



# Will the Olympic Flame Shine Once More?

*A study into the profitability of hosting the 2034 Winter Olympic and  
Paralympic Games in Norway*

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# Preface

This thesis is written as a part of our Master of Science in Economics and Business Administration at the Norwegian School of Economics and corresponds to one semester of full-time studies. We were two students working on this project during the fall semester of 2020, and it is part of our major in Business Analysis and Performance Management.

First, we would like to thank our supervisor Mario Guajardo for his guidance and support throughout this process.

We also wish to thank all the people who have provided us with the necessary information required for our analysis. In special Jens Kvarekvål, Knut Olav Karlsen and Tom Tvedt who have all been of tremendous help to us in collecting information about the Winter Olympic and Paralympic Games and setting the direction for this thesis, and to Magnus Sverdrup for sharing his knowledge of the New Norm.

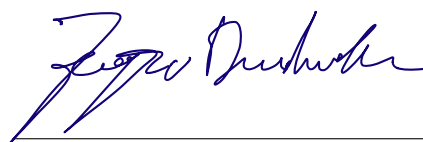
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# Abstract

The topic of this thesis is the project of hosting the 2034 Winter Olympic and Paralympic Games in Norway, studying its potential profitability. Subsequent to a recent project by the International Olympic Committee, known as the New Norm, the requirements for hosting the Olympics and Paralympics have undergone a revision. As a result, the many conditions faced by the Oslo 2022 Committee are not the same today.

Our study consists of an analysis of the direct cash flow effects of the Olympic project, resulting in a static net present value as a measure of its profitability, as well as a discussion of real options and external effects, and their potential impact on the expanded net present value. The result of our analysis is a negative static net present value of NOK 2 930 123 000, leaving the project unprofitable. Our discussion regarding the expanded net present value suggests there is a potential for the project having indirect effects on the Norwegian economy which could justify undertaking it despite our main findings. This decision would depend on the magnitude of such effects, and requires a further economic analysis building on our results.

In addition to the main findings, our study also suggests there is a potential for cutting certain costs due to the revisions made by the New Norm. Our analysis is based on estimates from previous Olympic budgets, and as a result their processes and strategies. Due to the lack of information and resources available to us, our study is unable to capture the full potential of the New Norm revisions for optimising processes such as the transportation and technology concepts, venue plan, etc. With access to this information, a planning committee would be better suited for conducting these optimisations, potentially increasing the value of the project to some extent.

In summary, our results provide insight to and establishes a baseline for a further investigation of the costs and benefits of hosting the 2034 Winter Olympic and Paralympic Games in Norway.

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# 1 Introduction

## 1.1 Topic and research question

In 2017, the Voss sports council started to explore the idea of hosting the Winter Olympics in Norway again, and formed Idrettens Olympiade. Idrettens Olympiade has initiated a process for deciding if Norway should launch a bid to host the Winter Olympic and Paralympic Games in 2034, requesting a thesis on this topic to aid them in their work. Responding to their request, this thesis is an ex ante project analysis of a potential Winter Olympic and Paralympic Games in Norway 2034.

The background for this thesis is the IOC's implementation of their new Olympic Standard, namely the New Norm. The New Norm is a set of 118 reforms aiming to improve the Olympic's economic, social and environmental footprint in the host region. The cost of hosting the Winter Olympic and Paralympic Games has been the major setback for all Norwegian initiatives after 1994. This has led to a large debate regarding Olympic costs and the IOC's standing in Norway. Idrettens Olympiade's initiative is the first attempt to applying for the Games subsequent to the launching of the New Norm, and the examination of its effect on the costs and benefits of a Winter Olympic and Paralympic games in Norway seems an intriguing one.

The research question for this thesis is whether or not hosting a post New Norm Winter Olympic and Paralympic Games in Norway is profitable, and how its profitability might influence the decision of launching the project.

## 1.2 Scope and limitations

The main subject of this project analysis is the study of the direct revenues and costs related to the Winter Olympic and Paralympic Games. We analyse the project from the standpoint of the Norwegian authorities as a project owner, examining the project's cash flow. Furthermore, we will look at the Winter Olympic and Paralympic games' repercussions. Our study does not have the ambition of providing a full scale economic analysis of all effects on the Norwegian economy, but touches on the subject through a discussion of what indirect effects might supplement our findings.

We will evaluate the project as external analysts and the analysis is based solely on publicly available information and data.

## 1.3 Structure

Before embarking on our study, we will give a brief explanation of the project's background. Further on, we will establish the theoretical framework to be used for evaluating the profitability of the potential Winter Olympic and Paralympic Games.

In our main analysis, we will give a detailed description of our findings, including an evaluation of our premises, assumptions and the uncertainty of our estimates.

Before concluding, we will discuss any additional values which may arise from the project.

## 2 Background

### 2.1 Olympics in Norway

The matter of hosting the Olympic Winter Games has sparked controversy in Norway numerous times in recent years. Although Norway's most recent Olympic Games, Lillehammer 1994, are still regarded as a great success and a fond national memory, today's attitude towards repeating the endeavour is split at best<sup>1</sup>.

On the one hand, Norway is the most successful of the contending nations<sup>2</sup>. Additionally, the public interest in winter sports and the lasting traditions for them have quite a unique standing in Norway compared to most other countries. On the other hand, hosting the Olympics has proven costly. The cost has also been the main subject of discussion in relation to the previous attempts at filing a Norwegian application, namely for Tromsø 2018 and Oslo 2022<sup>3</sup>. An important part of this has of course been the many conditions set by the IOC, for which they have been heavily criticised, adding to the costs without any apparent benefit for the host nation<sup>4</sup>.

The high cost was, along with the IOC's flailing reputation, a main factor leading to the vote against filing the application for hosting the Winter Olympics in Oslo in 2022<sup>5</sup>.

### 2.2 The New Norm

The IOC has responded to the criticism by revising their conditions through their project the New Norm<sup>6</sup>, aiming to cut unnecessarily costly conditions and facilitating more sustainable Games. A main theme of the revision is the emphasis on utilising existing venues and infrastructure.

Former Olympic Games have often seen a display of brand new and extravagant stadiums and venues, showcasing architectural splendour, before falling into disuse or use well below

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<sup>1</sup>See Strøm (2019), Bernhus (2019)

<sup>2</sup>Statista (2020)

<sup>3</sup>E.g. Fossen et al. (2014), Sivertsen (2018)

<sup>4</sup>Fossen et al. (2014)

<sup>5</sup>See NRK (2014), Bugge (2014)

<sup>6</sup>IOC, Olympic Agenda 2020 (2018)

their capacities<sup>7</sup>, although this is not a general rule<sup>8</sup>. After the New Norm, potential hosts are encouraged to reuse their existing venues as much as possible<sup>9</sup>. If there are no appropriate venues, they are encouraged to construct new ones with legacy in mind, ensuring they serve their purpose long after the Games are finished, or alternatively use temporary venues. The conditions have also become more flexible with regards to moving events away from the main city, even out of the host country<sup>10</sup>.

No Olympic Games have been held subsequent to the New Norm, but a few have been granted. Among them is the 2026 Olympic and Paralympic Winter Games in Milano/Cortina Italy<sup>11</sup>. They were elected over Stockholm/Åre Sweden in the final vote. The two candidates' applications give some insight as to how the implications of the New Norm may play out in practice<sup>12</sup>. It is, however, important to bear in mind that their candidature processes were not entirely within the New Norm regulations, which will not be the case until the 2030s<sup>13</sup>.

## 2.3 Future possibilities

The steps taken by the IOC have not gone unnoticed<sup>14</sup>. With the prospects of more affordable Olympics, plans are being developed for a new Norwegian application. New possibilities for a larger geographic spread of the Games have sparked plans for a different layout than has been the case for the previous attempts<sup>15</sup>.

The most recent initiative has been taken by Idrettens Olympiade, suggesting to host Olympic and Paralympic Games across most regions of the country, minimising the construction of new facilities and avoiding any Games specific permanent works<sup>16</sup>. This is the project for which this thesis has been requested, and is the baseline for our analysis.

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<sup>7</sup>Kasimati (2015), Flygind (2014), Grebey and Shaw (2018), Ponc (2020)

<sup>8</sup>Barber (2018)

<sup>9</sup>IOC, Olympic Agenda 2020 (2018) p. 25

<sup>10</sup>Ibid.

<sup>11</sup>IOC Media Relations Team (2019)

<sup>12</sup>International Olympic Committee (2019)

<sup>13</sup>IOC (2019)

<sup>14</sup>Ekeland (2014)

<sup>15</sup>Pamer (2019)

<sup>16</sup>Idrettens Olympiade, presentasjon (2020)

## 3 Approach

### 3.1 Idrettens Olympiade's requests

We were presented with Idrettens Olympiade's ambitions during the planning phase of this thesis. They have discussed where in Norway it could be reasonable to host the different Olympic and Paralympic events, and come up with different alternatives throughout the country<sup>17</sup>. It was also clear they regarded the utilisation of several regions as an objective in its own right, with a special emphasis on using the western part of the country.

Their request from us was an academic analysis of the costs and benefits of their plans for Olympic and Paralympic Games in Norway in 2030 or 2034. Apart from this baseline, the rest has been up to us, and we are not bound by their premises in any way.

### 3.2 Baseline for our analysis

Starting with the possibilities presented to us by Idrettens Olympiade, and through conversations with them, we have designed an illustrative Olympic concept as the subject of our analysis. This involves using the most appropriate and up-to-date existing venues available, see table 5.12 for details. In order to examine the possibility of using several regions, we have used this as a criterion where several venues are available, moving freestyle skiing and snowboarding to Voss, biathlon to Trondheim and so on.

We have also had conversation with Tom Tvedt, former President of the Norwegian Sports Association, and Magnus Sverdrup, Special Advisor and leader of International Sports Politics in the Norwegian Sports Association, aiding us in gathering information about the IOC, the New Norm and hosting Olympic and Paralympic events.

