SUSTAINABILITY ANALYSIS OF A NEWLY CONSTRUCTED
STADIUM FOR THE 2010 FIFA WORLD CUP COMPARED TO THE
UPGRADE OF AN EXISTING STADIUM

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October 2009
Declaration by student

I, the undersigned, hereby confirm that the attached treatise is my own work and that any sources are adequately acknowledged in the text and listed in the bibliography.

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Signature of acceptance and confirmation by student
ABSTRACT

Title of treatise : Sustainability analysis of a newly constructed stadium for the 2010 FIFA World Cup compared to the upgrade of an existing stadium.

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Date : October 2009

In preparation for the 2010 FIFA World Cup it was decided that a few new stadiums were to be constructed whilst other stadiums would be upgraded. The aim of this study is to compare the sustainability of a newly constructed stadium with that of an upgraded stadium. For that purpose the total capital outlay, operation and maintenance costs as well as the estimated future income for each stadium will be evaluated. The abovementioned information will then be used to determine if and when these costs will be recovered. As a result the sustainability of each stadium can be determined in order to conclude if the construction of a new stadium or the upgrade of an existing stadium would be more favourable.
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CHAPTER 1

BROAD OVERVIEW OF THE MAIN PROBLEM

1.1. Introduction

In 2004 it was announced that South Africa will be the host for the 2010 Fifa World Cup and ever since that day the whole country was preparing for this event in various ways. The Gautrain is being constructed, infrastructure is improved and a variety of accommodation schemes are developed. Various new stadiums are also being constructed, whilst only a few of the existing stadiums are upgraded. The objective of this treatise is to investigate the feasibility of a newly constructed stadium compared to the upgrade of an existing stadium in order to meet Fifa requirements. For the purpose of this treatise Green Point Stadium in Cape Town will be used as an example of a newly constructed stadium and Loftus Versfeld in Pretoria will be used as an example of an existing stadium being upgraded.

The total capital outlay will be analyzed in order to determine what the biggest cost components are. The various items included in the total capital outlay, such as construction cost and professional fees, will be evaluated. The short construction period, which often requires acceleration, will be analyzed in order to illustrate the potential effect on costs. It will also be illustrated how different options in design and choice of materials etc impact on the cost and how savings can be incurred through proper planning and cost control. In certain circumstances it would not be cost effective to upgrade an existing stadium due to the degree of changes required in order to meet FIFA requirements. However in most circumstances the construction of a new stadium will be more expensive than the upgrade of an existing stadium. The situation must therefore always be analyzed in terms of the circumstances, seeing that every project is unique.
According to Everett (1970:19) cost decisions must not only take into consideration the initial cost, but also the operation and maintenance costs. Therefore the different operation and maintenance cost associated with the stadiums will be identified, which mainly consist of water, electricity, security and general maintenance of the stadium. It will be rather complicated to determine the exact future costs of operation and maintenance. It will therefore be necessary to determine the likely operation and maintenance costs based on assumptions made particular to the circumstances of both stadiums. The study will also indicate what effect the various decisions in the design process have on these costs and how operation and maintenance cost can be reduced by life cycle cost planning and value engineering.

During the 2010 Fifa World Cup the stadiums will be full to capacity for most of the soccer matches, creating a high stream of income. The sales prices of tickets can also greatly be increased due to the high demand during the World Cup. The question however remains how much income the stadiums will generate after the World Cup. Most stadiums will have difficulty to generate adequate income after 2010. Especially cities such as Durban and Cape Town that will have an existing stadium close to a newly constructed stadium, where the situation will make it even more difficult to generate sufficient income to sustain both stadiums. A range of alternatives will be investigated in order to determine the likely stream of income over the next few years.

In addition the potential income will be compared to the total capital outlay plus all operation and maintenance costs to determine when and if the total cost can be recovered, therefore indicating whether the construction development is feasible or not. It must be remembered that it will be extremely difficult to forecast the potential income on any stadium as there are currently no firm commitments with regards to future use of most of the stadiums.
In this regard it will then be necessary to make assumptions based on worst and best case scenarios and ultimately the comparisons will be based on the most likely scenario. Existing stadiums will obviously require less income than a new stadium in order to recompense the debt of the total capital outlay. The evaluation of the feasibility will as a result also indicate whether the stadiums will be sustainable or not.

1.2. Statement of the main problem

Sustainability analysis of a newly constructed stadium for the 2010 Fifa World Cup, compared to the upgrade of an existing stadium.

1.3. Sub-problems

1.3.1. What components form part of the total capital outlay and how can these costs be reduced?

1.3.2. What operation and maintenance costs are related to the stadiums and how does design impact on it?

1.3.3. How can income be generated after the 2010 Fifa World Cup?

1.3.4. Will the income generated be sufficient to cover cost of construction (capital cost), operation and maintenance?

1.4. Hypothesis for each Sub-Problem

1.4.1. The designs for the new stadiums are very elaborate and therefore have an increase in unnecessary costs as a result. If the designs are changed to be less complex, yet still remain functional, reductions in costs are inevitable.
1.4.2. Operation and maintenance costs are directly connected to the design and material used for construction. Cost can therefore be reduced by selecting materials that require less maintenance. Likewise by designing smartly energy efficiency can be increased.

1.4.3. Income can be generated through hosting sporting events, as well as music concerts and other similar activities. Advertisements and television rights can also be used as a means of generating income.

1.4.4. It seems that the construction of a new stadium will not be feasible when all factors are taken into consideration and that the upgrading of existing stadiums would have been the better option.

1.5. Delimitations

For the purpose of this study Green Point stadium in Cape Town will be used as an example of a newly constructed stadium and Loftus Versfeld in Pretoria will be used as an example of an upgraded stadium. No other stadiums will be evaluated in the study. However certain aspects of the other newly constructed stadiums’ construction costs will be used as comparisons with regards to Greenpoint stadium’s construction cost. The study is therefore based on the South African construction industry and related markets and can not be utilized to evaluate stadiums internationally. The study can also not be used to analyze the sustainability of other types of structures.

The study will be based on high level calculation as well as certain assumptions based on worst/best/most likely scenarios. It will be necessary to obtain actual information with regards to the income as well as operating and maintenance costs when the stadiums are fully functional after 2010 to determine the actual situation.
In the study the latest estimated final construction costs for both stadiums will be used. However actual final costs will only be available once the final accounts for the stadiums are complete and this will only be done during 2010. The operation and maintenance costs are also forecasted costs and the actual costs with regards thereto will only be available once the stadiums are in use during 2010.

1.6. Definition of terms

1.6.1. FIFA: Federation Internationale De Football Association
1.6.2. LOC: Local organizing committee
1.6.3. BOQ: Bills of Quantities
1.6.4. PC Amounts: Prime cost amounts

1.7. Importance of the study

The purpose of the study is to determine and analyze in principle, based on information available at the time of the study, the sustainability of newly constructed as well as upgraded stadiums in order to conclude which option will result in the best value for money.

1.8. Research Methodology

1.8.1. Analyse FIFA requirements for 2010 stadiums.
1.8.2. Analyse Pre and Post tender estimates and compare with design.
1.8.3. Detail analysis of monthly progress and financial reports.
1.8.4. Interviews with key people involved with the development of the stadiums.
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CHAPTER 2
WHAT COMPONENTS FORM PART OF THE TOTAL CAPITAL OUTLAY AND HOW CAN THESE COSTS BE REDUCED

2.1. Introduction

In this chapter the total capital outlay of the project will be analyzed in order to determine what the biggest cost components are. During the course of the chapter it will be pointed out how different alternatives with regards to design and choice of materials etc impact on the cost. It will also be illustrated how various savings can be acquired if appropriate planning and cost control is implemented. FIFA requirements for the construction of stadiums will also be evaluated in order to determine the effect thereof on construction costs.

2.2. Construction cost for Greenpoint stadium in Cape Town

All the information used to compile this section of the study with regards to the construction costs for Greenpoint Stadium in Cape Town are based on Cost Report No. 21L dated 1 March 2009 as prepared by Davis Langdon Cape Town. The costs contained in the abovementioned report are however not final, seeing that construction is still taking place, and are therefore merely an estimated figure of what the final costs are expected to be. Although costs are not final it is expected that the deviation from estimated costs to final costs will not be more than 5%.

