stadium the profit of the stadium and the benefits for the municipality can be increased, while the costs and financial risks can possibly be constrained. And when the new stadium is also more profitable for the using BVO itself, its financial situation will also improve, which again decreases the financial risks for the municipality. After all, the club is the one that has to recoup the public investment.

1.4 Research objectives and expected results

The main objectives of this research are:

- Increasing the benefits of stadiums for municipalities.
- Decreasing the financial risks of investments in stadium projects for municipalities.
- Utilizing the potential advantages of sustainable redevelopment.
- Helping stakeholders of stadium development to realize their projects.

These overall objectives are especially applicable for the case study Stadion Feijenoord and the municipality of Rotterdam.

1.5 Research boundaries

Because municipalities are the problem owners of the defined problem, only stadium are considered that are (partly) owned by public parties, or where public parties are important stakeholders in the realization of the stadium.

Because the legislation and interests of municipalities all over the world are significantly different, this research will only focus on Dutch stadium projects. However, stadiums abroad can still be analysed in this research to the possible alternatives. Also the results of this research can possibly be applied to other cases abroad, albeit bound to certain preconditions.

Next to the stadiums of professional football clubs, the Netherlands also holds other kinds of stadiums, like; the Olympic Stadium in Amsterdam (for athletics and the old stadium of football club Ajax), Fanny Blankers Koen Stadion in Hengelo (for athletics and the second team of FC Twente), Thialf in Heerenveen (international ice skate stadium), Wagener-stadion in Amsterdam and Hazelaarweg in Rotterdam (both hockey stadiums). These are all Dutch stadiums with a capacity for at least 10,000 spectators and are in most cases also owned by municipalities.

But, since these stadiums do not have a continues using sports club that attracts thousands of spectators every other week, these stadiums are only worth the money that it gains during events, without having an major impact on society or the local economy. This means that municipalities tread these stadiums in a whole other way than football stadiums. Furthermore, the exploitation of a stadium with a permanent user can be made profitable as long as that specific user keeps using the stadium and is able to pay the rent. The mentioned stadiums for occasional or temporary events have a totally different exploitation. When these stadiums are not profitable anymore, the municipality can just sell or close them and these events will simply go to another venue. Possible problems and possible solutions for these stadiums are totally different compared to stadiums with a permanent user that is emotionally bounded to a certain city or area and becomes vacant when the club goes bankrupt. Therefore this research will only consider stadiums of Dutch professional football clubs.

1.6 Research question

The main question for this graduation research is:

How can sustainable redevelopment increase the benefits of stadiums for municipalities?

The scope of this research considers municipalities in the Netherlands who are shareholder or important stakeholder of a stadium used by a professional football club. Development approaches for a stadium include all kinds of changes to the stadium itself or the use of the stadium, including demolishing or construction of a new one. 'Sustainable' includes both environmental behaviour as well as a long-term vision for a continuous operation and exploitation of the stadium. 'Beneficial' is used in terms of positive impact on the objectives of a municipality, including profitability and indirect impact on the economy and society.

The sub-questions of this research are:

1.6.1 What determines the benefits of a stadium for a municipality?

Before it is possible to increase the benefits of a stadium for a municipality, its decision making process have to become clear. This determines which criteria a stadium should meet to become more beneficial for a municipality.

1.6.2 What are the characteristics of sustainable stadium redevelopment?

When it has become clear what is beneficial for a municipality regarding stadiums in their city, it should be determined if and how sustainable stadium redevelopment can meet these requirements. Which kinds of sustainable stadium redevelopment alternatives are there and how do these alternatives perform on the earlier determined criteria?

A case study of Stadion Feijenoord in Rotterdam is used to get insight in the performances of the different stadium redevelopment alternatives.

1.6.3 Which aspects of stadium redevelopment are the most important for municipalities?

In order to find out how a municipality can increase its benefits from a stadium by sustainable development, the most important aspects of such a project should be determined. Concerning municipalities should be asked for the prioritization of the previously determined criteria. This provides information about the decision making process of municipalities regarding investments in stadium development projects.

1.6.4 How to determine which stadium development alternative is the most beneficial for a municipality?

With the provided information about the importance of the different criteria that determine the benefits of a stadium for a municipality, these aspects can be reflected on the different alternatives that are available. Since the possible alternatives and their conditions strongly differ for each stadium project, the different alternatives of the case study Stadion Feijenoord are assessed as an example of how a municipality can increase their benefits for a stadium by sustainable development

1.7 Research design

The structure of this research is shown in *figure 1.1,* including the applied research methods. The sub-questions will be elaborated consecutively, except from the first two sub-question that are elaborated parallel to each other.

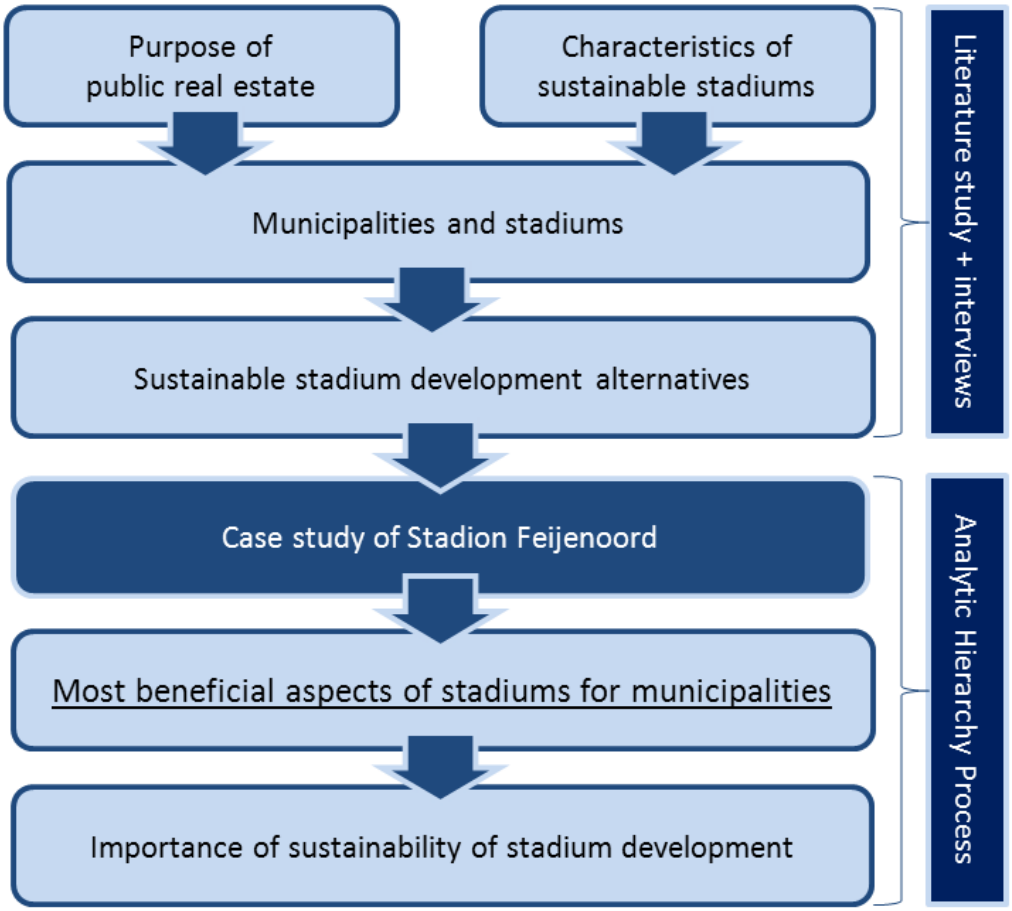


Figure 1.2 *| Research design including the applied research methods*

The answers to the first four sub-questions is information that is already known. With literature study and interviews with experts these information can be obtained. The same counts for the background information of the case study about Stadion Feijenoord.

1.7.1 Multiple-Criteria Decision Analysis

Since the DMP of municipalities regarding stadium projects is a complex process due to the large amount of factors, Multiple-Criteria Decision Analysis (MCDA) should be applied. From the possible methods Analytic Hierarchy Process (AHP) is suitable, since it can solve a large-scale socio-technical decision problem with intangible criteria (*Saaty, 1987*), which is also the case in development projects of public owned stadiums. Analytic Network Process (ANP) is also suitable for this problem, but since the questionnaire in ANP became too comprehensive, the survey would become too long and therefore too few respondents were expected. Further details about MCDA and AHP are given in chapter 8 “Methodology”.

1.8 Research relevance

1.8.1 Problem owners

In fact, the results of this research can be useful for especially two different parties. First, Dutch or maybe even European municipalities who are shareholder, investor or important stakeholder of a large stadium (with a capacity of 30,000-65,000 seats) who want to increase their benefits from their stadium because of the too high financial risks due to previous investments. It can also support their Decision Making Process (DMP) when they in future situations have to choose between different stadium development alternatives to invest in. Next to municipalities, it can also be useful for the professional football club (BVO) or a stadium development company that is working for a BVO or maybe even for the municipality itself, that has to make a design or business plan for a stadium development project and has the intention to convince the municipality to invest in their project. In that case they can use the results of this research to decide which aspects are important to take into account to achieve the main objectives of a municipality. And finally, this research is especially applicable for the municipality of Rotterdam and the whole 'Feyenoord family' about the case study Stadion Feijenoord.

1.8.2 Eindhoven University of Technology

The theoretical relevance of this graduation research is gaining better insight in the potential advantages of sustainable redevelopment of stadiums. Since sustainability is not yet totally developed and adopted in the world of sports and stadiums, where profitability is of overruling importance, the results of this research could be a catalyst for innovations in the field of sustainable development of stadiums.

1.8.3 KENWIB

For KENWiB (Kenniscluster Energie-Neutraal Wonen en Werken in Brabant) this research can be very useful, since the province of Noord-Brabant has the highest density of stadiums in the Netherlands, from which a large majority is public owned. The results of this research can help municipalities in their DMP to make their stadium more beneficial for them, which maybe even can improve the financial situation for the concerning municipalities in Noord-Brabant. This again can help in the objective of KENWiB to make the living and working environment of the province more sustainable.

Westfalenstadion, Dortmund, Germany

2. Municipal objectives regarding stadiums

In this first chapter the objectives of a municipality regarding stadium projects are determined, in order to find out how municipalities can benefit from a stadium in their city of which they are shareholder or investor. This is done by looking at the general objectives of a municipality and how the benefits of a certain project are determined. Subsequently, the investment criteria of public investments in real estate and especially in stadiums is researched including the possible ways of investments.

2.1 Public objectives in general

Currently, there are 415 municipalities in the Netherlands (*Dutch Government, 2013*), all with their own regulation to a certain extent. A municipality only performs tasks that are directly relevant to its inhabitants. The most decisions can be made by the municipality itself. Making these decisions carefully is the main task of the City Council. Next to this, Dutch municipalities have an executive role regarding national legislation (*Dutch government, 2013*). This is because all municipalities are bounded to the laws and regulations of the national government. Within these frameworks each municipality can differ the local regulations to their own discretion. But regulations are not the only thing that is set from out the national authorities. Also about 90% of the revenues of a municipality are provided by the government (*Overheid.nl, 2013*). Therefore, it is not surprising that the main objectives of Dutch municipalities are prescribed from out the national government.

Modern municipal or governmental decision making process (DMP) has always been a debate between different political parties with different political views (*Bouras e.a., 2003; Van den Broek, 2013*). According to Gawande, Krishna & Olarreaga (2009) the objective function of the government reflects the trade-off between social welfare and political contributions of lobbyists. This is because it cannot always be determined if certain decisions will improve the social welfare, resulting in the fact that public and private lobbyists can play and crucial role in the decision making process of a municipality.

According to the principles of the *Trias Politica* (*Montesquieu, 1748*) the administrative powers of the government are the executive, the legislative, and the judicial. Although, this personal essay was not meant to be about the governmental objectives but about the separation of responsibility so that no branch has more power than the other branches (*Barenboim, 2005*), it still provides a determination of the main duties of the national government. The first governments in Europe had the main tasks to maintain the good order, the infrastructure and the defence of their land. In modern days this is extended with e.g. education, social security, housing, and health care. Still, these objectives changes per tenure and composition of the government or municipal council (*Van den Broek, 2013*).

Because public objectives and the achievement of public targets are hard to measure (e.g. social or economic impact) this process seems impossible to comprehend completely (*Van den Broek, 2013*). This research is trying to find an approximation for this process, because this is needed to assess the benefits of different stadiums development alternatives for a municipality.

2.1.1 Local government objective functions

The objective functions of local governments does slightly differ per country , but the overall and general objective function of local governments is social welfare (*Mansoorian & Myers, 1994*). This 'umbrella term' is often broken down in the objectives; political, economic, social, cultural and environmental objectives (*Constitution of Ethiopia, 2013)*. Australia has a Local Government Act from 1999 where the Council's objectives are defined:

- Act as representative, informed and responsible decision makers in the interests of their communities.
- Provide and co-ordinate various public services and facilities and to develop their communities and resources in a socially just and ecologically sustainable manner.
- Encourage and develop initiatives within their communities for improving the quality of life within them.
- Represent the interests of their communities to the wider community
- Exercise, perform and discharge the powers, functions and duties of Local Government in relation to their areas.

2.2 **Measurable public objectives**

In democracy, there should always be transparency in public decision making, so voters can judge the current government or council in order to make the right decision for themselves in who they are voting on next election. For taking responsibility and evaluating or judging policies of the government and municipal councils, it is necessary to have measurable objectives (*Pruijsen, 2004*). The Dutch government requires that a policy budget of a municipality contains at least the overall program objective, how they are going to achieve this and what the revenues and costs are of that specific policy. The overall program objective indicates the objectives of the municipality, mostly in a qualitative way. A measureable objective of a municipality contains a quantitative indicator and a target value which has the quantitative indicator as a unit. (*Pruijsen, 2004*)

Municipalities measure their targets on two levels: effects on society (outcome) and what the specific organisation produces regarding this policy (output). For example, citizens of Rotterdam are 10% more proud of their city because Feyenoord is performing well (outcome), and citizens of Rotterdam are spending more money in pubs and restaurants because Feyenoord is performing well (output). Important is that the measurements have a certain relationship, which shows itself in the consistency and completeness of the objectives of the municipality. (*Pruijsen, 2004*)

2.2.1 SMART-principle

A common used principle for making targets of municipalities measurable is the SMART-principle (this stands for Specific, Measurable, Acceptable, Realistic, Time-phased). (*Pruijsen, 2004*)

Specific
It should be clear what the targets mean. The intended target should be unambiguous and everything concept should be clearly defined.

Measurable
Every target should be measurable, qualitative or quantitative. The target should have a baseline measurement and a target value.

Acceptable
There should be sufficient support among the stakeholders to succeed and achieving the targets. Usually the targets are already supported by the municipality itself, but special attention should be given to other stakeholders (do they agree to give priority to this target?) and the financial framework.

Realistic
The project should be feasible and the municipality should have sufficient influence to the process towards realizing the target.

Time-phased
The target should have a planning. At least each year the desired performances regarding a specific target should be indicated.

With these five steps of the SMART-principle both qualitative and quantitative achievements of the targets of a municipality can be determined before and afterwards.

2.3 Public investment criteria

Profitability is an essential signalling mechanism in investment decision making process for private parties. However, profitability may not be a good signalling mechanism from the viewpoint of the contribution of a project or investment to the national economy (*Ali, 1990*). Public investment criteria are less focused on one project or investment, but more about the long-term and total benefits for the community. Economic analysis of projects or investments for municipalities takes in account that that the actual revenue of the project may not equal the economic benefits and the actual expenditures may not equal the economic costs (*Ali, 1990*).

2.4 Public real estate asset

Estimates of the total municipal real estate stock in the Netherlands vary from 22 to 39 million m^2 gross floor area with a total replacement value of 29 to 50 billion euro (*Appel-Meulenbroek, e.a., 2002*). In a research from IPD (*2012*) among 18 large Dutch municipalities, the function of the public real estate asset is determined. About 69% has a social function, 10% is for accommodating their own activities, and 21% have other functions. By owning the real estate used to accommodate for example a community centre, sports hall or swimming pool, the council can influence the further development of an area (*Appel-Meulenbroek, e.a., 2002*).

2.4.1 Municipal Real Estate Management (MREM)

With the expansion of the public real estate asset, the urgency of proper management increased. Although, Dutch municipalities own about tens of millions square meters of floor

area of real estate, still their real estate management is not far from good in regard to private real estate management. According to a research from the Delft University of Technology in 2013, municipalities relatively have 20% higher exploitation costs for their real estate asset than private real estate investors (*De Jonge, 2013)*. Results also showed that real estate plays a minor role in government policy and that a policy for real estate is lacking. Most municipalities do not have a supporting real estate department and the municipal administration hardly shows any attention for real estate unless in case of excess situations (*Van Spaandonk, 2001*). According to a research of Deloitte (*2011*) "*many municipalities' real estate management is still in its infancy*" referring to the non-professional approach of municipalities regarding their huge real estate property. With the introduction of Municipal Real Estate Management, based on the principals of Corporate Real Estate Management, a more strategic management can be deployed (*Appel-Meulenbroek, e.a., 2002*).

Currently, the real estate management is based on the facility management perspective, presented in *figure 2.1* (*IPD, 2013*). This is a way to manage and control supporting activities of the primary process of an organization, which are necessary to achieve targets on both strategic level as practical level for individual employees.

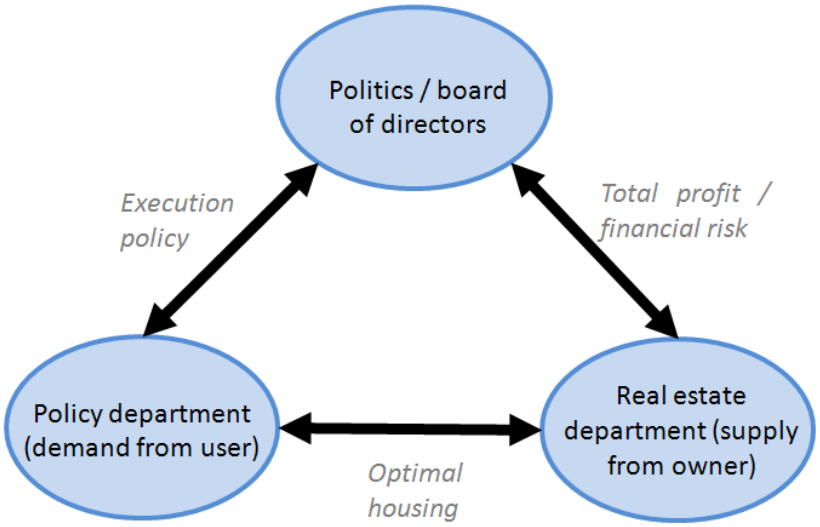


Figure 2.1 *Framework of public real estate management: Strategic management and transparency (IPD, 2013)*

Aspects of added value ascribed to real estate are (*Elfrink, e.a., 1993; Van Langen, 1995; Meulenberg, e.a., 1997; Konickx, 1998; Vijverberg, 1998; Van Hettema, e.a., 2001; Rijkenberg, 2001; Wildeboer, e.a., 2001*):

- Means for controlling implementation of changes (*Real estate can be used as leverage in reorganizations, mergers, cultural changes, etc.*)
- Contribution to image
- Attracting personnel
- Efficient use of space/flexibility

- Financial influence (*Redevelopment might release money*)
- Social value (*Real estate has a large influence on its surroundings/initial role in development*)
- Risk control

2.5 Public interest in stadiums

The debate about role of the government or municipality in the development of sporting venues is going on for centuries. In the first century AD stadiums like the Colosseum and Circus Maximus, both in Rome, were built by the emperors back then to entertain their people. A less ancient venue i.e. the Olympic Stadium in Amsterdam was built in 1928 with a loan of 500,000 guilders from the municipality after the Dutch government decided not to invest in the new national football and athletics stadium. This everlasting discussion resulted in the fact that the large sporting venues in the Netherlands sometimes are owned by the municipality, sometimes by the using sports club and sometimes by a third private party. However, due to financial problems of the Dutch BVOs in the last two decades, all municipalities have somehow invested in the stadium in their city.

It is indisputable that sporting venues of BVOs have a positive social and economic impact on the city, which are two of the main objectives of municipalities. What however can be discussed is if the size of the impact compensates the total public investments and financial risks. This discussion is encouraged by the increase of popularity of football in the Netherlands the past 25 years, which also resulted in an increase of public investments in stadium development projects.

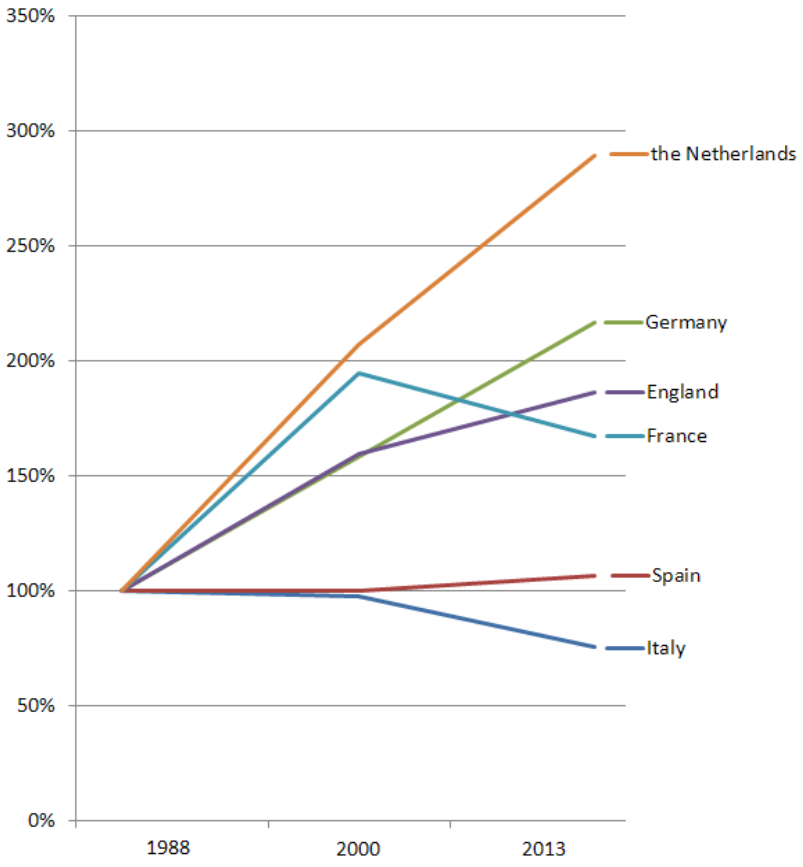


***Figure 2.2** | The relative increase of the average league attendance of the European top competitions in the years 1988, 2000 and 2013 (EFS, 2013).*

Looking at *figure 2.2*, it can be concluded that especially in the Netherlands the importance of football in society has increased enormously. For example, the relative increase of average league game attendances for the Netherlands is almost tripled since the last 25 years, while in the other European top competitions the increase was significantly lower, and for Italy there is even an decrease of average league game attendance (*EFS, 2013*).

This tendency caused an increase of new stadium projects, but is also a result of the development of new stadiums. That an increase of attendance results in the expansion of a stadium seems obvious, but that the expansion of a stadium also causes an increase of attendance is more remarkable. *Appendix 7* shows how the average attendance of league games is changing after the (re)development of a stadium. Regarding the six most recent stadium development projects in the Netherlands, the average attendance after the first five years after completion increased with 80%. This had also effect on their budget and their performance. The budget of the six considered clubs increased with an average of 41% in just one years after the completion of the new or redeveloped stadium. The performance of these six clubs the five years after completion of the stadium increased with 25% in regard to the five previous years.

This self-performed survey shows that stadium development has a strong positive impact on the three main objectives of a BVO (i.e. performance, attendance and budget). At least two of these three objectives, (i.e. performance and attendance) are very important for the benefits of professional football for a municipality. These are measurable targets for a municipality regarding city branding and other positive social and economic impact (*Van den Berg, 2013*). Therefore it can be stated that the benefits of professional football for a municipality will probably increase through stadium development projects, disregarding the investment of the municipality in the project.

2.6 Role of municipalities in stadium projects

A new stadium in the Netherlands will cost at least 20 to 50 million euro, and larger stadiums (30,000 seats and higher) often cost around 100 million euro or higher. Modern BVOs are not able to afford these kind of investments themselves, so the club has to find an investing party that is willing to build the stadium for them or provide a loan of at least 50% of the construction costs. Since stadium are not highly profitable real estate objects, most private parties are not interested to invest in these projects (*Hellinga, 2013*). A financially strong third party is needed that also has an interest in the stadium or the using BVO, which makes it less important that the stadium is not that profitable as other commercial real estate asset. These parties are e.g. a sponsor, the wealthy owner of the club, a bank with trust in the club, but usually it is the municipality.

The power-interest diagram (*figure 2.3*) about stakeholders in Dutch public owned stadium development projects shows that the parties with the highest interest and power are also the possible investors in the project. The municipality and the future renter (the concerning BVO) both have the most power and most interest in a stadium development project and are also mostly the largest investors in Dutch stadium projects, but also in the rest of Europe (*Stadionwelt, 2013*).

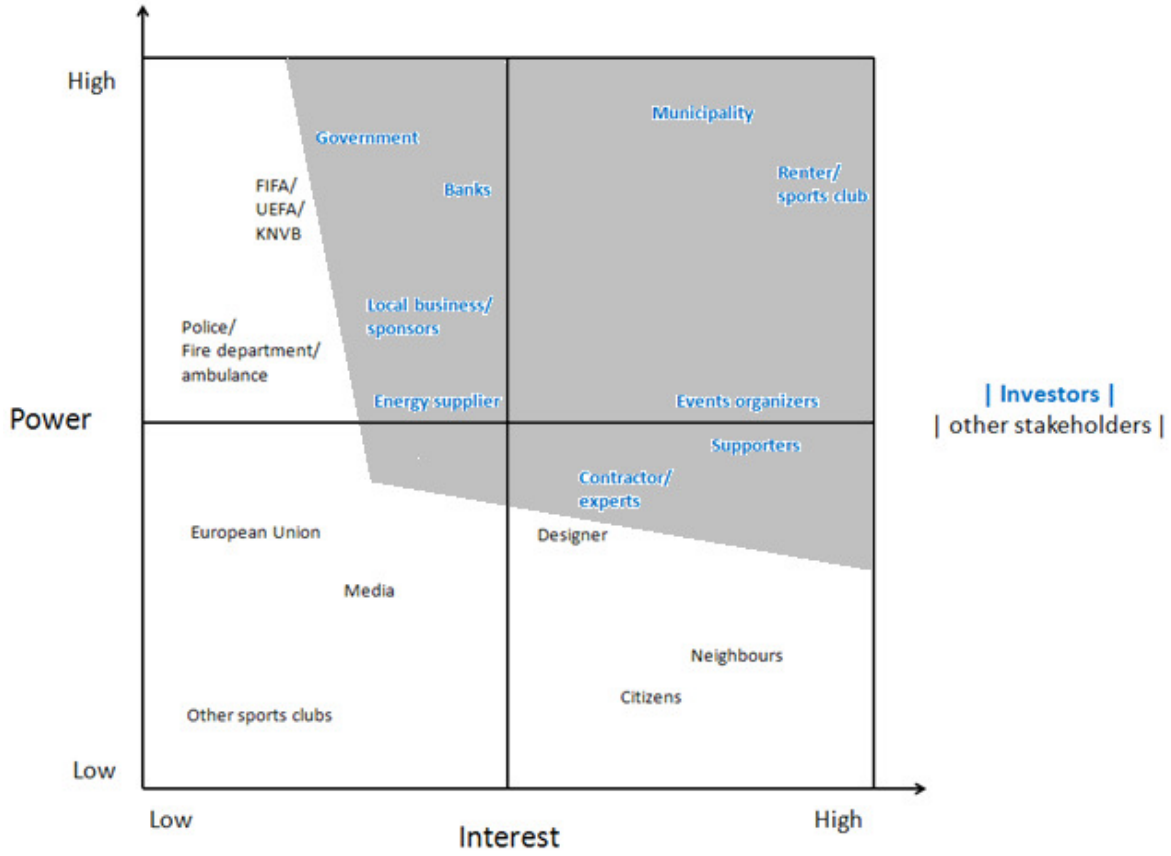


Figure 2.3 *| Power-interest diagram of stakeholders in sustainable stadium development projects (based on Metze e.a., 2011; Stadionwelt, 2013; VI, 2013)*

Regarding the liquid assets of most European BVOs, the high investment costs, and the lack of interest of private parties to do such high and risky investments, it can be concluded that financial involvement of a municipality is inevitable for realizing a stadium development project (*Hellinga, 2013*), not taken into account wealthy club owners from the Middle East or eastern European countries who are taking over more and more Western European clubs for apparently non-profit reasons (e.g. Chelsea, Manchester City, Paris Saint-Germain, AS Monaco, Vitesse) (*VI, 2013*). In some cases bank consortia are willing to take that risk, but often under the condition that the municipality give a guarantee for the mortgage, hence municipalities are still financially involved in these situations.

2.6.1 Recent example of public investments

As earlier mentioned in this report, almost every stadium in the Netherlands is owned by the municipality or realized with a public investment, loan or guarantee. In *appendix 2* the investors of four examples of large stadium projects are analysed from which the investors were known. These stadiums are; Grand Stade Lille Métropole (50,000 seats, built in 2012), Grolsch Veste in Enschede (30,000 seats, expanded in 2011), the Euroborg in Groningen (22,000 seats, built in 2006) and Borussia-park in Mönchengladbach (54,000 places, built in 2004). In the case of the Euroborg and Borussia-park the municipality did a single investment of 30% and 40% of the total investment costs of the stadium. In the case of the Grosch Veste in both stages of the expansion the municipality gave a loan of about 40% of

the construction costs. In the last case, the Grand Stade Lille Métropole the municipality did some extraordinary high investments to the stadium, because it was convinced of the high positive impact the new stadium has on the city and surrounding area. The municipality, in a Public-Private partnership (PPP) construction, is paying 24.7 million euro every year of a period of time of 31 years, with which the municipality accounts for the construction costs and the operation and maintenance costs (*ELISA, 2009*). Even during this research Dutch municipalities decided to invest in stadium development projects, disregarding the increasingly negative image of public investments in professional football nowadays. The municipality of Kerkrade lowered the annual rent of the public owned stadium for using BVO Roda JC with 300,000 euro, and the municipality of Dordrecht decided to invest 1.7 million euro in the infrastructure around the new to build stadium of FC Dordrecht. Another form of investment, albeit not financial, is the decision of the municipality of Almelo to give permission for a land-use plan that is contradictory to their own economic policy regarding shopping areas, in order to get a balanced financial feasibility plan for the new to build stadium of BVO Heracles Almelo.