For the purpose of how this thesis can be applied to further work on the subject, it is important to note the concept which is analysed is simply an illustration of one possible plan for hosting the Olympic and Paralympic Games in Norway in 2034. We do not have the information nor the resources for conducting an in depth evaluation of what would be the optimal plan, but are quite certain our illustration is a viable option.

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<sup>17</sup>Idrettens Olympiade, presentasjon (2020)

### 3.3 Hosting the Olympic and Paralympic Games

The costs and revenues of hosting the Olympics/Paralympics, are defined by what measures they require and what possibilities they generate. The obvious examples are the need for sporting and other venues, and the possibility for selling tickets to the events, but there are numerous other sources of expense and of income. A detailed description of these is given in the analysis, under section 5.1.

## 4 Theoretical framework

### 4.1 Introduction

The goal of this thesis is to evaluate the profitability of hosting the Winter Olympics in Norway. For this purpose, we need a theoretical framework for determining what constitutes a profitable project, and how this project performs based on those criteria.

In the case of the Winter Olympics, the "investor" or "project owner" is the Norwegian authorities on behalf of the Norwegian people. In order to determine the correct framework for the profitability analysis, we will, in addition to looking at the standards for public investments in Norway, examine existing studies from similar events.

### 4.2 Standards for public investments

For all projects and for all investors, there is a desire to use the resources available to them in an efficient way. Naturally, this assumption also applies to investments in which a nation owns the project. For this purpose, the Norwegian Government Agency for Administration and Financial Management has created guidelines on how to conduct economic analyses and states that there are three methods applicable to the evaluation of the surplus from public investments<sup>18</sup>:

1. **Cost/benefit analyses**<sup>19</sup>, which aim to highlight all effects of an action. All consequences should be quantified to the extent possible. If the benefits sum up to be larger than the costs, the investment is considered profitable.
2. A **cost effectiveness analysis**<sup>20</sup> should be used when the benefits are assumed to remain unchanged. It is an analysis focusing solely on the cost, and the cheapest option is therefore considered the most profitable.
3. **Cost impact analyses**<sup>21</sup> are used for cases where the benefits are difficult to quantify. They are based on qualitative measures of the benefits, while the costs are

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<sup>18</sup>Direktoratet for økonomistyring (2018)

<sup>19</sup>NOU 2012: 16. (2012)

<sup>20</sup>Ibid.

<sup>21</sup>Ibid.



quantified.

## 4.3 Existing literature

Proponents of Olympic bids often justify the games by claiming that the Olympics will provide major economic benefits to the host region. The size of these economic benefits is however rather uncertain, and many studies have been conducted with an aim to measuring the benefits of hosting the Olympics (or similar mega-events). Roughly, there are two different methods that have been used in these studies; cost/benefit analysis (CBA)<sup>22</sup> and economic impact analysis<sup>23</sup>.

### 4.3.1 Economic impact analysis

The goal of an economic impact analysis is to measure the total economic impact, including that of the non-quantifiable effects of a cost/benefit analysis. It uses input-output tables to estimate multiplier effect from the realisation of new products, for example an increased demand for goods, services and labour, arising from the project (Pilipenko (2013)). The impacts are normally measured by their effects on Gross Domestic Product, job creation, increased tourism, etc. The method has, however, been criticised for over-estimating the economic impact of mega events<sup>24</sup>.

The main basis for this criticism is the assumption that all expenditures and capital costs have a positive impact on the studied economy. An economic impact analysis assumes no money is wasted. As a result, almost all projects assessed by an economic impact analysis turn out to be attractive for public spending because the analysis assumes that all public spending stimulates further economic activity, although there is no guarantee that the employees and capital owners will spend their income in the home economy<sup>25</sup>. Furthermore, and specifically relevant for an analysis of the Olympic project, all jobs that are created from an investment are assumed to be permanent<sup>26</sup>. For a one-time sports event, it is likely that many of the new jobs will be temporary, thus failing to serve as a permanent benefit for the economy. Finally, in an economic impact analysis, the

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<sup>22</sup>See for instance Pilipenko (2013) or Shaffer et al. (2003)

<sup>23</sup>See for instance Blake (2005) or Preuss (2004)

<sup>24</sup>See for instance Crompton (1995) or Hudson (2001)

<sup>25</sup>E.g. Taks et al. (2011)

<sup>26</sup>Pilipenko (2013)

opportunity costs are essentially ignored, due to the assumption that the input factors of the studied economy are underutilised, and that any project can be realised without affecting other projects. Several studies have shown that this assumption rarely holds in reality<sup>27</sup>.

Although an economic impact analysis is intended to measure the total economic impact of a project, it is based on many assumptions which, in most cases, are violated. The result is that it often fails in measuring the true impact<sup>28</sup>. Since it is likely that most of the economic impact of the Olympic project is quantifiable and because it aligns with the Norwegian standards for public investments, we will conduct a cost/benefit analysis. We will, however, delimit the analysis somewhat, as explained below.

### 4.3.2 Cost/benefit analysis

As previously mentioned, the goal of a cost benefit analysis is to compute the total net benefit (cost) related to a project. Benefit in traditional cost-benefit studies is measured by the consumers' willingness to pay, or in other words: what the consumers are willing to give up of other goods for what the project provides. The costs are measured by the opportunity cost: what people or a society give up by investing capital and employing workers in one project as opposed to any other. More specifically, a cost benefit analysis measure if the people are willing to pay for the resources required to host to Olympics, instead of using the resources on something else. A typical cost-benefit analysis includes the following steps<sup>29</sup>:

1. Explaining the purpose of the CBA
2. Specifying the set of alternative projects
3. Deciding whose benefits and costs count
4. Predicting impacts quantitatively over time
5. Monetising all impacts
6. Discounting costs and benefits to present values

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<sup>27</sup>See for instance Crompton (1995) or Taks et al. (2011)

<sup>28</sup>Hudson (2001)

<sup>29</sup>Boardman et al. (2018)

7. Computing NPVs for each alternative
8. Performing sensitivity analyses
9. Making a recommendation

In addition to the pure economic impacts (i.e payable costs and tax income), a cost-benefit analysis also takes into account social, environmental and other impacts that affect the utility of consumers. However, many of these impacts are difficult to quantify (e.g. the total economic benefit of lower CO<sub>2</sub> emissions). In most cases, in a cost benefit analysis, the potential costs or benefits of such hard-to-quantify effects are left to a qualitative discussion. This ensures all effects are taken into account, although a quantification is always preferable over a mere discussion.

## 4.4 Discounted cash flow

### 4.4.1 Net present value

The main criterion for determining the profitability of a project, is its ability to generate returns exceeding the investor's required return on his capital. In other words: the economic value added (EVA)<sup>30</sup> for the project.

This is normally measured by the project's net present value. The net present value is the difference between the present value of the future cash inflows and outflows, where the present value<sup>31</sup> is the future cash flow discounted at a discount rate. The purpose of discounting is to acknowledge the fact that there are alternative usages for the invested capital. As seen from (4.1): the higher the discount rate, the lower the present value of future cash flows. Determining the appropriate discount rate is therefore key to properly evaluating future cash flows. The appropriate discount rate for this project will be discussed in the following, under section 5.1.4.

$$\text{NPV} = I_0 + \sum_{t \in T} \frac{CF_t}{(1+r)^t} \quad (4.1)$$

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<sup>30</sup>Chen (2020)

<sup>31</sup>Murphy (2020)

$T$  = set of time periods in question

$I_0$  = Invested capital in period 0 (today)

$CF_t$  = Cash flow in period  $t$

$r$  = discount rate

The rule of thumb is that a project with a positive NPV is accepted, and a project with a negative NPV is rejected<sup>32</sup>. Thus, the Olympics should be accepted if the NPV for the project as a whole is greater than or equal to 0.

### 4.4.2 Flexibility

A traditional assumption in a present value analysis is that a project is held passively through its economic lifetime and that the management is unable to influence the profitability of an ongoing project. In the real world, however, the management is often able to evaluate ongoing projects and make adjustments as they see how things unfold. This flexibility is referred to as real options<sup>33</sup>. A real option is defined as a right, but not an obligation, to undertake certain business opportunities. As a matter of consequence, the value of a real option cannot be negative. The alternative to making use of it is simply not to do so. For example, if the curling interest in Norway increases significantly in the years prior to the Olympics, the host organisation could increase the capacity of the curling arena, enabling the sale of more tickets.

### 4.4.3 External effects

The goal of a net present value analysis is to quantify all the economic consequences of a project and then calculate the overall profitability of the project. Some of these consequences could be difficult to quantify, but they could still have a significant impact, either positively or negatively, on the overall profitability. Hiller and Wanner (2015) documented that Olympic hosting produces psycho-social benefits and that the festival atmosphere positively affects the public mood. Similarly, Pawlowski et al. (2014) concluded that hosting events raises subjective well-being even more than the pride from sporting success. A happy public could have a positive impact on people's productivity<sup>34</sup> and

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<sup>32</sup>Bøhren and Gjørnum (2009)

<sup>33</sup>Hayes (2020)

<sup>34</sup>Zelenski et al. (2008)

absenteeism<sup>35</sup>. Although the economic effect of a happy population is difficult to quantify, it is still, among many others, an effect which could be crucial to the decision of whether or not to host the Olympics. A basic net present value analysis neglects effects such as these, which could lead to a decision based on too little information.