The various items that make up the total capital outlay for the stadium will be summarised in a table format. The original budget, estimated final cost, percentage of each item in relation to the total cost as well as the cost per seat (there are 70 000 seats in Greenpoint stadium) of each component will be indicated in this table. Not every component indicated in the table will be discussed. Only the elements that form part of the larger cost components will be examined further.
<table>
<thead>
<tr>
<th>Description</th>
<th>Budget Amount (R)</th>
<th>Estimated Final Cost (R)</th>
<th>% of Total Cost</th>
<th>Cost per seat (R)</th>
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2.2.1. **Preliminaries and Overheads**

The Preliminaries and Overheads component forms a very large part of the total project cost at 23.24%. This component (R 1,029,533,293) consists of the Contractor’s preliminaries (R 493,673,473) as well as the Contractor’s overheads and profit (R 535,859,820). A possible explanation for these costly amounts could be the relatively short construction period in which the stadium must be completed. Various factors such as the short contract period, the large portion of the design that still has to be done (including decisions regarding finishes) and the unpredictable weather conditions will all increase the risk to the Contractor. In turn this could result in additional costs which could not necessarily be recovered through the contract. The deadline for completion is critical in order to be ready for the 2010 FIFA Soccer World Cup and the stadium can under no circumstances be completed late. This would also explain the inclusion of the amount of R 53,000,000 for Acceleration which again confirms the necessity for completing the project on time.

2.2.2. **Insitu concrete structure, stairs and float roof**

The concrete structure of the stadium also accounts for a significant portion of the construction cost. In light of the type of structure required for the construction of the stadium, it would be a reasonable conclusion that 10.15% is not extreme. However if a different type of roof construction was used, it could have resulted in a cost saving with regards to the structural frame.

Concrete columns and rakerbeams are higher and have much bigger dimensions. They also contain more steel and require different shuttering to compensate for the huge load and tension brought about by the outer compression ring of the roof structure.
The external cladding used to give an aesthetically pleasing finish to the stadium is now also more than that which would have been required with a different roof design where lower columns and rakerbeams would have been used.

2.2.3. Precast concrete seating

The precast concrete seating and stadium seats are 3.09% of the total project cost. In the FIFA Stadium Space Requirements manual (2006:4) there are very specific requirements stated with regards to seating such as: Seats must conform to FIFA safety standards, the backrest of each seat must be at least 30cm high and the first row for spectators must in principle be 2.5m above pitch level. Therefore certain requirements had to be met in order to comply with FIFA regulations, regardless of the cost.

2.2.4. Roof construction

The roof construction (R 475,399,618) is a very complex structure that requires a high standard of materials and excellent workmanship. It consists of a structural steel compression ring (R 184,882,911) running on the perimeter of the stadium fixed to reinforced concrete columns, a steel cable tension ring (R 39,600,788) forming the inner circle of the roof and a steel truss and tangential beam installation with a 16mm thick glass roof covering (R 178,274,857). The roof is finished internally with a protective membrane (R 72,641,062). According to FIFA requirements the main pavilion must be covered with a roof, but there are no specific requirement pertaining to the rest of the stadium. The roof structure for Greenpoint stadium covers all the pavilions and incurs unnecessary costs as a result.
The roof of the new stadium in Polokwane covers only the main pavilion at a cost of approximately R 2,333.33 per seat (+/- R 105,000,000). Nelspruit stadium’s roof covers all the pavilions at an estimated cost of R 2,130.43 per seat (+/- R 110,000,000). Whereas the cost per seat for the roof of Greenpoint stadium is R 6,791.42. Therefore a massive reduction in costs for the roof structure could have been incurred by either covering only the main pavilion (as was done in Polokwane) or to cover all pavilions, but to use more cost effective design methods (as was done in Nelspruit). A combination of smart design and the cutting of unnecessary costs would acquire the greatest saving.

2.2.5. Specialist cladding

The specialist cladding of the structure accounts for 4.53% of the total cost. This is rather excessive seeing that there are no specific requirements regarding the cladding of the stadium. It would thus have been more cost effective to use less expensive cladding material instead of specialist cladding.

Environmental impact studies revealed certain requirements with regards to noise pollution. Although it is accepted that this is necessary, the specific design and materials used could in all probability have been changed to save on construction as well as maintenance costs.

2.2.6. Electrical installation

The electrical installation amounts to 5.52% of the total cost. This might seem steep at first; however according to FIFA Stadium Space Requirements (2006:7) there are certain components that are a necessity for stadiums such as floodlights with a minimum of 1500 lux, a proper substation and an emergency generator.
2.2.7. Summary of construction costs for Greenpoint stadium

If the total project cost is compared to the original budget of the project it is clear that the project is way over budget by 55%. This could be due to various factors such as the higher than expected escalation of building costs which cannot be controlled or precisely calculated in advance as market conditions are very unpredictable, elaborate designs and expensive materials.

Some of the materials used for the construction of the stadium are of a very specialised nature and was therefore manufactured overseas and shipped to South Africa. For instance the glass covering for the roof was manufactured in Germany and one of the conditions of German manufacturers was that they personally come to South Africa and install the glass or else no guarantee would be provided. These prices could however not be fixed beforehand and remained market-related, therefore an estimate was done for budget purposes. In the end the costs were much higher than anticipated and this caused a budget overrun of approximately 53.6%.

The original budget for the reinforced concrete structural frame was based on the assumption that a normal structural frame would be used as for a standard type of stadium. However with the elaborate design of the roof the structural frame had to be adjusted in order to effectively support the roof. The structural frame design was also more complex than it was planned in the beginning of the project. Therefore the cost of the reinforced concrete structural frame was higher than originally estimated (76.7% over budget).
The abovementioned information clearly indicates that no proper cost control mechanisms or planning methods were used, which led to unnecessary costs which in turn led to budget overruns.

It was also difficult to estimate the impact of exchange rate fluctuations at the beginning of the project and similarly the import duties/taxes could not be tied up at the inception of the project.

2.3. Construction cost for the upgrade of Loftus Versfeld stadium in Pretoria

The following tabled construction costs are based on Financial Report No. 9 dated 1 September 2008 as prepared by Davis Langdon Pretoria. The original budget amount, the estimated final cost as well as the percentage of each item in relation to the total capital outlay will be indicated in the table.

The cost per seat will also be given (there are 55000 seats in Loftus Versfeld stadium). However it must be kept in mind that the cost per seat can create a distorted picture as this is not a newly constructed stadium, but only an upgraded stadium. The cost per seat will therefore appear much lower.

As was the case with Greenpoint stadium, not every item will be discussed in detail, but only components that have a greater impact on the total capital outlay will be discussed. The costs given below are merely estimated final amounts to provide an indication of what the potential final costs will be and the actual final costs will only be available once the final account has been done.
<table>
<thead>
<tr>
<th>Description</th>
<th>Budget Amount (R)</th>
<th>Estimated Final Cost (R)</th>
<th>% of Total Cost</th>
<th>Cost per seat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New roof over eastern pavilion</td>
<td>9,500,000</td>
<td>20,005,081</td>
<td>16.48</td>
<td>363.73</td>
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<tr>
<td>New lift installation</td>
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<td>Additions and alterations</td>
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<tr>
<td>IT &amp; Security systems</td>
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<td>Omitted items</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Overlay items</td>
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<td>15,000,000</td>
<td>12.36</td>
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<td><strong>Subtotal</strong></td>
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<td>95,867,247</td>
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<td>7,011,752</td>
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<td>Pre-tender escalation</td>
<td>2,936,617</td>
<td>1,800,000</td>
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<td>32.73</td>
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<tr>
<td>Post-tender escalation</td>
<td>4,939,410</td>
<td>5,211,752</td>
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<td><strong>Subtotal</strong></td>
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<td>5,143,950</td>
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<td><strong>Subtotal – Building Works</strong></td>
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<td>Items under consideration</td>
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<tr>
<td><strong>Total Construction Cost</strong></td>
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<td>DBSA fund</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Project Cost (Excl VAT)</strong></td>
<td>103,691,229</td>
<td>121,354,103</td>
<td>100.00</td>
<td>2,206.44</td>
</tr>
</tbody>
</table>

2.3.1. **New roof over eastern pavilion**

The new roof over the eastern pavilion accounts for 16.48% of the total project cost and consists of waterproofing (R 104,500), the roof coverings (R 1,803,890), structural steelwork frame (R 13,108,867), sundry metalwork (R 263,890), paintwork (R 1,635,080), an additional steel support structure (R 1,320,000) and the construction of concrete support bases (R 568,584). A contingency of R 1,200,000 is also included in the cost for the roof construction.
The new roof constructed for the upgrade of the Ellis Park stadium in Johannesburg costs approximately R150 per seat (+- R 9,300,000), whereas the new roof for Loftus Versfeld costs R363.73 per seat. It must however be kept in mind that the new roof at Ellis Park is smaller in relation to Loftus Versfeld’s new roof and that Ellis Park has 62,000 seats where Loftus Versfeld only has 55,000 seats. On the other hand it is evident that with a more cost effective design the cost for the roof construction could have been reduced somewhat.

It should also be noted that the new roof over the eastern pavilion is not very effective as it provides for very little shade during the afternoon. The roof will also not provide protection against rain as the lightest breeze will push rain underneath the roof.

It is therefore questionable whether the cost for the roof over the eastern pavilion should have been incurred in the first place.