2.6.2 Examples of beneficial public owned stadiums

Regarding Dutch stadiums, the municipalities of Amsterdam and Groningen were involved in the initiation phase and therefore willingly became owner of a newly build stadium. This does not automatically mean that they intended to make profit from owning the stadium, but they were convinced that the concerning football clubs (i.e. Ajax Amsterdam and FC Groningen) could not finance the stadium themselves. Both clubs needed a new stadium because their current stadium back then was not sufficient anymore for them. This could result in stagnation or decline of their performances, something municipalities thought that could have a negative effect on the city. If the clubs decided to finance the new stadium themselves, they could end up in a financial bad situation, resulting that the municipalities still had to financially support the stadium projects. Therefore, the municipalities decided to lead the project themselves. In the case of the Amsterdam Arena, the municipality could also give the stadium additional facilities, so they could optimally benefit from the stadium (*Nederlands Architecteninstituut, 2000*). This resulted in a multi-functional stadium with a roof, often used for live concerts, congresses and other large events. In the case of the Euroborg, the municipality of Groningen could also use the stadium as a role model for the surrounding business area regarding environmental behaviour (*Duurzaam Vastgoed, 2010*).

2.7 Investment methods in stadium projects

As mentioned in the chapter 1 ‘problem definition’ municipalities do not invest in stadium development projects because of the high profitability of these kinds of investments. They recognize the (indirect) social and economic benefits of professional football in their city and therefore are willing to support their local BVO when necessary. These situations occur in two different situations; the club is in financial problems and needs financial support to avoid bankruptcy, the club wants to build a new stadium but does not have the financial possibilities for it. In the first situation municipalities are usually willing to buy (shares of) the stadium from the club, lower the rent of the stadium if it is already public property, or the municipality remits parts of an earlier provided loan to the club or the stadium company. A direct donation is not allowed according to European law, but indirect

donations like subsidies or sponsorships are used in the past (e.g. Willem II Tilburg, ADO Den Haag, De Graafschap Doetinchem, etc.) (*Metze e.a., 2011*).

Situation	Financial problems club	New stadium plans
Ways of investments for municipalities	Providing public loan	Providing public loan
	Purchase (shares of) the stadium	Purchase (shares of) the stadium
	Become owner of the stadium	Adept the role of the client (i.e. the club)
	Remit public loan	Taking certain activities for their account
	Giving a donation to the club	Giving a donation to the project

***Table 2.4** | Different ways for municipalities to invest in professional football (Stadionwelt, 2013; VI, 2013)*

2.8 State aid

When a municipality decided to invest in a stadium project or directly in the BVO they are bound to certain European legislation, mainly about State aid. In *article 87(1)* of the European Community Treaty the regulation for aid by local authorizes (e.g. municipalities) is explained. This article has the primary function to avoid unfair competition due to State aid (*European Union, 2013*). It is not allowed for a municipality to provide financial support to a private party in a way that this specific entity gets unjustified advantage compared to other similar entities in the same branch.

That is why municipalities do not provide money directly to the BVO, but does an investment 'of public importance' in the stadium of the club. But also for public investments in stadium projects certain regulations are applied. The municipality has to act like a commercial party, which means that only public investments are allowed if it is proportional to the profit or benefits a municipality gain with the investment.

The State Aid regulations are recently tightened, e.g. the purchase of the ground under the stadium of PSV by the municipality of Eindhoven is condemned by the European Commission (EC). Previously, the EC tolerated much more obvious cases of State Aid, like lots of example in the Netherlands were municipalities bought the stadium of the BVO and sold it back after a couple of years for only 1 euro (*appendix 1*). But since this sharpened monitoring the European regulations have to be strictly followed by municipalities.

2.9 Consequences of public investments in stadium projects

There is countless literature about the advantages or disadvantages of public investments in stadium projects, but there is still no unambiguous answer to this question. But, since municipalities currently still keep investing in stadium projects (*appendix 3*) it seems that municipalities still are convinced about that benefits of it, and therefore it is still relevant to look how the benefits of these investments can be optimized and how the disadvantages can be constrained. The biggest mistakes municipalities make is that the first investment in a stadium project makes them problem owner of the stadium and BVO forever.

2.10 Business of a professional Dutch football club

Whatever the impact of public investments in stadium projects for municipalities may be, the financial and sportive performance of the concerning BVO is the fundament of all direct and indirect advantages and disadvantages for the municipality (*Hellinga, 2013*). If the club is performing well on both fields the positive social and economic impact on the city will increase and the financial risks for the municipality will decrease, since they are financially healthy and they can meet all the financial commitments to the municipality.

Therefore, it can be stated that the objectives of a municipality regarding a stadium development project should be to let the BVO perform as good as possible (*Hellinga, 2013*). In order to get insight in how this can be achieved, the business of a professional football club should be considered.

Looking at the budget of a Dutch professional football club, between only 5-10% is used for the housing of the club, while the revenues on match days, due to the stadium exploitation, is more than 20% for European top clubs (*Deloitte, 2012*) and even 31% of Dutch First Division clubs (*KNVB, 2012*), with an average of € 7,333,000.- per club. The rest of the costs are mostly transfer and salary costs (an average of € 15,405,000.- per club, according to the *KNVB, 2012*), while the revenue is mostly obtained by broadcasting rights (an average of € 2,444,000.- per club; *KNVB, 2012*) and commercial activities (an average of € 10,722,000.- per club; *KNVB, 2012*). However, transfer fees can be a large part of the revenue of a club, the Deloitte research excludes revenue due to transfers, because this is too fluctuating to determine the financial position of a club.

Considering these high amounts of money it can be concluded that a direct investments in a clubs is not effective at all, since a public investment of several million euros can simply be nullified with one single wrong player transfer. It is therefore of municipal concern that a public investment has a continuously positive impact on the BVO in their city, for example when the club can benefit from a new stadium but currently does not have enough financial possibilities to realize the project on their own.

2.10.1 Multi-functionality of the stadium

A frequently heard statement is that a stadium have to become multi-functional in order to increase the public benefits of the stadium. The opinions of stadiums experts strongly vary on this matter.

Since a stadium with multiple functions is not beneficial for the using BVO it should not be an objective of the municipality, considering the previous paragraph. This can only be beneficial if the profit of the additional concerts and other events in the stadium are higher than the additional investment in the stadium to make it multi-functional, which is again a new financial risk issue for the stadium investors, e.g. the municipality (*Hellinga, 2013*).

However, according to *Reurink (2008*) the multi-functionality of a stadium can provide more revenue for the using BVO if they own the stadium and provide less costs if they rent the stadium, because the construction costs that are being recouped by the rent is not only paid by the football club. An unambiguous answer can therefore not be given to this topic.

2.11 Public investment criteria regarding stadiums and BVOs

Considering the earlier mentioned hypothesis that municipalities currently benefit more from the indirect impact of the using sports club of the stadium than the benefits of the stadium itself as a real estate object, the increase in popularity and performances of the sports club should be the most beneficial scenario for a municipality. However, the municipality has very little impact on these aspects. That is because the input of one euro public support to a sports club will never yield more than one euro to society. Considering a football club like Roda JC Kerkrade has a budget of 11 million euro, while it represents an annual public benefit of about € 400,000 for the municipality (*Municipality of Kerkrade, 2013; Ecorys, 2012*). If this ratio is proportional, in a normal situation one million euro extra budget for the club will possibility represent about € 36,500 increase of value for the municipality. This proves the already commonly recognized hypothesis that it is not beneficial for a municipality to give direct financial support to a professional sports club. This changes when the clubs continued existence is at stake. If a club is at the edge of bankruptcy, a relative small amount of money could secure a continued flow of social benefit for the municipality. Depending on the required amount of money that is needed to save the club and the financial risk of the investment, the municipality could decide to financially save the club or letting it go bankrupt. In the Netherlands usually the first option is chosen, but the last years more municipalities do not trust the management of the professional football clubs anymore and stop to financially support them, resulting in the bankruptcy of HFC Haarlem (in 2010), RBC Roosendaal (2011), AGOVV Apeldoorn and SC Veendam (both 2013).

2.11.1.1 Ecorys report about Roda JC Kerkrade

To avoid reinventing the wheel, other researches about the benefits of stadiums and a local BVO for municipalities are analyzed. Dutch research company Ecorys determined the value of Roda JC for the municipality of Kerkrade. They did research to the specific direct and indirect benefits for the municipality of Kerkrade, but most examined aspects were generic aspects from which a municipality could benefit from a stadium or BVO in their city.

Ecorys stated that there are different ways a BVO or stadium can gain money for a municipality. Those can be grouped in the main aspects 'direct financial flows', 'economic value' and 'social impact'. The public objectives regarding stadium projects and professional football in a city are shown in *table 2.5*. The analysis of the whole Ecorys report can be found in *appendix 8.*

Direct financial flows	Economic value	Social impact
Investment costs stadium	Creating jobs	Enjoyment of watching sports
Rental revenue (*$ Risks!*)	Creating value	Local pride due to success
Additional financial support for rescuing the club	Image and branding for the surrounding (business) area	Promoting sports among local youth
Infrastructure costs around the stadium	Increasing value of surrounding (public-owned) ground	Usual social impact of cultural events
Costs of police and security	Stadium attracts companies	Unifying element of citizens
Real estate taxes	Branding of the city	

***Table 2.5** | Criteria to determine the benefits of professional football and the stadium for municipalities (Ecorys, 2012)*

2.11.1.2 Verification with municipalities and experts

After interviews with Ferry van den Broek (councillor of Eindhoven) and Ben Veenbrink (owner of The Stadium Consultancy BV, stadium consultant of the UEFA, director of the Euroborg stadium, and ex-director of the Amsterdam ArenA) some criteria were merged or excluded.

According to Veenbrink (2013) police and security costs are not or nearly influenced by the stadium design. Inside the stadium the security costs are for the using club itself. The traffic police, riot police and other security costs are for the municipality. However, the design of the stadium, regarding prevention possibilities, has no consequences on the police costs for the municipality. Also the size of the stadium has not significant influence compared to the mood of the rival supporters. If a club only has a few but very violent supporters, the security costs could be much higher than a larger group of much more peaceful supporters.

Van den Broek (2013) stated that specific municipal cornerstones (e.g. sports, design, science, environmental behaviour, etc.) are also an important criteria in the decision making of municipalities. According to Veenbrink (2013) sustainability is a cornerstone for almost every municipality in the Netherlands, so it should be a separate cluster of criteria.

2.12 **Conclusion**

In this chapter it is attempted to give an answer to the first sub-question of this research:

What determines the benefits of a stadium for a municipality?

2.12.1 General objectives of a municipality

The overall objective of local governments is social welfare, which is broken down in political, economic, social, cultural and environmental objectives. The benefits of public real estate for a municipality depends on the overall objectives of municipalities and which of these objectives are tried to achieve with public real estate asset. However, municipalities do not have certain objectives that are specifically attempted to achieve with their real estate asset. This means that also sustainability, as a part of the environmental objectives of a municipality, could be a criteria that is attempt to be achieved with public real estate.

Most part of the public real estate asset (69%) is social real estate and is publicly owned to get more influence on the exploitation of that object and the development of the surrounding area. Most municipalities do not have a supporting real estate department and the municipal administration hardly shows any attention for real estate unless in case of excess situations.

Making profit by real estate transactions or exploitation is not the main objective in MREM, but can be a positive side-effect. The other way around, potential high losses are avoided if possible by selling the real estate object in question. The benefits of the public owned real estate are more about the positive social and economic impact it has on the area than the profit or revenue it gains for a municipality. As a result, it is hard to measure if the right

targets are achieved due to the exploitation of public real estate. The Decision Making Process for these intangible objectives is mainly based on debates and political viewpoints.

With the newly introduced SMART-principle only specific and measurable (qualitative and quantitative) targets and results are considered, which makes it possible to measure and judge the performances of projects or policymakers in the field of MREM. However, if projects change over time or excess situations occur, the SMART-principle might become inadequate, because measurable targets could not be achieved anymore and it can be decided to cancel the project, while the intangible benefits might still be higher than the total investments for the municipality.

2.12.2 Objectives of a municipality regarding stadium projects

Regarding the limited liquid assets of most European BVOs, the high investment costs of a stadium, and the lack of interest of private parties to do such high and risky investments, it can be concluded that financial involvement of a municipality is inevitable for realizing a stadium. It is therefore necessary for a municipality to invest in the stadium development project in order to keep the direct and indirect benefits from their local BVO and stadium in their city.

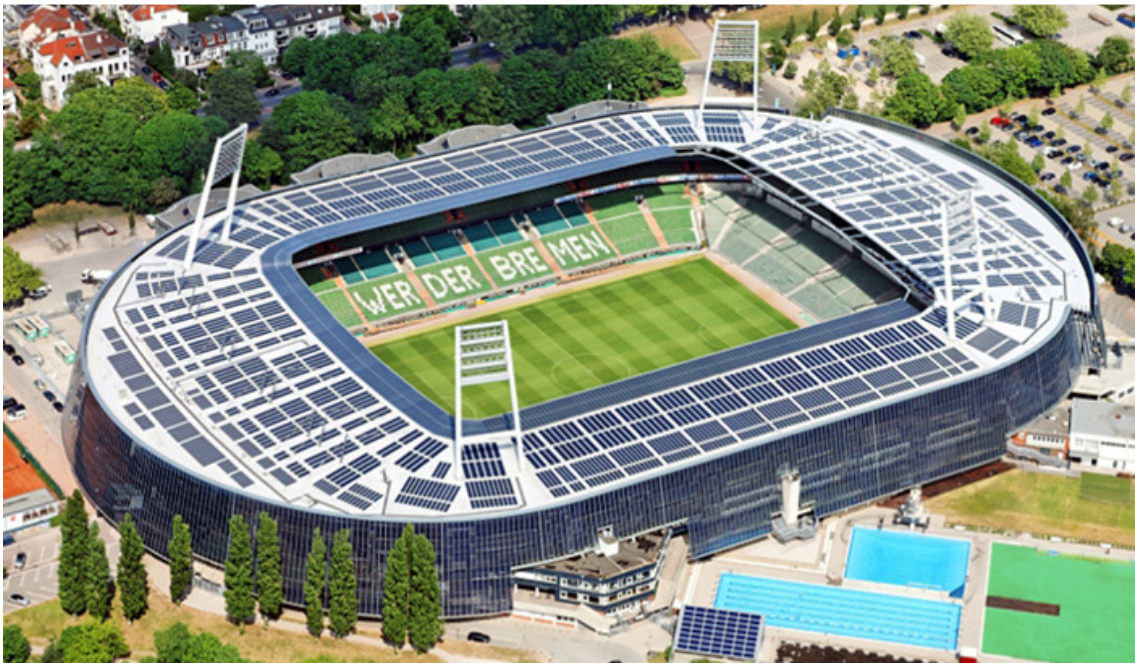
Since a good financial situation of the concerning BVO is very important for constraining the financial risk of a public investment in a stadium, it is also beneficial for a municipality to focus on requirements for a stadium that are both beneficial for the BVO as for themselves. This is like killing two birds with one stone, since the municipality also benefits from a well performing and financially healthy BVO.

The main objectives of a municipality in every situation are the economic and social impact, and next to that the profitability of a project, since a good financial situation is required to achieve these social and economic goals. Sustainability is a relatively new topic for national and local governments. Since sustainable development is not always profitable for (private) parties, governments also consider this as a main objective for themselves.

From the Ecorys report about Roda JC Kerkrade (*2012*) and the verification with stadium experts, the most important sub-criteria for the four main criteria regarding stadium development for municipalities are determined. After combining somehow similar sub-criteria, in order to constrain the size of the resulting questionnaire, by chance the same number of sub-criteria for each main criteria were the result, namely four. These sixteen sub-criteria, which are important when considering the benefits of a sustainable stadium development project for a municipality, are showed in *table 2.6*. The selected sub-criteria of sustainability are explained in the next chapter, about environmental assessment methods.

Direct financial flows	Economic value	Social impact	Sustainability
Total direct investment	Creating jobs	Enjoyment	Energy costs
Rental revenue	Attracting companies	Local pride	CO_2 emission
Taxes	Branding and increasing value of surrounding area	Promoting sports among youth	Use of natural resources
Financial risks	Expenses supporters	City branding	Long-term planning

***Table 2.6** | Criteria to determine the benefits of professional football and the stadium for municipalities (Ecorys, 2012; Hellinga, 2013; Van den Broek, 2013; Veenbrink, 2013)*



Weserstadion, Bremen, Germany

3. Sustainable stadium development

In this chapter the different alternatives of sustainable stadium redevelopment are determined by considering what makes real estate asset sustainable, and analysing case studies about the different alternatives and aspects of sustainable (re)developed stadiums.

3.1 Sustainable development

When talking about sustainability, the first thing to do is to determine the content of the word itself. Regarding this research two different viewpoint on sustainability are important. Since the topic of this research is sustainable stadium development and the research objective is increasing the benefits for municipalities, the sustainability as it is used in real estate objects and sustainability as it is described in the environmental objectives of a municipality have to be combined. The Brundtland Commission (*1987*) defined sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" The 'needs' in this definition are the essential needs of every person on this planet. So, everything we do to satisfy our needs should have not negative effect on future generations in their attempt to satisfy their needs. Since all our needs initially come from the natural resources on this World, a responsible use of natural resources is the key to sustainable development (*Epema, 2013*).

3.2 Real estate development

When real estate asset does not provide the right benefits for the owners or users of the specific object, there are two things they can do: keep it or dispose it. When the owner or user decides to dispose the building, there are again different options. They can sell or give away the building and take the possible losses, or they can demolish the building, for example if there are no other potential owners for the building or the land is worth more than the building itself (*Deloitte, 2011*).

But if the owner decides to keep the building, there are endless options. In a passive approach the owner can accept the losses and do not change the object. To increase the benefits of the real estate object, it somehow has to be changed. This can be realized with certain changes in the management of the building or with actual physical changes.

Keep the building	Dispose the building
Passive approach (accepting the current situation)	Sell (accept possible losses)
Technical adjustments	Give away (accept losses)
Management changes (increase profitability)	Demolish (accept losses or redevelop the land)
Expansion	
Renovation	
Adding facilities	
Change surrounding area	

Table 3.1 *| Possible development options for a non-profitable real estate object*

The management changes can include a change in the way of exploitation in order to generate more rental revenue. However, management changes do not only generate more income, but it can also lower the costs. For example, a more environmental behaviour regarding energy use or less maintenance costs due to more sustainable materials. And finally, the most various option is actual physical change to the real estate object. This

change can include; renovation, expansion, technical adjustments, adding more facilities, or even change the surrounding area. An overview of the mentioned possibilities for owners or users of a unprofitable real estate object are presented in *table 3.1*.

3.3 Government environmental policy

Sustainability as an objective of local governments, like municipalities, is a result of their environmental objectives. The content of this objective can be prescribed by national government or even World-wide agreements, like the Kyoto-protocol about carbon dioxide (CO_2) emission. The traditional public decision making process (DMP) to economic and environmental policy, is determined by political and economic self-interest (*Aidt, 1997*). But also in the traditional approach, stimulation of environmental behaviour by local government is required, since the current level of pollution in especially the Western world also reduces welfare directly (*Aidt, 1997*). However, since it is not possible for every local government to determine the (presumably negative) effects of non-environmental behaviour on the welfare of their population, the policy of local government regarding sustainability is prescribed on national or even World-wide level.

The environmental problems due to human development with the highest priority from governments are the ones that are caused by high CO_2 emissions and the related increase of energy use. This is also reflected in the environmental policies of most governments. For example, the main subject of these policies are often intended to decrease the amount of energy use and CO_2 emission (*Dutch Sustainability Monitor, 2011*). Also water usage and reduce of waste are important topics in government environmental policy. An extensive research to the incentives for environmental behaviour of public and private parties is presented in *appendix 4*.

3.4 Sustainability for real estate objects

The benchmark for sustainability regarding real estate objects is more fixed than the local government environmental objective, due to the different sustainability certificates for real estate objects, like LEED (worldwide), BREEAM (mostly England) and GPR (the Netherlands).

3.4.1 LEED

Leadership in Energy and Environmental Design (LEED) is developed by the United States Green Building Council (USGBC) in 1993 and is a system that rates high performance green building on their design, construction and operation. More than 7,000 projects worldwide are LEED certified. There are four levels of certification; Certified (40-49 points), Silver (50-59 pts.), Gold (60-79 pts.), and Platinum (≥80 pts.).

The targets of LEED are (*USGBC, 2013*):

- Lower the operating costs
- Increase the asset value
- Conserve energy, water and other resources
- Be healthier and safer for occupants
- Qualify for money-saving incentives, like tax rebates and zoning allowances

The three benchmarks of the LEED certification are (*Powersmiths, 2009*):

1. Energy & Atmosphere
2. Innovation in Design
3. Materials & Resources

3.4.2 BREEAM

Building Research Establishment Environmental Assessment Method (BREEAM) is a European environment assessment methodology, designed by BRE in 1988, focussing on certification of designs of buildings or existing buildings. Over 250,000 buildings worldwide are certified with BREEAM.

Criteria for existing buildings in the assessment of the BREEAM(-NL) methodology are:

1. Management
2. Health
3. Energy
4. Transport
5. Water
6. Materials
7. Waste
8. Land use & environment
9. Pollution

The subgroups of these categories are shown in *appendix 5.*

3.4.3 GPR

GPR Gebouw is a Dutch environmental assessment methodology for residential and non-residential buildings regarding construction projects, existing buildings and major renovations. GPR can be used for different phases of the building; design, construction and management. GPR is developed by W/E Adviseurs and the municipality of Tilburg. It is a tool for municipalities, architects, project developers, housing associations, real estate investors and consultancy companies. And if real estate owners are still interested in their BREEAM score, a GPR expert can also determine that, but of course without a real BREEAM certificate.

GPR is classified in five themes:

1. Energy
2. Environment
3. Health
4. User quality
5. Future value

Each theme will get a grade between 1 and 10. The input of a new building will take about two hours of time. The input of an existing building depends on the available plans of the building, but will be about four to eight hours of time.

GPR is a adopted by the Dutch government for the sustainability assessment of public purchase of real estate (*VMRG, 2012*). GPR can assess the sustainability of the real estate asset of public and private parties and can even assess the effect of different renovation or reconstruction scenarios. This can also be very useful in strategic decision making, for example the decision between a new building or renovation of the existing building (*VMRG, 2012*).

Advantages of GPR Gebouw are:

- A quick overview of the sustainability for new buildings and existing buildings.
- Focused on performance and meets recent regulations
- Recognized by the Dutch government
- Cheap and no expensive certification

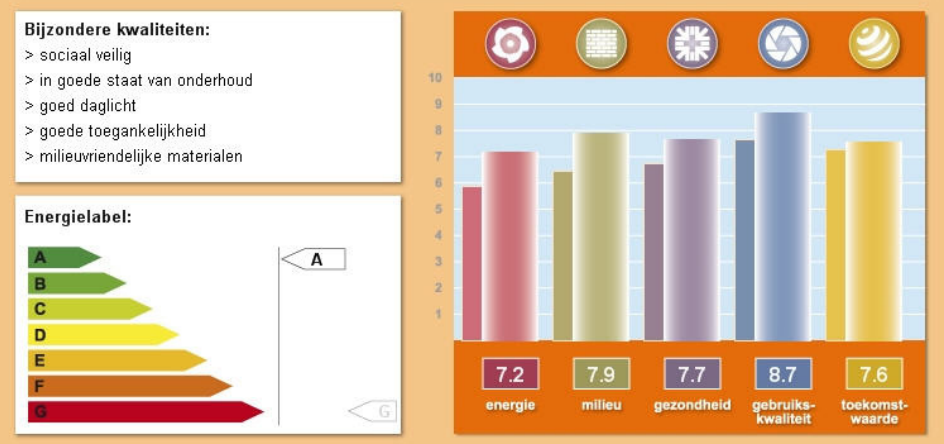


***Figure 3.2** | The layout of the results of the GPR assessment methodology*

3.4.4 Comparing methodologies

All three environmental assessment methodologies are recognized, used and recommended on large scale by both public and private parties. GPR however, is not internationally recognized, but is much less expensive (€ 275 per building, compared to € 2,000 - € 5,000 for BREEAM, and more than € 10,000 for LEED).

To be able to make a good decision about which environmental assessment methodology to use, the reason of certification should be determined. LEED and BREEAM are much more expensive, but have an international prestige, in contrast to GPR. So, first the choice between national (GPR) and international (LEED and BREEAM) certification have to be made.

Certification can increase the value of an real estate object in the market. But, since stadiums are usually not subject to change of ownership, this aspect of certification is less important for stadiums (*Epema, 2013*). Considering larger stadiums used for international games, the international publicity of the stadium is an important aspect regarding city branding. Thus, with only national environmental certification the main reasons for

certification of a stadium are not achieved. If a certification for a stadium is desirable, LEED or BREEAM are the most beneficial options.

3.4.4.1 LEED vs. BREEAM

When it comes to the international publicity of a building, LEED and BREEAM have somehow the same effect. According to Eszter Gulacsy, a sustainability consultant from MTT/Sustain, LEED is simpler in its approach, while BREEAM is more academic and more rigorous. In the Netherlands BREEAM is adopted and translated to Dutch laws and policies (i.e. BREEAM-NL). Therefore, BREEAM-NL is more relevant for buildings in the Netherlands.

3.5 Sustainable stadiums

The average stadium is a highly inefficient building regarding energy consumption (*Hellinga, 2013*). It has a very low occupancy and very high peaks. In general, a stadium is empty about 27 days a month and three or four days a month tens of thousands of people are intensively using it. This results in the construction of a very large building, including all the energy costs and carbon-dioxide emission, while it is only used about twenty-five times a year.

Next to the sustainability of the construction in regarding use of the building, also the operational phase of a stadium is hard to make sustainable. Only a few stadiums in the world are LEED or BREEAM certified. Of all the 2,500 small and large stadiums in the United States of America (*Worldstadiums, 2013*) in 2009 only three stadiums are LEED certified and another three are seeking for LEED certification (*Bleacher report, 2009*). Nowadays the newly built Estádio Nacional de Brasília is the only LEED platinum certified stadium in the world (*AutoCAD, 2013*). Apart from the difficulties sports clubs, municipalities and other stadium owners encounter, it is of course still possible to make the stadium as sustainable as (financially and technically) possible.

3.6 Case studies of sustainable (re)developed stadiums

Several case studies of recently (sustainable) developed stadiums in the Netherlands, in whole Europe, and in the rest of the world are performed to get an overview of the different possibilities regarding sustainable stadium redevelopment (*appendix 6*). The stadiums that are considered are shown in the table below.

Stadium	City	Country	Capacity	Built
Amsterdam ArenA	Amsterdam	the Netherlands	53,000	1996
Euroborg	Groningen	the Netherlands	22,000	2006
AFAS Stadion	Alkmaar	the Netherlands	17,000	2006
Imtech Arena	Hamburg	Germany	57,000	1998
Weserstadion	Bremen	Germany	42,500	2011
Wembley	London	United Kingdom	90,000	2007
Estadi Cornellà-El Prat	Barcelona	Spain	42,000	2010
Estádio Nacional	Brasilia	Brazil	73,000	2013

***Table 3.3** | Considered case studies of sustainable developed stadiums*

These case studies can be divided in four different groups:

1. Technical adjustments to improve the environmental behaviour of the stadium (*Amsterdam, Groningen, Alkmaar, and Hamburg*)
2. Change of management of the stadium to improve the environmental behaviour (*London*)
3. A total renovation of the stadium, with a high environmental performance (*Bremen, and Brasilia*)
4. Constructing a whole new stadium, with a high environmental performance (*Barcelona*)

3.6.1 Technical adjustments to improve the environmental behaviour of the stadium

Making technical adjustments in order to improve the sustainability of a stadium is a new kind of development alternative, initiated by energy related companies that were willing to invest in a stadium in order to use is as a publicity stunt. The concerned stadiums require some maintenance, but not yet need a total renovation. These stadiums are not older than twenty years.

The technical adjustment to make the stadium to improve the environmental behaviour of the stadium are:

- Sustainable heating and cooling, like:
  - District heating
  - Heat-and-cold storage
  - Residual heating system
- Renewable energy generation
  - Wind turbines
  - Solar panels
  - External generated renewable energy use
- Energy efficient modifications
  - Energy efficient HVAC systems
  - LED lighting
  - Active energy management among employees
- Stimulation of environmental behaviour
  - Charging points for electric cars
  - Creating environmental awareness of the crowd
  - Stimulate sustainable behaviour of local business and inhabitants
- Other sustainability adjustments
  - Waste and water management
  - Cradle-to-cradle situation for the whole stadium

3.7 Sustainable stadium development alternatives

The different general real estate development alternatives from *table 3.1* can also be applied to stadiums. However, stadiums are not always meant to be profitable. Social and economic impact of a real estate object is usually not important in the decision making process of a commercial party, but it is for a municipality. Therefore, this list of development options for unprofitable real estate objects for commercial parties can be

reduced to a smaller list of alternatives. This research is about stadiums that are (partly) owned by Dutch municipalities or stadium that have the municipality as an important stakeholder, in case of a large mortgage or another kind of public investment. So, regarding the objectives of this research, the development options that are considered for the research should always be an improvement of the situation of the concerning municipality.