#### 4.4.4 Expanded net present value

Our profitability analysis is intended to illustrate the costs and benefits directly related to the Winter Olympics project, serving as a baseline for a broader analysis investigating the full impact of hosting the Winter Olympic Games. In order to facilitate this application, we will expand the traditional net present value analysis by discussing the value of flexibility and external effects that might arise from the event. By doing so, we will get a more nuanced picture of the overall profitability, serving as a better basis for making decisions than the static net present value alone. This approach aligns with Norwegian Authorities' standard for economic analysis<sup>36</sup>. Mathematically, the expanded net present value is presented as follows:

$$\text{Expanded NPV} = \text{Static NPV} + \text{Value of flexibility} \pm \text{External effects}$$

## 4.5 Limitations and our approach

Winter Olympics is a large and complicated project. Due to the time and resources available, we have to make some necessary limitations to this thesis. As mentioned above, the benefit side of a cost/benefit analysis is people's willingness to pay. We will not try estimate the Norwegian population's utility from the Olympics, but instead focus on the direct income and costs related to the project. One could argue that this limitation causes our analysis not to give a clear picture of the project's total net benefit (cost), which, to a certain extent is true. It is, however, less problematic considering the fact that people's utility from the Olympics is very unlikely to be negative. This implies that if we find the Olympic project to be profitable, from a financial point of view, it is very likely that it is profitable for the economy as a whole. In any case, the result will serve as a necessary

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<sup>35</sup>George (1989)

<sup>36</sup>Direktoratet for økonomistyring (2018)

starting point for a further investigation of the less direct impacts of the project.

The further details of our assumptions and delimitations are described as they occur.

## 5 Analysis

### 5.1 Cash flow

#### 5.1.1 Premises

##### 5.1.1.1 General

**5.1.1.1.1 Timeline** The base year of our calculation is 2021 and the net present value is based on the nominal cash flow impact on the total capital before tax. The final year of the planning horizon is 2036, as we expect some Games related cash flows to occur in the years following the events, giving the project a lifetime of 15 years. We have assumed an annual inflation rate of 2 %<sup>37</sup>.

**5.1.1.1.2 VAT** For simplicity, we have included VAT in all our calculations, as opinions differ regarding the IOC's and Organising Committee for the Olympic Games (OCOG) tax status in Norway<sup>38</sup>.

**5.1.1.1.3 Capital structure** Our cash flow is that of the total capital, disregarding how it is financed. Miller and Modigliani state that as long as we do not have access to subsidised loans and the tax system is neutral, a project's value will not be influenced by the capital structure<sup>39</sup>. Building on this, we have disregarded the financing, assuming that the OCOG can borrow money at market price and that the tax system does not favour equity over debt or vice versa.

**5.1.1.1.4 Currency** Seeing as most revenue and costs are in Norwegian Kroner (NOK), so are our cash flow calculations. Where necessary, we have assumed an exchange rate (USD/NOK) of 9.00<sup>40</sup> for the entire economic lifetime of the project. The exchange rate is naturally a key uncertainty factor, and changes in the exchange rate would largely influence our calculations, potentially causing an estimation error.

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<sup>37</sup>Norges Bank (2020)

<sup>38</sup>Deloitte Advokatfirma AS (2013)

<sup>39</sup>Brealey et al. (2008)

<sup>40</sup>The exchange rate estimation with the longest horizon on <https://tradingeconomics.com/forecast/currency>

### 5.1.1.2 Sources

In order to estimate the different cash flow variables, we have largely relied on six different sources of information:

1. The Oslo 2022 budget, presented in the quality control of the Oslo 2022 application for state guarantee (DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013)).
2. The Oslo 2022 Olympic Office's own work regarding the consequences of the 2022 games in Oslo (Oslo Kommune Olympic Office (2013a)).
3. The Milano/Cortina 2026 budget included in their Olympic bid (International Olympic Committee (2019)).
4. The Stockholm/Åre 2026 budget included in their Olympic bid (International Olympic Committee (2019)).
5. The operational requirements from the host city contract between IOC and Milano/Cortina 2026 (IOC, Host City Contract (2018a)).
6. The New Norm, as described by IOC, Olympic Agenda 2020 (2018).

### 5.1.1.3 Scaling

Another key prerequisite for conducting our analyses is an overview of all dimensioning factors<sup>41</sup>. We have the following key assumptions:

- We expect approx. the same number of athletes in 2034 as in PyeonChang 2018.
- There is a 1:1 relationship between athletes and team officials, i.e. 1 athlete requires an average of 1 team official.
- The media and volunteer requirements will be the same as for Oslo 2022.
- The number of Paralympic athletes and team officials is the same as for Oslo 2022.

Furthermore, we have assumed the winter sports which traditionally have the greatest popularity in Norway to sell out completely. Less popular sports are assumed to generate an average ticket sale of 60 % of their venue capacities.

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<sup>41</sup>See appendix A1 for details



### 5.1.2 Budget

The first step of our analysis is the calculation of all revenues and costs, presented in table 5.1. We found a surplus of 2034 NOK - 3 976 500 000 before discounting the cash flows. A detailed description of the methodology, assumptions, findings and uncertainty for each item is presented in the following.

**Table 5.1:** Budget

<b>Revenue</b>	NOK (000)	%
IOC Contribution	4 672 900	43%
TOP Programme	2 067 600	19%
Domestic sponsorship	1 477 900	14%
Ticket sales	1 681 300	15%
Licensing and merchandising	397 900	4%
Other revenue	586 400	5%
<b>Total revenue</b>	<b>10 884 000</b>	<b>100%</b>
<b>Expenditure</b>		
Venue infrastructure	300 900	2%
Venue rent and provisionals	1 713 500	12%
Transport	268 500	2%
Accommodation	245 500	2%
Medical services	134 200	1%
Security	3 026 400	20%
Technology	2 747 400	18%
People management	3 799 000	26%
Ceremonies and culture	621 800	4%
Communication, marketing and look	620 000	4%
Corporate admin. and legacy	527 100	4%
Other expenses	856 200	6%
<b>Total expenditure</b>	<b>14 860 500</b>	<b>100%</b>
<b>Surplus</b>	<b>-3 976 500</b>	

### 5.1.3 Timing

As previously mentioned, a key to a net present value analysis is taking the monetary time value into account. Because the information about when different revenues and costs arise is not specified in any of the available sources, we have had to make several assumptions. Although these assumptions are unlikely to be 100% accurate, our aim is to acknowledge which items are first to arise and when the largest proportion of each item occurs. All our

assumptions are found in appendix A9.

Seeing as we have not been able to verify our assumptions regarding timing, it is a major uncertainty factor.

#### 5.1.4 Discount rate

The discount rate, or the required rate of return, is intended to reflect the return achievable from an available and equally risky alternative investment. In other words: the discount rate shows an investor's cost of capital<sup>42</sup>.

One common way to calculate the discount rate is to use the Capital Asset Pricing Model (CAPM). This single-factor model calculates the required rate of return based on how the project varies in relation to a market portfolio, see (5.1) below.

$$K_e = r_f + \beta_i(E(r_m) + r_f) \quad (5.1)$$

$K_e$  = Return on equity

$r_f$  = Risk free rate

$\beta_i$  = beta of asset i

$E(r_m)$  = Expected market return

This model assumes the investor to be well diversified, which implies that only the systematic (market) risk is relevant. It is reasonable to assume the Norwegian authorities to be a well diversified investor.

As mentioned under section 5.1.1.1.2, we do not take into account the effects of capital structure. The return on equity will thus be equal to the total return:

$$k_e = k_r$$

Finding the correct risk free rate requires taking the economic lifetime of the project and the currency being used in the cash flow estimate<sup>43</sup> into account. Because we use Norwegian Kroner in our estimates, we need a Norwegian risk free rate. Furthermore,

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<sup>42</sup>Bøhren and Gjørsum (2009)

<sup>43</sup>Brealey et al. (2008)

our required rate of return requires a risk free rate with approximately 15 years maturity. NOU 2012: 16. (2012) has calculated the the risk free rate for projects with an economic lifetime of less than 40 years to 2.5 %.

An asset's beta (5.2) is a measurement of the extent to which an asset's return is influenced by fluctuations in the market.

$$\beta_i = \frac{COV_{m,i}}{VAR_i} \quad (5.2)$$

For the Olympic project, both the project's variance and its covariance with the market are unknown. In such cases, it is regarded reasonable to use peer projects as a proxy for estimating a benchmark beta. Peer projects would in this case naturally be previous Olympic Games, but their beta and source of funding are not publicly available data. Furthermore, no suitable market of reference exists. Due to this lack of information, an attempt to estimate the Olympics' beta based on e.g. the Oslo Stock Exchange would be unreliable<sup>44</sup>.

However, since the project owner of the winter Olympics 2034 is the Norwegian people, it categorises as a public investment. The discount rate for Norwegian public investments with an economic lifetime of less than 40 years is set to 4 %<sup>45</sup> (risk free rate of 2.5 % + risk premium of 1.5 %). The standard holds an ambition of, to the extent possible, evaluating systematic risk, and thus discount rate, independently for each individual project<sup>46</sup>. As described above, an individual evaluation of the systematic risk is not possible for the Olympic project, due to the lack of a reference market and data from similar projects.

## 5.1.5 Static Net Present Value

### 5.1.5.1 Findings

Based on our premises and all assumptions and calculations, described in detail in section 5.2 below, we have calculated a net present value of NOK -2 930 123 000. According to the profitability criterion presented in section 4.4.1, the Winter Olympics in Norway 2034

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<sup>44</sup>A similar problem is faced by emerging economies' analysts, where the lack of historical data on stock prices complicates the computation of the beta. See Akdeniz et al. (2003)

<sup>45</sup>NOU 2012: 16. (2012)

<sup>46</sup>Ibid.

is not profitable. The entire cash flow can be found in appendix A10.

This is, however, before taking the value of flexibility and external effects into account, which will be discussed in section 6.

### 5.1.5.2 Uncertainty

Our profitability analysis of winter Olympics 2034 is an ex ante evaluation based on our best estimates of costs and revenue between 2021 and 2036. As all these items have yet to occur, our estimates are indeed uncertain. Furthermore, the quantity and quality of publicly available data regarding each item varies, forcing us to making necessary assumptions in many of our estimates, each of which is thoroughly described in section 5.2.