2.3.2. Sound and evacuation installation

The sound and evacuation system form a relative part of the total project cost at 3.48%. The FIFA Stadium Space Requirements (2006:7) states very specific prerequisites regarding the sound system of the stadium. A loudspeaker system must be installed on the inside and on the outside of the stadium and the equipment for sound transmission must be of the highest quality. Therefore certain expenses were unavoidable.

2.3.3. Additions and alterations

Additions and alterations by far forms the largest part of the total project cost, and accounts for 26.43% (more than a quarter) of the costs.
FIFA (2006:5) has precise requirements with regards to dressing rooms for the players, offices, meeting rooms, storage facilities, working rooms, waiting rooms and interview rooms. In the FIFA Stadium Space Requirements manual the quantity required of each type of room as well as its approximate location is specified.

Therefore a lot of alterations were needed in order to ensure that both the internal and external areas of the stadium conform to FIFA regulations.

2.3.4. New seats

Installation of new seats (9.09% of total cost) comprises the removal of existing seating, making good of finishes, new spectator seats, additional VIP suite seats and a contingency. As previously stated in the evaluation of the construction costs for Greenpoint stadium, certain criteria must be met with regards to seating. It was therefore necessary to remove 48900 seats and replace them with new seats according to FIFA regulations.

2.3.5. IT and security systems

FIFA requires that the stadium and the stadium infrastructure must be constructed and operated on the highest international standard of security and safety. The IT and Security systems installation, which accounts for 8.31% of the total project cost, is therefore a very important component of the stadium. This installation includes perimeter security, video surveillance, asset tracking, parking access booms and a control room among others.
2.3.6. **Overlay items**

Overlay items is the third largest component at 12.36% of the total project cost. These overlay items consist of camera platforms, the new media tribune, dug outs for reserves, a pull out shelter for the tunnel and media system. A balance of R 12,114,598 must still be allocated to specific items by FIFA.

2.3.7. **Summary of construction costs for Loftus Versfeld stadium**

As was the case with Greenpoint stadium, Loftus Versfeld is also over budget (approximately 17%). This is mainly due to the fact the work was much more extensive than originally anticipated. For instance a larger roof was built than what was budgeted for, which led to a budget overrun of 110.6%.

Additions and alterations were also over budget by more or less 25.9%. This was primarily due to more alterations than were expected, a more extensive HVAC installation and the fixing of larger diesel generators.

At first it was estimated that approximately 45,000 seats would be removed and replaced with new ones. However in the end it turned out that 48,900 seats had to be replaced and that additional VIP suite seats had to be installed, which was not included in the budget and resulted in a budget overrun of 75.1%.

Overall the budget overrun was due to design development and unforeseen circumstances. Therefore in general the cost control methods were reasonable under the circumstances, although appropriate planning techniques could have resulted in a lesser overrun.
2.4. Summary

From the information provided above, it is clear that the designs for the new stadium are very elaborate and therefore very expensive. This is all done in an effort to make an impression on everyone visiting South Africa for the 2010 FIFA World Cup as well as people around the world watching this event take place. It is a chance to show everyone what South Africa is capable of. For this reason no costs were spared.

Table 1 and Table 2 above evidently shows that neither of the stadiums evaluated were within budget as previously discussed. Greenpoint stadium is roughly 55% over budget and Loftus Versfeld stadium is approximately 17% over budget. This is mainly due to poor management of the costs by all team members, inaccurate planning methods and unrealistic budgets.

2.5. Conclusion

The cost analysis clearly indicates that the upgrade of an existing stadium is much less expensive than the construction of a new stadium. It would not be possible in every scenario to upgrade an existing stadium. However in Cape Town there is an existing stadium (Nuweland stadium) which would have been ideal to upgrade. Nuweland already conforms to most of the FIFA requirements and therefore only minor additions and alterations would have been required. It consequently would have been much more cost effective to upgrade Nuweland stadium, than to construct Greenpoint stadium.
2.6. Testing of hypothesis

Hypothesis as stated in Chapter 1: “The designs for the new stadiums are very elaborate and therefore have an increase in unnecessary costs as a result. If the designs are changed to be less complex, yet still remain functional, reductions in costs are inevitable.”

In this chapter it was undoubtedly proven that many unnecessary costs were incurred during the construction and upgrading of the stadiums. If the stadiums were designed to be less elaborate and more practical, it would clearly have resulted in a reduction in costs.
CHAPTER 3
WHAT OPERATING AND MAINTENANCE COSTS ARE RELATED TO THE STADIUMS AND HOW DOES DESIGN IMPACT ON IT?

3.1. Introduction

The different operating and maintenance cost associated with the stadiums will be identified in this chapter. Operating costs includes components such as water and electricity, security and general management amongst others.

According to Seeley (1976:8) maintenance comprises of mainly three components namely:

- **Servicing**: Routine maintenance (also referred to as day-to-day maintenance)
- **Rectification**: To rectify shortcomings in design early in the life of the building
- **Replacement**: Maintenance due to decay of materials or breakages

For the purpose of this study only day-to-day maintenance as well as specific maintenance activities related to the structure and the roof of the stadium will be taken into account. The study will also indicate what effect the various decisions in the design process have on these costs.

3.2. Greenpoint stadium Cape Town: Operating costs

3.2.1. Water and electricity

Normally the projected cost of water and electricity is in the region of 3% to 4% of the construction cost of the building or structure. However Greenpoint stadium is considered to be very expensive with regards to design and finishes and it would therefore be unrealistic to use the normal region of 3% to 4% for this specific stadium.
As a result an allowance of approximately 1% of the total project cost is made. In Chapter 2 the total project cost for Greenpoint stadium is indicated as R 4,430,735,479 and the allowance for water and electricity would therefore be R 3,700,000 per month if rounded up to the nearest hundred thousand and based on that calculation the allowance per annum would be R 44,400,000.

3.2.2. Sewerage, refuse removal and other council levies

As with water and electricity the estimated cost for sewerage, refuse removal and other council levies are based on a percentage related to the construction cost, usually around 2%. However is stated above Greenpoint is a very expensive stadium and therefore an allowance of 1% would be more than sufficient in this case.

The cost for sewerage, refuse removal and other council levies would under these circumstances be in the region of R 3,700,000 per month or roughly R 44,400,000 per annum.

3.2.3. Cleaning services

It is estimated that there will be cleaning teams working at the stadium on a full time basis. A cleaning team consists of 5 cleaners and it is estimated that there will be 4 teams required. Thus there would be 20 cleaners working on a full time basis. If it is assumed that each cleaner is paid more or less R 100 a day that would be a total cost of R 2,000 a day. There are roughly 30 days in each month and therefore the total cost of full time employed cleaners would be R 60,000 per month.

However on weekends more teams would be required in order to accommodate the enormous amount of people coming to the stadiums.
If an additional 4 teams of 5 cleaners each is used for 3 days every week for 4 weeks a month, it would mean that 20 cleaners are required for 12 days each month. If these cleaners are also paid R 100 a day it would cost roughly R 24,000 per month for the additional cleaners.

Supervisors must also be employed to supervise these cleaning teams. If 4 supervisors are employed on a full time basis at R 7,000 a month each, it would be R 24,000 per month for supervisors.

If the full time employed teams, the additional teams and the supervisors are taken into account, the total cost for cleaning services is R 108,000 per month or R 1,296,000 per annum.

Bear in mind that the assumptions made with the regards to the number of cleaning teams are very conservative and could easily increase depending on the circumstances at the time.

3.2.4. Security services

Security services mainly consist of access control and guard services for which 10 people will be required as well as roaming guards for which 5 people will be required. There must be 24 hour security for the stadium. Therefore 3 teams of 15 people will be required each day seeing that a shift is 8 hours long. If the guards are paid R 150 a day it would add up to roughly R 202,500 a month assuming that each month has 30 days.

As with the cleaning services extra guards would be required over weekends. If 50 additional guards per shift work for 2 shifts for 2 days every weekend, it would amount to R 120,000 a month if these guards also earn R 150 a day.
For management and supervision of the guards 4 people must be employed on a full time basis. If each supervisor is paid R 8,000 a month the total cost for management and supervision would be R 32,000 a month.

The total cost for security services is therefore R 354,500 per month or approximately R 4,254,000 per year.

An alarm system will probably be installed in certain sections of the stadium such as offices, etc. and will have an installation cost of between R 80,000 and R 100,000. An armed response team will be incorporated with the system which will incur a monthly fee of approximately R 5,000.

The cost for the abovementioned system as well as the armed response unit was however not incorporated into the calculations due to the fact it was not yet confirmed if the system will in fact be installed.

3.2.5. Insurance and public indemnity

This insurance premium would be in the region of R 2,000,000 per month or R 24,000,000 per annum.

This is currently open as it will depend on the type of events hosted as well as the frequency thereof.

3.2.6. Gardening and landscaping

In order to properly maintain the stadium gardens and landscaping 2 teams of 4 people each will be employed on a full time basis. If these workers earn R 100 a day it would amount to a total of R 24,000 per month.
A supervisor must be employed to manage these workers and would earn R 7,000 a month. That brings the total cost for gardening and landscaping services to R 31,000 per month or R 372,000 per annum.