3.7.1 Change of management of the stadium to increase the environmental behaviour

Change of management includes a more active policy towards energy use due to the exploitation of the stadium, like creating awareness or active policy among employees. Usually this only works for relative new stadiums were the exploitation is still in its infancy and not yet totally developed. For example, Wembley stadium in London had a total reduction of energy consumption in 2011 of 28%, compared to the year 2007 when the new stadium was (re)opened. Another advantage of changing management can also be achieved apart from the energy efficiency, regarding older stadiums. If a stadium needs a renovation, the change of management can also generate new revenue or can increase costs, which avoids an expensive renovation. However, this is only a short-term solution.

3.7.2 A total renovation of the stadium, with a high environmental performance

Total renovation of the stadium is at issue when the stadium is more than twenty years since the opening or previous renovation. Depending on the requirements regarding capacity the stadium can only be modernized or also expended, for example with a second or third tier to increase the capacity. Often more and better seats or spaces are created for the VIPs and the sponsors, the so-called skyboxes. In addition to the modernization of the stadium also technical adjustments to improve the environmental behaviour of the stadium can be made, like in the first alternative. Another sustainable aspect of total renovation is that there is no need any more for a totally new stadium, with all the use of energy and natural resources during the construction.

3.7.3 Constructing a whole new stadium, with a high environmental performance

A new stadium is the most comprehensive and the most diverse development alternative, since it is not bound to preconditions of an existing stadium. This alternative automatically includes a modernization of the stadium. The new capacity can differ depending on the change of demand of spectators since the opening or previous renovation of the stadium. Sometime the using sports club is relegated and their large stadium is too big and too expensive for their decreased fan base. But if the club has large ambitions or is performing relatively better the capacity can be extended. The advantage of a new stadium is that it is no longer bound to the current location, which is an crucial aspect of every real estate object. A new location with better infrastructure or less surrounding residents who must be kept in mind during every match or event. A disadvantage of moving to another location is that possibly new infrastructure has to be build. Finally, when designing a new stadium as much sustainability measures as desired can be added to meet every level of environmental behaviour, even LEED or BREEAM, although stadiums are not often certificated at all.

3.7.4 Sale and demolishing the stadium

In the selection process to the most suitable development alternatives for a stadium, also the preconditions and consequences of these alternatives have to be considered. For

example, if the municipality wants to sale the stadium, in that case to a private party, the buying party should always redevelop the stadium, because a private party should never buy a non-profitable real estate object without implementing certain changes. But, since a large part of the advantages of a (non-profitable) stadium are indirect or immaterial benefits (*Hellinga, 2013),* these stadiums are in general not interesting for private parties. Also the using club itself should never purchase the stadium (back) from the municipality to a somehow competitive price. It is therefore not always an option for a municipality to sell the stadium. But if the stadium generate non-acceptable losses for a municipality, it can decide to just give away the stadium and accept the losses in the past to avoid and even higher loss in the future. So, because a sale of the stadium will almost never recoup the invested money for the municipality, this will always include a certain amount of loss, depending on the availability of potential buyers. Therefore, it is not relevant for a municipality to distinguish the options selling and giving away the stadium.

When a stadium is causing high losses, redevelopment is too expensive, and there are no potential buyer for it, a municipality could decide to demolish the stadium. However, municipalities cannot afford to demolish the stadium of their local BVO, if there is no alternative housing available for the club. In practice, this will always include the construction of a new stadium (e.g. Turin (2011), Cologne (2004), etc.). In the extreme and non-realistic case the municipality still decides to do so, the club has to build a new stadium, which again can result in a situation in which the municipality is asked for financial support.

Therefore, all disposing alternatives for a stadium come down to the same result for the municipality; disposal of the total ownership of the stadium and accepting the loss of the existing investments.

3.8 Conclusion

This chapter attempts to provide an answer to the sub-question:

What are the characteristics of sustainable stadium redevelopment?

The sustainability of real estate objects can be determined with different environmental assessment methodologies are recognized. GPR, LEED and BREEAM are the three mostly recognized certification methods. BREEAM is the best method for sustainable stadium development in the Netherlands, since it is internationally recognized and it considers the Dutch laws and regulations.

Analysing the most sustainable stadiums in Europe and some well performed sustainable developed stadiums in the rest of the World, four main alternatives of sustainable stadium development are distinguished, all with their own characteristics. Next to these four alternatives it is also an option for a municipality for demolish or sell the stadium, or choosing the passive approach and leaving the stadium as it is. Demolishing and selling the stadium comes down to the same outcome for municipalities, since there are usually no private parties that want to purchase a non-profitable stadium. This results in a status quo for the municipality which only can be avoided by demolishing the stadium. Therefore, the following six alternatives for sustainable stadium (re)development are selected.

1) Changing the management of the stadium

A very cheap option for making a stadium more beneficial is changing the management of the stadium. The attitude of the users and possible regulations can make that the stadium is used much more effective. This could be sustainable changes but also a better way of sharing the stadium, possible with other sports clubs or other kind of users.

2) Make technical adjustments to the stadium

When the existing facilities meet the requirements of the users of the stadium, a total renovation is not always necessary to change the use of the stadium. Technical adjustments can make the stadium more energy efficient and more sustainable. There are multiple examples of stadiums in the Netherlands and Germany where an energy company or an electrical company pays for the technical adjustments to achieve these requirements.

3) Renovate and expand the stadium

The renovation of a stadium is a less expensive alternative if an existing stadium does not longer meet the modern requirements. It can include expansion or just a modernisation.

4) Building a new stadium

If it is practical impossible to achieve the changed requirement of the user of owner with redevelopment of the stadium, the construction of a new stadium can make the difference. There are no preconditions of the old stadium and the sky is the limit.

5) Disposing the stadium

When it becomes clear that the stadium is really causing very high losses for the municipality and the acceptance of the waste of the investment costs is more beneficial than keep paying for annual ownership costs and financial risks for the long-term future, it may be more beneficial for the municipality to sell the stadium or give it away to the using sporting club or an interested third private party. And if there are no interests purchasers, then it is also an option to demolish the stadium, but of course only if the using club is bankrupt or does not need the stadium anymore since they already has an alternative.

6) Passive approach

If the municipality decides not to invest in the stadium at all, because the investment will not be recouped, than there is the last alternative to choose a passive approach and leaving the stadium as it is.

3.8.1 SWOT analysis

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is performed for all six alternatives, in order to approach the scores of the alternatives per intangible sub-criterion (*appendix 9*). SWOT-analysis is a useful tool to combine with AHP or ANP regarding the intangible criteria (*Görener, 2012*).

Stadion Feijenoord (De Kuip), Rotterdam, the Netherlands

4. Case study *Stadion Feijenoord*

4.1 Current state of Stadion Feijenoord

Although, Stadion Feijenoord is not owned by a public party, the current situation of the stadium is a suitable case study for this research. The municipality of Rotterdam admits recognizes the public benefits of Feyenoord and the exploitation of the stadium. However, they are still considering if they want to invest in the renovation of the stadium or construction of a new state-of-the-art stadium. First, the municipality wants to know the (financial) risks of such an investment, and of course they are looking at the benefits for their city. The sports club itself and the owning company of the stadium both claim that a new stadium is the best option for the club and the city, but the fans and inhabitants of Rotterdam want to renovate the current stadium. In this case it is useful for the municipality to know which option is the most beneficial for them, before they are investing in the stadium.

Name	Stadion Feijenoord
Nickname	De Kuip
User(s)	Feyenoord; Dutch national football team; Dutch cup finals; live music concerts
Owner	Stadion Feijenoord N.V. (main shareholder is the amateur sports club S.C. Feyenoord)
City	Rotterdam, the Netherlands
Capacity	51,137 seats (of which 85% is roofed)
Past capacity	65,000 places (about 20% roofed)
Built	from 1935 to 1937
Renovated	In 1994
Architects	Leendert van der Vlugt; Broekbakema (renovation)

Table 4.1 *| Background information about Stadion Feijenoord*

Currently, two development alternatives of Stadion Feijenoord are seriously considered by the municipality of Rotterdam and the 'Feyenoord family' itself. A new stadium and a renovation of the stadium. When the decision is will be postponed automatically the third alternative, passive approach, will be applied.

4.2 New stadium

In 2006 Feyenoord started to make plans for a new stadium. The renovated stadium is also outdated, which caused less international matches or finals and less concerts, thanks to new stadiums like the Amsterdam Arena en the Gelredome in Arnhem. Again, due to the historical and emotional value of the stadium also plans are developed to renovated the current stadium for a second time. The direction of Feyenoord and Stadion Feijenoord N.V. think a renovation cannot meet the modern requirements of the use of a stadium. Also a research from the selected contractor VolkerWessels proved the financial advantages of a new stadium compared to the renovation of the current stadium.

***Figure 4.2** | Impression of the new Stadion Feijenoord*

4.2.1 Finance of the new stadium

The new stadium would cost about 361.9 million euro. A commercial priced land transaction of 35 million euro from the municipality leaves still 327 million euro for the rest of the project. A bank consortium of the three largest Dutch banks, ING, ABN Amro and Rabobank, are willing to give a loan to Feyenoord if the municipality of Rotterdam will guarantee for an amount of € 160 million. The municipality is now investigating what the financial risks are for them.

Construction costs	Costs
Land costs	€ 35,000,000
Building costs	€ 235,150,000
Honoraria	€ 14,400,000
Other costs	€ 2,750,000
Unexpected costs	€ 9,000,000
Fundraising costs	€ 29,300,000
Reserve accounts	€ 5,000,000
Training ground SC Feyenoord and the BVO	€ 14,000,000
General costs and insurance costs	€ 17,300,000
Total construction costs	€ 361,900,000

***Table 4.3** | Construction costs of the new stadium*

The municipality has a 'subordinated' loan, which means that by disappointing exploitation revenues first the private parties have to take their losses. And only if the exploitation revenue will be 85% lower than expected will the municipality pay the residual creditors. In that case the municipality will become owner of the stadium, which they can exploit to recoup their losses.

4.3 Renovation project 'Red de Kuip' (Save the Kuip)

There is an independent group of experts that have come up with their own development plans for Stadion Feijenoord, because they are convinced that a renovation of the historical stadium is much better than the construction of a new stadium. The group consists of architects, engineers, lawyers, urban developers, entrepreneurs and students, which develop their plans in their own spare time. Because of the high expertise of the group, this development plan is regarded as a realistic and reliable plan (*Hellinga, 2013*).

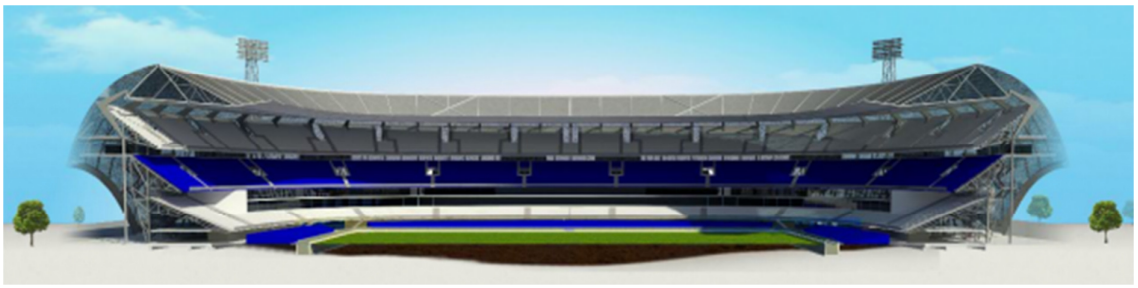


Figure 4.4 | *Section of the 3D render of the renovation plan of Stadion Feijenoord*

4.3.1 Numbers and figures of the renovation plan

- Construction costs of €117,000,000 (ex. taxes)
- Annual profit from stadium exploitation will rice from € 12,000,000 tot € 35,000,000
- Capacity of 63,000 seats, from which 7,000 business seats
- 88 business units
- 4 business lounges with view on the pitch
- 4 restaurants with view on the pitch
- Conservation of training ground Varkenoord
- No additional infrastructure needed
- Conservation of the historical stadium
- 8 elevators
- New toilets and facilities on the second tier
- Corridor around the higher levels of the stadium
- Strong increase of the safety
- The right required surface area on every tier
- Modern design due to arcs, which keep the visibility of the old stadium structure
- Construction planning of just one season
- Multiple contractors are already interested
- Significant financial growth of the using sports club Feyenoord (€ 51 m. to € 91 m.)
- 82% of the Feyenoord fans and 60% of the citizens of the area Rijnmond support the renovation alternative of the stadium

4.4 Alternatives vs. sub-criteria matrix

Concluding from the extensive case study of Stadion Feijenoord (*appendix 10*), the following scores are given the different sub-criteria in the conducted survey for all six stadium development alternatives.

Sub-criteria	Management changes	Technical adjustments	Total renovation	New stadium	Disposing stadium	Passive approach
Financial flow						
Investment	€ 1 mln	€4 mln	€117 mln	€ 362 mln	€ 47.5 mln	None
Rental revenue	€ 1.5 mln	€ 1.5 mln	€ 5 mln	€ 10 mln	None	€ 1.5 mln
Taxes	€0.5 mln	€ 0.5 mln	€ 1 mln	€ 2 mln	None	€ 0.5 mln
Financial risks	€ 12.5 mln (loan)	€12.5 mln (loan)	€ 32 mln (loan)	€ 172.5 mln(loan)	None	€12.5 mln(loan)
Economic value						
Creating jobs	4.778	5.556	7.278	7.889	2.389	3.556
Attracting companies	5.167	5.278	7.000	7.778	2.000	3.389
Area branding	5.556	5.444	7.111	8.111	1.722	3.667
Supporters' expenses	5.389	5.167	6.222	7.000	1.333	4.000
Social impact						
Enjoyment	5.611	5.278	6.278	6.833	1.778	4.000
Local pride	5.556	5.778	7.167	7.056	1.722	3.889
Promoting sports	5.222	5.500	6.389	7.167	1.833	3.889
City branding	5.556	5.556	7.000	8.167	1.889	3.667
Sustainability						
Energy costs	€400,000	€250,000	€600,000	€700,000	None	€477,812
CO2 emission	3000 tons	2000 tons	4000 tons	None	None	3000 tons
Natural resource use	None	100 tons	24000 tons	990000 tons	None	None
Long-term planning	10 years	15 years	25 years	35 years	0 years	5 years

Table 4.5 *| All values are annual scores. The values for the 'Economic value' and 'Social impact' are unit-less ratings between 1 and 10.*

5. The Analytic Hierarchy Process (AHP)

The decision making process of a specific stadium development alternative is based on a lot of different criteria. The using sports club, the most important stakeholder of the stadium project, is mainly concerned about its own interests, which results in decision criteria like; costs, capacity, business facilities, and revenue possibilities. For a municipality there are much more criteria that determine what is the most beneficial development alternative for a stadium. The different development alternatives do not only influences the use of the stadium, but also the surrounding area, the local economy, and other projects in the area or city. This are all important objectives that municipalities should consider in their decision making process. That is why the decisions about the most beneficial stadium development alternative for a municipality should be based on the analysis of multiple criteria.

5.1 Multiple-criteria Decision Analysis

Multiple-Criteria Decision Analysis (MCDA) is a Decision Support System (DSS) were multiple decision criteria are analysed in order to get a prioritization of the different available alternatives. The aim of the MCDA is to guide the decision maker in determining the course of action that best achieves the long-term goals, by providing the decision-maker with some measure of consistency (*Stewart, 1992*).

There is no uniform classification of MCDA methods, and therefore there are many ways to classify them, such as form or model (e.g. linear, non-linear, stochastic), characteristics of the decision space (e.g. finite or infinite), or solution process (prior specification or preferences or interactive) (*Saaty, 1990*). For intangible criteria as applied in this research (e.g. economic value and social impact) the Analytic Hierarchy Process (AHP), or its generalization to dependence and feedback; the Analytic Network Process (ANP), are suitable approaches to relative measurement (*Saaty, 2005*). With these approaches a scale of priorities is derived from pairwise comparison measurements when the elements to be measured are known (*Saaty, 2005*). Furthermore, AHP and ANP are useful for making multi-criteria decisions involving e.g. benefits (*Saaty, 2005*).

5.2 AHP vs. ANP

The AHP approach achieves pair-wise comparisons among criteria in order to prioritize them at each level of the hierarchy. In addition to AHP, ANP technique is a general form that allows interdependencies, outer-dependencies and feedbacks among decision criteria in the hierarchical or non-hierarchical structures (*Görener, 2012*). ANP is therefore used when the different criteria influence each other, which is a more realistic approach. However, ANP requires a much more comprehensive questionnaire, which will result in a lower responds rate. Since City Councillors indicated that they will probably not participate on a survey that will take them more than fifteen minutes, the ANP methodology would probably provide too few responds for this research. AHP will therefore be selected for this survey, which also is easier for participants to understand.

5.3 The Analytic Hierarchy Process

The responds of the pair-wise comparison questionnaires from the questionnaire are the input of AHP software (Expert Choice, or by creating an own Excel document) which calculates the Eigenvalue and normalized value of all criteria and sub-criteria per respondent, and the Consistency Index (CI), Random Inconsistency Index (RI) and the Consistency Ratio (CR).

5.3.1 Pair-wise comparison matrix

In the pair-wise comparison questionnaire the respondent can determine the relative importance of two different criteria, by selecting a certain intensity of importance, like in *table 5.1*.

Intensity of importance	Explanation
1	Two criterion contribute equally to the objective
3	Experience and judgement slightly favour one over another
5	Experience and judgment strongly favour one over another
7	Criterion is strongly favoured and its dominance is demonstrated in practice
9	Importance of one over another affirmed on the highest possible order
2, 4, 6, 8	Used to represent compromise between the priorities listed above

Table 5.1 *| Pairwise Comparison Scale (Saaty, 1996; Yüksel and Dağdeviren, 2007)*

Each pair-wise comparison part of the questionnaire of each respondent are put in a matrix.

CRITERIA		1	2	3	4
1	Direct financial flows	1.0000	0.3333	1.0000	5.0000
2	Economic value	3.0000	1.0000	3.0000	3.0000
3	Social impact	1.0000	0.3333	1.0000	3.0000
4	Sustainability	0.2000	0.3333	0.3333	1.0000

Table 5.2 *| A matrix with the results of one pair-wise comparison part*

The yellow cells are filled in with the results of the questionnaire. For this the fractions are converted to decimals. So if, for example criterion 2 is three times more important than criterion 1, the value is 0.3333. The criteria compared with itself always have a value of exactly 1, because it is the same criterion. The other values, bottom left, are the inverse of the values resulting from the questionnaire. So, if criterion 1 is five times more important than criteria 4, the value of criterion 4 compared to criterion 1 is 1/5.0000 = 0.2000. The formula *Saaty (2004)* uses is for the pair-wise comparison matrix is:

Figure 5.3 | *The equation for the normalisation of the pair-wise comparison matrices*

5.3.2 Super matrix

The next step is squaring the matrix to get the so called supermatrix.

	CRITERIA	1	2	3	4	Eigen-vector	Normalized Eigenvector
1	Direct financial flows	4.0000	2.6667	4.6667	14.0000	25.3333	0.23246
2	Economic value	9.6000	4.0000	10.0000	30.0000	53.6000	0.49184
3	Social impact	3.6000	2.0000	4.0000	12.0000	21.6000	0.19821
4	Sustainability	1.7333	0.8444	1.8667	4.0000	8.4444	0.07749

Table 5.4 *| A supermatrix with the results of the squared pair-wise comparison matrix*

In the supermatrix the values of the pair-wise comparison matrix are square with each other according to the following method: the value of a cell in the supermatrix is the first cell (from the left) of the row of the same cell in the pair-wise comparison matrix, times the first cell (from above) of the column of that cell, plus the second cell of that row time the second cell of that column, etc. The formula *Saaty (2004)* uses for squaring the matrix to a supermatrix is:

$$
W = \begin{array}{c} \\ C_1 \\ \\ C2 \\ \\ \\ \\ \\ \\ CN \end{array}
\begin{array}{c}
\begin{array}{cccccc} C_1 & C_2 & \cdots & C_{N-2} & C_{N-1} & C_N \\ e11 \cdots e1n1 & e21 \cdots e2n2 & & e(N-2)1 \cdots e(N-2)nN-2 & e(N-1)1 \cdots e(N-1)nN-1 & eN1 \cdots eNnN \end{array} \\
\begin{bmatrix}
0 & 0 & \cdots & 0 & 0 & 0 \\
W_{21} & 0 & \cdots & 0 & 0 & 0 \\
0 & W_{32} & \cdots & 0 & 0 & 0 \\
\bullet & \bullet & \cdots & \bullet & \bullet & \bullet \\
\bullet & \bullet & \cdots & \bullet & \bullet & \bullet \\
\bullet & \bullet & \cdots & \bullet & \bullet & \bullet \\
0 & 0 & \cdots & W_{1n-1,\,n-2} & 0 & 0 \\
0 & 0 & \cdots & 0 & W_{n,\,n-1} & 1
\end{bmatrix}
\end{array}
\begin{array}{c} e_1 \\ \vdots \\ e_{1n1} \\ e_{21} \\ \vdots \\ e_{2n2} \\ \bullet \\ \bullet \\ \bullet \\ e_{N1} \\ \vdots \\ e_{NnN} \end{array}
$$

Figure 5.5 | *The equation for squaring the supermatrices used by Saaty (2004)*

The 'Eigenvector' of a criterion is then determined by the sum of the four comparison scores in the row of that criterion. The 'Normalized Eigenvector' is determined by dividing the Eigenvector by the sum of the Eigenvectors of all criteria in that matrix. In this way the sum of all Normalized Eigenvectors is always exactly 1, which is after all the definition of a normalization.

5.3.3 Iteration

The process to create a supermatrix is repeated as long as the different between the Normalized Eigenvector of the last supermatrix and the Normalized Eigenvector of the

previous supermatrix is lower than 0.0001. This is called the iteration and has to be performed four or five times before the described requirement is achieved.

5.4 Consistency analysis

For the consistency analysis the Consistancy Ratio (CR) is determined of each supermatrix. The CR is an approximate mathematical indicator, or guide, of the consistency of pairwise comparisons (*Suárez Bello, 2003*). A CR ≤ 0.10 is assumed to be reliable enough of the assessment of the relative importance of the different objectives (sub-criteria) for a municipality (*Saaty, 1987*). In literature, there are some researchers who call this rule into question and claim that a higher minimum of consistency ratio (up to 0.20) also can be reliable (*Bhushan & Rai, 2003; Karlström, Runeson & Wohlin, 2002; Karlsson & Ryan, 1997; Bodin & Gass, 2003; and Heo, Kim & Cho, 2012*). *Saaty (1987)* however is restraint in increasing the consistency limit and warns for the possible errors in can entail. Because the rule CR ≤ 0.10 would exclude too much data from the conducted questionnaire for this research, which makes the research also unreliable, and CR ≤ 0.20 entails possible errors, this research will be applied with an inconsistency limit of CR ≤ 0.15.

Consistency analysis should be determined for each super matrix of a respondent (*Saaty, 1987*), for each individual respondent in total, the overall participant's consistency (*Saaty, 1987*), and for all respondents together, the groups consistency (*Tung, Chao & Julian, 2012*). The Consistency Ratio is determined by the formula: CR = CI / RI, where the CI is the Consistency Index, determined by $(\lambda_{max} - n) / (n - 1)$, and RI is the Random Consistency Index (0.9 for four criteria). With this formula the CR of each super matrix is determined. The overall CR of individual respondents is determined by the sum of the CR of all its matrices, and the same is done to determine the CI and the RI. Also here the formula $CR_{overall} = CI_{overall} / RI_{overall}$ is used. For the ground consistency, the geometric mean is taken of all consistent responses. These outcomes are put again an a super matrix were the same consistency analysis is used as for normal matrices ($CR_{group} = CI_{group} / RI_{group}$).

5.5 Normalisation of the alternatives

Normalisation of the scores of alternatives in AHP or ANP is sometimes causing some problems, e.g. rank reversal, etc. (*Nishizawa, 2012*). *Howlett & Jain (2006)* discussed different normalisation methods for AHP. One is a normalised verification by the traditional AHP procedure and another is a normalised verification by maximum alternative value to 1. The difference between those two normalisation verifications is that in the traditional AHP procedure the sum of the scores of all alternatives equals 1. This meant that when adding another alternative the difference between the scores of the other alternatives is slightly fading. This reflects with reality since the prioritization of a human decision maker is also fading when more alternatives are added.

The normalisation of the alternatives in this research is done by first normalising the relative score of the sixteen sub-criteria for each alternative. The normalisation is done by dividing the score of the alternative per sub-criteria by the highest score of the six alternatives on that specific sub-criteria, called Perfect Evaluation Score (*Nishizawa, 2012*). In this case the

score on a specific sub-criteria cannot be higher than 1, but the sum of the scores of all alternatives on that specific sub-criteria are always ≥ 1.

Values of 'negative' criteria are converted with the formula: $A_{positive} = (1 - A_{negative})^2$ (*Wang, 2010*). However, this is not the case in the DMP of municipalities regarding stadium projects, since this kind of comprehensive and expensive projects are pair-wise compared and therefore the relative importance does not fade when another alternative is added. This error can be solved by using the a normalised verification by maximum alternative value to 1. The maximum score for each (sub-)criteria is rated with 1, and all other alternatives are rated with a score determined by comparing them with the alternative with the maximum value.

5.5.1 Using different kind of normalisations in the same research

By using the alternative way of normalisation to assess the prioritization of the different alternatives than the normalisation of the prioritization of the criteria a validation seems required. However, these two ways of normalisation are totally independent from each other. The normalisation for the prioritization is done in a valid and proved scientific way, which resulting in a well substantiated prioritization of the different (sub-)criteria. When determining the prioritization of the different alternatives with different kinds of normalisation methods, the validity and accuracy of the prioritization of the (sub-)criteria is not changed. It is therefore possible to use a different kind of normalisation for the (sub-) criteria and the alternatives in the same research (*Howlett & Jain, 2006).*

6. AHP model for sustainable stadium development

In order to collect the data for this research, a questionnaire was conducted among Councillors from Amsterdam, Rotterdam, Eindhoven and Enschede, which are the cities in the Netherlands that have a stadium with a capacity higher than 30,000 seats. The Councillors are the decision makers of a city and therefore are expected to have proper knowledge of determining the importance of the different objectives for a municipality. The lower limit of 30,000 seats for a stadium is chosen, because this is the minimum requirements for hosting a European Championship game or a Europe League final according to the current UEFA regulations (UEFA, 2013).

6.1 Research goal

The goal of this research is increase the benefits of stadium development projects for municipalities with supporting the Decision Making Process (DMP) of municipalities. This is done by determining the relative importance of the objectives of municipalities regarding stadium development projects, which can be used for municipalities to assess the relative importance of different Stadium Development Alternatives. The second part of the research is an application of the results of this first part of the research to the case Stadion Feijenoord in Rotterdam. With this case study the most beneficial alternative is determined for the municipality of Rotterdam.

6.2 Research process

The research process consists of the following steps:

1) Determining the goal of the research
2) Determining the criteria and sub-criteria
3) Determining the (stadium development) alternatives for the case study
4) Assess the tangible sub-criteria of the case study
5) Conducting a questionnaire, based on:
    a. pair-wise comparison of (sub-)criteria
    b. direct preference of alternatives
    c. assessing the intangible sub-criteria of the different alternatives
6) Selecting the results based on the inconsistency check (*Saaty, 1987*)
7) Determining the relative importance of the different criteria and sub-criteria with the Analytic Hierarchy Process (AHP)
8) Determining the relative score of the different alternatives of the case study with the results of the AHP
9) Determining the direct preferences of the respondents
10) Comparing the direct preferences with the most beneficial alternatives based on the AHP

6.3 Questionnaire design

The questionnaire consists, apart from the introduction, of five parts. The first part is the pair-wise comparison on a 1-9 scale between the four criteria, which are the main objectives of Dutch municipalities regarding stadium development projects.

The four main criteria are:

A. Direct financial flows
B. Economic value
C. Social impact
D. Sustainability

The participants got to list of six pair-wise comparisons, which are [A] vs. [B], [A] vs. [C], etc.

Example of the layout of the pair-wise comparison questions of the main criteria:

[A] Direct financial flows	9	7	5	3	1	3	5	7	9	[B] Economic value

The second part are again 4 x 6 pair-wise comparisons on a 1-9 scale between the four sub-criteria of each main objective, which are [A1] vs. [A2], [A1] vs. [A3], and [B1] vs. [B2], etc.

The 16 sub-criteria are:

A1. Total direct investment
A2. Rental revenue
A3. Taxes
A4. Financial risks

B1. Creating jobs
B2. Attracting companies
B3. Area branding
B4. Expenses of supporters

C1. Enjoyment
C2. Local pride
C3. Promoting sports
C4. City branding

D1. Energy costs
D2. CO2 emission
D3. Use of natural resources
D4. Long-term planning

Examples of the layout of the pair-wise comparison questions of the sub-criteria:

[A1] Direct financial flows	9	7	5	3	1	3	5	7	9	[A2] Economic value
[B2] Direct financial flows	9	7	5	3	1	3	5	7	9	[B3] Economic value
[C3] Direct financial flows	9	7	5	3	1	3	5	7	9	[C4] Economic value
[D1] Direct financial flows	9	7	5	3	1	3	5	7	9	[D3] Economic value

The third part is a direct relative preference of the six stadium development alternatives of the case study. This is not a usual part of an questionnaire for the AHP, but is included to use as a control function to determine how the direct preference of City Councillors relate to what is the most beneficial for them based on relative preference of the (sub-)criteria and scores of the alternatives assessed by the AHP. The six alternatives are shortly introduced with some numbers and facts.

The six stadium development alternatives for the case study Stadion Feijenoord are:

1. Change in management
2. Technical adjustments
3. Total renovation
4. New stadium
5. Sale/demolition
6. Passive approach

The fourth part is an assessment of the intangible sub-criteria of the alternatives of the case study. These are assessed with a score from 1 (low) to 10 (high). The eight intangible sub-criteria are the sub-criteria of the two main criteria Economic value and Social impact.

The fifth and last part of the questionnaire is a more personal part about the political option and the personal emotional involvement in football of the respondents. With this control function the reliability of the responds is guaranteed. Hence, if only right orientated City Councillors or City Councillors that all do not like football, the outcome of this research can be misrepresented.