Nevertheless, some interesting questions might be addressed through an examination of the uncertainty at a more general level:

1. What would it take for the static NPV to be positive?
2. How sensitive is the total net present value to changes in total revenue and expense?
3. Which items (revenues or expenses) have the greatest impact on the static net present value?

Table 5.2 shows how sensitive the static net present value is to changes in the total revenues and total cost (and any combination of changes).

**Table 5.2:** NPV sensitivity by total revenue and total cost

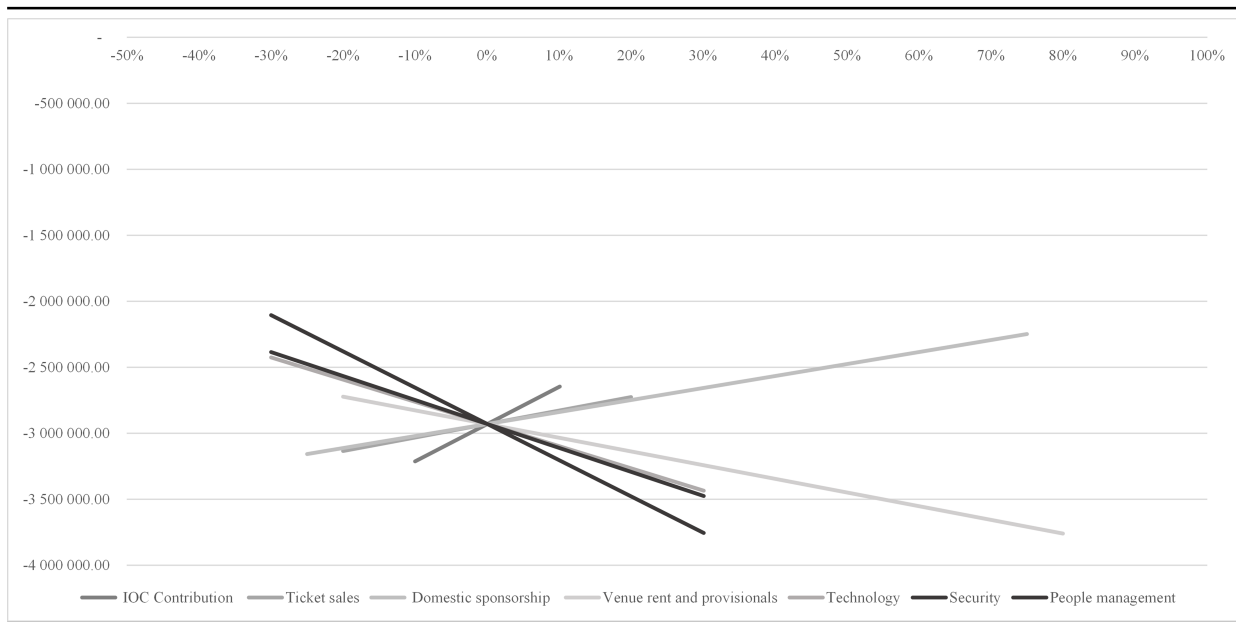
Revenue \ Cost	-30 %	-20 %	-10 %	0 %	10 %	20 %	30 %
-30 %	-2 051 086	-1 387 986	-724 887	-61 787	601 313	1 264 413	1 927 512
-24 %	-2 624 753	-1 961 653	-1 298 554	-635 454	27 646	690 745	1 353 845
-18 %	-3 198 420	-2 535 321	-1 872 221	-1 209 121	-546 021	117 078	780 178
-12 %	-3 772 087	-3 108 988	-2 445 888	-1 782 788	-1 119 689	-456 589	206 511
-6 %	-4 345 755	-3 682 655	-3 019 555	-2 356 456	-1 693 356	-1 030 256	-367 156
0 %	-4 919 422	-4 256 322	-3 593 222	-2 930 123	-2 267 023	-1 603 923	-940 824
6 %	-5 493 089	-4 829 989	-4 166 890	-3 503 790	-2 840 690	-2 177 590	-1 514 491
12 %	-6 066 756	-5 403 656	-4 740 557	-4 077 457	-3 414 357	-2 751 258	-2 088 158
18 %	-6 640 423	-5 977 324	-5 314 224	-4 651 124	-3 988 025	-3 324 925	-2 661 825
24 %	-7 214 090	-6 550 991	-5 887 891	-5 224 791	-4 561 692	-3 898 592	-3 235 492
30 %	-7 787 758	-7 124 658	-6 461 558	-5 798 459	-5 135 359	-4 472 259	-3 809 159

At our estimated total cost, the revenue would have to increase by more than 40 % for the static NPV to be positive. Alternatively, the cost would have to be reduced by a little more than 30 % at our estimated revenue. In the upper right of the table, we see how a combination of reduced costs and increased revenue might result in a positive static NPV. These figures give some indication of the required value of the external effects relative to the invested amounts, in order for the project of hosting the 2034 Winter Olympic and Paralympic Games in Norway to be worthwhile.

We also note that the static net present value is more sensitive to changes in total cost than to total revenue. This is natural when taking their relative sizes and timing into account, as the costs are larger than the revenue and occur earlier in the planning horizon (e.g. costs related to the application process)<sup>47</sup>.

Figure (5.1) below shows how much each item impacts the total NPV.

**Figure 5.1:** NPV sensitivity by items



Naturally, the largest items (e.g. IOC contribution and people management) have the largest impact on the static net present value. Equally natural, the items occurring early in the planning horizon have a greater impact than those which occur closer to the games. If the OCOG aims to increase the static net present value, they should follow the Willie Sutton Rule<sup>48</sup> and focus on the items which impact is greatest on the static NPV.

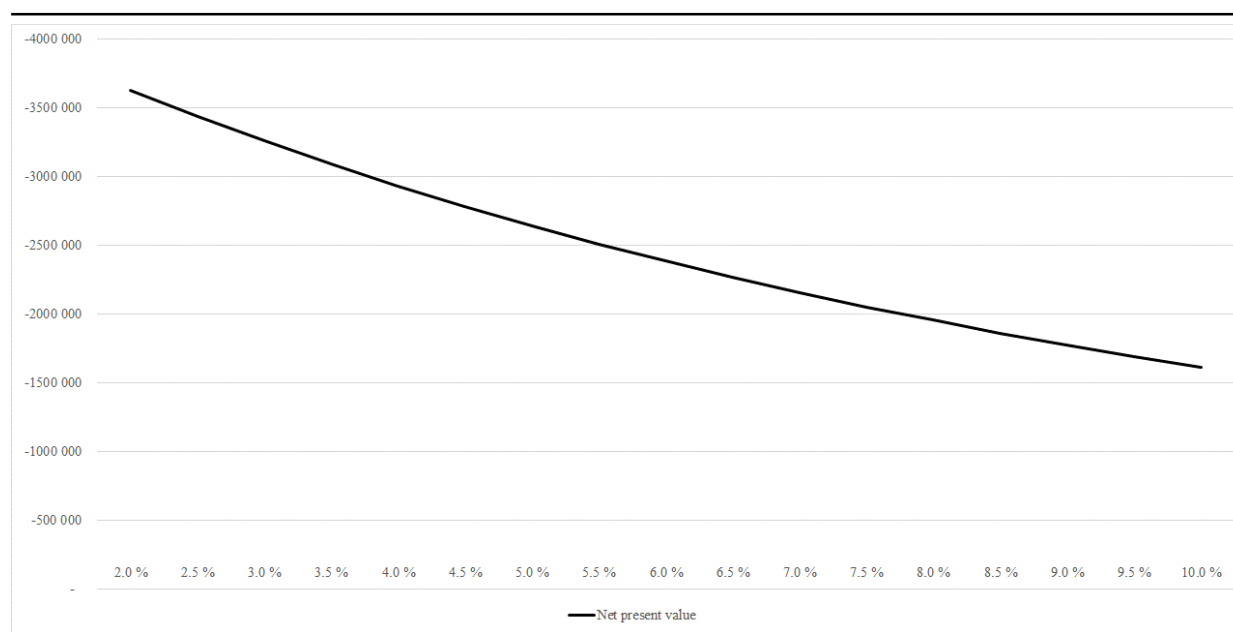
<sup>47</sup>See appendix A10 and A9 for details

<sup>48</sup>Bjørnenak (2019)

### 5.1.5.3 NPV profile

Although we are not able to evaluate the Olympic project's exposure to systematic risk<sup>49</sup>, an examination of the project's sensitivity to changes in the discount rate serves as a reasonable illustration of the effect. Figure 5.2 shows the project's net present value at different discount rates. Please note that the vertical axis ranges from 0 to -4 million, illustrating an increase in NPV as the discount rate increases.

**Figure 5.2:** NPV profile



The figure shows that the project has a negative net present value for the entire range of discount rates. Because the project has a net cash outflow in its early years, which is never compensated by large net inflows, no discount rate will cause NPV to be positive.

### 5.1.5.4 VAT

As mentioned under 5.1.1.1.2, the IOC and host OCOG VAT status is unclear, and we have therefore included VAT in our calculations. VAT is revenue to a country's economy, used for funding schools, hospitals etc. A large proportion of the negative NPV we have calculated originates from VAT. A large proportion of the costs will thus be paid to the Norwegian economy and should not be considered a cost for the Norwegian economy as a whole.

<sup>49</sup>As mentioned under 5.1.4 above

However, it is reasonable to assume that many of the resources allocated to the Olympic and Paralympic Games have alternative uses and would have generated an equal amount of VAT regardless of the Olympic and Paralympic games. This implies that the VAT generated from resources that would have been used alternatively without the Olympics should not be considered revenue for the Norwegian economy. Only the VAT from excess activities generated directly from the Olympics should be considered as revenue for the Norwegian economy.