As the landscaping has not been finalised, it is not yet possible to determine the type of equipment that will be required to maintain the gardens. It is further also not possible to determine the cost of plants, shrubs, foliage, etc until the landscaping design has been completed. This could be a substantial amount, but no allowance has been made in this study for such costs.

3.2.7. General stadium management

The general management team consist of a general manager, an assistant manager and 5 general administration personnel and support staff. If the general manager is paid R 50,000 a month, the assistant manager is paid R 30,000 a month and the other staff is paid R 7,000 each a month, the total cost for the general management of the stadium would amount to R 115,000 per month or R 1,380,000 per year.

3.3. Greenpoint stadium Cape Town: Maintenance costs

Generally the maintenance cost is considered to be between 2% and 3% of the construction cost per annum. The main focus of this study will be on the day-to-day, structure and roof maintenance of the stadium.

3.3.1. Day-to-day maintenance

A permanent maintenance team must be employed that has to attend to all minor breakages and repairs with regards to all aspects of the stadium.
Such a team consists of 4 workers and 1 supervisor. If each of the workers are paid R 4,000 per month, whilst the supervisor is paid R 7,000 a month it would amount to R 23,000 a month.

However it must be kept in mind that the abovementioned costs only include for the labour component of the day-to-day maintenance. A further allowance must be made for the materials to be used for the maintenance. This allowance is usually in the region of R 20,000 a month.

The total cost for day-to-day maintenance is therefore R 43,000 per month or R 516,000 per annum.

3.3.2. **Structure maintenance**

The structure of the stadium will require lower maintenance than the other components of the stadium. Maintenance will be focused mainly on ablution, offices, etc. If an allowance of 1% of the total project cost is made for the maintenance of the structure the cost would be more or less R 44,307,355 per annum.

3.3.3. **Roof maintenance**

The roof maintenance is a very expensive operation, especially taking into account the elaborate design of the roof and the various materials used in the roof construction. As mentioned in Chapter 2 the roof structure for Greenpoint stadium consists of a structural steel compression ring, a steel cable tension ring, a truss and tangential beam installation with glass roof covering and finished internally with a protective membrane.
The glass roof covering must be cleaned at least every 2 months and the design of the roof makes it a very difficult and time consuming process. It would take 10 people approximately 5 days to clean the entire glass surface of the roof. If each of these cleaners were paid R 200 a day it would cost roughly R 10,000 every 2 months to clean the glass. That will amount to a total cost of R 60,000 per annum for the cleaning of the glass. However the abovementioned costs only include the cost for labour related to cleaning the glass. Therefore an additional allowance must be made for the material used to for the cleaning which would be more or less R 50,000 for every cleaning session, which would add up to approximately R 300,000 per annum for cleaning material.

Besides the cleaning of the glass every 2 months, an additional allowance must be made for the general maintenance of the roof and its structure. This will be roughly 1% of the cost for the roof construction and in this case the cost per annum would be R 4,750,000 on average.

However based on the complexity of the roof construction it might be advisable to allow a higher percentage for general maintenance, for instance 2% of the cost for the roof construction. In the last instance the total cost for general maintenance will be in the region of R 9,500,000 per annum.

If the cleaning of the glass, material for cleaning and the general roof maintenance is taken into account, the total cost for roof maintenance will be R 5,110,000 per annum (if 1% allowance is made for general maintenance) or R 9,860,000 (if 2% allowance is made for general maintenance).
3.4. Loftus Versfeld stadium Pretoria: Operating costs

The same principles will be followed for Loftus Versfeld stadium as what was followed for Greenpoint stadium.

3.4.1. Water and electricity

Loftus Versfeld stadium is a much less expensive stadium than Greenpoint stadium and does not have such a lavish and such luxurious finishes. Therefore the usual parameters used for estimating water and electricity costs can be used and it does not need to be adjusted as was the case with Greenpoint stadium.

The cost for water and electricity will amount to roughly R 36,000,000 per annum or R 3,000,000 per month.

3.4.2. Sewerage, refuse removal and other council levies

The cost for sewerage, refuse removal and other council levies is estimated to be in the same region as the cost for water and electricity. Therefore the total cost is projected to be more or less R 36,000,000 per annum or R 3,000,000 per month.

3.4.3. Cleaning services

Loftus Versfeld stadium is smaller than Greenpoint stadium and the number of cleaning teams required is therefore also less. It is estimated that 3 cleaning teams consisting of 5 cleaners each will be sufficient to do the normal cleaning of facilities in the stadium during the week. These teams will be employed on a full time basis. If the cleaners are paid R 100 a day it would amount to R 60,000 per month.
However just as it was in the case of Greenpoint stadium, additional cleaning teams will have to be employed over the weekends. If an additional 3 teams of 5 cleaners each is used over weekends (3 days every week), it would suggest that 15 cleaners are required for 12 days each month. The cost for the additional cleaners would be R 18,000 per month, assuming that these cleaners also earn R 100 a day.

It must also be taken into account that supervisors must be employed to manage these cleaning teams. In this case 3 supervisors should suffice. If each supervisor is paid R 7,000 per month, the cost for supervisors would be R 21,000 per month. The total cost for cleaning services would therefore be R 99,000 per month or R 1,188,000 per annum.

As was the case with Greenpoint stadium the number of cleaning teams is also based on conservative assumptions and could easily increase depending on the circumstances at the time.

3.4.4. Security services

It is estimated that 8 people will be required for access control and guard services and 4 people will be required as roaming guards in the stadium. These guards will only work 8 hour shift, so 3 teams are required in order to provide 24 hour security. That means 36 guards have to be employed on a full time basis. If these guards earn R 150 a day the cost would be about R 162,000 per month.

Additional guards will be required over weekends to assist with the security when games take place. If these guards work for 2 shifts for 2 days every weekend, approximately 50 additional guards would be sufficient. The extra cost per month would be R 120,000 if these guards also earn R 150 a day.
Supervisors must be employed to manage and supervise the guards. It would be adequate to employ 3 supervisors on a full-time basis. If each supervisor is paid R 8,000 a month the total cost for management and supervision would be R 24,000 a month.

The total cost for security services therefore amounts to R 306,000 per month or roughly R 3,672,000 per year.

It is very likely that an alarm system will be installed in some portions of the stadium such as offices, etc. The cost of installation for such a system will probably be between R 80,000 and R 100,000. An armed response team will be integrated with the system and the cost of such a team will be roughly R 5,000 per month. However, these costs were not included in the above calculations, because it is still uncertain whether the system will be installed.

3.4.5. Insurance and public indemnity

This insurance premium would be in the region of R 2,000,000 per month or approximately R 24,000,000 per annum.

As was the case with Greenpoint stadium the cost of insurance is presently open due to the fact that the insurance premium will depend on the type and frequency of the events hosted at the stadium.

3.4.6. Gardening and landscaping

If 2 teams of 3 people each are employed to do the normal gardening functions, it would be satisfactory. If these workers are paid R 100 a day the cost would be R 18,000 per month.
However it would also be necessary to appoint a supervisor to manage the workers. The supervisor would earn more or less R 7,000 a month. The cost for gardening and landscaping services would therefore be R 25,000 per month or approximately R 300,000 per annum.

A similar situation to that of Greenpoint stadium is also present at Loftus Versfeld stadium where the landscaping has not been finalised. It is therefore thus far not probable to determine the exact type and number equipment that will be necessary to maintain the gardens and the landscaping. The cost of this could be significant. However for the purpose of this study no allowance has been made for these costs.

3.4.7. General stadium management

The general management of the stadium is basically the same as for Greenpoint stadium. A general manager (R 50,000 a month), an assistant manager (R 30,000 a month) and 5 general administration and support personnel (R 7,000 a month each), would amount to R 115,000 per month or R 1,380,000 per year.

3.5. Loftus Versfeld stadium Pretoria: Maintenance costs

3.5.1. Day-to-day maintenance

As was the case with Greenpoint stadium a permanent maintenance team must be employed that has to attend to all minor breakages and repairs. If such a team consists of 4 workers (R 4,000 a month each) and a supervisor (R 7,000), the cost for labour would be roughly R 23,000 per month.
An allowance of R 20,000 must be made for materials used for maintenance and repairs involved with day-to-day maintenance.

When taking labour and materials into account the total cost for day-to-day maintenance is therefore roughly R 43,000 per month or R 516,000 per annum.

3.5.2. **Structure maintenance**

As previously stated the maintenance requirements for the structure is less than for other components. An allowance is made based on the total project cost and for Loftus Versfeld stadium the maintenance cost of the structure is estimated to be approximately R 30,000,000 per annum.