6.4 Data collection

The survey for this research was performed by conducting a questionnaire among the Municipal Councils of Amsterdam, Rotterdam, Eindhoven and Enschede. These four cities have the four biggest stadiums in the Netherlands, the four highest average attendance during last Eredivisie-season (2012/13) and have the four best performing football clubs since the introduction of professional football in the Netherlands in 1957. These aspects are important for this research, because it can assumed that the stadium is playing an important role in the decision making of the concerned municipalities.

City	Inhabitants	Coun-cillors	Stadium	Capacity	Attendance (2012/13)	Club
Amsterdam	801,542 (1st)	45	Arena	53,000 (1st)	50,490 (1st)	Ajax (1st)
Rotterdam	616,528 (2nd)	45	De Kuip	51,000 (2nd)	45,324 (2nd)	Feyenoord (3rd)
Eindhoven	218,559 (5th)	45	Philips Stadion	35,000 (3rd)	33,176 (3rd)	PSV (2nd)
Enschede	158,741 (11th)	39	Grolsch Veste	30,500 (4th)	29,453 (4th)	FC Twente (4th)

Table 6.1 | *Information about the four selected municipalities for the survey*

In Eindhoven and Enschede Council meetings were visited to approach the Councillors personally for the questionnaire. From the potential population of 84 Councillors 27 completed questionnaires. Since there was no possibility to visit the Council meetings of Amsterdam and Rotterdam it was agreed with four party chairmen to send twenty hard copies to both cities. After several reminders this resulted in only in completed questionnaire. Therefore, it was decided to also conduct a digital questionnaire, exactly the same as the hard copy questionnaires which was sent to all Councillors in Amsterdam and Rotterdam. This finally resulted in four completed questionnaires. The specific approach per City Council is presented in *appendix 12.*

6.5 Results

First the consistency of the responds is analysed, in order to determine if the results are reliable. Then the relative importance of the criteria and sub-criteria according to the municipality regarding stadium development is presented in table and figures, followed by the variation in relative importance between the different subgroups. The results of the second part of the survey are shown by two figures about the direct prioritization of the different development alternatives for the case study Stadion Feijenoord and the prioritization based on the AHP analysis. Finally, the sensitivity analysis of the results is determined. The final prioritization of the (sub-)criteria and alternatives according to all participating city councillors is presented below in *figure 6.2*.

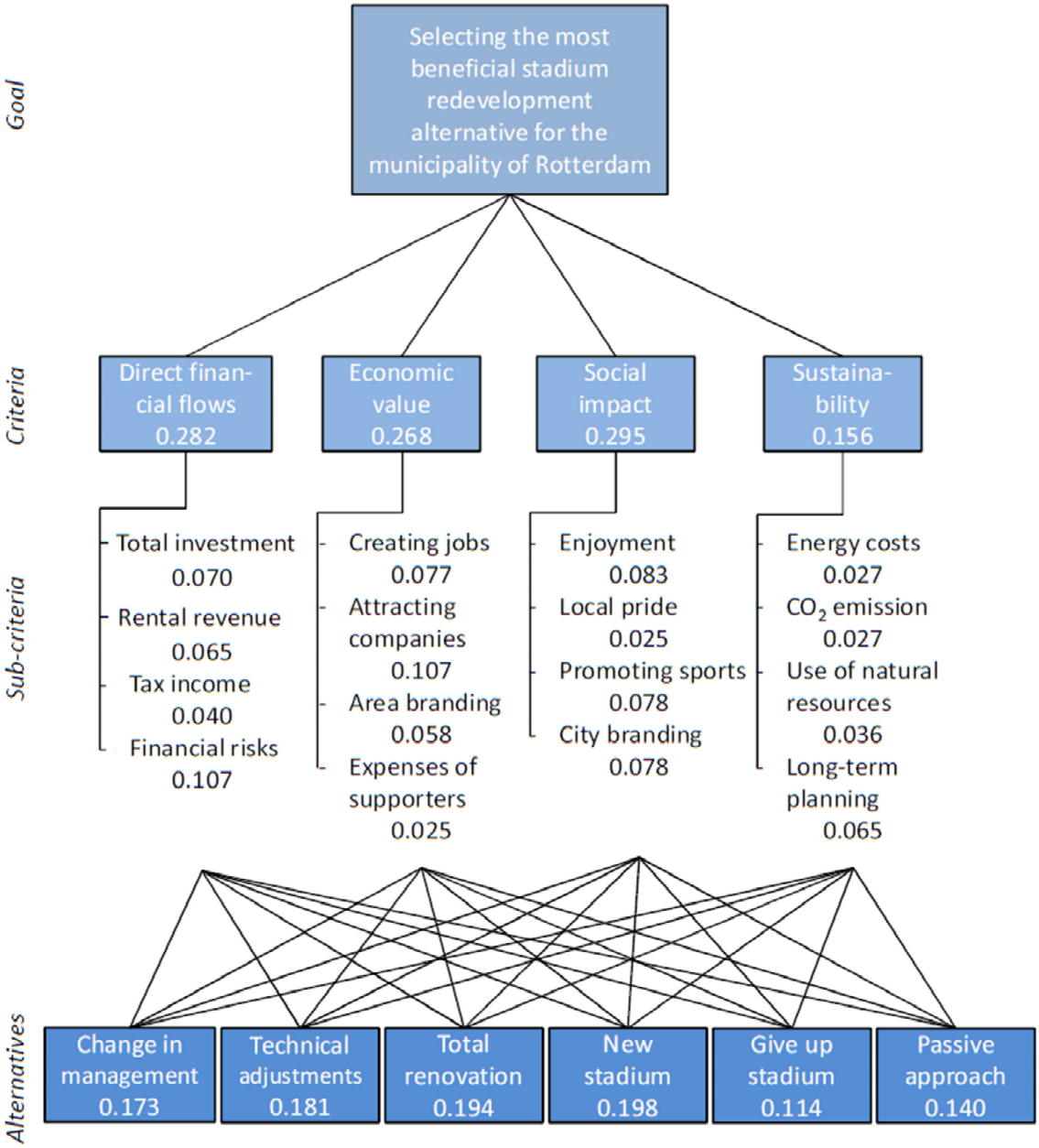


Figure 6.2 | *Analytic Hierarchy Process model of the results of this research*

The survey was performed in the four Dutch cities Amsterdam, Rotterdam, Eindhoven and Enschede, which resulted in a total of 31 City Councillors who completed the pair-wise comparison part of the questionnaire, from which 25 also completed the ranking of the six stadium development alternatives. The assessment of the 16 intangible sub-criteria of the six alternatives for the case study 'Stadion Feijenoord' is completed by 17 City Councillors and one stadium expert, who is involved in the Stadion Feijenoord redevelopment project. The values as a results of this assessment are already presented in the chapter 7 'Case study Stadion Feijenoord' (*table 4.4*).

6.6 Consistency analysis

Strictly according to the consistency rule of CR ≤ 10%, only seven out of 31 respondents have a sufficient overall consistency measure of their questionnaire. With the set inconsistency limit of CR ≤ 15% there are 17 out of 31 respondents who are consistent. The consistent responds per pair-wise comparison matrix, including a distinction between the different subgroups, is shown in *table 6.3*.

Groups	All	**All**	Fan	Fan	No fan	No fan	Left	Left	Right	Right
Matrices	CR ≤10%	**CR ≤15%**	CR ≤10%	CR ≤15%	CR ≤10%	CR ≤15%	CR ≤10%	CR ≤15%	CR ≤10%	CR ≤15%
Overall	7	**16**	7	16	7	16	7	16	7	16
Main criteria	6	**10**	0	2	3	4	2	3	4	6
Direct financial flows	3	**12**	1	3	1	5	1	4	2	7
Economic value	3	**12**	1	3	1	6	2	6	1	6
Social impact	4	**14**	1	4	2	7	2	6	2	8
Sustainability	5	**14**	1	3	1	7	2	5	3	8

***Table 6.3** | Number of consistent respondents for CR ≤ 10% and CR ≤ 15% for the overall questionnaire, for the matrix of the main criteria, and for the four matrices of the sub-criteria.*

Since the responds rate with CR ≤ 10% is too low, the responds with CR ≤ 15% are analysed and presented in this report as the main results of this research.

6.6.1 Subgroups' consistency

Due to the additional survey in the questionnaire about the political preference and the emotional involvement with professional football of the individual participants, it is also possible to conclude special interests of these subgroups (i.e. football fans, not football fans, left politicians, and right politicians). However, some subgroups have such an high inconsistency in their responses (*table 6.2*) that for the inconsistency limit of CR ≤10% the results are highly unreliable. Therefore, only the results of the subgroups are analysed with the inconsistency limit of CR ≤15%.

6.7 Relative importance

6.7.1 Main criteria

The results from the first part of the questionnaire, which is the outcome of the pair-wise comparison of the main criteria, is shown in *figure 6.4*. This shows that according to all participating Dutch City Councillors the most important aspect for a municipality regarding stadium development projects is creating social impact (29.5%). The direct financial flows (28.2%) and the economic value (26.8%) are valued as less important. Sustainability is considered as least important (15.6%).

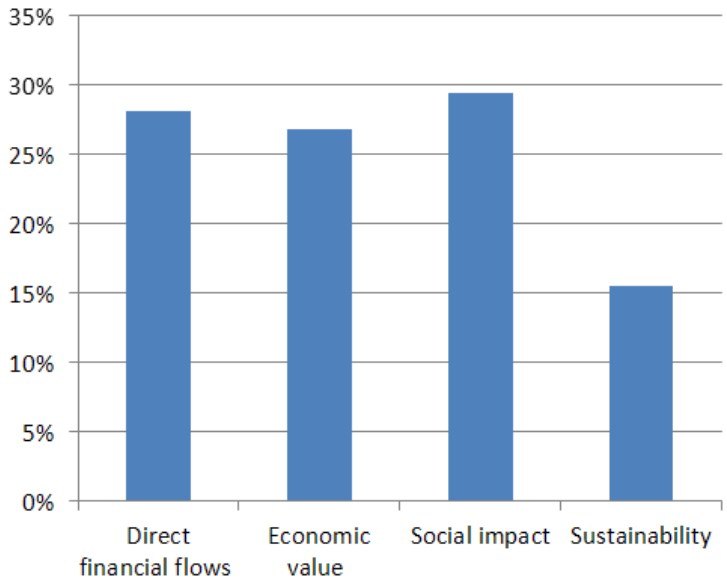


***Figure 6.4** | Relative importance of the main criteria*

6.7.2 Sub-criteria

The importance of the sub-criteria, which is related to the relative importance of the main criteria, shows some evident results. The financial risks of a possible investment in a stadium development project and attracting companies as a result of stadium development in a city (both 10.7%) have by far the highest relative importance for a municipality. The four sub-criteria that follow, from which three are related to social impact, have an almost equal relative importance; the enjoyment a stadium can create for the inhabitants (8.3%), city branding due to the stadium and its events (7.8%), the promotion of sports among youth (also 7.8%), and the creation of jobs due to the stadium development projects and activities related to it (7.7%).

The least important sub-criteria of stadium development projects are; tax income (4.0%), expenses of supporters during match days in the stadium and in the city (3.0%), and three of the four sustainability sub-criteria; CO_2 emission (2.3%), energy costs (3.1%) and the use of natural resources for the construction of the stadium (re)development (3.5%).

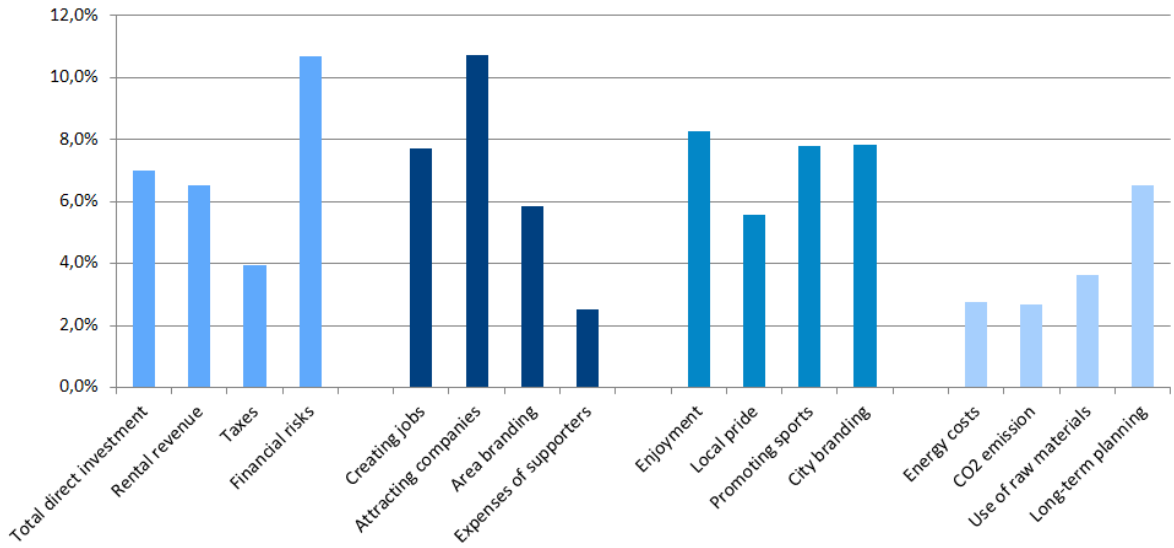


***Figure 6.5** | Relative importance of the sub-criteria of all respondents with CR ≤ 15%*

6.8 Subgroups

Due to the control function in the survey to the participants' personal political position and their interest in football, the survey also provided some information about the opinion of these four subgroups. In *table 6.6* it is shown that all four subgroups are somehow equally represented among the respondents. Only the results with CR ≤ 15% will be analysed.

	Football fan (*7-10*)	Average (*5-6*)	No fan (*1-4*)	Un-known	Left/ social	Centre	Right/ liberal	Un-known
Distribution of respondents	10	5	14	3	12	5	12	3

***Table 6.6** | The distribution of the respondents regarding football fan and political opinion*

From *table 6.7* it can be concluded that there are some differences between the opinion of football fans and non-fans. The aspects that differ the most are local pride and city branding, which are considered as very important among football fans and not really important among non-fans. Surprisingly, the opposite counts for the sub-criteria 'enjoyment'. Maybe even more surprising is the large difference between the relative importance of financial risks according to football fans (15.9%) and non-fans (5.8%), since financial risk is usually an important argument of opponents of public investments in professional sports clubs or stadiums.

As expected, much more significant differences are shown between the lift (or social) and right (or liberal) politicians. This is obviously the result of their different point of view regarding politics. The largest differences are: economic value (9.5% left, 38.4% right), social impact (45.7% left, 25.6% right), financial risks (13.8% left, 7.0% right), attracting companies (3.1% left, 17.8% right), and enjoyment (16.1% left, 4.7% right), from which financial risks is the most unexpected difference, since this is usually a important subject of right or liberal parties. The other described differences are quite natural considering the usual political issues of both sides.

Groups	All	**All**	Fan	Fan	No fan	No fan	Left	Left	Right	Right
(Sub)-criteria	CR ≤10%	**CR ≤15%**	CR ≤10%	CR ≤15%	CR ≤10%	CR ≤15%	CR ≤10%	CR ≤15%	CR ≤10%	CR ≤15%
Direct financial flows	23,6%	**28,2%**	*n.a.*	26,6%	20,0%	21,0%	28,8%	28,4%	19,7%	20,7%
Economic value	22,4%	**26,8%**	*n.a.*	19,1%	19,4%	29,5%	7,7%	9,5%	34,7%	38,4%
Social impact	33,6%	**29,5%**	*n.a.*	39,8%	34,8%	31,2%	40,3%	45,7%	28,2%	25,6%
Sustainability	20,3%	**15,6%**	*n.a.*	14,5%	25,7%	18,2%	23,2%	16,3%	17,5%	15,4%
TOTAL (*criteria*)	100%	**100%**	*n.a.*	100%	100%	100%	100%	100%	100%	100%
Total investment	6,2%	**7,0%**	*n.a.*	5,2%	5,0%	5,4%	6,4%	5,7%	5,4%	5,6%
Rental revenue	5,1%	**6,5%**	*n.a.*	3,2%	5,0%	6,1%	8,3%	6,4%	3,6%	4,5%
Taxes	3,5%	**4,0%**	*n.a.*	2,4%	5,0%	3,7%	2,8%	2,5%	3,6%	3,6%
Financial risks	8,9%	**10,7%**	*n.a.*	15,9%	5,0%	5,8%	11,4%	13,8%	7,1%	7,0%
Creating jobs	5,5%	**7,7%**	*n.a.*	4,1%	8,0%	8,8%	2,2%	3,5%	5,8%	8,2%
Attracting companies	5,6%	**10,7%**	*n.a.*	10,4%	1,9%	11,5%	1,6%	3,1%	12,8%	17,8%
Area branding	1,9%	**5,8%**	*n.a.*	3,4%	8,4%	5,8%	3,3%	2,4%	12,8%	6,7%
Expenses of sup.	2,2%	**2,5%**	*n.a.*	1,2%	1,1%	3,3%	0,6%	0,5%	3,3%	5,6%
Enjoyment	8,6%	**8,3%**	*n.a.*	6,6%	10,7%	9,2%	12,1%	16,1%	5,9%	4,7%
Local pride	4,8%	**5,6%**	*n.a.*	8,5%	5,8%	3,7%	4,3%	9,1%	5,2%	4,3%
Promoting sports	10,1%	**7,8%**	*n.a.*	7,8%	12,7%	9,6%	14,3%	10,8%	6,8%	6,2%
City branding	10,1%	**7,8%**	*n.a.*	16,8%	5,6%	8,7%	9,5%	9,7%	10,2%	10,4%
Energy costs	3,9%	**2,7%**	*n.a.*	1,9%	6,4%	3,3%	2,7%	1,7%	4,3%	3,5%
CO_2 emission	3,4%	**2,7%**	*n.a.*	1,5%	6,4%	4,6%	3,5%	4,4%	2,8%	2,0%
Natural resources	4,9%	**3,6%**	*n.a.*	3,5%	6,4%	4,1%	3,0%	3,9%	5,6%	3,5%
Long-term planning	8,2%	**6,5%**	*n.a.*	7,6%	6,4%	6,3%	14,0%	6,3%	4,8%	6,3%
TOTAL (*sub-criteria*)	100%	**100%**	*n.a.*	100%	100%	100%	100%	100%	100%	100%

***Table 6.7** | Relative importance of all (sub-)criteria for all subgroups (CR≤10% and CR≤15%)*

6.9 Most beneficial development alternative for Stadion Feijenoord

The prioritization of the different sustainable stadium development alternatives for the case study Stadion Feijenoord in Rotterdam is determined in two different ways. First the participant filled in the pair-wise comparison part of all the criteria and sub-criteria. For the prioritization the Analytic Hierarchy Process is used. The second is a direct prioritization as an additional survey in the questionnaire, where the participants had to rank the different stadium development alternatives based on a short description of the six alternatives.

6.9.1 Direct prioritization

The additional survey of the direct prioritization of the development alternatives for Stadion Feijenoord are completed by 25 City Councillors, by ranking the six alternatives from 1 (most beneficial) to 6 (lease beneficial). The result of the normalization of this prioritization is presented in *figure 6.8.*

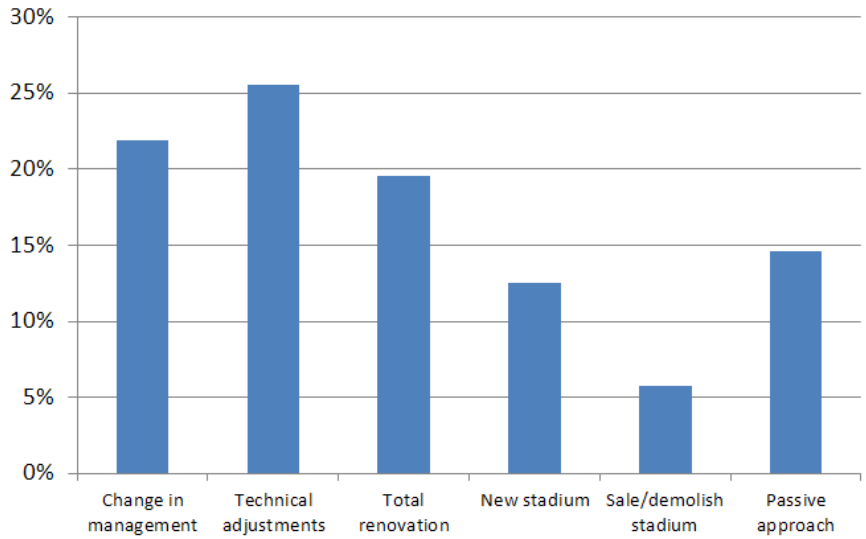


***Figure 6.8** | Direct prioritization of the most beneficial development alternatives for Stadion Feijenoord according to the responds of the City Councillors*

Making technical adjustments has the highest ranking with 25.6%. Also the other two alternatives that are changing the current stadium are highly ranked; Changing the current management of the stadium in order to optimize the exploitation of the current stadium (21.9%) and total renovation of the stadium (19.6%). Giving up the stadium, by selling or demolishing it, by far has the lowest priority with 5.7%. Building a new stadium (12.5%) and leave the stadium as it is (14.6%) got an average score of the 25 City Councillors.

6.9.2 Prioritization with the AHP

The prioritization of the different development alternatives of Stadion Feijenoord determined with the AHP has a different outcome. The difference between the two inconsistency limits (CR ≤ 10% and CR ≤ 15%) is not more than 0.2% for the priority of each alternative, which means it has a low sensitivity regarding this aspect.

After assessing the score of all six stadium development alternatives for the sixteen sub-criteria, the scores where normalized with the in chapter 8 described idealization method. The results in *table 6.9* show that the alternatives are very close to each other. Regarding to the benefits of the municipality of Rotterdam a new stadium has a relative score of 19.8%, while a total renovation of Stadion Feijenoord is not far behind (19.4%). Also performing technical adjustments to the stadium (18.1%) and a change of management regarding the exploitation of the stadium (17.3%) have a significant high score. A passive approach (14.0%) and giving up the stadium (11.4%) are the lease beneficial alternatives for the municipality of Rotterdam.

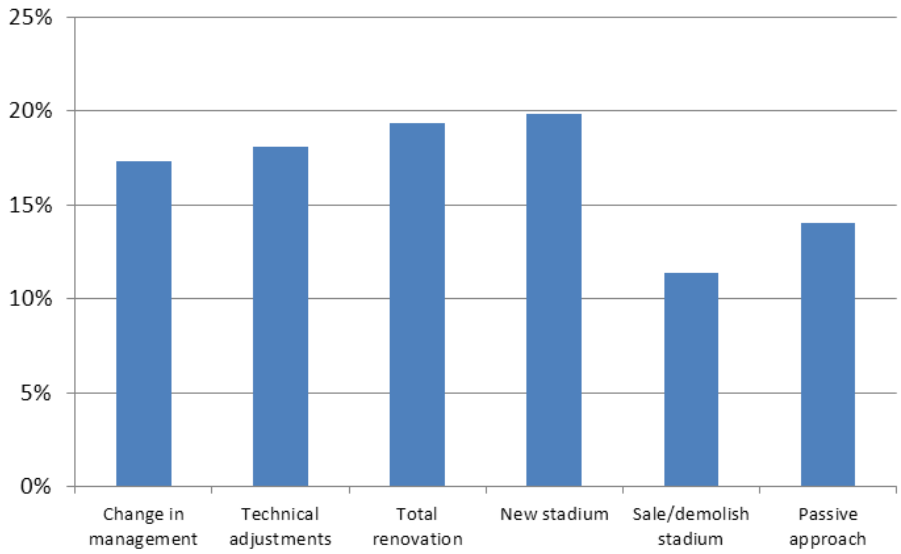


***Figure 6.9** | Prioritization with the AHP of the most beneficial development alternatives for Stadion Feijenoord*

6.10 Sensitivity analysis

A sensitivity is necessary to determine if the results of the research are changing significantly if small changes are made in responds or in the applied analysis methods. Regarding the three described normalization methods by Howlett & Jain (*2012*) the relative importance of the different sub-criteria only differ up to 0.2%. The ranking of the six alternatives also does not change by applying these three normalization methods. Only the degree of difference between the importance of the alternatives differs slightly.

6.11 Conclusion

Considering the amount of responds, an inconsistency limit of CR ≤ 15% still provides sufficient data to get reliable results and conclusions. Also the distribution of the different subgroups is well spread and therefore the research is based on a realistic reflection of the reality. There is not enough data to draw reliable conclusions about all the different subgroups, although some indication can be suggested due to large differences between some subgroups. The conclusion of the results of the questionnaire is analysed in the next chapter.

7. Conclusions and recommendations

7.1 Conclusions

In this chapter the answer to the last two sub-questions of this research will be given;

Which aspects of stadium redevelopment are the most important for municipalities?

And;

How to determine which stadium development alternative is the most beneficial for a municipality?

First, the conclusions will be drawn from the results about the relative importance of the different (sub-)criteria for a municipality regarding stadium development projects. This provides the base for the analysis about the importance of sustainability in municipal decision making process. Then, the results of the most beneficial option regarding the different stadium development alternatives for the case study Stadion Feijenoord are analysed. Finally, a conclusion will be drawn about the unintended results from this research.

7.1.1 Relative importance

From the results about the relative importance of the different (sub-)criteria about making stadium projects more beneficial for municipalities it becomes apparent that they can be divided in three groups. Attracting companies and financial risks are by far the most important sub-criteria (*the black bars in figure 7.1*). That financial risks have a higher relative importance than the direct investments and revenues seems logical, since an investment is only considered as too high when the expected results are not sufficient in regard to the height of the investment and if the financial risks attached to it are acceptable.

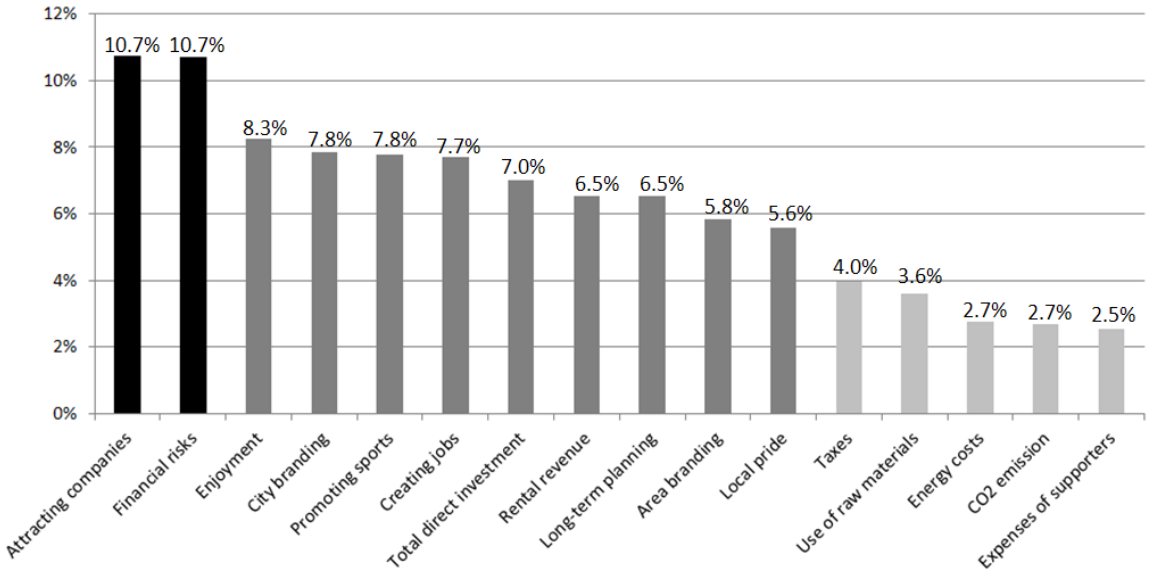


Figure 7.1 | *Relative importance of the sub-criteria divided in three groups*

The sub-criteria that also have a high relative importance (*dark grey bars in figure 7.1*) also play in important role for the municipal. In particular the social aspects have a high relative importance. This can be explained by the fact that a stadium is usually not a profitable real estate object for municipalities. Apparently, municipalities seen the purpose of a stadium more in comply with their social objectives, like amusement and vivacity during events, city branding, promoting of sports (e.g. among youth) and in lesser extent local pride by the performance of the using BVO or the impressive effect of the design of the stadium.

The less important sub-criteria are mainly the sustainability sub-criteria, because the criteria sustainability itself is rated as less important than the other three main criteria. This is probably because the other three criteria are the real main objectives of a municipality and sustainability is a criteria that should actually be a sub-criteria of one of those criteria, but is promoted to a main criteria by many municipalities considering the actuality and urgency of this topic all over the World (e.g. the Kyoto Protocol in 1997) and the fact that corporate sustainability is still in its infancy. Private parties are still reserved in significant sustainability adjustments because of the low profitability of it, hence local and national public parties have to lead by example. However, private parties are currently stimulated by new regulations to increase their environmental behaviour (*SAR, 2013*).

7.1.2 Most beneficial sustainable stadium development alternative

This research is applicable for stadium where the following preconditions:

- The municipality is an shareholder of the stadium or important investor
- The stadium is located within the borders of the city
- It has a train station nearby
- It has a capacity between the 30,000 and the 65,000 seats
- It has a using sports club performing on national top level
- The stadium can also be used for other outdoor events like (small) concerts
- It can also be used for international matches and European cup finals

But still the scores for the sixteen sub-criteria of the stadium development alternatives are very case specific. If a stadium is recently built, the option to build a new stadium is obviously less beneficial than in case the stadium is already built several decades ago. This makes is difficult and maybe even senseless to recommend one certain alternative. Therefore, different aspects of a stadium development alternative are recommended, which can result in the fact that some alternatives are more likely to get a higher relative score then others. Starting with the two most important sub-criteria, attracting companies, and financial risks. Attracting companies is a very intangible criteria, but it is assumed that a modern stadium with a positive impact on the surrounding area will attract the most companies. These aspects are included in a new stadium, but that alternative is usually very expensive and therefore includes high financial risks.