Valuating the excess VAT is naturally a complicated task and outside the scope of this paper. However, by including VAT in our calculations, we have indirectly assumed that the Olympics do not generate any excess activities. This assumption is unlikely to hold, leaving our calculated cost for the Norwegian economy likely to be overestimated. Decision makers should evaluate the consequences of VAT before deciding on whether or not to apply for the Olympics 2034.

## 5.2 Details

### 5.2.1 Introduction

Under this section, we aim to give some insight to the details of the cash flow, item by item, from which our static net present value is calculated. It will give a detailed overview of the assumptions we have made, how we have estimated the cost or revenue of each item, which items have the largest impact on the total profitability and which are the most important to consider more closely before making a decision.

### 5.2.2 Revenue

#### 5.2.2.1 IOC Contribution

In our conversations with Tom Tvedt and Magnus Sverdrup, we were informed that the IOC provides the OCOG with a substantial financial contribution. The total amount is a bit unclear, as some of the contribution is based on the OCOG's specific needs. These types of contribution are accounted for elsewhere in our analysis, for instance under 5.2.3.10 Corporate Administration and Legacy.

**Table 5.3:** Sensitivity analysis - IOC Contribution

Percentage change	NPV (000)
-10 %	-3 213 516
-9 %	-3 185 177
-8 %	-3 156 838
-7 %	-3 128 498
-6 %	-3 100 159
-5 %	-3 071 820
-4 %	-3 043 480
-3 %	-3 015 141
-2 %	-2 986 801
-1 %	-2 958 462
0 %	-2 930 123
1 %	-2 901 783
2 %	-2 873 444
3 %	-2 845 105
4 %	-2 816 765
5 %	-2 788 426
6 %	-2 760 086
7 %	-2 731 747
8 %	-2 703 408
9 %	-2 675 068
10 %	-2 646 729

A good portion of the contribution is, however, a direct payment of USD 452 000 000, related to revenues generated from Broadcast Agreements<sup>50</sup>. In 2034 NOK the amount is 4 672 900 000.

It is important to note this number is specific for the Milano/Cortina 2026 Games. There is no guarantee it will be exactly the same for other editions. This uncertainty is illustrated by its effect on the total NPV in table 5.3 below.

#### 5.2.2.2 TOP Sponsors

A good portion of the sponsors for the Olympics and Paralympics are from TOP<sup>51</sup>, including both cash and value-in-kind. The value of this contribution was estimated at USD 200 million for the 2026 Olympics<sup>52</sup>. In 2034, it is NOK 2 067 600 000.

<sup>50</sup>IOC, XXV Olympic Winter Games 2026 (2018) art. 9

<sup>51</sup>The Olympic Programme, also known as the International Programme, see IOC, Olympic Agenda 2020 (2018) page 3 and IOC, XXV Olympic Winter Games 2026 (2018) page 25.

<sup>52</sup>Ibid. §8.2(b)



This is exactly what Milano/Cortina expected<sup>53</sup> Stockholm/Åre expected USD 300 million<sup>54</sup>, which we cannot know if they would be granted.

For the purpose of considering the possibility of a greater contribution, our sensitivity analysis spans upwards to a 50 % increase. We do not consider a lower future contribution a possibility.

**Table 5.4:** Sensitivity analysis - TOP

Percentage change	NPV (000)
0 %	-2 930 123
2 %	-2 898 320
5 %	-2 866 518
8 %	-2 834 716
10 %	-2 802 914
13 %	-2 771 111
15 %	-2 739 309
18 %	-2 707 507
20 %	-2 675 705
23 %	-2 643 902
25 %	-2 612 100
28 %	-2 580 298
30 %	-2 548 496
33 %	-2 516 693
35 %	-2 484 891
38 %	-2 453 089
40 %	-2 421 286
43 %	-2 389 484
45 %	-2 357 682
48 %	-2 325 880
50 %	-2 294 077

### 5.2.2.3 Domestic sponsors

The expected contribution from domestic sponsors for Oslo 2022 was NOK 960 000 000<sup>55</sup>. Accounting for the growth in the sponsor market, about 4 %<sup>56</sup>, our estimate for 2034 is NOK 1 477 900 000.

We note that the Swedish and Italian expectations are far greater<sup>57</sup>, but as they are largely

<sup>53</sup>International Olympic Committee (2019) p. 74. (The budgeted number is their 2018 NPV).

<sup>54</sup>International Olympic Committee (2019) p. 37

<sup>55</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 66

<sup>56</sup>NTB (2017)

<sup>57</sup>International Olympic Committee (2019) p. 37 and 74

separate markets, we use the numbers from Oslo 2022. This is still an implication that our number could very well be underestimated, illustrated by the span of our sensitivity analysis.

**Table 5.5:** Sensitivity analysis - Domestic sponsors

Percentage change	NPV (000)
-25 %	-3 157 442
-20 %	-3 111 978
-15 %	-3 066 514
-10 %	-3 021 050
-5 %	-2 975 586
0 %	-2 930 123
5 %	-2 884 658
10 %	-2 839 194
15 %	-2 793 731
20 %	-2 748 267
25 %	-2 702 803
30 %	-2 657 339
35 %	-2 611 875
40 %	-2 566 411
45 %	-2 520 947
50 %	-2 475 483
55 %	-2 430 019
60 %	-2 384 556
65 %	-2 339 092
70 %	-2 293 628
75 %	-2 248 164

#### 5.2.2.4 Ticket Sales

**5.2.2.4.1 Description** Ticketing and Hospitality represent the most prominent, and often first and last, contact that spectators have with the Games. Spectator experience is one of the key criteria for a positive public opinion and thus the success of the games. The host OCOG is entitled to retain the gross revenues generated from ticket sales, including hospitality<sup>58</sup>.

The IOC makes requirements and provides guidelines to the host OCOG on how to handle ticket sales. The main target is full stadiums, prioritising fans' access to events<sup>59</sup>. The

<sup>58</sup>IOC, Host City Contract (2018b) §8.1(b)

<sup>59</sup>IOC, Host City Contract (2018a) art. 37

ticketing strategy must be approved by the IOC and must contain a detailed plan which, among other things, includes:

- A **ticketing and hospitality plan** which includes all Olympic ticket prices and pricing zones and all ticket allocation plans for different stakeholders (e.g. fans, athletes' families, etc.).
- A **full stadium strategy**, which is a detailed plan to optimise sales and attendance for all events.
- A plan to minimise unauthorised ticket resale.

**5.2.2.4.2 Assumptions/Our Approach** Naturally, the ticket revenue is a function of price and sales volume. The optimal ticket price is one which maximises ticket revenue while still filling the stadiums as much as possible, criteria we expect Oslo 2022 Stockholm/Åre 2026 and Milano/Cortina 2026 to have worked by. We have assumed, according to standard economic theory, that the audience is sensitive to changes in ticket prices and that a higher price would lead to lower volume (and vice versa).

Finding the correct price and volume for each different ticket zone for every single Olympic and Paralympic event would involve planning to a level of detail beyond the scope of this paper<sup>60</sup>. We have applied (5.3) and calculated an average<sup>61</sup> price of approx. 1400 NOK and 1720 NOK for Stockholm/Åre 2026 and Milano/Cortina 2026 respectively, with 100 % of tickets sold.

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<sup>60</sup>According to IOC, Host City Contract (2018a) art. 37 the ticketing strategy should include this information

<sup>61</sup>Including both Olympic and Paralympic tickets

$$p = \frac{R}{\sum_{v \in V} c_v \cdot d_v \cdot s_v} \quad (5.3)$$

$p$  = Ticket price

$V$  = Set of all venues

$R$  = Ticket revenue

$c_v$  = Capacity in venue  $v$

$d_v$  = Event days in venue  $v$

$s_v$  = Presumed coverage in venue  $v$

We do note that the actual number of tickets sold might include tickets to non-competitive events, making it higher than the total venue capacities, meaning the actual average price is consequently somewhat lower. We do find these prices to be higher than expected, especially considering the significantly lower estimate of Oslo 2022 at NOK 550<sup>62</sup>. In order to avoid an overestimation, we place the average ticket price (per person/day) in the lower part of the interval between the three at NOK 1080, or arbitrarily split for Olympics and Paralympics at 1200 and 700 respectively.

Secondly, we had to calculate the correct sales volume. Naturally, we cannot sell more tickets than the sum of the venue capacities. Our sales volume is based on a qualitative discussion of the national and international interest in each sport. We have assumed the following (average) sales coverage for each venue.

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<sup>62</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 66

**Table 5.6:** Capacities and ticket volume

Sport	City	Event days	Presumed avg coverage	Capacity	Estimated tickets sold
Alpine skiing	Narvik	8	1	10 000	80 000
Biathlon	Trondheim	9	1	20 000	180 000
Sliding	Lillehammer	14	0.6	10 000	84 000
XC	Oslo	10	1	28 000	280 000
Nordic combined	Oslo	3	1	28 000	84 000
Ski jumping	Oslo	4	1	32 000	128 000
Curling	Oslo	18	0.6	3 000	32 400
Figure skating	Bergen	12	0.6	3 000	21 600
Freestyle skiing/SB	Voss	16	1	6 000	96 000
Ice hockey	Oslo	16	0.6	7 000	67 200
Short track	Bergen	5	0.6	3 000	9 000
Speed skating	Bergen	12	1	9 000	108 000
Total					1 170 200

The total average for the Olympics is 83 %, giving a total volume of 1 170 200 tickets, or one-event ticket equivalents, as the actual Games will have a wider range of types and classes of tickets available. For the Paralympic Games, we assume that the 2034 games will sell a total of 340 000 tickets which is close to the sales volume of previous games<sup>63</sup>. We assume the sports have the same popularity relative to each other, but less than their Olympic counter parts, allowing for a reduction of capacities. The Oslo 2022 Committee calculated an average of 87 % for the Olympics<sup>64</sup>.