3.5.3. **Roof maintenance**

The roof maintenance for Loftus Versfeld stadium will be much less complex and less expensive than for Greenpoint stadium due to the nature of the roof construction. Greenpoint stadium’s roof is very elaborate as discussed previously, whereas Loftus Versfeld stadium’s roof is a very simple steel roof construction. The roof would therefore only need to be painted periodically depending on the state of the roof and does not require regular cleaning.

The roof will mainly require general maintenance, which is estimated based on the roof construction cost. The roof maintenance cost for is projected as roughly R 500,000 per annum.
3.6. Summary

The above information clearly indicates that certain operating and maintenance costs are unavoidable such as public indemnity insurance, security services, etc. However the design of the stadium and the materials used for construction can have a huge impact on maintenance costs, for example: Greenpoint stadium has a very elaborate roof design and the roof maintenance costs are therefore very high, whilst Loftus Versfeld stadium has a very simple roof design and the maintenance costs a much lower. According to Seeley (1976:12) it is at the design stage that the maintenance burden can be influenced either positively or negatively based on the decisions made.

The following tables indicate the total operating costs per annum as well as the total maintenance costs per annum for both Greenpoint stadium and Loftus Versfeld stadium.

Table 3: Summary – Operating costs per annum

<table>
<thead>
<tr>
<th>Operating costs per annum (R)</th>
<th>Greenpoint stadium</th>
<th>Loftus Versfeld Stadium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water &amp; Electricity</td>
<td>44,400,000</td>
<td>36,000,000</td>
</tr>
<tr>
<td>Sewerage, refuse removal and other council levies</td>
<td>44,400,000</td>
<td>36,000,000</td>
</tr>
<tr>
<td>Cleaning services</td>
<td>1,296,000</td>
<td>1,188,000</td>
</tr>
<tr>
<td>Security services</td>
<td>4,254,000</td>
<td>3,672,000</td>
</tr>
<tr>
<td>Insurance &amp; public indemnity</td>
<td>24,000,000</td>
<td>24,000,000</td>
</tr>
<tr>
<td>Gardening &amp; landscaping</td>
<td>372,000</td>
<td>300,000</td>
</tr>
<tr>
<td>General management</td>
<td>1,380,000</td>
<td>1,380,000</td>
</tr>
<tr>
<td><strong>Total cost per month</strong></td>
<td><strong>120,102,000</strong></td>
<td><strong>102,540,000</strong></td>
</tr>
</tbody>
</table>
Table 4: Summary – Maintenance costs per annum

<table>
<thead>
<tr>
<th>Maintenance cost per annum (R)</th>
<th>Greenpoint stadium</th>
<th>Loftus Versfeld Stadium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day-to-day maintenance</td>
<td>516,000</td>
<td>516,000</td>
</tr>
<tr>
<td>Structure maintenance</td>
<td>44,307,355</td>
<td>30,000,000</td>
</tr>
<tr>
<td>Roof maintenance</td>
<td>9,860,000</td>
<td>500,000</td>
</tr>
<tr>
<td><strong>Total cost per annum</strong></td>
<td><strong>54,683,355</strong></td>
<td><strong>31,016,000</strong></td>
</tr>
</tbody>
</table>

3.7. Conclusion

If proper value engineering and life cycle costing processes are applied during the planning and design phases of the project, it could have an impact on future operating and maintenance costs.

According to Seeley (1976:13) designers could contribute significantly to a reduction in maintenance costs if they ask themselves four when designing each component of a building:

- How can it be reached?
- How can it be cleaned?
- How long will it last?
- How can it be replaced?

Therefore if materials and designs are chosen based on all information, not only on aesthetics or cost of materials, it can result in lower maintenance costs. For instance certain materials might be more expensive when purchased, but has a longer lifespan and needs less maintenance, making the total cost throughout the life cycle less expensive than other alternatives. The focus must be on the entire project and the future costs to be incurred, not only on the present circumstances.
3.8. Testing of hypothesis

Hypothesis as stated in Chapter 1: “Operating and maintenance costs are directly connected to the design and material used for construction. Cost can therefore be reduced by selecting materials that require less maintenance. Likewise by designing smartly energy efficiency can be increased.”

Evidently the operating and maintenance costs are greatly affected by the type of design as well as material used. It is also clear that by utilizing value engineering the materials chosen and the design used can be the most cost effective option for the particular project, taking all factors into account.
CHAPTER 4

HOW CAN INCOME BE GENERATED AFTER THE 2010 FIFA WORLD CUP?

4.1. Introduction

A high stream of income will be generated during the 2010 Fifa World Cup due to the fact that the stadiums will be full to capacity for most of the soccer matches. The sales prices of tickets can also greatly be increased due to the high demand during the World Cup. However the real question is how much income can be generated by the stadiums after the World Cup. It is expected that most stadiums will have difficulty to generate adequate income after 2010 in order to sustain the stadiums. Cities such as Durban and Cape Town that will have an existing stadium close to a newly constructed stadium will especially have problems due to the fact that the situation will make it even more difficult to generate sufficient income to sustain both stadiums, let alone one. In this Chapter a range of alternatives will be investigated in order to determine the likely stream of income over the next few years for both Greenpoint stadium and Loftus Versfeld stadium.

4.2. Greenpoint stadium Cape Town

4.2.1. Scenarios for the generating of income after 2010

In the following section six different scenarios will be investigated to determine the probable income for Greenpoint stadium for after 2010.

4.2.1.1. Scenario No.1

In the first scenario it is assumed that one soccer match will take place every weekend (four matches per month) and that one additional event will take place every month.
The additional event will be something like a music concert, a show or any other sporting event. It is also assumed that the stadium will be filled to capacity for every match as well as each event and that tickets will be sold at an average price of R100 a ticket. Taking into account that Greenpoint stadium has 70 000 seats, the following can be calculated:

- If the average selling price of a ticket for a soccer match or an event is R100 per seat and Greenpoint stadium has 70 000 seats, an income of R 7,000,000 can be generated per match or event.
- If four soccer matches and one event take place every month at an income of R 7,000,000 per match or event, the income that can be generated will be R 35,000,000 per month.

Based on the above calculations a total income of R 420,000,000 will be generated per year.

4.2.1.2. Scenario No.2

In the second scenario it is assumed that four soccer matches and one additional event will take place every month. It is also assumed that the stadium will be filled to a capacity of 80% for every match as well as each event and that tickets will be sold at an average price of R100 a ticket. The following can thus be calculated:

- It is assumed that the stadium will only be filled to a capacity of 80% for each match, therefore only 58 000 of the 70 000 seats will be taken
- If the average selling price of a ticket for a soccer match or an event is R100 per seat and 58 000 seats of the stadium will be used, the income that can be generated per match or event will be R 5,600,000.
• If four soccer matches and one event take place every month at an income of R 5,600,000 per match or event, it will result in an income of R 28,000,000 per month.

It can therefore be concluded that the stadium will generate approximately R 336,000,000 per year.

4.2.1.3. Scenario No.3

The third scenario is very similar to the first scenario, because it is also assumed that four soccer matches as well as one additional event will take place every month. The main difference between Scenario No. 1 and Scenario No. 3 is the average selling price of tickets and the capacity used. In this scenario it is assumed that ticket prices will be lowered in order to ensure that a capacity of 100% is maintained at all times. It is therefore assumed that the average selling price of a ticket will be R75 per ticket. From the above information the following can be calculated:

• The stadium will once again be filled to a capacity of 100% (70 000 seats), but the average selling price of a ticket will be R75, which generates an income of R 5,250,000 per match or event.
• As before four soccer matches and one event will take place every month at an income of R 5,250,000 per match or event and will therefore generate an income of R 26,250,000 per month.

As a result the stadium will generate an expected income of more or less R 315,000,000 each year.
4.2.1.4. **Scenario No.4**

In the fourth scenario it is assumed that a soccer match will only take place every other weekend (two matches per month) and that one additional event will take place twice a year. It is once again assumed that the stadium fill be filled to a 100% capacity and that ticket prices will remain at an average of R100 per ticket for matches as well as events. The following can therefore be calculated:

- If the 70 000 seat stadium is filled to the maximum capacity and an average selling price of R100 per ticket is obtained, it will result in an income of R 7,000,000 per match or event.
- However in this scenario only two soccer matches take place each month thus an income of R 14,000,000 can be generated every month or R 168,000,000 per annum.
- Two events will take place each year which provides an additional income of R 14,000,000 per annum.

An income of R 182,000,000 per year can therefore be generated.

4.2.1.5. **Scenario No.5**

In the fifth scenario it is once again assumed that only two soccer matches will take place per month and that one additional event will take place twice a year. The stadium will only be filled to an 80% capacity. However the average selling price of a ticket will remain at R100 a ticket for the soccer matches and the events. The following can therefore be calculated:

- If the stadium is filled to a capacity of 80% and tickets are sold at an average selling price of R100, an income of R 5,600,000 will be generated for every match or event.
• If only two soccer matches take place every month at an income of R 5,600,000 per month, an income of R 11,200,000 can be obtained every month or R 134,400,000 per year.