The other sub-criteria with a high relative importance are related to the performance of the using sports club or related to one of the two mentioned sub-criteria. Creating jobs is strongly related to attracting companies and total investment and rental revenue are strongly related to financial risks. The performance of the using BVO has a very high impact on the social aspects, enjoyment, city branding, promotion of sports, and the lower ranked sub-criteria local pride. Furthermore, the sportive and financial performance of the BVO, which are strongly related to each other, also have an impact on the ability to pay a high

rent or paying back a possible loan to the municipality, and therefore to the most important sub-criteria, financial risks. Hence, it can be concluded that the most beneficial stadium development alternative for a municipality is the most beneficial alternative for the performance of the using BVO.

The most beneficial stadium development alternative for a municipality is the one were the financial risks are low and the attraction to companies is high. These two criteria can be met with a combination of a total renovation, where through modernization the stadium will be more attractive for companies to hire a sky box or VIP seats, and by making technical adjustments and possible even change the management of the stadium regarding environmental behaviour in order to making it more sustainable. Companies want to be associated with a modern and sustainable stadium. So, be combining the positive parts of the three renovation alternatives (i.e. change in management, technical adjustments, and total renovation) a stadium can achieve the main objectives of a municipality without extraordinary high financial risks. On the other hand, a new stadium can have a very positive impact on both the financial and sportive performance of a BVO (*appendix 7*), and therefore on the financial risks for the municipality, although a new stadium brings along high investment costs and with that new financial risks for the municipality. It can therefore be a good alternative for both the municipality and the using BVO to lower the price of the new stadium, especially to the detriment of expensive aspects of the stadium design that do not have relatively strong impact on the other objectives of the municipality.

7.1.3 Stadion Feijenoord

While the average opinion of the City Councillors assumes that a new stadium for Feyenoord is definitely not the best alternative, the results of this research show that the new stadium can still be very beneficial for the municipality, even if it is by far the most expensive and most risky alternative for them. However, the other three redevelopment alternatives were almost as beneficial as the new stadium alternative (19.8%). The total renovation of the stadium (19.4%), performing technical adjustments (18.1%), and a change in the current management of the stadium (17.3%) also are beneficial alternative for the municipality of Rotterdam. Abandon the stadium or leaving the stadium in its current state are both significantly less beneficial and therefore no realistic option for both the municipality and the using BVO, namely Feyenoord.

7.1.4 Influence of sustainability

Sustainability (15.6%) as main criteria has a low importance in the decision making process of municipalities regarding stadium development in relation to the three other main municipal objectives, which are direct costs and revenue (28.2%), economic value (26.8%), and social impact (29.5%). Related to this result also the sub-criteria of sustainability have a low relative importance for municipalities. Surprisingly, the three most environmental sub-criteria (i.e. use of natural resources, energy costs and CO_2 emission) have a much lower score than the forth sub-criteria of sustainability; long-term planning. Possibly because the long-term planning also has a significant relation to the highly ranked criterion financial risks. If during the design phase of the stadium sufficient attention is paid to the long-term planning regarding strategic design (for a possible change of function or change in requirements) the stadium will keep its value for the city and the using BVO for a much longer period of time. This can ensure the municipality of a higher benefit during its lifetime without new public investments.

With the results of this research it seems like single sustainability aspects (i.e. energy use, use of natural resources, and CO_2 emission) are not plying an important role in the decision making process of municipalities regarding stadium development projects. During the conduction of the questionnaire City Councillors also suggested that a stadium is not the most efficient way to express the sustainable objectives of a municipality. Sustainability aspects (e.g. long-term planning) that ensure the municipalities of increased benefits from the other main objects are relatively more important in their decision making process.

7.2 Discussion

The main discussion of this research is the fact that it attempts to catch the decision making process of a municipality with a scientific approach. According to the Councillors this is almost impossible, since public decisions are often partly based on emotion and the issues of the day. However, the same Councillors admitted that this research can still support their decision making process.

7.2.1 Process

The objectives of this research are somehow contradictory, because it intends to increase the benefits for municipalities and constrain their financial risks of investments in stadium projects. But, since also stadium developers can use the results of this research to convince the municipality of investing in a new stadium project. But, when the decision making process of municipalities is well performed they will still benefit from these investments. Furthermore, sustainability is seen as a part of social impact and therefore the relative importance of it according to the respondents is somehow distorted. When it was a sub-criteria of social impact the relative importance of the different sustainability sub-criteria would possible be much higher.

Regarding the prioritization of the different stadium development alternatives of the case study Stadion Feijenoord, the impact of the total investment could be underestimated in the normalisation, although the most suitable method is used. The nature of Councillors is to look at the outcome of a decision and not only to the investment costs. But, since an investment in a stadium project is about such large amounts of money the decision making process gets distorted. This is reflected in the decision of the municipality of Rotterdam to not invest in the new stadium, because of the high financial risks for the municipality, which is in contrast to the results of this research.

7.2.2 Questionnaire

During the conduction of the survey, some discussion was initiated by an number of participating Councillors. The first was about the alternative ‘sale/demolish stadium’. This confused the participants since these both words suggesting totally different situations. Although, the selection of alternatives is well substantiated, the formulation or effect of it has on the participants should have been better considered. The second discussion was about the consistency of the participants. Despite an explanation about consistency of the pair-wise comparison survey, still participants filled in totally inconsistent answers. The explanation they gave for it was that the importance of a number of criteria can differ when it is compared to different other criteria. This suggests that Analytic Network Process (ANP) should be more suitable for this research. However, with this survey, based on AHP,

participants already indicated that the questionnaire was too comprehensive. With ANP the survey would become even more comprehensive which affects the number of respondents.

7.3 Recommendations

With the results of this research several recommendations can be given to Dutch and other European municipalities, stadium developers, and especially to the 'Feyenoord family' (i.e. the BVO Feyenoord, the amateur club SC Feyenoord, and the management and shareholders of Stadion Feijenoord together).

7.3.1 Municipalities

The results of this research can support the decision process of municipalities in the whole Western world, because the objectives of Western local municipalities in general is considered. However, since the main concerns of municipalities per country strongly differ and this survey is only conducted in the Netherlands, it is less suitable for other countries.

In the decision making process of a municipality regarding stadium projects, it would be wise to look at the long-term planning and consequences of their decision. A single investment in a stadium is almost never just a single investment. From then on, the financial issues of a stadium or its using BVO becomes also their problem. However, it seems that municipalities already underestimate the social and economic benefits of the high investments of a new stadium. Municipalities indicate to prefer less expensive stadium development alternatives, while these are less beneficial compared to its total investment.

The recommendations to municipalities from this research are:

- Also consider future financial risks that are the result of an investment in a stadium.
- Do not automatically choose for the less expensive stadium development alternative. It will cost less money but will possibly gain much less benefit in comparison to the more expensive alternatives.
- Do not demand for additional functions or adjustments to a stadium that are not relevant for the using BVO, since this only makes the stadium more expensive, which increases the financial risks for both the municipality itself as the using BVO.
- Do not demand for specific high performance sustainability adjustments, because the direct and indirect benefits would probably be disappointing.
- Do not underestimate the economic added value of stadium development in general.

7.3.2 Stadium developers

For stadium developers who want to obtain the approval and support of the municipality, it could be beneficial to look at the most preferred criteria and sub-criteria, without adding facilities or other functions that are not in the original requirement specifications of the initial client and future user of the stadium.

The recommendations to stadium developers from this research are:

- Do not only focus on constraining the initial investment costs, but also look at the indirect costs like financial risks in the future for the municipality or the using BVO.
- Focus on the social and economic impact of the stadium during the design phase.

- Do not only concentrate on specific sustainability aspects, but on the environmental behaviour of the whole stadium development project, especially long-term planning.

7.3.3 Feyenoord family

The Feyenoord family believes that a new stadium is the only right solution for their current situation. They focused very much on the environmental behaviour of the stadium in the hope to convince the municipality to invest in the new stadium plans. This research shows that the municipality is not really interested in these individual sustainability aspects like CO_2 emission and energy use, since this only makes the stadium more expensive. While this research was coming to an end, the municipality of Rotterdam decided on July 11th that they will not invest in the current plans for a new stadium and that the Feyenoord family has to offer them a new alternative for the (re)development of Stadion Feijenoord.

The recommendations to Feyenoord family from this research are therefore:

- Although the new stadium seems the relatively best stadium development alternative for the municipality of Rotterdam, other alternatives (i.e. total renovation, technical adjustments, or change of management) are almost as beneficial as the new stadium for the municipality. This may be a less beneficial option for the Feyenoord family according to themselves, but these other alternatives can possible convince the municipality to provide the necessary investment, unlike the (apparently) too expensive current new stadium design.
- For the revision of the proposed plans for the new stadium especially the financial risks and the attraction of companies should be considered.
- For the revision of the new stadium plans, do not focus on the individual sustainability aspects, but look at the environmental behaviour of the whole stadium project, especially the long-term planning for the exploitation of the stadium.

7.4 Follow-up considerations

The initial intention of this research was to create and generic tool for all Dutch or even European municipalities with a large stadium (>30,000 seats), but the required data collection by additional surveys proved to be too comprehensive. Also the conditions of the stadium itself should be considered in the tool in order to make it more generic. This can possible be done by making a distinction between the age of the stadium and the additional requirements for the redevelopment of it. For example, a relatively new stadium that is too big for the using club requires another approach than a very old stadium that has to be extended to meet the increased demand of spectators.

For the follow-up researches regarding this topic I would like to recommend:

- Create a generic tool that does not need additional surveys for the case-specific intangible sub-criteria.
- In order to make the results of this research more generic, the variation in objectives between municipalities in different European countries should be researched and should be processed in the final decision support tool.
- Create a distinction between the different conditions of stadiums, in order to make the tool more generic and suitable for more stadium redevelopment projects.

References

Literature

Ali, I. (1990). "Public investment criteria: Financial and economic internal rates of return" - *Economics and development resource center, Report No. 50, april 1990*

Appel-Meulenbroek, H.A.J.A.; Maussen, S.J.E.; De Bis, N. & Verkerk, B.G. (2002). "Municipal Real Estate deployed as a capital asset" - Eindhoven University of Technology

Baade, R.A. (1994). "Stadiums, Professional Sports, and Economic Development: Assessing the Reality" – *Policy Study, Heartland Institute No. 62 April 4, 1994*

Baade, R.A. & Dye, R.F. (1988). Sports Stadiums and Area Development: A Critical Review" - *Lake Forest College*

Barfod, M.B.; Salling, K.B.; Leleur, S. (2010). "Composite decision support by combining cost-benefit and multi-criteria decision analysis." - *Decision Support Systems 51 (2011) pp. 167–175*

Berg, M. (2012). "The 7 Most Energy-Efficient Baseball Stadiums in the U.S." *Inhabitat - Sustainable Design Innovation, Eco Architecture, Green Building* - (last obtained on April 8th, 2013)

Bodin, L. & Gass, S. (2003). "On teaching the analytic hierarchy process" - *Computers & Operations Research 30 (2003) 1487–1497*

Bouras, C.; Katris, N. & Triantafillou, V. (2003). "An electronic voting service to support decision-making in local government" - *Telematics and Informatics 20 (2003) 255–274*

Brønn, P.S. & Vidaver-Cohen, D. (2009). "Corporate Motives for Social Initiative: Legitimacy, Sustainability, or the Bottom Line?" - *Journal of Business Ethics (2009) 87 pp. 91–109*

Chatzimouratidis, A.I. & Pilavachi, P.A. (2009). "Sensitivity analysis of technological, economic and sustainability evaluation of power plants using the analytic hierarchy process" - *Energy Policy 37 (2009) 788–798*

Damart, S. & Roy, B. (2009). "The uses of cost–benefit analysis in public transportation decision-making in France" - *Transport Policy, Volume 16, Issue 4, August 2009, Pages 200–212*

Deloitte (2011). "Municipal real estate. Comparing public real estate management in European cities" *Real Estate EMEA, December 2011*

Deloitte (2012). "Fan power. Football Money League" *Sports Business Group, February 2012*

Deloitte (2013). "Captains of industry. Football Money League" *Sports Business Group, January 2013*

Ding, G.K.C. (2008). Sustainable construction: The role of environmental assessment tools - *Journal of Environmental Management 86 (2008) pp. 451–464*

Ecorys (2012). "Roda JC Kerkrade op waarde geschat" – *A research commissioned by the municipality of Kerkrade to the value of Roda JC for the municipality, October 28th, 2012*

Farragher, E.J. & Savage, A. (2008). "An Investigation of Real Estate Investment Decision-Making Practices"- *Journal of Real Estate Practice and Education, Volume 11, No. 1, 2008*

Gawande, K.; Krishna, P. and Olarreaga, M. (2009). "What Governments Maximize and Why: The View from Trade" - *International Organization, Cambridge University Press, vol. 63(03), pages 491-532*

Görener, A. (2012). "Comparing AHP and ANP: An Application of Strategic Decisions Making in a Manufacturing Company." - *International Journal of Business and Social Science Vol. 3 No. 11; June 2012*

Heo, E.; Kim, J. & Cho, S. (2012). "Selecting hydrogen production methods using fuzzy Analytic Hierarchy Process with opportunities, costs, and risks" - *International journal of hydrogen energy 37 (2012) 17655-17662*

Hong, F. & Xiaozheng, X. (2010). "Communist China: Sport, Politics and Diplomacy" - *The International Journal of the History of Sport Publication details, published online: 08 Sep 2010.*

Karlsson, J. & Ryan, K. (1997). "A Cost-Value Approach for Prioritising Requirements" – *IEEE Software September/October, 1997, pp. 67-74.*

Karlström, D.; Runeson, P. & Wohlin, C. (2002). "Aggregating Viewpoints for Strategic Software Process Improvement - A Method and a Case Study" - *IEE Proceedings - Software Engineering, Vol. 149, No. 5, pp. 143-152*

KPMG (2011). "European Stadium Insight 2011" – *Research report from KPMG Tanácsadó Kft. with KPMG International Cooperative*

Krein, J. (2006). "What are the arguments regarding the use of public funds to subsidize sports venue construction, and what role does corporate naming rights have in the argument?" - *Computer Skills for Economics, Module 4: Research Essay, October 13, 2006*

Kuijstermans, C. (2012). "Sustainability: does it influence investors' decision?" - *Graduation thesis, Construction Management & Engineering, Eindhoven University of Technology, march 21st, 2012*

Mansoorian, A. & Myers, G.M. (1994). "On the consequences of government objectives for economies with mobile populations" - *Journal of Public Economics 63 (1997) 265-281*

Marchand, A., Walker, S. & Tim Cooper, T. (2010). "Beyond Abundance: Self-Interest Motives for Sustainable Consumption in Relation to Product Perception and Preferences" - *Sustainability 2010, 2, pp. 1431-1447*

Metze, M.; Engbers, J.; Den Boer, H.; Logger, B. & Pinster, J. (2011). "Overheid steunt betaald voetbal met ruim 1 miljard euro" – *Results of a masterclass research, De Groene Amsterdammer, 18-05-2011*

Miller, E.A. (2005). "Taxpayers Should Cry Foul Over Stadium Subsidies" - *Washington Post, July 24, 2005*

Montesquieu, C. de (1748). "De L'Esprit des Lois" - *Genève 1750*

Nishizawa, K. (2012). "Normalization method based on dummy alternative with perfect evaluation score in AHP and ANP" - *Systems and Technologies, Volume 15, pp. 253-262*

Pruijsen, K.W. (2004). "Checklist meetbare doelstellingen DIBB / programmabegroting" - *Afdeling Onderzoek en statistiek, Municipality of Nijmegen, February 2004*

Saaty, T.L. (1987). "The Analytic Hierarchy Process – What it is and how it is used", *Mathl Modelling, Vol. 9, No. 3-5, pp. 161-176*

Saaty, T.L. (2005). "The Analytic Hierarchy and Analytic Network Processes for the Measurement of Intangible Criteria and for Decision-Making" - *International Series in Operations Research & Management Science Volume 78, 2005, pp. 345-405*

Santo, C.A. (2005). "The economic impact of sports stadiums recasting the analysis in context" - *Journal of Urban Affairs, Volume 27, Number 2, pp. 177-191.*

Santo, C.A. (2007). "Beyond the economic catalyst debate: can public consumption benefits justify a municipal stadium investment?" - *Journal of Urban Affairs, Volume 29, Number 5, pp. 455–479.*

Sapotichne, J. (2012). "Rhetorical strategy in stadium development politics" - *City, Culture and Society 3 (2012) pp. 169–180*

Schulenkorf, N. (2009). "The roles and responsibilities of a change agent in sport event development projects" - *Sport Management Review 13 (2010) pp. 118–128*

Suárez Bello, M.J. (2003). "A case study approach to the supplier selection process" - *Management Systems Engineering*

Thompson, D. (2005). "China's soft power in Africa: from the 'Beijing consensus" to health diplomacy" - *China Brief: Volume 5, Issue 21 (October 13, 2005)*

Von Aichberger, S. (2013). "Alwitra's largest solar roofing membranes yet" - *PHOTON International, March 2003* - (last obtained on April 9th, 2013)

Wang, Y.J. (2010). "Fuzzy multi-criteria decision-making based on positive and negative extreme solutions" - *Applied Mathematical Modelling 35 (2011) 1994–2004*

Wembley Stadium's Sustainability Project Team (2012). "Wembley Stadium - CRC Energy Efficiency Case Study" - *Case Study produced by the Wembley Stadium Sustainability Manager and Eco Consultancy*

WVB Marketing (2007). "Betekenis PSV voetbal" - Commissioned by Gemeente Eindhoven and PSV NV

Yakita, A. (1994). "Public Investment Criterion with Distored Capital Markets in an Overlapping Generations Economy" - *Journal of Macroeconomics, Fall 1994, Vol. 16, No. 4, pp. 715-728*

Yunus, R. & Yang, J. (2011). Sustainability Criteria for Industrialised Building Systems (IBS) in Malaysia - *Procedia Engineering 14 (2011) pp. 1590–1598*

Zaizen, M., Urakawa, T., Matsumoto, Y. & Takai, H. (1999). "The collection of rainwater from dome stadiums in Japan" - *Urban Water 1 (1999) 355-359*

Books

Bhushan, N. & Rai, K. (2003). "Strategic Decision Making: Applying the Analytic Hierarchy Process". *Springer-Verlag London, 2004; ISBN 1852337567*

Howlett, R.J. & Jain, L.C. (2004). "Intelligent Decision Technologies", *Springer New York, ISBN 978-3-642-29976-6*

John, G., Sheard, R. and Vickery, B. (2007). "Stadia: A Design and Development Guide ", *Published by Elsevier Limited, ISBN: 978-0-75-066844-X*

Nederlands Architecteninstituut (2000). "Het stadion – de architectuur van massasport", *NAi uitgevers, Rotterdam, ISBN: 90-5662-144-0*

Reurink, F. (2008). "Het stadioncomplex"*, Het sporthuis, 2008, ISBN: 978-90-295-6474-8*

Saaty, T.L. & Vargas, L.G. (2006). "Decision Making with the Analytic Network Process", *Springer New York, ISBN 978-1-4614-7278-0*

World Wide Web

Beard, E. (2011). "China, why Costa Rica?" - on 16 November 2011, http://www.thefootballramble.com/blog/entry/china-why-costa-rica (last obtained: July 15th, 2013)

Bloemers, H. (2011). A quote from the commercial director of football club De Graafschap Doetinchem on the website of Dutch energy company Eneco. - http://corporatenl.eneco.nl/nieuws_en_media/Persberichten/Pages/eneco-onderzoekt-hoe-duurzaam-nieuwe-stadion-de-graafschap-kan.aspx (last obtained: April 8th, 2013)

Duurzaam Vastgoed (2010). "Energy Valley maakt van Euroborg meest duurzame stadion van Europa" - *http://www.duurzaamvastgoed.com/energy-valley-maakt-van-euroborg-meest-duurzame-stadion-van-europa* (last obtained: May 12th, 2013)

Eneco (2011). "Stadion De Graafschap: hoe duurzaam kan het?" - *http://corporatenl.eneco.nl/nieuws_en_media/Persberichten/Pages/eneco-onderzoekt-hoe-duurzaam-nieuwe-stadion-de-graafschap-kan.aspx* (last obtained: April 8th, 2013)

European Commission (2013). Eurostats: Half-yearly electricity and gas prices - *http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Electricity_and_natural_gas_price_statistics*

Government of South Australia (2013). "Roles, functions and objectives of councils" - *http://www.localgovt.sa.gov.au/how_councils_work/roles,_functions_and_objectives_of_councils* (last obtained: July 16th, 2013)

Greenium (2013). Website of Dutch energy company Greenium - *http://www.greenium.nl/nieuws/greenium-voorziet-afas-stadion-van-honderd-procent-groene-energie* (last obtained: April 8th, 2013)

Inbuilt (2010). "BREEAM versus LEED" - *http://www.inbuilt.co.uk/media/406565/breeamvsleed.pdf* (last obtained: April 18th, 2013)

Nuon (2011). "Video Amsterdam Arena" - *http://www.nuon.nl/grootzakelijk/nieuws-en-kennis/videos/video-amsterdam-arena.jsp* (last obtained: April 8th, 2013)

Overheid.nl (2013). "De gemeente" - *http://www.overheid.nl/zowerktdeoverheid/ wievormendeoverheid/degemeente* (last obtained: April 22th, 2013)

Rijksoverheid (2013). "Taken van de gemeente" - *http://www.rijksoverheid.nl/onderwerpen/ gemeenten/taken-gemeente* (last obtained: April 22th, 2013)

Will, R. (2011). "China's Stadium Diplomacy" – *Date published: 10-21-2011* - http://uschina.usc.edu/w_usci/showarticle.aspx?articleID=17566&AspxAutoDetectCookieSupport=1 (last obtained: July 15th, 2013)

World Building Directory (2013). "New RCD Espanyol Football Stadium" *http://www.worldbuildingsdirectory.com/project.cfm?id=2825* (last obtained: April 10th, 2013)

Woonhelp (2013). "Bouwbesluit Energiezuinigheid: Thermische isolatie" - *http://www.ekbouwadvies.nl/bouwbesluit/energiezuinigheid/vervangenkozijnen.asp* (last obtained: April 7th, 2013)

Interviews

Broek, F. van den (2013). Interview with the vice-chairman of the VVD party in Eindhoven and councillor of the municipality of Eindhoven – *May 14th, 2013 in Eindhoven*

Epema, M. (2013). Interview with sustainability expert and project manager Maarten Epema of the consultancy company Draaijer+partners in Bunnik – *April 15th, 2013 in Bunnik*

Hellinga, H. (2013).* Interview with stadium expert and project manager Hylke Hellinga of the consultancy company Draaijer+partners in Bunnik – *March 26th, 2013 in Rotterdam*

Hellinga, H. (2013).* Interview with stadium expert and project manager Hylke Hellinga of the consultancy company Draaijer+partners in Bunnik – *April 25th, 2013 in Bunnik*

Veenbrink, B. (2013). Interview with the CEO of The Stadium Consultancy BV in Naarden, UEFA stadium consultant, director of stadium Euroborg in Groningen, and former director of the Amsterdam ArenA – *May 17th, 2013 in Naarden*

* *After the two interviews with Hylke Hellinga multiple meetings followed which had a more coaching nature.*

Appendices

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Appendix 1 Shareholders of Dutch stadiums

Stadium	Municipality	Owner	User	Capacity
Kyocera Stadion	Den Haag	ADO (**main building owned by municipality**)	ADO	15,000
Amsterdam ArenA	Amsterdam	Stadium company (**municipality 50%? owner**)	Ajax + **concerts**	53,000
AFAS Stadion	Alkmaar	Independent stadium company	AZ	17,000
Stadion Feijenoord	Rotterdam	Independent stadium company	Feyenoord **+ conc.**	51,150
Euroborg	Groningen	Stadium company (**municipality 50%? owner**)	FC Groningen	22,550
Abe Lenstra Stadion	Heerenveen	Partly SC Heerenveen, **partly municipality**	Heerenveen **+ conc.**	26,100
Polman Stadion	Almelo	**100% Municipality**	Heracles	8,500
Rat Verlegh Stadion	Breda	**100% Municipality**	NAC	19,000
De Goffert	Nijmegen	**100% Municipality**	NEC	12,500
Ijsseldelta Stadion	Zwolle	PEC (**<2003: 100% municipality**)	PEC	12,500
Philips Stadion	Eindhoven	PSV (**ground owned by municipality**)	PSV **+ concerts**	35,000
Mandemakers Stadion	Waalwijk	**100% Municipality**	RKC	7,500
Parkstad Limburg Stadion	Kerkrade	**37% Roda JC, 63% Municipality**	Roda JC	20,000
Gem. Sportpark Kaalheide	Kerkrade	**100% Municipality**	Roda JC	21,500
Grolsch Veste	Enschede	FC Twente (partly financed with public loan)	FC Twente	30,200
Stadion Galgenwaard	Utrecht	Curator of Midreth (€25 mln of munic. claim)	FC Utrecht	24,500
Gelredome	Arnhem	FGH Bank (**<2006: 100% municipality**)	**Concerts** + Vitesse	25,000
De Koel	Venlo	**100% Municipality**	VVV	8,000
Koning Willem II Stadion	Tilburg	**100% Municipality**	Willem II	14,500
Fly Brazil Stadion	Apeldoorn	AGOVV ama. (**<1999: 100% municipality**)	AGOVV amateurs	3,500
Mitsubishi Forklift Stadion	Almere	Project developer Kroonenberg	Almere City	3,000
Cambuur Stadion	Leeuwarden	Cambuur (**ground owned by municipality**)	Cambuur	10,250
De Vliert	Den Bosch	**100% Municipality**	FC Den Bosch	8,500
GN Bouw Stadion	Dordrecht	FC Dordrecht (**ground owned by municipality**)	FC Dordrecht	4,500
Jan Louwers Stadion	Eindhoven	**100% Municipality**	FC Eindhoven + PSV	4,500
Univé Stadion	Emmen	**100% Municipality**	FC Emmen	8,600
Stadion Woudestein	Rotterdam	Excelsior (**partly financed by municipality**)	Excelsior	3,500
Trendwork Arena	Sittard	Project developer Dik Wessels	Fortuna	12,500
De Adelaarshorst	Deventer	**100% Municipality**	Go Ahead Eagles	6,700
De Vijverberg	Doetinchem	De Graafschap (**<1998: 100% municipality**)	De Graafschap	12,600
Haarlem Stadion	Haarlem	**100% Municipality**	~~Haarlem~~	3,500
Lavans Stadion	Helmond	**100% Municipality**	Helmond Sport	4,100
De Geusselt	Maastricht	**100% Municipality**	MVV	10,000
Frans Heesen Stadion	Oss	**100% Municipality**	FC Oss	4,650
RBC Stadion	Roosendaal	**100% Municipality**	~~RBC~~	5,000
Het Kasteel	Rotterdam	**100% Municipality**	Sparta	11,000
TATA Steel stadion	Velsen	**50% municipality**, 50% curator Memid	Telstar	3,250
De Langeleegte	Veendam	**100% Municipality**	~~SC Veendam~~	6,300
Kras Stadion	Volendam	**100% Municipality**	FC Volendam	8,500
Wageningse Berg	Wageningen	**100% Municipality**	~~FC Wageningen~~	6,800

Table 14.1.1 | *An overview of who is owning the football stadiums in the Netherlands (Metze, 2011)*

Appendix 2 Stadium investors

There are a lot of different investors in stadiums; public parties, sponsors, banks, building consortiums and the using sports club itself. Because this research has to be as up-to-date as possible, the investors of four very recent stadium development projects are analysed.

Grand Stade Lille Métropole (50,000 seats)

This in 2012 built stadium with a capacity of 50,000 seats in the France city Lille costed about 618 million euros, including 282 million euro for the stadium itself, 42 million euro for additional development such as parking, hotels, and restaurants, and 96 million euro to ensure that it meets seismic standards for that area. The table with investments of the municipality and the club also includes operational and ownership costs.

Investor	Investment	Remarks
Municipality of Lille	€ 24,700,000	*every years, over 31 years*
Lille OSC (*the using club*)	€ 7,500,000	*every year*
Regional government	€ 45,000,000	*once*

Table 14.2.1 | *Investments Grade Stade Lille Métropole*

2011 - Grolsch Veste, Enschede (30,000 seats)

The stadium in the city of Enschede was expended from 13,500 seats to 24,500 seats (2008, € 50 million) and later to 30,000 seats (2011, € 17 million).

Investor	Investment	Remarks
Municipality of Enschede	€ 20,000,000	*loan*
Province of Overijssel	€ 15,000,000	*mortgage*
Private investors	€ 10,000,000	*once*
FC Twente (*the using club*)	€ 5,800,000	*once*

Table 14.2.2 | *Investments Grolsch Veste; expansion, 2008 (TSC, 2007)*

Investor	Investment	Remarks
Municipality of Enschede	€ 8,700,000	*loan*
Province of Overijssel	€ 2,500,000	*once*
Private investors	€ 6,500,000	*once*

Table 14.2.3 | *Investments Grolsch Veste; expansion, 2011 (Volkskrant, 2010)*

2006 - Euroborg, Groningen (22,000 seats)

The construction costs for the Euroborg park in Groningen were € 190 million, from which only € 45.5 million for the stadium itself (*FC Groningen, 2013*). The stadium is financed with 'five financial courses' (*FC Groningen, 2013*), from which the municipality of Groningen is by far the largest; € 15,500,000 (*Volkskrant, 2003*).

2004 - Borussia-park, Mönchengladbach (54,000 places)

The stadium of Borussia Mönchengladbach is a role model for low finance building. The stadium with a capacity of 54,000 is built for only € 86,9 million (*architekten24, 2004*).

Municipality	BVO	Kind of investment
Rotterdam	Feyenoord	On July 11th it will be decided if the municipality will give a guarantee of € 165,000,000.- for the new stadium

Table 14.2.4 | *Investments Borussia-park*

Appendix 3 Stadium projects today

Even during this research Dutch municipalities were dealing with the question to invest in a stadium project or not. A majority of these municipalities still agreed with a certain investment.