Finally, we have assumed that 25 000 of the 32 000 tickets to the opening and closing ceremony are available for sale, leaving the same amount of accredited tickets as for Oslo 2022<sup>65</sup>, seeing as this is not mentioned in the New Norm. For the Olympic and Paralympic ceremonies, this is a total of 100 000 tickets<sup>66</sup>.

**5.2.2.4.3 Findings** With an average price of NOK 1080 and a total sale of 1 610 200 tickets, we have calculated a total ticket revenue of NOK 1 681 300 000. This number seems reasonable and is naturally higher than the Oslo 2022 budget<sup>67</sup> p and lower than both 2026 applicants<sup>68</sup>.

<sup>63</sup>International Paralympic Committee (2018)

<sup>64</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 66

<sup>65</sup>Oslo Kommune Olympic Office (2013b)

<sup>66</sup>4\*25 000 = 100 000 tickets

<sup>67</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 66

<sup>68</sup>International Olympic Committee (2019) p. 37 and 74

**5.2.2.4.4 Uncertainty** Of course, our estimate involves significant uncertainty. As previously mentioned, ticket revenue is a function of price and volume and both variables are uncertain. We have therefore conducted a two-way sensitivity analysis of the ticket revenue showing the impact of changes in price and volume.

The sales volume is dependent on different factors. For instance, the ticket prices will have a volume impact. Maybe equally important is the domestic interest in a sport and the possibility for a Norwegian medal. For example, if Norway were to have a dominating bobsleigh team by 2034, the people of Lillehammer would quite likely buy tickets en masse and cheer for the Norwegian team. The upper boundary for ticket sales is naturally given by the capacity in each venue. An average sold out level of 83 % implies that the maximum growth in sales volume is 20 %<sup>69</sup>. As Winter sports are very popular in Norway, we assume it to be highly unlikely for the total ticket sales to stoop below 80 % of the volume we have assumed.

We have set the price range from approximately NOK 540, lower than the Oslo 2022 ticket price, to approximately NOK 1850, which is higher than the Milano/Cortina prices. The total net present value for the games as a whole, for different levels of price and volume is shown in table 5.7 below.

**Table 5.7:** Sensitivity by ticket revenue

Ticket price \ Volume	652	870	1087	1305	1522	1740
-20 %	-3 461 367	-3 297 908	-3 134 448	-2 970 988	-2 807 528	-2 644 068
-16 %	-3 436 848	-3 265 216	-3 093 583	-2 921 950	-2 750 317	-2 578 684
-12 %	-3 412 329	-3 232 524	-3 052 718	-2 872 912	-2 693 106	-2 513 300
-8 %	-3 387 810	-3 199 832	-3 011 853	-2 823 874	-2 635 895	-2 447 916
-4 %	-3 363 291	-3 167 140	-2 970 988	-2 774 836	-2 578 684	-2 382 532
0 %	-3 338 773	-3 134 448	-2 930 123	-2 725 798	-2 521 473	-2 317 148
4 %	-3 314 254	-3 101 756	-2 889 258	-2 676 760	-2 464 262	-2 251 764
8 %	-3 289 735	-3 069 064	-2 848 393	-2 627 722	-2 407 051	-2 186 380
12 %	-3 265 216	-3 036 372	-2 807 528	-2 578 684	-2 349 840	-2 120 996
16 %	-3 240 697	-3 003 680	-2 766 663	-2 529 646	-2 292 629	-2 055 612
20 %	-3 216 178	-2 970 988	-2 725 798	-2 480 608	-2 235 418	-1 990 228

Because ticket revenue is a large proportion of the total revenue, changes in ticket revenue would have a noticeable impact on the overall profitability. Consequently, a good ticketing

<sup>69</sup>0.83\*1.2=100 %

strategy would be important for the OCOG, if Norway were to host the 2034 Winter Olympics.

### 5.2.2.5 Licensing and Merchandising

**5.2.2.5.1 Description** The IOC will implement an International Programme consisting of, among other things, a worldwide licensing programme related to the games<sup>70</sup>. This includes plans for the production and sale of official licensed products and merchandise, such as the classic Olympic pin. The OCOG has the right to receive a share of the net revenues from the International Programme, the amount of which is to be determined by the IOC on its sole discretion<sup>71</sup>.

**5.2.2.5.2 Assumptions/Our Approach** Our calculation is based on the Oslo 2022 budget<sup>72</sup> and both 2026 applicant budgets<sup>73</sup>. We assume the Norwegian market for official Olympic products to be unchanged from the Oslo 2022 application. We have therefore used the Oslo 2022 number and adjusted it according to inflation.

**5.2.2.5.3 Findings and Uncertainty** We have calculated the following licensing and merchandising revenue:

**Table 5.8:** Licensing and merchandising

	2026 applicants <sup>74</sup>	Oslo 2022	Norway 2034
Licensing and Merchandising	568 305 000	320 000 000	397 900 000

We do note that the 2026 applicants have significantly higher revenue from licensing and merchandising, which is quite reasonable considering the size of these countries. Because Sweden and Italy have larger populations than Norway, it is likely that the market for official products is bigger in these countries. It thus seems reasonable that the 2026 applicants will have higher revenues from licensing and merchandising than Norway 2034.

Nevertheless, the difference also has the possible implication that we (and the Oslo2022 Olympic Office) have underestimated the Norwegian market for official products, reflected

<sup>70</sup>IOC, Host City Contract (2018b) § 24.7c

<sup>71</sup>IOC, Host City Contract (2018b) § 8.1e

<sup>72</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 67

<sup>73</sup>International Olympic Committee (2019) p. 37 and 74

<sup>74</sup>Average: International Olympic Committee (2019) p. 37 and 74

in the range of our sensitivity analysis being -20%/+80% as shown in table 5.9.

**Table 5.9:** Sensitivity analysis - Licensing and merchandise

Percentage change	NPV (000)
-20 %	-2 978 152
-15 %	-2 966 144
-10 %	-2 954 137
-5 %	-2 942 130
0 %	-2 930 123
5 %	-2 918 115
10 %	-2 906 108
15 %	-2 894 101
20 %	-2 882 094
25 %	-2 870 087
30 %	-2 858 079
35 %	-2 846 072
40 %	-2 834 065
45 %	-2 822 058
50 %	-2 810 050
55 %	-2 798 043
60 %	-2 786 036
65 %	-2 774 029
70 %	-2 762 022
75 %	-2 750 014
80 %	-2 738 007

Because licensing and merchandising revenue counts for only 4 % of the total revenue, and because it mainly occurs during the games, the overall impact of this item on the total NPV is rather small.

### 5.2.2.6 Other revenue

**5.2.2.6.1 Assumptions/Our Approach** We have defined other revenue as revenue from Paralympics and test events, administration fees for accommodation, revenue from cultural events, sale of OCOG assets, etc.

Revenue from Paralympics is all other revenue than ticket sales, for example Paralympic specific sponsors and sale of Paralympics merchandise. Revenue from test events are all revenues from the mandatory test events<sup>75</sup> prior to the games. We do not have the

<sup>75</sup>All venues should be tested with a sports event. Preferably an event at World Cup scale: IOC, Host City Contract (2018a) art. 17



information about revenue from Paralympics and test events from the 2026 applicants, and have therefore used the Oslo 2022 budget as input.

We assume (real) revenue from Paralympics and test events to be equal to that of Oslo 2022, and have reused the numbers, however adjusted according to inflation.

The administration fee for accommodation is 10 %<sup>76</sup> of all accommodation payments for all accredited personnel, except athletes and team officials. It is calculated as 10 % of 30 days of rent of 20 448<sup>77</sup> hotel rooms. Naturally, the administration fee is a direct consequence of the accommodation prices and rent period and is thus subject to the same uncertainty as the accommodation costs described in section 5.2.3.4.4.

We assume the remaining items under this umbrella, for example revenue from cultural events and sale of OCOG assets, to be approximately the same as in the Oslo 2022 budget, except subjected to inflation.

**5.2.2.6.2 Findings and Uncertainty** We have calculated the following other revenue:

**Table 5.10:** Other Revenue

Revenue	NOK 2022	NOK2034
Revenue from Paralympics	128 000 000	159 200 000
Revenue from test events	49 000 000	60 900 000
Administration fees accommodation		136 300 000
Other revenue	185 000 000	230 000 000
Total other revenue		586 400 000

As for all our calculations, this number is subject to uncertainty. Because all numbers are based on the Oslo 2022 budget, we have selected the same uncertainty interval as the Oslo 2022 Olympic Office<sup>78</sup>. As other revenue is a small proportion of the total revenue, changes within other revenue would have a very marginal impact on the Games' overall profitability.

<sup>76</sup>Consistent with the fee in the Oslo 2022 budget DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 68

<sup>77</sup>24 000 – 3552 rooms (reserved for athletes and team officials). See appendix A5 for more details.

<sup>78</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 69

## 5.2.3 Expenditures

### 5.2.3.1 Venues

**5.2.3.1.1 Description** Venues are one of the most basic requirements for staging the Olympic and Paralympic games. The Olympic host must ensure that all venues fulfil all operational and sports-related needs. Furthermore, the IOC encourages the host to use all venues in compliance with the best practices of health, safety and sustainability. The Key Olympic Venues include all competition venues; the Olympic Villages; International Broadcast Centre (IBC); Main Press Centre (MPC); Mountain Media Centre (MMC) and other zone Media Centres where relevant; Ceremony stadium(s) and Medal Plaza(s) (where relevant); Olympic Family Hotel(s) (OFH); accommodation villages (where relevant); Olympic Park(s) and major common domain(s); and airports and other major points of arrival and departure (where relevant). In addition to the Key Olympic Venues, and where appropriate, there may be Paralympic-specific venues (competition and/or non-competition)<sup>79</sup>. Venue costs include rent, provisionals and technical upgrades.