• If two additional events take place twice a year a further income of R 11,200,000 can be generated per annum.

Based on the abovementioned information the stadium will generate an income of R 145,600,000 per year.

4.2.1.6. Scenario No.6

In the last scenario it is assumed that two soccer matches will take place for nine months of the year and that only one additional event will take place once a year. As was the case in Scenario No.3 the prices of tickets are reduced in order to ensure that the stadium is filled to its maximum capacity. As a result the tickets will be sold at an average selling price of R75 a ticket. Taking the above information into account the following can be calculated:

• All 70 000 seats of the stadium will be used and tickets will be sold at R75 a ticket, which results in an income of R 5,250,000 per soccer match or event.

• Due to the fact that only two soccer matches will take place for nine months an income of R 10,500,000 will be generated every month for nine months or R 94,500,000 per year.

• If one additional event takes place each year a further income of R 5,250,000 can be generated.

The stadium will therefore generate approximately R 99,750,000 per year.
4.2.2. **Summary of the income that can be generated**

From the information given above in the various scenarios it is clear that the first scenario would be most favourable for Greenpoint stadium, whilst the last scenario would be the least favourable. However when determining the most likely stream of income for the various circumstances pertaining to that particular stadium must be taken into account. A specific drawback in the case of Greenpoint stadium is the fact that Nuweland stadium is in very close proximity to Greenpoint stadium. Therefore Greenpoint stadium will be used for soccer matches, whilst Nuweland stadium will be used for rugby matches. However any additional events such as musical performances, shows, etc. that will take place in the area will most likely be shared between the two stadiums. Therefore the scenario that would most likely take place would be Scenario No. 6 seeing that the soccer season is only for nine months of the year where two matches will take place each month and only one other event would take place each year. However this will not be the case for every month, sometimes Scenario No. 4 or No.5 would be applicable where two matches per month as well as two additional events per year would take place. The only difference between Scenario No. 4 and No. 5 being the average ticket prices and the capacity of the stadium utilized.

4.3. **Loftus Versfeld stadium Pretoria**

4.3.1. **Scenario for the generating of income after 2010**

The same approach followed for Greenpoint stadium will now also be followed for Loftus Versfeld stadium, where six different scenarios will be evaluated to predict what the most likely income of Loftus Versfeld stadium will be after 2010.
4.3.1.1. **Scenario No.1**

Loftus Versfeld stadium is currently used for both rugby and soccer matches and will continue to host both types of matches in future. In the first scenario it is assumed that four matches and one additional event will take place every month. As discussed above in Scenario No.1 of Greenpoint stadium, an additional event will be something like a music event, a show or any other sporting event. For this scenario it is also assumed that the stadium will be filled to a 100% capacity for every match as well as each event and that the average price of tickets will be sold R100 a ticket. Loftus Versfeld stadium has 55 000 seats in total. Based on the information provided the following can be calculated:

- If the average selling price of a ticket for a match or an event is R100 per ticket and the stadium is filled to 100% capacity (55 000 seats), an income of R 5,500,000 can be generated per match or event.
- Assuming that four matches as well as one event take place every month at an income of R 5,500,000 per match or event, the resultant income will be R 27,500,000 per month.

These calculations indicate that the stadium will be able to generate an income of R 330,000,000 per year.

4.3.1.2. **Scenario No.2**

As was the case with the first scenario it is assumed that one match (rugby or soccer) will take place every weekend (four matches per month) and that one additional event will take place every month. However in this scenario it is assumed that the stadium will only be filled to a capacity of 80% for every match or event.
The average selling price of tickets will still be R100 a ticket. The following can therefore be calculated:

- If the stadium is only filled to a capacity of 80% as assumed above, only 44,000 seats will be used (tickets sold) and if the tickets are sold at an average selling price of R100 per ticket, the income that can be generated per match or event will be R 4,400,000.
- Therefore if four matches and one event take place every month at an income of R 4,400,000 per match or event, it will result in an income of R 22,000,000 per month.

Based on the above calculations an income of R 264,000,000 can be generated by the stadium per year.

4.3.1.3. Scenario No.3

In the third scenario it is assumed that four soccer matches will take place every month and that one additional event will take place every month (as was the case in Scenario No.1). In this scenario however to ensure that the stadium is filled to the maximum capacity (100%) for all matches and events, the average selling price of a ticket is lowered to R75 a ticket. Taking all this into account the following can as a result be calculated:

- If all 55,000 seats will be used for every match and event and tickets will be sold at an average selling price of R75 a ticket. This will generate an income of R 4,125,000 per match or event.
- If four matches and one event take place every month at an income of R 4,125,000 per match or event, an income of R 20,625,000 will be generated per month.

Therefore a total income of R 247,500,000 can be generated per year.
4.3.1.4. **Scenario No.4**

In the fourth scenario the stadium is once again assumed to be filled to a 100% capacity for each match or event, although in this scenario it is assumed that only two matches will take place every month (one match every other weekend) and that one additional event will take place twice a year. It is once again assumed that the ticket prices will remain at an average of R100 per ticket. The following can thus be calculated:

- Seeing that the stadium is filled to the maximum capacity (55 000 seats) and tickets are sold at an average selling price of R100 per ticket, a resultant income of R 5,500,000 will be generated for every match or event.
- In this scenario only two matches will take place every month. The total income that can be generated for each month is R 11,000,000 or R 132,000,000 per year.
- If two events take place each year it would result in an additional income of R 11,000,000 per annum.

In this scenario the stadium will generate an income of R 143,000,000 each year.

4.3.1.5. **Scenario No.5**

This scenario is very similar to Scenario No.4 due to the fact that only two matches will take place each month and one additional event will take place at the stadium twice a year. However in this scenario the stadium will only be filled to a capacity of 80%. The average selling price of the tickets will remain constant at R100 per ticket.
The following can therefore be calculated:

- Only 44,000 seats will be used for each match or event, because the stadium is only filled to an 80% capacity. The average selling price for the tickets are R100 per ticket. This brings the income generated at each match or event to an amount of R 4,400,000.
- Since only two matches and take place every month at an income of R 4,400,000 per month, the income that can be obtained every month is R 8,800,000 or R 105,600,000 per year.
- Two events per year will provide a further income of R 8,800,000 per annum.

The stadium will therefore generate an income of R 114,400,000 per year.

4.3.1.6. Scenario No.6

In the last scenario it is assumed that only one additional event will take place at the stadium per year and that two soccer matches will take place per month for nine months of the year. To ensure that the stadium is filled to the maximum capacity at all times, the average selling price tickets is reduced to R 75 a ticket. The following can therefore be calculated:

- The stadium will be filled to maximum capacity, therefore 55,000 tickets will be sold at an average selling price of R 75 a ticket, resulting in an income of R 4,125,000 per match.
- Two matches will take place per month for nine months per year. Therefore an income of R 74,250,000 will be generated per annum.
- A further R 4,125,000 will be generated by the additional event.

From the above information it can be concluded that the stadium will earn an income of R 78,375,000 per year.
4.3.2. **Summary of the income that can be generated**

As was the case with Greenpoint stadium the first scenario would also be most favourable for Loftus Versfeld stadium, whilst the last scenario would be least favourable. Loftus Versfeld stadium however has an advantage due to the fact that there are no stadiums in close proximity. Loftus Versfeld stadium hosts soccer as well as rugby matches and therefore more matches as well as events will take place at Loftus Versfeld stadium than at Greenpoint stadium. In this case Scenario No. 4 or No. 5 would be the most likely to occur as two matches per month and two events per year will take place, the only difference being the capacity used as well as the average ticket prices. However in certain months it could be likely that Scenario No. 2 or No. 3 could take place where four matches as well as one event take place every month, once again the only difference being the capacity used and the average ticket prices.

4.4. **Advertisements and television rights**

The income that can be generated through advertisements and television rights is very complicated to determine. It depends on various factors such as the sponsors, the importance of the match taking place, etc. For the purpose of this study the income generated by advertisements as well as television rights are therefore excluded and not taken into account.

4.5. **Summary**

From the information provided in the six different scenarios for each stadium, it is clear that the first scenario would be the most favourable for both stadiums, whilst the last scenario would be the least favourable for both stadiums. In both cases the individual circumstances of each stadium was taken into account to determine what the most likely scenario would be.
The following figures (own information) indicate the scenarios for income that can be generated in one year after the 2010 FIFA Soccer World Cup as discussed above for both Greenpoint stadium and Loftus Versfeld stadium.

**Figure 1: Income generated in one year for Greenpoint stadium**

**Figure 2: Income generated in one year for Loftus Versfeld stadium**
4.6. **Conclusion**

During the 2010 FIFA World Cup the stadiums will be filled to maximum capacity and ticket prices will be higher than normal. The stadiums will therefore generate higher income streams than would usually be possible. In this chapter only six different scenarios were identified for each stadium to determine the likely income stream after the 2010 FIFA World Cup. It is clear that Scenario No. 1 is highly unlikely to occur at either of the stadiums and that each stadium relates to a different scenario for its probable income stream. Great care must therefore be taken when projecting what the future income stream of a stadium will be. All the facts and unique circumstances of the stadium must be taken into account to ensure that the projected income stream is determined in a realistic way.