Dutch municipalities decided to invest in 2013

Municipality	BVO	Kind of investment
Kerkrade	Roda JC	Lowered the rental price with € 300,000
Dordrecht	FC Dordrecht	€ 1,700,000 in the infrastructure of the new stadium area
Almelo	Heracles	Gave permission for a land-use plan that is contradictory to their economic policy regarding shopping areas

Table 14.3.1 *| Dutch municipalities decided to invest in 2013*

Dutch municipalities refused to invest in 2013

Municipality	BVO	Kind of investment
Venlo	VVV	The municipality withdraw their promised investment

Table 14.3.2 *| Dutch municipalities refused to invest in 2013*

Dutch municipalities still deciding whether or not to invest in 2013

Municipality	BVO	Kind of investment
Rotterdam	Feyenoord	On July 11th it will be decided if the municipality will give a guarantee of € 165,000,000.- for the new stadium

Table 14.3.3 *| Dutch municipalities still deciding whether or not to invest in 2013*

On July 11th 2013 the municipality of Rotterdam decided not to invest in the current design of the stadium and that Feyenoord had to come up with a new alternative.

Appendix 4 Environmental behaviour

The vast majority of the people in the Netherlands is concerned about the environment. However, environmental awareness is no guarantee for sustainable behaviour. This is caused by a lack of knowledge (what is possible? or, what are the consequences for the environment?), costs (sustainable products are often more expensive) and comfort (environmental behaviour is generally seen as discomfort). (CBS, 2010)

Also the motive for people to behave environmental is deferring. You can distinguish three types of motives, although different study use different groups (CBS, 2010; Marchand, *et al.* 2010):

- Legitimacy or automatism (there are no suitable or legal alternatives)
- Profitability and image (it saves money or it attracts more customers)
- Solidarity with future generations (social behaviour or a feeling of responsibility)

Legitimacy and automatism

Environmental problems are a common recognized issue, but does not always have a problem owner. Therefore, public authorities are usually the first to put sustainability on their agenda. This can be environmental behaviour of themselves or the introduction of new environmental regulations. These regulations can motivate people by automatism (e.g. separating of waste in different dumpsters) or by penalties (e.g. companies need a carbon-dioxide filter on their chimney or else they get a fine). This legitimacy can also cause automatism because it excludes all other alternatives (*CBS, 2010*). For example, you cannot buy or rent a new house without energy saving double glass, because single glass window frames are banned by the Dutch government (*Woonhelp, 2013*).

Profitability and image

With keeping a company running as the core business of the most companies, the saving of money could be an important motive for environmental behaviour. The long-term vision of a company could help them realize that investments in sustainability could gain them money in the nearby or long-term future. This could be all kinds of adjustments, from changing the business in a company, changing the way of thinking of their employees or technical adjustments like solar panels or heat recovery. The profitability of these adjustments are strongly differing, which makes it necessary to make a business plan of its costs and revenues in the future in order to see if it is profitable or not. This profitability can also be cause by indirect benefits. Customers could (also unknowingly) be more attracted to companies with environmental responsibility. This could be a positive side effect of environmental behaviour or maybe the main motive for a company to become more sustainable.

Solidarity with future generations and feeling of responsibility

The inner feeling of responsibility to future generations is the last kind of motive for environmental behaviour. Although it is hard to proof if this is the real motive of a company or person, it is the most socially appreciated motive. That is because this motive is the most sincere one, which makes a person or party more reliable towards potential customers (*Hellinga, 2013*). For example, if regulations change or the profitability of this sustainable adjustments changes, it is more likely they will still continue their environmental behaviour.

Corporate sustainability

However, if you look at the motive for environmental behaviour of the most companies or organisations, it is a combination of all these things. If sustainable behaviour is not the result of someone's own feeling of social responsibility, people will notice that they only act out of self-interest, which can result in the opposite of the intended effect on people (*Hellinga, 2013*). Most companies looking for the synergy between sustainability and profitability. A company could have a feeling of social responsibility, but should always keep looking at the profitability of it. This results in a continuing desire for environmental behaviour for companies, which will be met when a suitable chance (e.g. a profitable sustainable adjustment) occurs.

Sustainability for municipalities

The same goes for sporting clubs in the Netherlands. Dutch professional sports clubs have a desire for environmental behaviour, because of their own feeling of responsibility and also the advantages regarding their public image (*Bloemers, 2011; Gerbrands, 2013*). These desire is met when for example an energy company (e.g. Essent and the Euroborg, NUON and the Amsterdan Arena, Greenium and the AFAS Stadion) is willing to finance the sustainable adjustments for the stadium (*Ecceco, 2011; NUON, 2011; Greenium, 2013*). Furthermore, also companies with sustainable products like Philips (*Bodenstaff, 2013*) are willing to finance environmental behaviour, in this case LED lighting in shops as a pilot of the Dutch foot company Marqt.

Sustainability for sports clubs

Dutch Football clubs already have difficulty to survive today, so they have less interest in investments for the future, especially if it is not profitable in the near future. Therefore, sustainability in terms of environmental behaviour is not a real objective for football clubs. However, if a private party is willing to finance technical adjustments that lower the operational costs, or if a relative small investment in sustainability can influence the public opinion and attract new or higher sponsor contracts, it suddenly becomes are very interesting option for a football club (e.g. FC Groningen, Ajax Amsterdam, and AZ Alkmaar).

Appendix 5 Benchmarks of BREEAM certification

1	**Management**						
1.1	Project management	1.2	Measure & monitor the impact	1.3	Integration area & accessibility	1.4	Maintenance
2	**Health**						
2.1	Visual comfort	2.2	Inside climate & air quality	2.3	Inside climate temperature & air humidity	2.4	Acoustics
2.5	Water quality	2.6	Safety & security				
3	**Energy**						
3.1	Energy use regarding installations	3.2	Total energy use	3.3	Energy use regarding building shape & material use	3.4	Energy use management
4	**Transport**						
4.1	Transport en mobility management	4.2	Transport facilities	4.3	Transport requirements		
5	**Water use**						
5.1	Efficiency drinking water	5.2	Water use management	5.3	Alternative sources	5.4	Wasting drinking water
6	**Materials**						
6.1	Adequate use of materials	6.2	Application environmental friendly materials	6.3	Application sustainable produced materials		
7	**Waste**						
7.1	Waste recovery	7.2	Increasing waste	7.3	Waste management & monitoring		
8	**Land use & environment**						
8.1	Long-term impact on biodiversity	8.2	Limit disturbance on biodiversity	8.3			
9	**Pollution**						
9.1	Local air-water-land pollution + light-sound pollution	9.2	Pollution through carbon	9.3			

Appendix 6 Case studies of sustainable developed stadiums

The Netherlands

Amsterdam Arena, - Amsterdam, the Netherlands

Info: 53.000 seats | build in 1996 | used for football, live concerts, entertainment and business events | stakeholders: Amsterdam Arena BV (the municipality of Amsterdam, AFC Ajax) and energy company NUON |

The Amsterdam Arena wants to become the first carob-dioxide neutral stadium in the Netherlands. They use 100% district heating from the energy plants of NUON, which saves 50% of the carbon-dioxide emission of their old gas heaters. In the future the stadium will get sustainable cooling from the NUON cooling centre. This saves 75% of the carbon-dioxide emission of their current cooling machines. Totally this results in an annual saving of about 815 tons of carbon-dioxide emission.

Furthermore, a sustainable HVAC-system will be installed, that monitors and controls all the individual rooms in the stadium. There are also planning to put state-of-the-art solar panels on the roof and maybe a wind turbine. This makes the Amsterdam Arena in off-peak periods an energy producer. And last, also waste-management will be implemented in the nearby future.

Euroborg – Groningen, the Netherlands

Info: 22.000 seats | build in 2006 | used for football games only | stakeholders: FC Groningen, the municipality of Groningen, energy company Essent and Imtech |

The club wants to become the 'greenest club of Europe' and an important part of this plan is the stadium. Essent paid for free changing point for electric cars, to stimulate electric driving. Essent also consults in energy savings to become energy neutral, like good heating and lighting management. LED will replace the current lighting and the field will heated with heat-and-cold storage. The municipality is looking to finance solar panels on the roof and Essent maybe will install wind turbines on the roof. A big LED screen with energy and water consumption will increase the environmental awareness of the crowd during the games. This environmental behaviour also has its impact on the surrounding area. This companies on

the neighbouring business park have also started to investigate the sustainable possibilities for themselves. In the future, FC Groningen desires a total cradle-to-cradle situation for the stadium and the business park (Imtech, 2013).

AFAS Stadion – Alkmaar, the Netherlands

Info: 17.000 seats | built in 2006 | used for football games only | stakeholders: AZ Alkmaar, energy company Greenium |

Energy company Greenium will provide the AFAS Stadion of 100% sustainable energy. The stadium will be heated with residual heat from domestic waste centrals, and in the future the stadium will be carbon-dioxide neutral. AZ wants to decrease their energy consumption and stimulate the local business and inhabitants of the province Noord-Holland to become more sustainable as well. AZ had planned to install solar panels on the stadium, but this plan failed due to external parties. Nevertheless, AZ is still interested in external initiatives for solar panels.

Rest of Europe

Imtech Arena - Hamburg, Germany

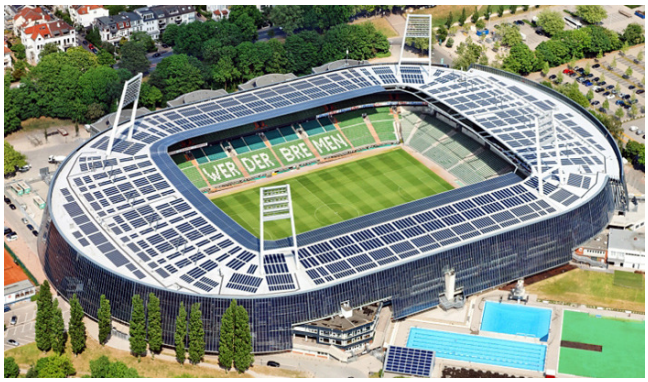
Info: capacity of 57,000 | (re)built in 1998 | used for football and live concerts | stakeholders: Hamburger SV and engineering company Imtech |

In return of the naming rights of the stadium, Hamburg engineering company Imtech improved the environmental situation of the stadium of Hamburger SV. In this way Imtech uses the stadium as an international sign to show what they are capable of regarding energy efficiency.

The reduction of energy consumption will be around 3,500 MWh, approximately 35% of the past emission rate (equal to € 450,000, regarding industrial Germany energy price of € 0.128 per KWh (EC, 2013)), with an overall annual reduction carbon-dioxide emission of 1,200 tons (about 200 single family homes). Furthermore, the letters and logos on the stadium are equipped with LED lights with the possibility to be dimmed, which results in an energy saving of 40%.

Weserstadion – Bremen, Germany

Info: capacity of 42.500 | (re)built in 2011 | used for football games only | stakeholders: SV Werder Bremen and engineers company Alwitra |



The stadium is renovated and provided with 10,470 m2 Solar waterproofing membranes, as an alternative for roofing which also generates 1000 MWh a year, equal to 300 German households. This results in an annual CO2 emission reduction of 450 tons. Costs: about € 4,000,000 (*Von Aichberger, 2013*).

Wembley Stadium – London, U.K.

Info: capacity of 90.000 | (re)built in 2007 | used for football, rugby, live concerts, entertainment and business events | stakeholders: the British Football Association |

The new Wembley Stadium has reduced energy (electricity) consumption year on year since opening. The annual percentage energy savings are shown below. The total reduction in 2011 energy consumption based on 2007 figures is 28%. Unusually for an organisation of Wembley's size, energy savings have been achieved through improved management rather than significant investment in new technologies. Some initiatives are detailed in the sections below. Annual saving (in comparison to the previous year): 17.3% (2008), 4.4% (2009), 2.6% (2010), 7.2% (2011) (UK government, 2012).

Estadi Cornellà-El Prat - Barcelona, Spain

Info: capacity of 42.000 | built in 2010 | used for football and live concerts | stakeholders: RCD Espanyol and energy company Trina Solar |

The stadium cost only € 62 million, and with € 1,500 per seat it is a reference for modern stadium costs. Trina Solar became shirt sponsor in

return of approximately € 3 million of solar panels, which will be located on the of the stadium and generate 680,000 kWh per year of electricity, the annual consumption of 200 homes. It will generate revenue for the club of more than € 217,000 per year through the sale of electricity.

Rest of the World

Estádio Nacional - Brasilia, Brazil

Estádio Nacional de Brasília is the only LEED platinum certified stadium in the world (*AutoCAD, 2013*). The new stadium in the capital city of Brazil is an ecologically correct building and may annual reduce operating costs up to € 2,660,000 due to: energy efficiency; smart use of water, materials and resources; indoor environmental quality; sustainable sites; and innovations and technologies, scoring at least 80 out of the maximum 100 points for LEED.

Rigorous compliance may initially increase building costs by up to 5%. In the long term, however, maintenance and operating costs will drop dramatically. “Our advantage is that sustainability is an integral part of the project's design, which makes the goal easier to achieve." (*Copa2014, 2013*)

Characteristics of sustainable stadiums in the USA

Stadium projects in the United States of America are considered in a whole other way than in the rest of the world. Municipalities are more convinced in the social and economic impact of stadiums in their city and are therefore less concerns about providing public financial support to stadiums. Also regarding environmental behaviour, it is not an exception than US municipalities providing millions of dollars of extra financial support for environmental measures. Therefore no case studies are done about specific stadiums in the USA, but in regard to their sustainability measures it can provide new insights in sustainable stadium development in general.

The aspects of sustainable (re)developed stadiums in the USA are mostly the same is in Europe and the rest of the world, except that these adjustments are more extreme in the USA. For example, the Marlins park in Miami has a 8,000-ton retractable roof that can be opened or closed with only $ 10,- in energy costs.

Stadium development projects		*Attendance*			*League performance*			*Budget*		
Football club	**Year**	**Previous 5 years**	**Next 5 years**	**Last 5 years**	**Previous 5 years**	**Next 5 years**	**Last 5 years**	**Previous year**	**Next year**	**After 5 years**
PEC Zwolle	2011	4.139	**9.005**	**6.129**	25	**19**	**19**	€ 4,1 mln	**€ 7,1 mln**	N.A.
FC Twente	2008	13.124	**25.581**	**25.581**	6	**3**	**3**	€ 15,1 mln	**€ 28,5 mln**	**€ 45,4 mln**
ADO Den Haag	2007	6.579	**10.628**	**10.628**	16	**15**	**15**	€ 8,1 mln	**€ 10,8 mln**	**€ 14 mln**
FC Groningen	2006	12.792	**20.823**	**21.350**	14	**7**	**8**	€ 10,4 mln	**€ 12,5 mln**	**€ 17,25 mln**
Heerenveen	2006	14.227	**23.049**	**25.528**	5	**5**	**8**	€ 21 mln	**€ 23 mln**	**€ 26 mln**
AZ Alkmaar	2006	7.748	**16.340**	**16.417**	6	**5**	**5**	€ 15 mln	**€ 22 mln**	**5 25 mln**

A self-performed research to the effect of the most recent Dutch stadium development projects, regarding; attendance, league performance and budget (EFS, 2013; VI, 2013)

Appendix 8 Ecorys report about Roda JC Kerkrade

The reports of the Dutch research company Ecorys, that determined the value of Roda JC for the municipality of Kerkrade, there are different ways the club or stadium can gain money for the municipality. Those can be grouped in the main aspects 'direct financial flows', 'economic value' and 'social impact'.

A professional football club creates jobs for the city and surrounding area. It also creates value with their activities. The difference between the turnover of the club and the costs of the purchased materials they used to offer products and services. If a club has a zero-budget, the housing costs and salary costs ('overhead costs', 63% in the case of Roda JC) are equal to the created value by the club. Both aspects stimulate the local economy (*Ecorys, 2012*). This way of value creating calculation is often used to determine the value of private companies or activities for the economy. The percentage of Roda JC (63%) is quite high regarding companies in other private sectors, caused by the relative high salary costs of a professional football club.

The stadium itself stimulates the image and branding of the surrounding (business) area. It therefore attracts companies to settle in or nearby the city. Those companies also have their own turnovers and job creation which both again stimulate the local economy. The stadium also increases the value of the surround ground, which is often property of the municipality (*Ecorys, 2012*). The purchase or ownership of the stadium by the municipality is usually cost-neutral, so the direct costs and revenue for the municipality is usually around zero. However, the financial risk for the municipality that the club could go bankrupt and not being able to pay back the public investment is an aspect that could be seen as an extra cost for the municipality, because in usual market conditions private parties should also include costs for these financial risk in their rental price (*Ecorys, 2012*). Regarding other entertainment and cultural activities, municipalities also provide financial support. Cultural activities, like sports and entertainment, are in general not self-supporting and therefore need public support. The height if this support depends on the width of the public support for the concerning event or project. This could be another reason why municipalities would support professional football clubs (*Ecorys, 2012*).

Furthermore, immaterial benefits of professional football for the municipality are: the enjoyment of watching or playing football for the inhabitants of the city, the promotion and branding of the city itself by the club because of the national popularity of the sport, and the club as an ambassador of promoting sports among the local youth.

Appendix 9 SWOT analyses of the six stadium development alternatives

Changing the management of the stadium

A very cheap option for making a stadium more beneficial is changing the management of the stadium. The attitude of the users and possible regulations can make that the stadium is used much more effective. This could be sustainable changes but also a better way of sharing the stadium, possible with other sports clubs or other kind of users.

For example, due to management changes of the Wembley stadium in London, about 28% of the energy use was reduced in the first 5 years of the new stadium (*UK government, 2012*).

SWOT analysis

	Helpful	Harmful
Internal origin	*Strengths* - Low change costs - Decrease of energy costs	*Weaknesses* - Possible change in managers - It takes time to change
External origin	*Opportunities* - More revenue due to events - Higher/divers social impact	*Threats* - No new exploitation facilities - No real big changes

SWOT analysis of changing the management of the stadium

Make technical adjustments to the stadium

When the existing facilities meet the requirements of the users of the stadium, a total renovation is not always necessary to change the use of the stadium. Technical adjustments can make the stadium more energy efficient and more sustainable. There are multiple examples of stadiums in the Netherlands and Germany where an energy company or an electrical company pays for the technical adjustments.

SWOT analysis

	Helpful	Harmful
Internal origin	*Strengths* - Very low construction costs - Lower energy and water use	*Weaknesses* - The stadium will not be changed according to the new user requirements
External origin	*Opportunities* - Sponsors might finance the new installations for their own promotion - New sponsors might be attracted to the stadium or the using sports club	*Threats* - Only the energy costs (about 10%) can be increased, which does not really decrease the municipal financial risks - It is not long-term solution

SWOT analysis of making technical adjustments to the stadium

Renovate and expand the stadium

The renovation of a stadium is a not expensive alternative if an existing stadium does not longer meet the modern requirements.

SWOT analysis

	Helpful	Harmful
Internal origin	*Strengths* - Low construction costs and time due to existing building - Infrastructure already (partly) exists - Less natural resources needed	*Weaknesses* - Major changes to the stadium are difficult to perform due to the existing building - Compromises and difficulties due to existing building
External origin	*Opportunities* - The area and local citizens are already adapted to the stadium - Supporters will appreciate the conservation of the historic stadium	*Threats* - Infrastructure could be outdated - The construction planning has to take the use of the current stadium into account

SWOT analysis of renovating the stadium

Building a new stadium

If the current stadium is hard to make profitable, because it has too little facilities and it is too expensive to renovate it, the construction of a new stadium can make the difference.

SWOT analysis

	Helpful	Harmful
Internal origin	*Strengths* - A best location with the best circumstances (e.g. infra + safety + nuisance) can be chosen - No compromises or difficulties due to existing building	*Weaknesses* - High construction costs - Demolishing costs - High use of natural resources - Legacy problems of the old stadium
External origin	*Opportunities* - Strategic building can be applied - Much publicity - Attract new events and other exploitation possibilities	*Threats* - Financial risks due to high mortgage - The historical value of the stadium is gone

SWOT analysis of building a new stadium

Demolish the stadium / sell the stadium to a private party

When it becomes clear that the stadium is really causing very high losses for the municipality and the acceptance of the waste of the investment costs is more beneficial than keep paying for annual ownership costs and financial risks for the long-term future, it may be more beneficial for the municipality to sell the stadium or give it away to the using sporting club or an interested third private party. And if there are no interests purchasers, then it is also an option to demolish the stadium, but of course only if the using club is bankrupt or does not need the stadium anymore because it has an alternative.

SWOT analysis

	Helpful	Harmful
Internal origin	*Strengths* - No extra costs and financial risk in the future	*Weaknesses* - Wasting the already invested money - Demolishing costs have to be made
External origin	*Opportunities* - Ground can be sold or be used for other purposes - Opponents of football will appreciate the decision of the municipality - The money could be put in other public matters	*Threats* - Heavy riots in the city/country - The using club needs a new stadium (or using the stadium of another local club) - A purchaser of the stadium/ground has to be found

SWOT analysis of demolishing/selling the stadium

Passive approach

If the municipality decides not to invest in the stadium at all, because the investment will not be recouped, than there is the last alternative to choose a passive approach and leaving the stadium as it is.

SWOT analysis

	Helpful	Harmful
Internal origin	*Strengths* - No extra costs - No extra financial risk	*Weaknesses* - The annual loss of the stadium will continue
External origin	*Opportunities* - No protests from opponents of public support to sports clubs	*Threats* - The old financial risks remain, like a vacant stadium after bankruptcy of the club - The stadium will be outdated in the future

SWOT analysis of a passive approach regarding stadium development

Appendix 10 Case study of Stadion Feijenoord

Although, Stadion Feijenoord is not owned by a public party, the current situation of the stadium is a suitable case study for this research. The municipality of Rotterdam admits recognizes the public benefits of Feyenoord and the exploitation of the stadium. However, they are still considering if they want to invest in the renovation of the stadium or construction of a new state-of-the-art stadium. First, the municipality wants to know the (financial) risks of such an investment, and of course they are looking at the benefits for their city. The sports club itself and the owning company of the stadium both claim that a new stadium is the best option for the club and the city, but the fans and inhabitants of Rotterdam want to renovate the current stadium. In this case it is useful for the municipality to know which option is the most beneficial for them, before they are investing in the stadium.

Name	Stadion Feijenoord
Nickname	De Kuip
User(s)	Feyenoord; Dutch national football team; Dutch cup finals; live music concerts
Owner	Stadion Feijenoord N.V. (main shareholder is the amateur sports club S.C. Feyenoord)
City	Rotterdam, the Netherlands
Capacity	51,137 seats (of which 85% is roofed)
Past capacity	65,000 places (about 20% roofed)
Built	from 1935 to 1937
Renovated	In 1994
Architects	Leendert van der Vlugt; Broekbakema (renovation)

History

In 1931 Leen van Zandvliet, director of Sport Club Feijenoord, came with the idea to build a large stadium for the harbor club of Rotterdam. The first stadium in the world with a second tier all around the field. The tier should hover so no pillars were needed that bock the view for the first tier. The stadium was financed with support of local harbour businessman D.G. van Beuningen. The infrastructure was financed and realized by the municipality.

Events

Of course football club Feyenoord played all of its home games in De Kuip since 1937, but next to this the stadium also hosted ten European cup finals and one European Championship final in 2000, the Dutch national team played over hundred games here, and since the end of the 70's more than eighty music concerts have took place in De Kuip.

Dutch Cup Finals

Bert van Oostveen (director professional football KNVB): ''Since 1989 the Dutch cup finals are played in Stadion Feijenoord. 'De Kuip' hosted 38 cup finals, from which 37 since the introduction of professional football in the Netherlands in the season 1954/55.

The first cup finals since this tradition was PSV – FC Groningen in 1989, which only attracted 9.483 spectators (RSSSF, 2013).

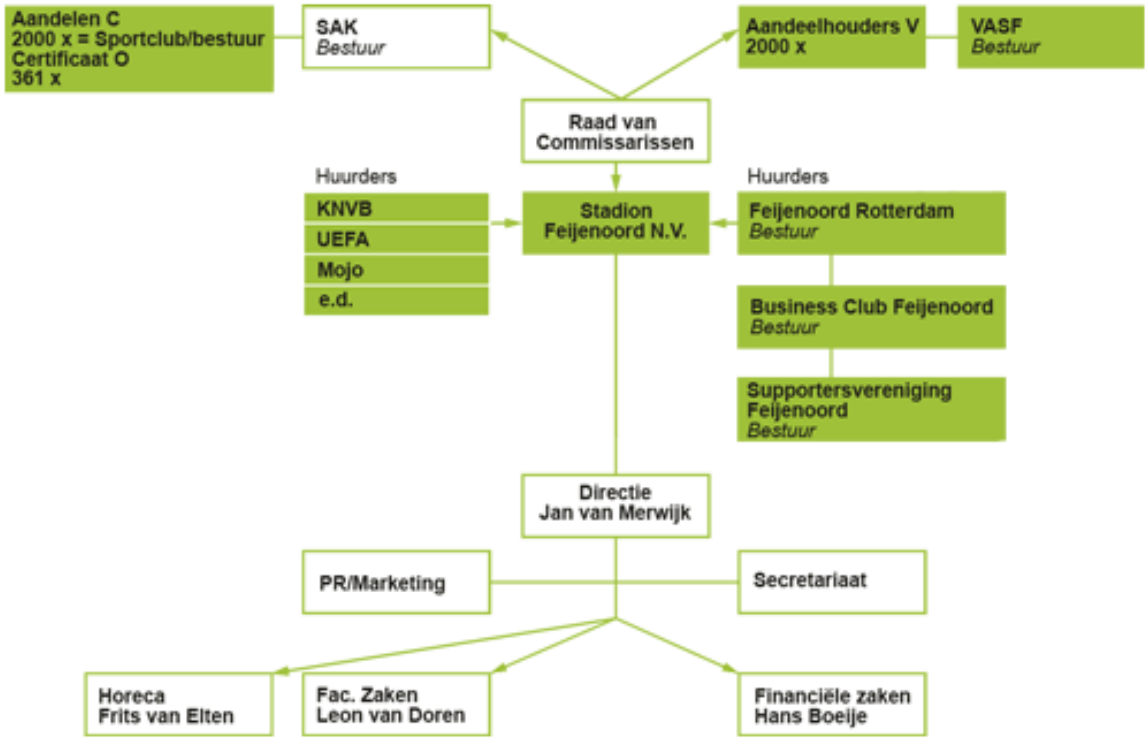
Current condition

The current stadium, which is renovated in 1994, has again lots of shortcomings. For example, due to safety regulations only 47,000-49,000 of the total amount of 51,177 seats in the stadium can be used. Furthermore, there are much too few business seats for such a large football club. Also other facilities are not sufficient for the current standards in top sports. For example, tens of seats have to be removed to make room for the cameras.

Other facilities, like toilets and food & beverage, have to be rented externally and placed outside the stadium during every event. According to KNVB director Bert van Oostveen sponsors and fans are complaining about the comfort, and the infrastructure is also 'horrible' despite of the nearby train station and parking spaces.

Shareholders

Since the completion of the stadium the club Feyenoord and the stadium are different parties, although Feyenoord owned a majority of the shares in the stadium company. The other shares are owned by all kinds of persons, companies and organisations. When in 1978 the amateurs and the professional branch of the club formally split, the shares stayed at the amateur club SC Feyenoord, but were placed in the 'Stichting Administratiekantoor' (Administration Foundation). Since 1990 all formal links were cut between the sports club Feyenoord and the stadium company. This resulted in continuing argumentations about match day incomes and other revenue dividing. But, because the shareholders of the stadium are still emotionally bounded to the club, the stadium company always helped the club in difficult times and situations.



Demolishing or renovation

When the Dutch government wanted to host the Olympic Games of 1992, they were planning to build a new Olympic stadium on the ground of the Feyenoord stadium. These plans were cancelled and the Olympics went to Barcelona. Around the year 1990 there were plans to demolish the stadium because of carbonation and erosion of the concrete. Also safety and accessibility played an important role. Due to the historical and emotional value of the stadium, they decided to renovate the stadium. The renovation cost 120 million Gilder, which was financed by a loan from the municipality and 'founders' of the stadium (Amstel beer, contractor BAM, Pepsi cola, Port of Rotterdam, Plan@Office and Siemens). In 2013 still € 12,500,000 is left of that public loan (Feyenoord, 2013). New seats were installed which brought down the capacity from 65,000 to 51,137 spectators. Also a new roof was constructed that covered 85% of the seats. The stands next to the pitch are still not weather proof. And not unimportant, the concrete elements and steel structure were renovated.

Het Nieuwe Stadion (The New Stadium)

In 2006 Feyenoord started to make plans for a new stadium. The renovated stadium is also outdated, which caused less international matches or finals and less concerts, thanks to new stadiums like the Amsterdam Arena en the Gelredome in Arnhem. Again, due to the historical and emotional value of the stadium also plans are developed to renovated the current stadium for a second time. The direction of Feyenoord and Stadion Feijenoord N.V. think a renovation cannot meet the modern requirements of the use of a stadium. Also a research from the selected contractor VolkerWessels proved the financial advantages of a new stadium compared to the renovation of the current stadium.