Although the requirements for all venues have been eased significantly under the New Norm, technical requirements and guidelines still exist<sup>80</sup>. The overall goal is that all venues should be planned in line with the long-term needs in the specific region. The Host City Contract – Operational Requirements<sup>81</sup> includes 28 requirements and suggestions for how the host OCOG should design the Olympic venues. The key points are briefly explained in the following.

- The host should ensure that all sports events take place in the host city of the Olympic events. However, for reasons of legacy, sustainability and cost-efficiency, the IOC can, according to the New Norm, allow entire sports or disciplines to be held outside the host city, or even in another country.
- The IOC encourages the use of existing and temporary venues. Unlike under the previous requirements, new venues should only be built if there is a sustainable business plan for the post-Games use of the venues. Furthermore, all temporary or

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<sup>79</sup>IOC, Host City Contract (2018a) art. 39

<sup>80</sup>See IOC, Host City Contract (2015) section 3.2 compared to IOC, Host City Contract (2018a) art. 39

<sup>81</sup>IOC, Host City Contract (2018a)

relocatable venues should be planned in the most cost efficient way.

- There are no longer any minimum capacity requirements for each arena. The arena capacities should be planned according to a local context and the goal of selling out the stadiums. According to the New Norm, the capacity should reflect the national interest in the host country for each sport<sup>82</sup>.
- All sports venues should follow the latest International Federation technical requirements regarding the fields of play, warm-up space and Back-of-House facilities for each sport. Thus, arenas which fulfil the technical requirements for World Cup or World Championship events, will be suitable for the Olympics.
- The host should maximise the use of shared venues, between sports and between the Olympic and Paralympic games.
- In general, the New Norm encourages the host to design all venues in the most sustainable way possible, with regards to environmental, social and economic aspects.

**5.2.3.1.2 Assumptions/our approach** There are many key venues, and each has its own detailed requirements. Naturally, evaluating the standard of all potential venues across Norway and calculating the exact cost of the necessary upgrades would be a rather extensive paper itself. Taking the IOC's goal of maximising the use of existing venues, and each venue's technical requirements into account, we can somewhat reduce the number of potential venues. There is a limited number of top standard sports arenas and suitable non-competitive venues in Norway. Still, for some sports (e.g. Nordic Skiing and Alpine Skiing) we face several alternative venues. For simplicity, we have assumed it to be equally expensive to host a sport in any of several similar venues. For example, we assume that the cost of organising alpine skiing is the same in Narvik as in Kvitfjell<sup>83</sup>. This implies that our selection of venues serves as illustrative examples and that our calculated costs are the costs of organising the games in a "generic" Norwegian winter sports venue. We have selected the following locations for hosting the Olympic Games, based on which venues meet the IOC's operational requirements.

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<sup>82</sup>IOC, Olympic Agenda 2020 (2018) p. 26

<sup>83</sup>Narvik has applied for the 2027 Alpine Skiing World Cup, Plener (2019), and Kvitfjell is a regular World Cup destination, see <https://www.fis-ski.com/DB/general/event-details.html?sectorcode=AL&eventid=45145&seasoncode=2020>

**Table 5.11:** Suggested Cities

City	Olympic Sports	Paralympic Sports
Narvik	Alpine Skiing	Alpine Skiing, Snowboard
Oslo	Nordic Skiing, Ice Hockey, Curling	XC, Hockey, Curling, Biathlon
Voss	Freestyle Skiing, Snowboard	
Bergen <sup>84</sup>	Speed Skating, Short Track, Figure Skating	
Trondheim	Biathlon	
Lillehammer	Bobsleigh, Luge, Skeleton	

We assume venues which required technical upgrades according to the Oslo 2022 analysis, still require those same upgrades. We also assume that the (real) costs related to the upgrades are unchanged. For example, the cost of bringing the Hunderfossen Bobsleigh Arena up to date is still the same, only inflation adjusted.

Furthermore, we assume that the Games can rent all publicly owned venues to a price equal to the operating costs in the period (i.e. non-profit). This includes the original operating costs and any increase in operating costs as a consequence for technical upgrades. The rent period is set to six months<sup>85</sup>, resulting in a rent of 50 % of the annual operating costs for each venue. For all privately owned venues, we assume a profit margin of 10 % on top of the operating costs.

Because our illustrative location suggestions involve six different cities, we assume that each city would need their own “mountain media center” and “medals plaza”. These venues are treated as generic venues. Due to fewer events in each city, the operating costs are assumed to be somewhat lower than the mountain media center and medals plazas suggested in the Oslo 2022 application.

Finally, we assume that the need for provisional items (TV screens, safety nets etc.) are unchanged from the Oslo 2022 application.

**5.2.3.1.3 Findings** Table 5.12 displays the total venue costs. See the appendix A3 for the detailed calculations.

<sup>84</sup>Given the plans for the skating arena at Slåtthaug are set to effect, see Øystein Vik (2019). Alternatively, these events can be relocated to other venues such as Vikingskipet, Sørmarka Arena, etc.

<sup>85</sup>Oslo 2022 assumed different rent periods for each venue, but did not specify them, with an average of approx. 6 months, see the summary from DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013)

**Table 5.12:** Venue costs

	Competitional venues	Non-Competitional venues	Total
Venue rent	154 700 000	365 600 000	520 300 000
Provisional items	524 200 000	669 000 000	1 193 200 000
Technical upgrades	300 900 000		300 900 000
Total	979 800 000	1 034 600 000	2 014 400 000

Based on our assumptions, we have calculated a total venue cost of NOK 2 014 400 000. This number seems reasonable compared to the 2026 applicants<sup>86</sup>. However, it is subject to uncertainty.

**5.2.3.1.4 Uncertainty** As the IOC has moved from encouraging the construction of new Olympic venues to maximising use of existing ones, we find it difficult to compare our venue costs with previous Olympic Games and the Oslo 2022 application. However, we do have the budgets from the Stockholm/Åre 2026 and Milano/Cortina 2026 Olympic bids. These budgets include total venue costs of 172 and 276 million USD respectively. Converted to Norwegian Kroner this is approximately 1 548 and 2 484 mNOK. Our number, 2 125 mNOK is between the 2026 applications.

However, both the Stockholm/Åre and the Milano/Cortina applications involved building new venues. Building a new venue is naturally far more expensive than using an existing one, and our calculated cost is therefore somewhat surprising. For example, it is possible that the need for provisionals is lower than we assume. Similarly, it is possible that we have assumed unnecessarily extensive technical upgrades. Nevertheless, our calculation is based on well-documented calculations from the Oslo 2022 application, and we are fairly confident in most of our estimates. Thus, the sensitivity analysis is just slightly skewed towards lower costs (table 5.13).

<sup>86</sup>International Olympic Committee (2019) p. 37 and 74

**Table 5.13:** Sensitivity analysis - Venue costs

Venue infrastructure		Venue rent and provisionals	
Percentage change	NPV (000)	Percentage change	NPV (000)
-30 %	-2 872 651	-30 %	-2 618 976
-28 %	-2 877 441	-28 %	-2 644 905
-25 %	-2 882 230	-25 %	-2 670 834
-23 %	-2 887 019	-23 %	-2 696 763
-20 %	-2 891 809	-20 %	-2 722 692
-18 %	-2 896 598	-18 %	-2 748 621
-15 %	-2 901 387	-15 %	-2 774 549
-13 %	-2 906 176	-13 %	-2 800 478
-10 %	-2 910 966	-10 %	-2 826 407
-8 %	-2 915 755	-8 %	-2 852 336
-5 %	-2 920 544	-5 %	-2 878 265
-3 %	-2 925 333	-3 %	-2 904 194
0 %	-2 930 123	0 %	-2 930 123
2 %	-2 934 912	2 %	-2 956 052
5 %	-2 939 701	5 %	-2 981 980
8 %	-2 944 490	8 %	-3 007 909
10 %	-2 949 280	10 %	-3 033 838
13 %	-2 954 069	13 %	-3 059 767
15 %	-2 958 858	15 %	-3 085 696
18 %	-2 963 648	18 %	-3 111 625
20 %	-2 968 437	20 %	-3 137 554

The NPV for the project as a whole is relatively sensitive to changes in the venue costs, especially rent and provisionals. This is because venue costs counts for a relatively large proportion of the total cost (15 % in total). We see that if the Norwegian OCOG can bring the venue cost close to the cost from the Stockholm/Åre 2026 application, the overall profitability of the Olympic games in Norway would be improved by approximately 10 % (around 25 % cost reduction in table 5.13).

### 5.2.3.2 Transport

**5.2.3.2.1 Description** A prerequisite for hosting the Olympic Games is the ability to move the large amount of people involved to and from venues, between venues and between the clusters. The IOC still has, although moderated by the New Norm<sup>87</sup>, a number of quite detailed conditions regarding the transport concept<sup>88</sup>.

<sup>87</sup>IOC, Olympic Agenda 2020 (2018), page 35-36

<sup>88</sup>IOC, Host City Contract (2018a) art. 38

The most prominent conditions relate to the transport of accredited groups, namely athletes and support teams, media, certain sponsor groups and some other stakeholders. In addition, the public transport system must hold the capacity to service the many spectators enjoying the events.

**5.2.3.2.2 Assumptions/our approach** Taking into consideration all details, both those of the IOC conditions and those stemming from the inherent complexity of a transportation problem of this scale, would make for quite an extensive paper in itself. Naturally, such an undertaking is beyond the scope of this thesis. The level of detail is also restricted by the amount and type of information available. In any case, the uncertainty of all the individual details would become substantial in total, undermining the value of a detailed approach.

Our best estimate for the application of the IOC conditions in a transport concept is the work done for the Oslo 2022 application draft<sup>89</sup>, in combination with our interpretation of the post New Norm Host City Contract<sup>90</sup>. We found that a certain portion of the measures taken for the Oslo application would now be redundant due to the New Norm. The main revisions regard the Olympic Lane<sup>91</sup>, of which there is no mention in the updated contract<sup>92</sup>, and a general loosening of the vehicle requirements, allowing for adaptations and encouraging a more extensive use of the public transport system<sup>93</sup>.