4.7. **Testing of hypothesis**

Hypothesis as stated in Chapter 1: “Income can be generated through hosting sporting events, as well as music concerts and other similar activities. Advertisements and television rights can also be used as a means of generating income.”

From the above discussions it is clear that the income that a stadium can generate is very uncertain, but that income can be generated through various ways such as the hosting of soccer or rugby matches, music concerts, shows and other similar events. The income generated will depend on the frequency as well as the importance of events. Additional income can also be generated by means of advertisements and television rights.
CHAPTER 5

WILL THE INCOME GENERATED BE SUFFICIENT TO COVER COST OF CONSTRUCTION (CAPITAL COST), OPERATION AND MAINTENANCE?

5.1. Introduction

In this chapter the potential income will be compared to the total capital outlay plus all operation and maintenance costs to determine when and if the total cost can be recovered, therefore indicating whether the construction development is feasible or not. Existing stadiums will obviously require less income than a new stadium in order to recompense the debt of the total capital outlay. The evaluation of the feasibility will as a result also indicate whether the stadiums will be sustainable or not.

5.2. Greenpoint stadium Cape Town

The total capital outlay for the stadium (discussed in Chapter 2) as well as the yearly operating and maintenance costs (discussed in Chapter 3) will be compared to the best and worst case scenarios (Scenario No. 1 and No. 6) for generating income as discussed in Chapter 4 to determine if and when the total cost of the stadium can be recovered. A most likely scenario will also be evaluated and in this scenario the income used will be the average of the income generated in best and worst case scenarios.

For the purpose of the research the cost of capital (interest) relating to the total capital outlay will be excluded from the calculations.

5.2.1. Best case scenario

The total capital outlay for Greenpoint stadium is R 4,430,735,479 excluding VAT. The total operating cost is R 120,102,000 per annum whilst the total maintenance cost is R 54,683,355 per annum.
Therefore the total expenses (operating costs plus maintenance costs) per annum are R 174,785,355. The income that can be generated per year according to Scenario No. 1 discussed in Chapter 4 is R 420,000,000. The net income for the first year of operation after 2010 is therefore R 245,214,645 (gross income minus total expenses).

According to JFD van Zyl (2009) it can be assumed that the total expenses will escalate at a constant rate of 8% per annum. It can also be assumed that the income will escalate by 12% each year (Van Zyl: 2009). Taking the above information into account in five years time the gross income will be R 660,878,131 per annum whilst the total expenses will be R 237,793,546 per annum. The net income in five years time will therefore be R 423,084,585 per annum.

If the same trend of escalation for expenses and gross income continue in the future it can be determined how many years it will take to recover the total capital outlay of the stadium. If all of the above information is taken into account it would take roughly 9.5 years to recover the total capital outlay of the stadium.

5.2.2. Worst case scenario

In the worst case scenario (Scenario No. 6 discussed in Chapter 4) the income that can be generated per year is R 99,750,000. The total capital outlay (R 4,430,735,479) as well as the total expenses (R 174,785,355) remain the same as stated in the above scenario. Therefore the total net income or loss (gross income minus total expenses) that can be generated in the first year of operation is a loss of -R 75,035,355.

It is once again assumed that the total expenses will escalate at 8% per year and that the gross income will escalate by 12% per year.
After five years the total expenses per annum will be R 237,793,546 and the gross income will be R 156,958,556. The net loss after five years will therefore be -R 80,834,990.

If it is assumed that the same trend for escalation will continue in future, it can be determined that the total capital outlay of the stadium will be recovered in roughly 30.25 years.

5.2.3. Most likely / Average scenario

The abovementioned scenarios depict the best and worst case circumstances with regards to income that can be generated. However neither of these scenarios is likely to occur. Therefore to determine the most likely scenario the average income between the best and worst case scenario must be calculated. This results in an average gross income of roughly R 259,875,000 per annum. The total expenses will once again remain at R 174,785,355 per annum. Therefore the net income that will be generated in the first year of operation will be R 85,089,645.

If the expenses escalate by 8% per year whilst the income escalates by 12% per year, it will result in a total cost of R 237,793,546 for expenses and an income of R 408,918,344 after five years. This means that the net income in five years time will be R 171,124,798 per annum.

Assuming that the abovementioned trends with regards to the escalation of income and expenses persist in future, the total capital outlay of the stadium will be recovered in approximately 14.25 years.
5.2.4. Summary of different scenarios

In the three scenarios above the estimated time in which the total capital outlay of the stadium will be recovered was determined by evaluating the net income that can be generated each year. The best case scenario indicated an estimated time of 9.5 years in which the total capital outlay will be recovered, whilst the worst case and most likely scenarios each depicted an estimated time of 30.25 years and 14.25 years respectively. In the construction industry the average acceptable time in which total capital outlay must be recovered is between 20 and 25 years (Van Zyl: 2009).

Therefore the best case scenario as well as the most likely scenario both fall within the required range, but the worst case scenario clearly falls outside the acceptable parameters. As a result it can be concluded that the construction of Greenpoint stadium is in fact feasible if the best case scenario or most likely scenario is applicable, but will not be feasible in terms of the worst case scenario.

5.3. Loftus Versfeld stadium Pretoria

The same approach that was followed for Greenpoint stadium will now also be followed for Loftus Versfeld stadium. The total capital outlay as well as the operating and maintenance costs will be compared to different scenarios of income that can be generated to determine if and when the total cost of the stadium can be recovered. Once again the cost of capital (interest) on the total capital outlay will be excluded from the calculations.
5.3.1. **Best case scenario**

The total capital outlay for Loftus Versfeld stadium is R 121,354,103 excluding VAT (as discussed in Chapter 2). The total operating cost for the stadium is R 102,540,000 per year and the total maintenance cost per year is R 31,016,000 (as discussed in Chapter 3). The total cost of expenses (operating costs plus maintenance costs) per annum is therefore R 133,556,000. According to Scenario No. 1 (discussed in Chapter 4) the income that can be generated is R 330,000,000 per annum. Therefore the net income (gross income minus total expenses) for the first year of operation after the 2010 is R 196,444,000.

From the above information it can evidently be concluded that the total capital outlay of the stadium can be recovered in less than a year. After the first year the stadium will therefore be making a profit. Bearing in mind that the gross income is assumed to escalate by 12% every year and that the total expenses will escalate at a constant rate of 8% per annum (as discussed previously), the profit that will be made will increase every year. For instance after five years the gross income that can be generated will be roughly R 519,261,389 per annum whilst the total expenses will be more or less R 181,701,464 per annum. Consequently the net income (or profit in this case) will be R 337,559,925 per annum.

5.3.2. **Worst case scenario**

Scenario No. 6 that was discussed in Chapter 4 depicts the worst case scenario for the stadium. In this scenario the income that can be generated per annum is R 78,375,000. The total cost of expenses remains the same at R 133,556,000 per year. Taking the above information into account the stadium will incur a net loss of -R 55,181,000 for the first year of operation.
It is assumed that the gross income will escalate by 12% each year whilst the expenses will escalate by 8% per year. Therefore after five years the gross income that can be generated will be R 123,324,580 and the total cost of expenses will be R 181,701,464 per year. This will result in a net loss of –R 58,376,884 for that year.

If the escalation trends for both income and expenses remain the same in future, it can be determined that the total cost of capital can be recovered in roughly 23.25 years.

5.3.3. Most likely / Average scenario

Just as before both the best and worst case scenarios are highly unlikely to occur. Therefore to establish what the most likely scenario would be the average gross income that can be generated for the best and worst case scenario is determined. As a result of this calculation the average gross income per year is R 204,187,500. Yet again the total cost of expenses will be R 133,556,000 per year. Taking the above into account the resultant net income for the first year of operation will be R 70,631,500.

Once again it is assumed that the expenses will escalate by 8% per year whilst the income will escalate by 12% per year. Therefore after five years the total cost of expenses will be R 181,701,464 and the gross income will be R 321,292,984. Consequently the net income in five years time will be R 139,591,520.

If the abovementioned trends of 8% escalation for expenses and 12% escalation for income continue in the future, it can be calculated that the total capital outlay will be recovered in more or less 1.75 years.
5.3.4. **Summary of different scenarios**

As was the case with Greenpoint stadium the various scenarios for Loftus Versfeld stadium also indicated the estimated time in which the total capital outlay can be recovered. This time was depicted as less than a year in the best case scenario, whilst it would take 23.25 years in the worst case scenario and 1.75 years in the most likely scenario. However the acceptable time to recover the total capital outlay cannot be evaluated on the same basis as Greenpoint stadium, hence the fact that Loftus Versfeld stadium is not a newly constructed stadium.