Finance of the new stadium

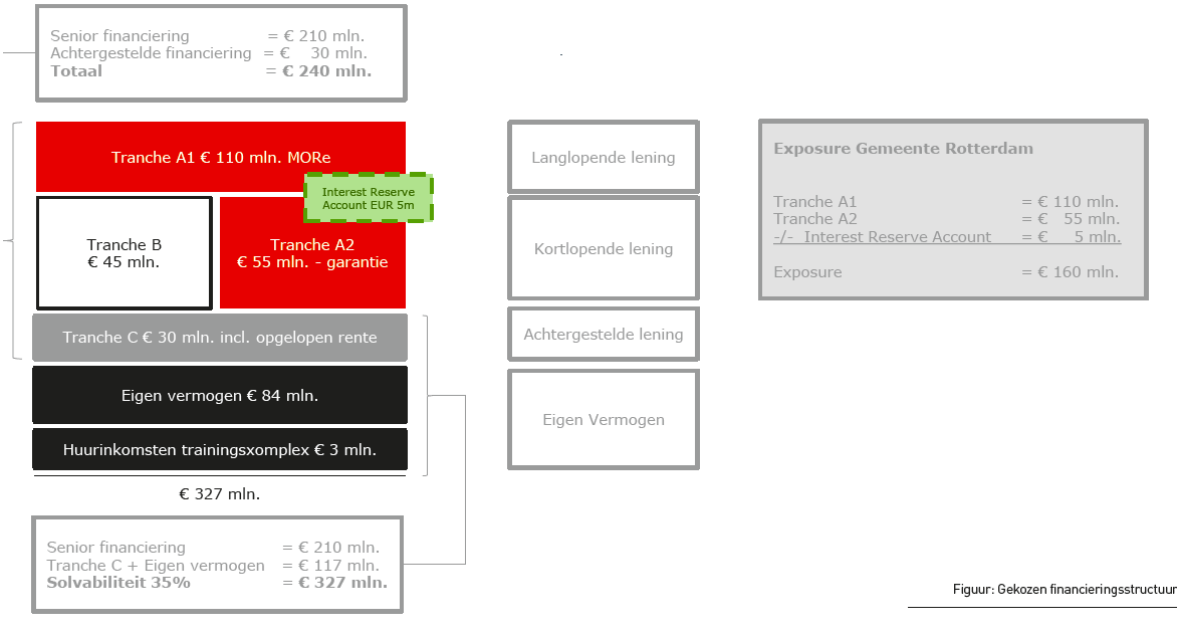
The new stadium would cost about 361.9 million euro. A commercial priced land transaction of 35 million euro from the municipality leaves still 327 million euro for the rest of the project. A bank consortium of the three largest Dutch banks, ING, ABN Amro and Rabobank, are willing to give a loan to Feyenoord if the municipality of Rotterdam will guarantee for an amount of € 160 million. The municipality is now investigating what the financial risks are for them.

Realisation costs	Costs
Land purchase	€ 35,000,000
Construction costs	€ 235,150,000
Honoraria	€14,400,000
Other costs	€ 2,750,000
Unforeseen costs	€9,000,000
Financing costs	€ 29,300,000
Reserve accounts	€ 5,000,000
Training ground Feyenoord	€ 14,000,000
General costs and insurance costs	€ 17,300,000
Total realisation costs	€ 361,900,000

The municipality has a ‘subordinated’ loan, which means that by disappointing exploitation revenues first the private parties have to take their losses. And only if the exploitation revenue will be 85% lower than expected will the municipality pay the residual creditors. In that case the municipality will become owner of the stadium, which they can exploit to recoup their losses.

Price per seats

The new stadium is a relatively very expensive stadium, due to all its modern facilities and sustainability measures. As a result the new stadium in Rotterdam is one of the most expensive stadiums build in the past fifteen years, regarding price per seat (*appendix 11*).



Figuur: Gekozen financieringsstructuur

Legacy of the old stadium

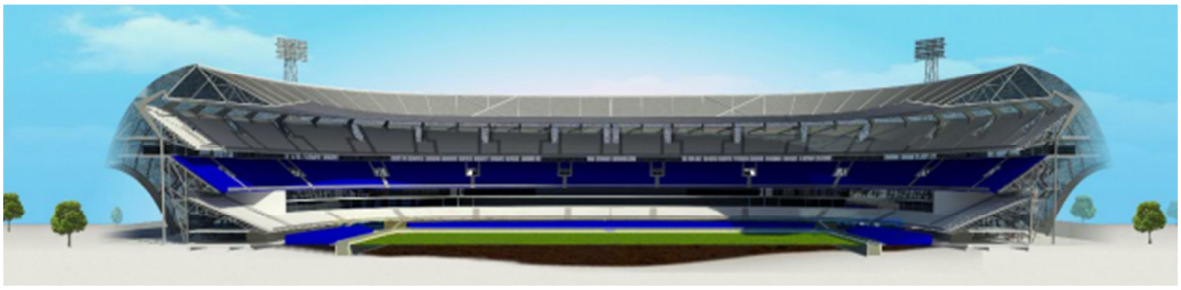
Because the current Stadion Feijenoord is a monument, all involved stakeholders want to keep the stadium. There are plans to 'back-renovation' of the stadium to its original design. Because there will be no constant user of the stadium when a new stadium is built, the exploitation of the stadium will be difficult. The annual maintenance costs of the stadium when it is not used are € 100,000 (VASF, 2012).

Energy use: the current stadium vs. the new stadium

Energy (per year)	'Het Nieuwe Stadion'	Current stadium
Heat demand	370,000 m3	556,731 m3
Cold demand	12,000 Giga Joule	0
Electricity	4,000,000 kWh	3,687,876 kWh
Water use	25,000 m3	16,799 m3
Total energy costs	ca. € 700,000	€ 477,812

Renovation project 'Red de Kuip' (Save the Kuip)

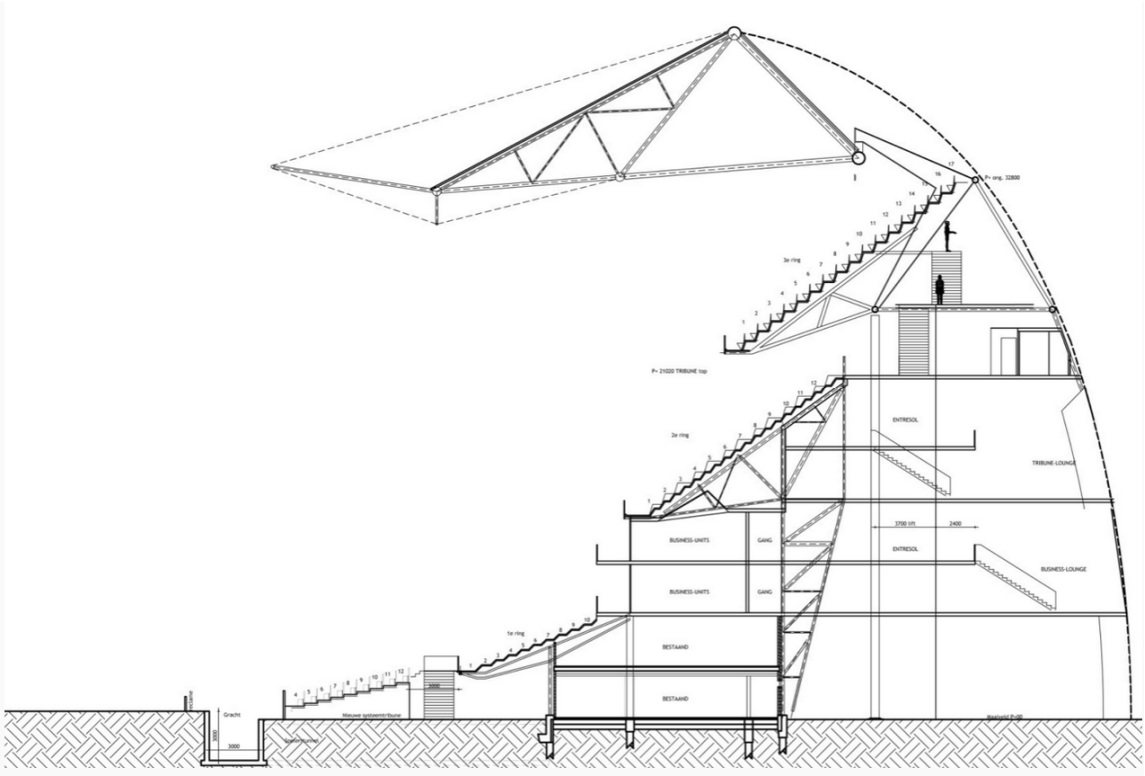
There is an independent group of experts that have come up with their own development plans for Stadion Feijenoord, because they are convinced that a renovation of the historical stadium is much better than the construction of a new stadium. The group consists of architects, engineers, lawyers, urban developers, entrepreneurs and students, which develop their plans in their own spare time. Because of the high expertise of the group, this development plan is regarded as a realistic and reliable plan (*Hellinga, 2013*).



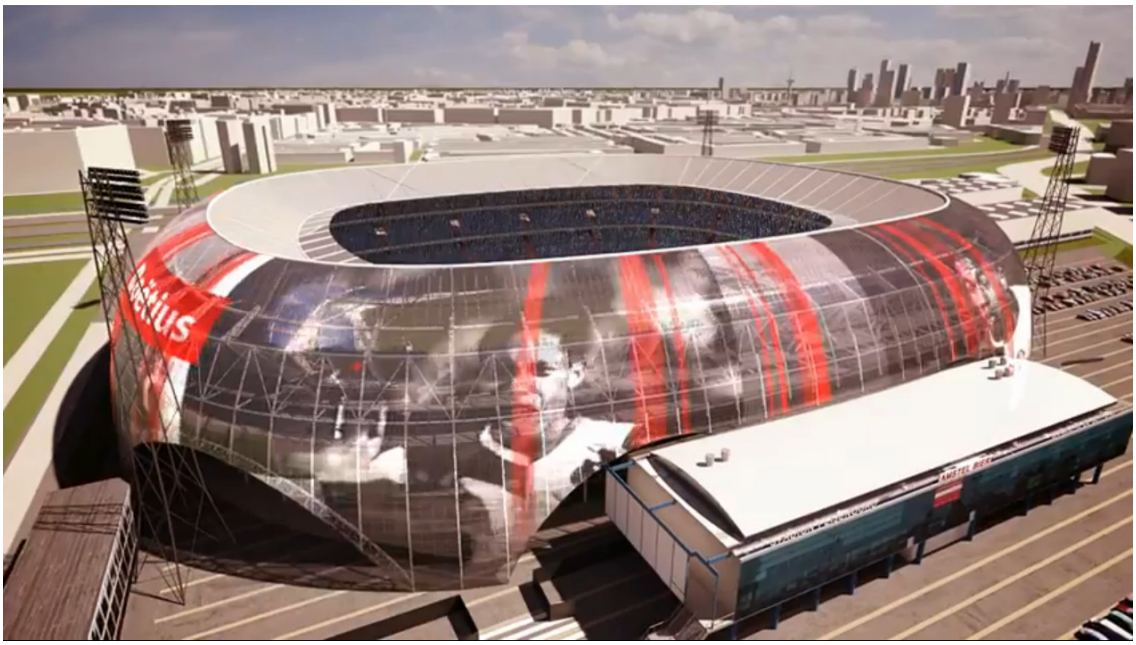
Section of the 3D render of the renovation plan of Stadion Feijenoord

<u>Numbers and figures of the plan</u>

- Construction costs of € 117,000,000 (ex. taxes)
- Annual profit from stadium exploitation will rice from € 12,000,000 tot € 35,000,000
- Capacity of 63,000 seats, from which 7,000 business seats
- 88 business units
- 4 business lounges with view on the pitch
- 4 restaurants with view on the pitch
- Conservation of training ground Varkenoord
- No additional infrastructure needed
- Conservation of the historical stadium
- 8 elevators
- New toilets and facilities on the second tier
- Corridor around the higher levels of the stadium
- Strong increase of the safety
- The right required surface area on every tier
- Modern design due to arcs, which keep the visibility of the old stadium structure
- Construction planning of just one season
- Multiple contractors are already interested
- Significant financial growth of the using sports club Feyenoord (from € 51m. to € 91m.)
- 82% of the Feyenoord fans and 60% of the citizens of the area Rijnmond support the renovation alternative of the stadium



Section of the renovation plans of Stadion Feijenoord.



3D bird view render of the renovation plans of Stadion Feijenoord.

Total floor space of the renovated stadium and the new stadium

Aspects	Red de Kuip	Het Nieuwe Stadion
Seats	63,846	63,000
Circulation outside	16,454 m^2	?
Circulation inside	15,828 m^2	14,431 m^2
Other circulation	5,992 m^2	6,868 m^2
Total circulation	21,820 m^2	21,300 m^2
Business units	88	90
Other business area	10,790 m^2	12,960 m^2
Business lounges	4	?
Total business area	17,982 m^2	18,040 m^2
Other spaces	10,692 m^2	10,868 m^2
Potential expansion	5,909 m^2	?
Total area	108,452 m^2	93,555 m^2

Investment costs renovated stadium

Cost	Red de Kuip	Percentage
Construction costs	€ 93,400,000	79.7 %
Other costs	€ 7,950,000	6.8 %
Legal fees	€ 1,350,000	1.2 %
Finance costs	€ 5,100,000	4.3 %
Contingencies	€ 9,340,000	8.0 %
Total	€ 117,140,000	100.0 %

Capacity current stadium vs. renovated stadium

Capacity stadium	Current stadium	Renovated stadium	Difference
Units and lounges	615	1,496	143 %
Business seats	3,659	5,504	50 %
Business	4,274	7,000	64 %
Tickets	46,726	56,000	20 %
Total capacity	51,000	63,000	24 %

Ticket revenue

Ticket revenue	Current stadium (11/12)	Renovated stadium	% difference
Match revenue	€ 10,431,000	€ 18,461,966	77 %

Budget per seat for Dutch top clubs

Benchmark 2011/12	Budget	Capacity	Budget/seat
Ajax Amsterdam	€ 104,000,000	52,960	1,964
PSV Eindhoven	€ 60,000,000	35,000	1,714
AZ Alkmaar	€ 28,000,000	17,023	1,645
FC Twente Enschede	€ 46,000,000	30,205	1,523
Vitesse Arnhem	€ 30,000,000	25,000	1,200
Feyenoord Rotterdam	€ 40,500,000	51,000	794

Food & beverage revenue

Revenue food & beverage	Current stadium (11/12)	Renovated stadium	Difference
Current situation	€ 6,830,000		
Banquet matches		€ 6,027,000	
Banquet week days		€ 2,850,000	
Spectator catering		€ 9,799,398	
Total budget	€ 6,830,000	€ 18,676,458	173 %
Purchase 'horeca'		€ 6,163,231	
Labor costs 'horeca'		€ 6,163,231	
Total profit		€ 6,349,996	

Rental income

Rental income	Number	Renovated stadium
Stadium – football matches	3	€ 525,000
Stadium – Events	2	€ 200,000
Subtotal		€ 725,000
Rent multi-functional space	1	€ 750,000
Commercial lettings	1	€ 0
Parking	1	€ 150,000
Total		€ 1,625,000

EBIT current stadium vs. renovated stadium

Comparison now and then	Financial report 2011/2012	%	Renovated stadium	%
Net budget				
Match revenues	€ 10,431,000	26.9 %	€ 18,461,966	20.2 %
Sponsoring	€ 19,982,000	51.6 %	€ 37,757,844	41.3 %
Media revenue	€3,198,000	8.3 %	€ 8,750,000	9.6 %
Funding	n.a.	n.a.	€ 100,000	0.1 %
Merchandising	€ 4,195,000	10.8 %	€ 6,000,000	6.6 %
Food % beverage	n.a.	n.a.	€ 18,676,458	20.4 %
Other revenue	€ 933,000	2.4 %	€ 1,625,000	1.8 %
Total revenue	€ 38,739,000	100 %	€ 91,371,268	100 %
Operating costs				
Labor costs	€17,236,000	44.5 %	€ 51,163,231	56.0 %
Sales costs	€ 6,757,000	17.4 %	€ 9,913,231	10.8 %
Housing costs	€ 4,538,000	11.7 %	€ 9.926,000	10.9 %
Match & training costs	€ 17,236,000	6.5 %	€ 3,250,000	3.6 %
General costs	n.a.	n.a.	€ 250,000	0.3 %
Depreciation costs	€ 268,000	0.7 %	€ 750,000	0.8 %
Other costs	€ 4,368,000	11.3 %	€ 500,000	0.5 %
Total costs	€ 35,667,000	92.1 %	€ 75,752,462	82.9 %
Total profit	€ 3,072,000	7.9 %	€ 15,618,806	17.1 %

Housing costs current stadium vs. renovated stadium

Costs	Current stadium	Renovated stadium	% difference
Labor costs			
Sportive budget team	€ 12,065,200	€ 35,000,000	190 %
Labor costs organization	€ 5,170,800	€ 10,000,000	193 %
Labor costs 'horeca'	n.a.	€ 6,163,231	n.a.
Subtotal	€ 17,236,000	€ 51,163,231	297 %
Purchase costs			
Purchase 'horeca'		€ 6,163,231	
Marketing costs		€ 750,000	
Purchase merchandising		€ 3,000,000	
Subtotal	€ 6,757,000	€ 9,913,231	147 %
Housing costs			
Current rental costs	€4,538,000	€ 4,538,000	0 %
Current maintenance	€ 2,000,000	€ 2,000,000	0 %
Current operational costs	€ 1,000,000	€ 1,000,000	0 %
Maintenance (expansion)		€ 1,638,000	n.a.
Operational costs (expansion)		€ 750,000	n.a.
Subtotal	€ 7,538,000	€ 9,926,000	132 %
Match & training costs	€ 2,500,000	€ 3,250,000	30 %
General costs	€0	€250,000	n.a.
Depreciation costs	€ 268,000	€ 750,000	180 %
Other costs	€ 1,368,000	€ 500,000	-63 %
Total	€ 35,667,000	€ 75,752,462	112 %

Exploitation plans

- The business case is based on a life-time of 25 years, starting from 2013 (till 2038).
- The stadium is the national football venue for 63,000 spectators and meets all UEFA 5-start ranking requirements.
- The stadium is attractive for large outdoor events.
- The stadium has all kinds of multi-functional facilities, which are 24-7 available for use.

Appendix 11 Price per seat of recent stadium projects in Europe

Club/city/stadium	Country	Year	Seats	Costs	€/seat
Wembley Stadium	Eng	2007	90,000	€ 1.000.000.000	€ 11.111
Warsaw Stadium	Pol	2011	58,000	€ 500.000.000	€ 8.621
Arsenal London	Eng	2006	60,400	€ 516.000.000	€ 8.543
Young Boys Bern	Swi	2005	32,000	€ 224.000.000	€ 7.000
Shakhtar Donetsk	Ukr	2009	52,500	€ 317.000.000	€ 6.038
AIK Stockholm	Swe	2012	50,000	€ 300.000.000	€ 6.000
Allianz Arena Munich	Ger	2005	66,000	€ 340.000.000	€ 5.152
Feyenoord Rotterdam	**Net**	**2018**	**63,000**	**€ 313.000.000**	**€ 4.968**
Servette FC Geneva	Swi	2003	31,100	€ 153.600.000	€ 4.939
Gdansk Stadium	Pol	2011	42,000	€ 178.250.000	€ 4.244
Bucharest Stadium	Rom	2011	55,600	€ 234.000.000	€ 4.209
Wroclaw Stadium	Pol	2011	42,800	€ 167.900.000	€ 3.923
Manchester City	Eng	2003	48,000	€ 184.800.000	€ 3.850
Schalke 04 G'kirchen	Ger	2001	52,500	€ 191.000.000	€ 3.638
Eintracht Frankfurt	Ger	2004	48,900	€ 150.000.000	€ 3.067
Juventus Turin	Ita	2011	40,000	€ 120.000.000	€ 3.000
Vitesse Arnhem	Net	1998	26,000	€ 70.000.000	€ 2.692
Zurich Stadium	Swi	2007	30,000	€ 76.800.000	€ 2.560
Sporting Lisbon	Por	2003	50,300	€ 121.000.000	€ 2.406
Benfica Lisbon	Por	2003	65,700	€ 130.000.000	€ 1.979
Espanyol Barcelona	Spa	2009	40,500	€ 80.000.000	€ 1.975
FC Porto	Por	2003	50,100	€ 98.000.000	€ 1.956
Ajax Amsterdam	Net	1996	51,000	€ 96.000.000	€ 1.882
VfL Wolfsburg	Ger	2002	30,000	€ 53.000.000	€ 1.767
Hamburger SV	Ger	1998	57,000	€ 97.000.000	€ 1.702
Mönchengladbach	Ger	2004	54,000	€ 87.000.000	€ 1.611

Appendix 12 Approach of participants

Eindhoven

After a meeting with Ferry van den Broek, who is Vice President of the liberal party in the City Council of Eindhoven, it is decided to perform the survey with hard copy questionnaires and approach the Councillors personally during an official council meeting. On Tuesday May 14th, the questionnaire was conducted among the City Councillors of Eindhoven during an official council meeting. This seemed a very effective way to collect data from the potential respondents, with ten completes. When certain matters appeared to be unclear for a participants, it was possible to provide further explanation.

Enschede

The same approach was used for the city of Enschede, were Jeroen Heuvel (an independent registrar of the City Council of Enschede) gave the opportunity of conduct the questionnaire during a City Council meeting on Monday June 17th. Also here there was the opportunity to provide additional explanation to the participant. It resulted in another seventeen completes.

Amsterdam and Rotterdam

The same approach could not be used for the cities of Amsterdam and Rotterdam, because they had no official council meeting in the nearby future were it was possible to conduct the survey. After consultation with the independent registrars of both City Councils, the chairmen of the biggest parties in both councils were approach. This resulted in the agreement with the liberal party and labor party of Amsterdam and the liberal party and the populist party of Rotterdam (together representing 51 City Councillors) to deliver forty hard copies of the questionnaire by post, which would be filled in and returned within two weeks. Unfortunately and unexpectedly, this only resulted in one complete responds, also after two personal reminders.

Digital questionnaire

After another consultation with the registrars of both City Councils, it was decided to digitalize the questionnaire. The digital questionnaire was made exactly like the hard copy version and was performed on June 19th. A request including the link to the digital questionnaire was send to all City Councillors of Amsterdam and Rotterdam, with permission of both councils. This resulted in the responds of another four completes.

Dutch summary

DUURZAME STADIONONTWIKKELING

Het verhogen van de voordelen van stadions voor gemeenten door middel van duurzame (her)ontwikkeling – een case study van Stadion Feijenoord

Introductie

Het overgrote merendeel van de Nederlandse gemeenten met een betaald voetbalorganisatie (BVO) in hun stad is eigenaar van het stadion. De schijnbare maatschappelijke voordelen en emoties die komen kijken bij voetbal zijn de voornaamste redenen dat gemeenten besluiten om financieel betrokken te geraken bij stadionprojecten. Het voornaamste probleem voor gemeenten die (mede)eigenaar zijn van een stadion zijn de bijbehorende financiële risico's, welke achteraf gezien veel te hoog blijken te zijn in verhouding tot de voordelen. Om deze voordelen te verhogen moet er bijgedragen worden aan de doelstellingen van desbetreffende gemeenten. Dit zijn voornamelijk de sociale en economische impact van het stadionproject op de stad en omgeving. Daarnaast wordt duurzaamheid steeds belangrijker voor meeste gemeenten en is het ook een opkomende trend in stadionprojecten. Duurzame aanpassingen bevorderingen niet alleen de milieuprestaties, maar hebben ook positief effect op de lange termijn planning en toekomstige exploitatie van een stadion. Daarom kan duurzaamheid een belangrijke rol spelen in het bevordering van de voordelen van stadions voor gemeenten.

Het centrale probleem van dit onderzoek luidt als volgt:

De financiële risico's voor een gemeente door investeringen in stadionprojecten blijken achteraf groter te zijn dan verwacht, waardoor een onwenselijke financiële situatie ontstaat voor de gemeente.

De hoofdvraag van dit onderzoek luidt als volgt:

Hoe kan duurzame herontwikkeling bedragen aan het verhogen van de voordelen van stadions voor gemeenten?

De sub-vragen van dit onderzoek zijn:

1. Wat bepaalt hoe voordeling stadions zijn voor gemeenten?
2. Wat zijn de eigenschappen van duurzame stadionontwikkeling?
3. Welke aspecten van stadionherontwikkeling zijn het meest belangrijk voor gemeenten?
4. Hoe kan men bepalen welk stadion ontwikkelingsalternatief het meest voordelig is voor een gemeente?

Doelstellingen van gemeenten aangaande stadions

Uit onderzoek van Ecorys naar het belang van Roda JC voor de stad Kerkrade en de verificatie door stadionexperts zijn de meest belangrijke (sub-)criteria bepaald voor gemeenten aangaande stadionontwikkelingsprojecten. Na het samenvoegen van sub-criteria met ongeveer dezelfde strekking, om zo de omvang van de enquête te beperken, zijn toevalligerwijs bij elk criterium vier sub-criteria uitgekomen. Deze zestien sub-criteria zijn belangrijk om de voordelen van stadionprojecten voor gemeenten te bepalen. De duurzaamheidscriteria wordt uitgelegd in het volgende hoofdstuk over duurzame stadionontwikkeling.

Direct financial flows	Economic value	Social impact	Sustainability
Total direct investment	Creating jobs	Enjoyment	Energy costs
Rental revenue	Attracting companies	Local pride	CO_2 emission
Taxes	Branding and increasing value of surrounding area	Promoting sports among youth	Use of natural resources
Financial risks	Expenses supporters	City branding	Long-term planning

Figuur 1 | *Criteria die de voordelen van stadionprojecten voor gemeenten bepalen (Ecorys, 2012; Hellinga, 2013; Van den Broek, 2013; Veenbrink, 2013)*

Duurzame stadionontwikkeling

De duurzaamheid van vastgoed kan met verschillende methoden bepaald worden. GPR, LEED en BREEAM zijn de drie meest erkende certificeringsmethoden. BREEAM is de beste optie voor duurzame stadionontwikkeling in Nederland, aangezien deze internationaal erkend wordt en deze ook rekening houdt met de Nederlandse wet- en regelgeving.

Na het analyseren van de meest duurzame stadions in Europa en andere goed uitgevoerde duurzame herontwikkelingsproject van stadions in de rest van de wereld kwamen vier manieren naar voren om een stadion duurzaam te ontwikkelen, elke met zijn eigen aspecten. Naast deze vier alternatieven is het ook mogelijk voor gemeenten om het stadion te verkopen of te slopen, of om helemaal niets te doen en het stadion in zijn huidige staat te laten. Dit resulteert in de volgende zes alternatieven:

1) De exploitatie van het stadion veranderen
2) Technische c.q. duurzame aanpassingen maken aan het stadion
3) Totale renovatie en eventueel uitbreiding van het stadion
4) Een geheel nieuw stadion bouwen
5) Het stadion opgeven
6) Niets doen

Case study ***Stadion Feijenoord***

Ook al is Stadion Feijenoord niet eigendom van een publieke partij is de huidige situatie van het stadion toch van toepassing voor dit onderzoek. De gemeente Rotterdam erkend de maatschappelijke voordelen van de club Feyenoord en het stadion voor de stad en

overweegt daarom te investeren in de (her)ontwikkeling van het stadion. Echter, ze twijfelen nog tussen een investering in de renovatie van het stadion of een geheel nieuw stadion. De club is zelf voor een nieuw stadion vanwege de grote voordelen voor hen, maar deze optie is wel veel duurder dan de renovatie van het huidige stadion.

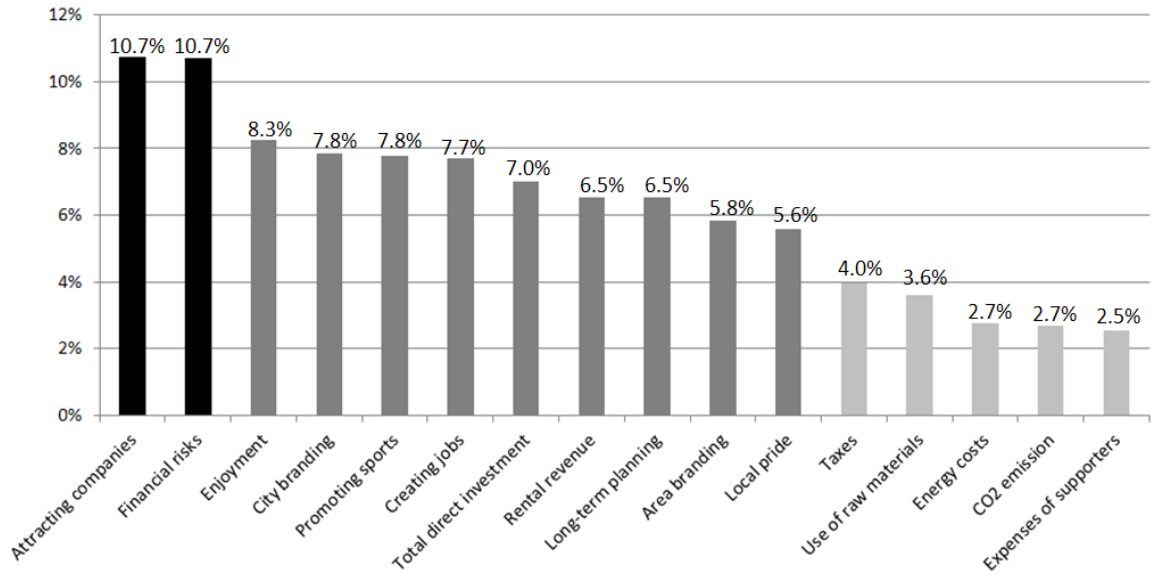
AHP model voor duurzame stadionontwikkeling

Via een enquête onder gemeenteraadsleden van de steden Amsterdam, Rotterdam, Eindhoven en Enschede wordt data vergaard door middel van paarsgewijze vergelijkingen tussen de verschillende criteria. Vervolgens wordt deze data geanalyseerd met de methode Analytic Hierarchy Process (AHP).

Als eerst wordt de consistentie van de respondenten geanalyseerd, om te bekijken of the resultaten wel betrouwbaar zijn. Dan wordt de prioritizering van de verschillende criteria bepaald, waarna ook de relatief beste alternatief voor de case study van Stadion Feijenoord naar voren komt. In de enquête is ook naar de directe prioritizering volgens de gemeenteraadsleden gevraagd.

Conclusies

Uit de resultaten van de prioritizering van de (sub-)criteria om stadionontwikkelings-projecten voordeliger te maken voor gemeenten, is naar voren gekomen dat deze in drie groepen kunnen worden verdeeld. Het aantrekken van bedrijven en de financiële risico's zijn verreweg het belangrijkste (*zwarte balken*). De sub-criteria die ook hoog scoren zijn de donkergrijze balken. Vooral de criteria die zorgen voor sociale toegevoegde waarde worden als belangrijk gezien door gemeenten.