In the construction industry the normal acceptable parameters in which to recover the total capital outlay of an upgraded stadium will be within 5 years of construction (Van Zyl: 2009). The timeframes stipulated in the best case and most likely scenarios therefore fall within the acceptable parameters. However the 23.25 years as estimated in the worst case scenario does not conform to these standards, which makes the upgrade of Loftus Versfeld stadium not feasible in the worst scenario case.

### 5.4. **Summary**

From the information given for both Greenpoint stadium as well as Loftus Versfeld stadium, it is clear that timeframe in which the total capital outlay of the stadiums can be recovered vary dramatically based on the assumptions made in each scenario. The best case scenario would be the most favourable for both stadiums. However the best case scenario is highly unlikely to occur. The best case scenario as well as the most likely scenario both falls within the required parameters for Greenpoint stadium as well as Loftus Versfeld stadium. Whilst the worst case scenario falls outside the acceptable parameters for both stadiums. This means that neither of the stadiums would be feasible if the worst case scenario was to occur.
The following figures (own information) indicate the various scenarios for the estimated net income that can be generated for 25 years after the 2010 World Cup as discussed above for Greenpoint and Loftus Versfeld stadium.

**Figure 3: Greenpoint stadium: Estimated net income for the next 25 years**

**Figure 4: Loftus Versfeld stadium: Estimated net income for the next 25 years**
5.5. **Conclusion**

The income that can be generated by the stadiums as well as the operating and maintenance cost are all estimated or projected figures. In fact the gross income plus the operating and maintenance costs that can be generated will vary from season to season and year to year. The estimated net income will constantly vary due to numerous factors that cannot be accurately predicted. However for the purpose of this study it is assumed the income that can be generated each year as well as the operating and maintenance costs will be constant except for the 12% escalation for the income and the 8% escalation for operating and maintenance costs that was taken into consideration for all calculations. Based on these assumptions depicted above in the various scenarios it can be concluded that the construction of Greenpoint stadium is feasible in all three scenarios. However Loftus Versfeld stadium will only be feasible in the best case and most likely scenarios.

5.6. **Testing of hypothesis**

Hypothesis as stated in Chapter 1: “It seems that the construction of a new stadium will not be feasible when all factors are taken into consideration and that the upgrading of existing stadiums would have been the better option.”

After the various scenarios were investigated it became apparent that in the best case scenario as well as the most likely scenario, both the construction of a new stadium as well as the upgrade of an existing stadium would be feasible. However in the worst case scenario neither the construction of a new stadium nor the upgrade of an existing stadium would be feasible.
CHAPTER 6

CONCLUSION

6.1. Background

When the planning and preparation for the 2010 FIFA Soccer World Cup began, it was decided that five new stadiums will be constructed whilst five existing stadiums will be upgraded for this event.

The stadiums have to comply with certain requirements as stipulated by FIFA and as a result certain unavoidable costs would have to be incurred to meet these requirements. However most of the stadiums are designed in such a way that it not only complies with the requirements, but exceed these requirements by far. This has unnecessary costs implications as a result.

The newly constructed stadiums were designed to be very impressive and elaborate. This was done in order to make an impression and to show the world what South Africa is capable of. No costs were spared to achieve this goal. It became apparent that none of the stadiums remained within their allocated budgets, mainly due to improper planning and poor cost control.

The design of the stadiums as well as the materials used for construction has an effect on the operation and maintenance costs of the stadium. By applying life cycle costing mechanisms and value engineering, these costs could be reduced.

It is obvious that the income that will be generated during the 2010 FIFA World Cup would be substantial, due to the fact the stadiums will most likely be filled to capacity at nearly all matches. However after 2010 the income that will be generated will return to normal. The income stream will therefore decline.
It seemed that sight was lost of the feasibility and sustainability of the stadiums and that no thought was given to what would happen to the stadiums after 2010. Major costs were incurred without determining if and when these costs will be recovered.

The purpose of this study is therefore to investigate the sustainability of a newly constructed stadium for the 2010 FIFA World Cup, compared to the upgrade of an existing stadium. It was decided to use Greenpoint stadium in Cape Town as an example of a newly constructed stadium, whilst Loftus Versfeld in Pretoria was used as an example of an upgraded stadium.

6.2. Summary

6.2.1. Total capital outlay

The latest Financial Reports for both Greenpoint stadium as well as Loftus Versfeld stadium was analyzed to determine what the total capital outlay of each stadium is. Neither of the stadiums remained within their original budgets. The total capital outlay of Greenpoint stadium is obviously much higher than that of Loftus Versfeld stadium, due to the fact that Greenpoint is a newly constructed stadium whereas Loftus Versfeld stadium is an upgraded stadium.

The total capital outlay was therefore analyzed to identify what the major cost components are. By analyzing these components it became apparent where unnecessary costs were incurred. The effect of the design of the stadium as well as the materials used was evaluated and it was determined that savings could have been incurred if proper planning and cost control was used. Most of the decisions made were based on aesthetics and not on functionality or cost effectiveness.
6.2.2. Operation and maintenance costs

Various operation and maintenance costs associated with the stadiums were identified. The operation costs included water and electricity, sewerage, refuse removal and council levies, cleaning services, security services, insurance and public indemnity, gardening and landscaping and the general management of the stadium. The maintenance costs included day-to-day maintenance, structure maintenance and roof maintenance. The operation costs as well as the maintenance costs for Greenpoint stadium are much higher than that of Loftus Versfeld stadium. There are various reasons for this such as the larger size of Greenpoint stadium, its complex roof structure and the materials used for construction.

Most of the operation and maintenance costs are unavoidable. However the design of the stadium as well as the materials used can have a significant impact on the maintenance costs. Certain materials require more frequent or laborious maintenance and certain materials have to be replaced more often than others.

6.2.3. Potential income generated after 2010

It is very difficult to determine the actual income that will be generated after the 2010 FIFA World Cup. It was therefore necessary to evaluate various scenarios based on different assumptions made, to determine the estimated future income for each stadium. The scenarios included income to be derived from soccer matches as well as rugby matches in the case of Loftus Versfeld stadium. It was also assumed that other events such as music concerts will take place at the stadiums from time to time and the income related thereto was also incorporated into the scenarios. The individual circumstances of each stadium will determine the income that can be generated and it is therefore critical to evaluate each stadium individually.
6.2.4. Recovery of total capital outlay plus operation and maintenance costs

The total capital outlay plus all operation and maintenance costs were compared to various potential income scenarios in order to determine the time in which the cost of the stadiums can be recovered. The results of the calculations indicated that both Greenpoint stadium as well as Loftus Versfeld stadium will be feasible in the best case and most likely scenarios, but will not be feasible in the worst case scenario.

6.3. Conclusion

There are mainly three factors that will determine the net income that a stadium can generate and therefore also determines the sustainability of the stadium. These three factors are the total capital outlay of the stadium, the operation and maintenance costs as well as the gross income that can be generated by the stadium.

The research done in this study shows that the construction cost for a newly constructed stadium is much higher than that of an upgraded stadium. The decisions made during the design process, such as the choice of materials and the complexity of the stadium design, in turn have an effect on the operation and maintenance costs of the stadium. As a result the operation and maintenance costs of the newly constructed stadium are also higher than that of the upgraded stadium.

The gross incomes that can be generated by the stadiums are determined by the individual circumstances of each stadium. Seeing that Loftus Versfeld stadium is an existing stadium it already has a steady stream of matches and events taking place at the stadium.
Loftus Versfeld stadium is also the only stadium in the vicinity and will therefore host all rugby and soccer matches in that region as well as any additional events that will take place. Greenpoint stadium however is a newly constructed stadium and Nuweland stadium, which is an existing stadium, is in very close proximity to Greenpoint stadium. These two stadiums will therefore share the matches and events that take place in that region. Greenpoint stadium will host only soccer matches, whilst Nuweland stadium will host only rugby matches and additional events will be hosted by both stadiums. It can therefore be determined that Loftus Versfeld stadium will be able to generate a higher gross income than Greenpoint stadium seeing that it would host more matches and events.

If all of these factors are taken into account it can be concluded that Loftus Versfeld stadium will be more sustainable than Greenpoint stadium due to the fact it would have a higher net income than will be generated. The total capital outlay of Loftus Versfeld stadium will therefore be recovered faster and the stadium will start showing a profit sooner.

The research and findings of this study therefore indicate that the upgrade of an existing stadium for the 2010 FIFA Soccer World Cup would be more sustainable than the construction of a new stadium.

6.4. Suggestions for further research

The operation and maintenance costs used in this study for the newly constructed stadiums are based on projected and estimated figures. The actual costs relating thereto will only be available after the stadiums are operational after 2010. It is therefore suggested that these actual costs be determined and used in a similar study as this to determine a more accurate net income that can be generated for newly constructed stadiums.
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