Figuur 2 | *Prioritizering van de zestien sub-criteria verdeeld in drie groepen*

De meest voordelige stadion ontwikkelingsalternatief voor een gemeente is er een waarbij de financiële risico's laag zijn en de aantrekkingskracht op bedrijven hoog. Deze twee sub-criteria kunnen worden behaald door het combineren van totale renovatie van het stadion, waarbij door het moderniseren van het stadion het aantrekkelijker wordt voor bedrijven om een skybox of VIP plaatsen te huren, en het maken van technische aanpassingen aan het stadion en mogelijk zelfs een verandering van exploitatie van het stadion, waardoor het stadion optimaal duurzaam wordt. Bedrijven willen geassocieerd worden met moderne en duurzame stadions. Dus door de positieve aspecten van de drie renovatiealternatieven (dat zijn, verandering van exploitatie, technische aanpassingen en totale renovatie) kan het stadion de belangrijkste doelstellingen van de gemeente behalen, zonder extreem hoge financiële risico's die eraan verbonden zijn.

Aan de andere kant kan een nieuw stadion een erg positieve impact hebben op de financiële en sportieve prestaties van de gebruikende voetbalclub, waardoor ook de financiële risico's voor de gemeente wordt verkleind, ook al brengt een nieuw stadion ook weer nieuwe investeringskosten met zich mee. Het is daarom een goed alternatief voor zowel de gemeente als de BVO zelf om een goedkoop nieuw stadion te ontwikkelen ten koste van dure aspecten van het ontwerp die geen grote invloed hebben op het behalen van de doelstellingen van een gemeente.

Aanbevelingen

Met de resultaten van dit onderzoek kunnen verschillende aanbevelingen worden gegeven aan Nederlandse en andere Europese gemeenten, stadionontwikkelaars and de Feyenoord-familie.

De aanbevelingen aan de gemeenten zijn:

- Vergis je niet in de toekomstige financiële risico's van investeringen in stadions.
- Kies niet direct voor de goedkoopste optie. Een hogere investering kan soms veel hogere maatschappelijke voordelen met zich meebrengen.
- Vraag niet om extra functies waar de clubs zelf niets aan heeft, aangezien dit het stadion alleen maar duurder maakt.
- Vraag niet om specifieke duurzame prestaties, maar bekijk het gehele plaatje.
- Onderschat niet de toegevoegde waar van stadions op economisch gebied.

De aanbevelingen aan stadionontwikkelaars:

- Kijk niet alleen naar het beperken van de realisatiekosten, maar kijk ook naar de indirecte kosten of financiële risico's in de toekomst.
- Concentreer je in het ontwerp op de sociale en economische impact van het stadion.
- Focus niet op specifieke duurzame prestaties, maar bekijk het gehele plaatje.

De aanbevelingen aan de Feyenoord-familie:

- Ook al lijkt het nieuwe stadion de beste optie voor de gemeente Rotterdam, andere alternatieven kunnen wellicht de gemeente wel overtuigen om alsnog te investeren.
- Besteed speciale aandacht aan de financiële risico's en het aantrekken van bedrijven in het nieuwe voorstel naar de gemeente om te investeren in het stadion.
- Kijk hierbij niet naar specifieke duurzame prestaties, maar bekijk het gehele plaatje.

English summary

SUSTAINABLE STADIUM DEVELOPMENT

Increasing the benefits of stadiums for a municipality through sustainable (re)development - A case study of Stadion Feijenoord

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ABSTRACT

Due to emotions and the apparent benefits of stadiums, almost all Dutch municipality hosting a professional football club are owner of the stadium. This brings along too high financial risks in relation to the gained benefits. With sustainable (re)development these stadiums can become more beneficial. A questionnaire among 31 City Councillors of the cities Amsterdam, Rotterdam, Eindhoven and Enschede showed that the low financial risks and attracting companies are the most important criteria for a municipalities to invest in stadium projects. Specific sustainability aspects are considered as less important, but the sustainability of the whole project, including long-term planning could increase the benefits for municipalities. A case study of Stadion Feijenoord was analysed for this research.

Keywords: stadiums, municipalities, sustainable development, financial risk, AHP

A majority of the Dutch municipalities with a professional football club (BVO) in their city is owner of the stadium. The apparent benefits for society and the high emotions related to

football are the main reasons for the decision of municipalities to get financially involved in stadium projects. The main problem of municipalities being shareholder of a stadium is the related financial risks, which might in hindsight be too high in regard to its benefits. To increase the benefits for a municipality, their objectives should be met. These are mainly the social and economic impact of the stadium project on the city and its surrounding area. Next to this, sustainability is an increasingly important objective of most municipalities and is also an upcoming tendency in stadium development projects. Sustainable adjustments do not only improve the environmental aspects, but also affects the long-term planning and future legacy of the stadium, which are again related to the financial risks. Therefore, sustainability can play and important role in increasing the benefits of stadiums for municipalities.

The problem in this research can be state as follows:

The financial risks for a municipality due to investments in stadium projects turn out to be higher than expected, resulting in an undesirable financial situation for the municipality.

The main question for this graduation research is:

How can sustainable redevelopment increase the benefits of stadiums for municipalities?

The scope of this research considers municipalities in the Netherlands who are shareholder or important stakeholder of a stadium used by a professional football club. Development approaches for a stadium include all kinds of changes to the stadium itself or the use of the stadium, including demolishing or construction of a new one. 'Sustainable' includes both environmental behaviour as well as a long-term vision for a continuous operation and exploitation of the stadium. 'Beneficial' is used in terms of positive impact on the objectives of a municipality, including profitability and indirect impact on the economy and society.

The sub-questions of this research are:

1. What determines the benefits of a stadium for a municipality?
2. What are the characteristics of sustainable stadium redevelopment?
3. Which aspects of stadium redevelopment are the most important for municipalities?
4. How to determine which stadium development alternative is the most beneficial for a municipality?

Municipal objectives regarding stadiums

In this first chapter the objectives of a municipality regarding stadium projects are determined, in order to find out how municipalities can benefit from a stadium in their city of which they are shareholder or investor. This is done by looking at the general objectives of a municipality and how the benefits of a certain project are determined. Subsequently, the investment criteria of public investments in real estate and especially in stadiums is researched including the possible ways of investments.

General objectives of a municipality

The overall objective of local governments is social welfare, which is broken down in political, economic, social, cultural and environmental objectives. The benefits of public real

estate for a municipality depends on the overall objectives of municipalities and which of these objectives are tried to achieve with public real estate asset. However, municipalities do not have certain objectives that are specifically attempted to achieve with their real estate asset. This means that also sustainability, as a part of the environmental objectives of a municipality, could be a criteria that is attempt to be achieved with public real estate.

Most part of the public real estate asset (69%) is social real estate and is publicly owned to get more influence on the exploitation of that object and the development of the surrounding area. Most municipalities do not have a supporting real estate department and the municipal administration hardly shows any attention for real estate unless in case of excess situations.

Making profit by real estate transactions or exploitation is not the main objective in MREM, but can be a positive side-effect. The other way around, potential high losses are avoided if possible by selling the real estate object in question. The benefits of the public owned real estate are more about the positive social and economic impact it has on the area than the profit or revenue it gains for a municipality. As a result, it is hard to measure if the right targets are achieved due to the exploitation of public real estate. The Decision Making Process for these intangible objectives is mainly based on debates and political viewpoints.

With the newly introduced SMART-principle only specific and measurable (qualitative and quantitative) targets and results are considered, which makes it possible to measure and judge the performances of projects or policymakers in the field of MREM. However, if projects change over time or excess situations occur, the SMART-principle might become inadequate, because measurable targets could not be achieved anymore and it can be decided to cancel the project, while the intangible benefits might still be higher than the total investments for the municipality.

Objectives of a municipality regarding stadium projects

Regarding the limited liquid assets of most European BVOs, the high investment costs of a stadium, and the lack of interest of private parties to do such high and risky investments, it can be concluded that financial involvement of a municipality is inevitable for realizing a stadium. It is therefore necessary for a municipality to invest in the stadium development project in order to keep the direct and indirect benefits from their local BVO and stadium in their city.

Since a good financial situation of the concerning BVO is very important for constraining the financial risk of a public investment in a stadium, it is also beneficial for a municipality to focus on requirements for a stadium that are both beneficial for the BVO as for themselves. This is like killing two birds with one stone, since the municipality also benefits from a well performing and financially healthy BVO.

The main objectives of a municipality in every situation are the economic and social impact, and next to that the profitability of a project, since a good financial situation is required to achieve these social and economic goals. Sustainability is a relatively new topic for national and local governments. Since sustainable development is not always profitable for (private) parties, governments also consider this as a main objective for themselves.

From the Ecorys report about Roda JC Kerkrade (*2012*) and the verification with stadium experts, the most important sub-criteria for the four main criteria regarding stadium development for municipalities are determined. After combining somehow similar sub-criteria, in order to constrain the size of the resulting questionnaire, by chance the same number of sub-criteria for each main criteria were the result, namely four. These sixteen sub-criteria, which are important when considering the benefits of a sustainable stadium development project for a municipality. The selected sub-criteria of sustainability are explained in the next chapter, about environmental assessment methods.

Direct financial flows	Economic value	Social impact	Sustainability
Total direct investment	Creating jobs	Enjoyment	Energy costs
Rental revenue	Attracting companies	Local pride	CO_2 emission
Taxes	Branding and increasing value of surrounding area	Promoting sports among youth	Use of natural resources
Financial risks	Expenses supporters	City branding	Long-term planning

Figure 1 | *Criteria to determine the benefits of professional football and the stadium for municipalities (Ecorys, 2012; Hellinga, 2013; Van den Broek, 2013; Veenbrink, 2013)*

Sustainable stadium development

In this chapter the different alternatives of sustainable stadium redevelopment are determined by considering what makes real estate asset sustainable, and analysing case studies about the different alternatives and aspects of sustainable (re)developed stadiums.

The sustainability of real estate objects can be determined with different environmental assessment methodologies are recognized. GPR, LEED and BREEAM are the three mostly recognized certification methods. BREEAM is the best method for sustainable stadium development in the Netherlands, since it is internationally recognized and it considers the Dutch laws and regulations.

Analysing the most sustainable stadiums in Europe and some well performed sustainable developed stadiums in the rest of the World, four main alternatives of sustainable stadium development are distinguished, all with their own characteristics. Next to these four alternatives it is also an option for a municipality for demolish or sell the stadium, or choosing the passive approach and leaving the stadium as it is. Demolishing and selling the stadium comes down to the same outcome for municipalities, since there are usually no private parties that want to purchase a non-profitable stadium. This results in a status quo for the municipality which only can be avoided by demolishing the stadium. Therefore, the following six alternatives for sustainable stadium (re)development are selected.

1) Changing the management of the stadium

A very cheap option for making a stadium more beneficial is changing the management of the stadium. The attitude of the users and possible regulations can make that the stadium is used much more effective. This could be sustainable changes but also a better way of sharing the stadium, possible with other sports clubs or other kind of users.

2) Make technical adjustments to the stadium

When the existing facilities meet the requirements of the users of the stadium, a total renovation is not always necessary to change the use of the stadium. Technical adjustments can make the stadium more energy efficient and more sustainable. There are multiple examples of stadiums in the Netherlands and Germany where an energy company or an electrical company pays for the technical adjustments to achieve these requirements.

3) Renovate and expand the stadium

The renovation of a stadium is a less expensive alternative if an existing stadium does not longer meet the modern requirements. It can include expansion or just a modernisation.

4) Building a new stadium

If it is practical impossible to achieve the changed requirement of the user of owner with redevelopment of the stadium, the construction of a new stadium can make the difference. There are no preconditions of the old stadium and the sky is the limit.

5) Disposing the stadium

When it becomes clear that the stadium is really causing very high losses for the municipality and the acceptance of the waste of the investment costs is more beneficial than keep paying for annual ownership costs and financial risks for the long-term future, it may be more beneficial for the municipality to sell the stadium or give it away to the using sporting club or an interested third private party. And if there are no interests purchasers, then it is also an option to demolish the stadium, but of course only if the using club is bankrupt or does not need the stadium anymore since they already has an alternative.

6) Passive approach

If the municipality decides not to invest in the stadium at all, because the investment will not be recouped, than there is the last alternative to choose a passive approach and leaving the stadium as it is.

Case study **Stadion Feijenoord**

Although, Stadion Feijenoord is not owned by a public party, the current situation of the stadium is a suitable case study for this research. The municipality of Rotterdam admits recognizes the public benefits of Feyenoord and the exploitation of the stadium. However, they are still considering if they want to invest in the renovation of the stadium or construction of a new state-of-the-art stadium. First, the municipality wants to know the (financial) risks of such an investment, and of course they are looking at the benefits for their city. The sports club itself and the owning company of the stadium both claim that a new stadium is the best option for the club and the city, but the fans and inhabitants of Rotterdam want to renovate the current stadium. In this case it is useful for the municipality to know which option is the most beneficial for them, before they are investing in the stadium. Currently, two development alternatives of Stadion Feijenoord are seriously considered by the municipality of Rotterdam and the 'Feyenoord family' itself. A new stadium and a renovation of the stadium. When the decision is will be postponed automatically the third alternative, passive approach, will be applied.

Alternatives vs. sub-criteria matrix

Concluding from the case study of Stadion Feijenoord, the following scores are given to the different sub-criteria in the conducted survey for all six stadium development alternatives.

Sub-criteria	Management changes	Technical adjustments	Total renovation	New stadium	Disposing stadium	Passive approach
Financial flow						
Investment	€ 1 mln	€4 mln	€117 mln	€ 362 mln	€ 47.5 mln	None
Rental revenue	€ 1.5 mln	€ 1.5 mln	€ 5 mln	€ 10 mln	None	€ 1.5 mln
Taxes	€0.5 mln	€ 0.5 mln	€ 1 mln	€ 2 mln	None	€ 0.5 mln
Financial risks	€ 12.5 mln (loan)	€12.5 mln (loan)	€ 32 mln (loan)	€ 172.5 mln(loan)	None	€12.5 mln(loan)
Economic value						
Creating jobs	4.778	5.556	7.278	7.889	2.389	3.556
Attracting companies	5.167	5.278	7.000	7.778	2.000	3.389
Area branding	5.556	5.444	7.111	8.111	1.722	3.667
Supporters' expenses	5.389	5.167	6.222	7.000	1.333	4.000
Social impact						
Enjoyment	5.611	5.278	6.278	6.833	1.778	4.000
Local pride	5.556	5.778	7.167	7.056	1.722	3.889
Promoting sports	5.222	5.500	6.389	7.167	1.833	3.889
City branding	5.556	5.556	7.000	8.167	1.889	3.667
Sustainability						
Energy costs	€400,000	€250,000	€600,000	€700,000	None	€477,812
CO2 emission	3000 tons	2000 tons	4000 tons	None	None	3000 tons
Natural resource use	None	100 tons	24000 tons	990000 tons	None	None
Long-term planning	10 years	15 years	25 years	35 years	0 years	5 years

Figure 2 | *All values are annual scores. The values for the 'Economic value' and 'Social impact' are unit-less ratings between 1 and 10.*

AHP model for sustainable stadium development

The decision making process of a specific stadium development alternative is based on a lot of different criteria. The using sports club, the most important stakeholder of the stadium project, is mainly concerned about its own interests, which results in decision criteria like; costs, capacity, business facilities, and revenue possibilities. For a municipality there are much more criteria that determine what is the most beneficial development alternative for a stadium. The different development alternatives do not only influences the use of the stadium, but also the surrounding area, the local economy, and other projects in the area or city. This are all important objectives that municipalities should consider in their decision making process. That is why the decisions about the most beneficial stadium development alternative for a municipality should be based on the analysis of multiple criteria.

Results

First the consistency of the responds is analysed, in order to determine if the results are reliable. Then the relative importance of the criteria and sub-criteria according to the municipality regarding stadium development is presented in table and figures, followed by the variation in relative importance between the different subgroups. The results of the second part of the survey are shown by two figures about the direct prioritization of the different development alternatives for the case study Stadion Feijenoord and the prioritization based on the AHP analysis. The final prioritization of the (sub-)criteria and alternatives according to all participating city councillors is presented below.

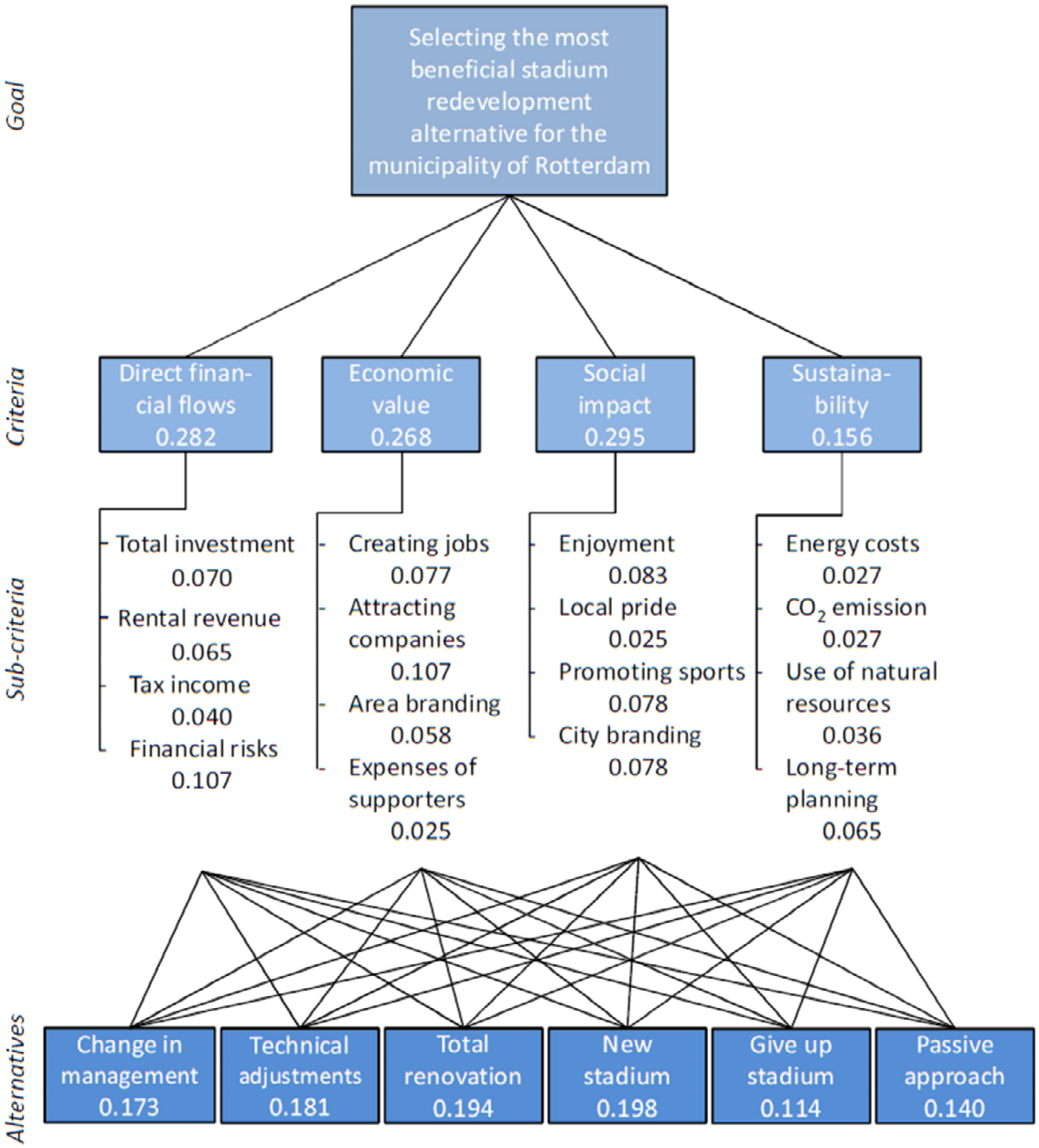

Figure 3 | *Analytic Hierarchy Process model of the results of this research*

Conclusions and recommendations

Considering the amount of responds, an inconsistency limit of CR ≤ 15% still provides sufficient data to get reliable results and conclusions. Also the distribution of the different subgroups is well spread and therefore the research is based on a realistic reflection of the reality. There is not enough data to draw reliable conclusions about all the different subgroups, although some indication can be suggested due to large differences between some subgroups.

Relative importance

From the results about the relative importance of the different (sub-)criteria about making stadium proejcts more beneficial for municipalities it becomes apparent that they can be divided in three groups. Attracting companies and financial risks are by far the most important sub-criteria (*the black bars*). That financial risks have a higher relative importance than the direct investments and revenues seems logical, since an investment is only considered as too high when the expected results are not sufficient in regard to the height of the investment and if the financial risks attached to it are acceptable.

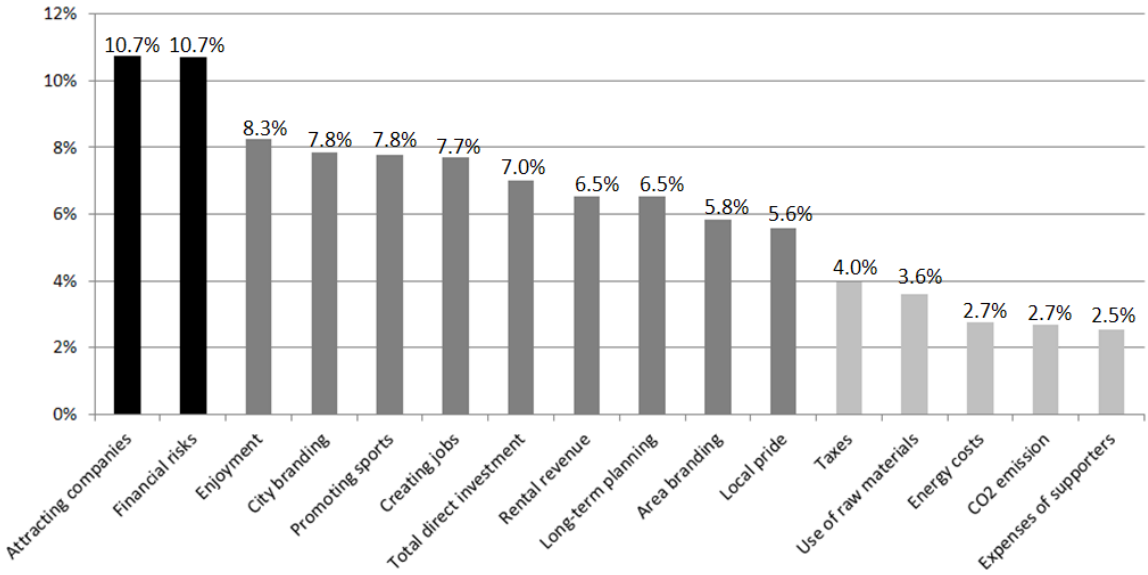

Figure 4 | *Relative importance of the sub-criteria divided in three groups*

The sub-criteria that also have a high relative importance (*dark grey bars*) also play in important role for the municipal. In particular the social aspects have a high relative importance. This can be explained by the fact that a stadium is usually not a profitable real estate object for municipalities. Apparently, municipalities seen the purpose of a stadium more in comply with their social objectives, like amusement and vivacity during events, city branding, promoting of sports (e.g. among youth) and in lesser extent local pride by the performance of the using BVO or the impressive effect of the design of the stadium.

The most beneficial stadium development alternative for a municipality is the one were the financial risks are low and the attraction to companies is high. These two criteria can be met with a combination of a total renovation, where through modernization the stadium will be more attractive for companies to hire a sky box or VIP seats, and by making technical

adjustments and possible even change the management of the stadium regarding environmental behaviour in order to making it more sustainable. Companies want to be associated with a modern and sustainable stadium. So, be combining the positive parts of the three renovation alternatives (i.e. change in management, technical adjustments, and total renovation) a stadium can achieve the main objectives of a municipality without extraordinary high financial risks. On the other hand, a new stadium can have a very positive impact on both the financial and sportive performance of a BVO, and therefore on the financial risks for the municipality, although a new stadium brings along high investment costs and with that new financial risks for the municipality. It can therefore be a good alternative for both the municipality and the using BVO to lower the price of the new stadium, especially to the detriment of expensive aspects of the stadium design that do not have relatively strong impact on the other objectives of the municipality.

Stadion Feijenoord

While the average opinion of the City Councillors assumes that a new stadium for Feyenoord is definitely not the best alternative, the results of this research show that the new stadium can still be very beneficial for the municipality, even if it is by far the most expensive and most risky alternative for them. However, the other three redevelopment alternatives were almost as beneficial as the new stadium alternative (19.8%). The total renovation of the stadium (19.4%), performing technical adjustments (18.1%), and a change in the current management of the stadium (17.3%) also are beneficial alternative for the municipality of Rotterdam. Abandon the stadium or leaving the stadium in its current state are both significantly less beneficial and therefore no realistic option for both the municipality and the using BVO, namely Feyenoord.

Influence of sustainability

Sustainability (15.6%) as main criteria has a low importance in the decision making process of municipalities regarding stadium development in relation to the three other main municipal objectives, which are direct costs and revenue (28.2%), economic value (26.8%), and social impact (29.5%). Related to this result also the sub-criteria of sustainability have a low relative importance for municipalities. Surprisingly, the three most environmental sub-criteria (i.e. use of natural resources, energy costs and CO_2 emission) have a much lower score than the forth sub-criteria of sustainability; long-term planning. Possibly because the long-term planning also has a significant relation to the highly ranked criterion financial risks. If during the design phase of the stadium sufficient attention is paid to the long-term planning regarding strategic design (for a possible change of function or change in requirements) the stadium will keep its value for the city and the using BVO for a much longer period of time. This can ensure the municipality of a higher benefit during its lifetime without new public investments.

With the results of this research it seems like single sustainability aspects (i.e. energy use, use of natural resources, and CO_2 emission) are not plying an important role in the decision making process of municipalities regarding stadium development projects. During the conduction of the questionnaire City Councillors also suggested that a stadium is not the most efficient way to express the sustainable objectives of a municipality. Sustainability aspects (e.g. long-term planning) that ensure the municipalities of increased benefits from the other main objects are relatively more important in their decision making process.

Recommendations

With the results of this research several recommendations can be given to Dutch and other European municipalities, stadium developers, and especially to the 'Feyenoord family' (i.e. the BVO Feyenoord, the amateur club SC Feyenoord, and the management and shareholders of Stadion Feijenoord together).

The recommendations to municipalities from this research are:

- Also consider future financial risks that are the result of an investment in a stadium.
- Do not automatically choose for the less expensive stadium development alternative. It will cost less money but will possibly gain much less benefit in comparison to the more expensive alternatives.
- Do not demand for additional functions or adjustments to a stadium that are not relevant for the using BVO, since this only makes the stadium more expensive, which increases the financial risks for both the municipality itself as the using BVO.
- Do not demand for specific high performance sustainability adjustments, because the direct and indirect benefits would probably be disappointing.
- Do not underestimate the economic added value of stadium development in general.

The recommendations to stadium developers from this research are:

- Do not only focus on constraining the initial investment costs, but also look at the indirect costs like financial risks in the future for the municipality or the using BVO.
- Focus on the social and economic impact of the stadium during the design phase.
- Do not only concentrate on specific sustainability aspects, but on the environmental behaviour of the whole stadium development project, especially long-term planning.

The recommendations to Feyenoord family from this research are therefore:

- Although the new stadium seems the relatively best stadium development alternative for the municipality of Rotterdam, other alternatives (i.e. total renovation, technical adjustments, or change of management) are almost as beneficial as the new stadium for the municipality. This may be a less beneficial option for the Feyenoord family according to themselves, but these other alternatives can possible convince the municipality to provide the necessary investment, unlike the (apparently) too expensive current new stadium design.
- For the revision of the proposed plans for the new stadium especially the financial risks and the attraction of companies should be considered.
- For the revision of the new stadium plans, do not focus on the individual sustainability aspects, but look at the environmental behaviour of the whole stadium project, especially the long-term planning for the exploitation of the stadium.

References

Deloitte (2011). "Municipal real estate. Comparing public real estate management in European cities" *Real Estate EMEA, December 2011*

Ecorys (2012). "Roda JC Kerkrade op waarde geschat" – *A research commissioned by the municipality of Kerkrade to the value of Roda JC for the municipality, October 28th, 2012*

Metze, M.; Engbers, J.; Den Boer, H.; Logger, B. & Pinster, J. (2011). "Overheid steunt betaald voetbal met ruim 1 miljard euro" – *Results of a masterclass research, De Groene Amsterdammer, 18-05-2011*

Howlett, R.J. & Jain, L.C. (2004). "Intelligent Decision Technologies", *Springer New York, ISBN 978-3-642-29976-6*

Pruijsen, K.W. (2004). "Checklist meetbare doelstellingen DIBB / programmabegroting" - *Afdeling Onderzoek en statistiek, Municipality of Nijmegen, February 2004*

Saaty, T.L. (1987). "The Analytic Hierarchy Process – What it is and how it is used", *Mathl Modelling, Vol. 9, No. 3-5, pp. 161-176*

Sapotichne, J. (2012). "Rhetorical strategy in stadium development politics" - *City, Culture and Society 3 (2012) pp. 169–180*

Veenbrink, B. (2013). Interview with the CEO of The Stadium Consultancy BV in Naarden, UEFA stadium consultant, director of stadium Euroborg in Groningen, and former director of the Amsterdam ArenA – *May 17th, 2013 in Naarden*

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After I finished high school in Enschede in 2006 I went to the Eindhoven University of Technology. After finishing the bachelor Architecture and Engineering, with the minor Construction and Engineering and the final bachelor project Construction management, I started with the master Construction management and Engineering. This was the result of my acquired experience apart from my study as the project manager of the relocation project of the Eindhovens Studenten Corps. Both projects will be finished in September 2013.

2006 – 2011	Bachelor Building science and architecture
2009 – 2010	Member of the board of the Eindhovens Studenten Corps
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2011 – Now	Master Construction Management and Engineering