This approach has led us to the following main guidelines:

- Accredited groups (athletes, media etc.) are to be provided transport from the most natural entry point (Gardermoen or Flesland) to the location of their event, and with transport the opposite way at the end of the Games.
- All volunteers require inner city transport (i.e. public transport tickets), and 10 % of volunteers need extra buses at night<sup>94</sup>. Additionally, a portion of athletes and media personnel are assigned a public transport ticket, roughly a one month pass

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<sup>89</sup>Oslo Kommune Olympic Office (2013c)

<sup>90</sup>IOC, Host City Contract (2018a) art. 38

<sup>91</sup>According to the conditions to which the Oslo application was subjected, a road or a lane was to be dedicated exclusively to Games related transport between Olympic venues, see the summary of Oslo Kommune Olympic Office (2013c).

<sup>92</sup>The term is used, but only on two occasions, referring to a lane at the immigration office, see IOC, Host City Contract (2018a) pages 36 and 195.

<sup>93</sup>IOC, Olympic Agenda 2020 (2018) p. 35-36 and IOC, Host City Contract (2018a) art. 38

<sup>94</sup>Same assumption as Oslo Kommune Olympic Office (2013c) page 22

for each.

- Accredited groups (mainly athletes and media) are to be provided a number of rental vehicles. For the sake of simplicity, we aggregate the different classes of vehicles used in the Oslo 2022 report<sup>95</sup> into buses and 9-seater cars. Media and national teams are assigned a number of each, roughly matching the proportions in the Oslo report.
- Spectators are provided a day of public transport with their ticket. This figure is also a rough approach to the cost of increasing the overall public transport capacity.
- The principles above are also applied for the Paralympic Games, but scaled down accordingly.

Generalising the transport problem to this extent allows us to use more reliable numbers whilst covering all the main aspects. However, a more detailed approach might have been better suited for utilising any potential for optimising the transport plan, such as setting a schedule for the use of rented vehicles, maximising the use of public transport etc. Sadly, we were unable to find detailed information about the transport plans of Milano 2026 and Stockholm 2026, which could have enabled us to generalise to a lesser extent.

**5.2.3.2.3 Findings** The first step of establishing the transport cost is finding the prices for the different means of transportation needed. This has resulted in the following figures:

- The cost of one aeroplane ticket is based on the current price of one ticket from Gardermoen or Flesland to Evenes at the end of next year (we assume these far-ahead prices are less affected by the current pandemic), adjusted for inflation until 2034. This comes out at roughly NOK 1000. The cost of a train ticket is estimated by the same principle, coming out at roughly NOK 400.
- We assume public transport tickets to have the same price in each city (this is roughly true at least for Oslo and Bergen). The cost of one day of public transport is estimated as the average of the daily cost of a one-month-ticket, the daily cost of a one-week-ticket and the cost of a one-day-ticket, as we expect a mix of these

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<sup>95</sup>Ibid.



options will be used. Adjusted for inflation, this comes out at NOK 69.

- The cost of renting one 9-seater car per month (the duration of the Games), is simply that price today adjusted for inflation, giving us about NOK 48 000. The cost of renting a bus proved more of a challenge, as these prices are not readily available online. We were, however, able to find the price of renting a 50-seat bus, with a driver, from Oslo to Bergen, corresponding to almost exactly one average working day. Adjusted for inflation, this cost is about NOK 26 000, of which we will need 25, assuming all buses are rented for the whole duration of the Games.

Adding up the costs across all stakeholder groups and all means of transportation, our best estimate for the total cost is NOK 221 800 000 for the Olympic Games and 49 600 000 for the Paralympic Games, as displayed in table 5.14<sup>96</sup>.

**Table 5.14:** Transport costs

<b>Olympics</b>	Aeroplane	Train	Bus	Car	Public transport
Price	1 000	400	26 000	48 000	69
Required number	5 560	3 560	3 877	597	1 236 500
Cost	5 560 000	1 424 000	100 802 000	85 318 500	28 656 000
Total cost	221 800 000				
<b>Paralympics</b>					
Required number	2 114	0	881	341 256	22
Cost	2 114 000	0	22 906 000	23 546 664	1 056 000
Total cost	49 600 000				

**5.2.3.2.4 Uncertainty** Or calculation seems reasonable, but there is of course a level of uncertainty. On one hand, the assumption that the transport prices (tickets, rental vehicles) follow the general inflation does not necessarily hold. The 2034 prices could prove higher or lower than our estimate. There is also the possibility of us having underestimated the number of vehicles required or of the mix of vehicles required being a more expensive one.

On the other hand, and seemingly more likely, our figure is an overestimation. The New Norm allows for a less rigid transport plan, in which vehicles can be re-allocated between

<sup>96</sup>See appendix A4 for details

stakeholder groups, based on their specific day-to-day needs. Additionally, accredited groups are not entitled to a vehicle if their needs can be met sufficiently by the public transport system. These nuances are not reflected in our analysis, as they require a great deal of information and a clear plan for the Olympic Games Programme.

In conclusion, we regard our estimate of NOK 270 million to be a reasonable, yet conservative one. There is uncertainty in both directions, but considering the IOC revision of their requirements, the potential for savings seems slightly greater than the potential for additional costs. This is reflected in the interval of our sensitivity analysis which ranges from -40% to +20%.

**Table 5.15:** Sensitivity analysis - Transport

<b>Percentage change</b>	<b>NPV (000)</b>
-40 %	-2 865 621
-37 %	-2 870 459
-34 %	-2 875 296
-31 %	-2 880 134
-28 %	-2 884 972
-25 %	-2 889 809
-22 %	-2 894 647
-19 %	-2 899 484
-16 %	-2 904 322
-13 %	-2 909 160
-10 %	-2 913 997
-7 %	-2 918 835
-4 %	-2 923 673
-1 %	-2 928 510
2 %	-2 933 348
5 %	-2 938 185
8 %	-2 943 023
11 %	-2 947 861
14 %	-2 952 698
17 %	-2 957 536
20 %	-2 962 374

Because the transport costs account for only 2 % of the total cost, the NPV for the Games as a whole is rather insensitive to changes to the transport costs.

### 5.2.3.3 Medical services

**5.2.3.3.1 Description** Sport at the highest level pushes the athletes to their limits and puts them at risk of injury. Winter sports are no exception. Many are even to be considered extreme sports, such as downhill skiing, freestyle skiing, snowboarding, ski jumping, luge and skeleton etc., where the hospitalisation of one or more athletes is not unusual. Naturally, the host of the Olympic and Paralympic Games is required to respond by providing medical services. The host is also required to ensure the anti-doping regulations are met, in order to guarantee the athletes a fair contest on equal terms.

These requirements are incorporated by the IOC in the Host City Contract<sup>97</sup>. They require the host to provide Olympic Village Polyclinics, an effective doping control programme, and set minimum requirements for the capacity and quality of hospitals and emergency preparedness. The impact of the New Norm is not as extensive as for other aspects of hosting the Olympics, but there are a few implications. Most importantly, the OCOG is allowed to let specific services or equipment be provided by local hospitals (within 15 minutes away), rather than at the Olympic Village Polyclinic<sup>98</sup>.

**5.2.3.3.2 Assumptions/our approach** Our best source for the specifics of the medical services needed for the olympics and Paralympics is the Oslo 2022 application work. However, the information available to us includes very little beside the plans for the services and the total cost, as well as the unit costs of a few factors such as medical doctors, nurses, administrative workers and emergency vehicles<sup>99</sup>.

For our cost estimate, we have simply used the number from the Oslo 2022 budget, and adjusted it for inflation<sup>100</sup>. A key difference is the geographical spread of our illustrative concept, for which we expect to need separate emergency preparedness vehicles and Olympic Village Polyclinics in each city. Apart from this, there are the savings due to the New Norm modifications. These are, however, a challenge to quantify, as we do not have the insight required to judge what services and equipment required by the Oslo 2022 committee to provide in the polyclinics can now be provided by local hospitals. This impact will be sought reflected in the sensitivity analysis.

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<sup>97</sup>IOC, Host City Contract (2018a) art. 22

<sup>98</sup>IOC, Olympic Agenda 2020 (2018) page 38

<sup>99</sup>Oslo Kommune Olympic Office (2013e)

<sup>100</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) page 77

**5.2.3.3.3 Findings and uncertainty** Our estimate of the cost for medical and anti-doping services is summarised in table 5.16 below<sup>101</sup>:

**Table 5.16:** Medical and anti-doping services

Oslo 2022 estimate	121 900 000
Additional helicopters in Narvik, Bergen, Voss and Trondheim	6 200 000
Additional ambulances	5 600 000
Administration for additional polyclinics	600 000
Total cost	134 200 000

Using the Oslo 2022 analysis as our baseline, means their evaluation of the uncertainty of the estimate, which favoured the downside (-10/+30%)<sup>102</sup> also applies to ours. In addition to their considerations, we also note there is a potential for savings due to the New Norm, leaving our span of uncertainty symmetrical at -30/+30 %.

Counting for only 1 % of the total costs, medical services is the smallest cost item in our calculation. Additionally, all medical services costs occur during the games, leaving the overall NPV largely insensitive to changes in medical costs.

#### 5.2.3.4 Accommodation

**5.2.3.4.1 Description** The Host City Contract - Operational Requirements includes the accommodation facilities required for both athletes/staff<sup>103</sup> and other accredited groups (e.g. the IOC members, media, etc.)<sup>104</sup>. The accommodation requirements for all accredited groups, apart from the athletes and staff, describe in detail the need for rooms in detail (both quantity and quality)<sup>105</sup>. This group requires a total of 24 000 rooms. The OCOG is responsible for making the required number of rooms, of the required standard, available to a fixed USD rate. This fixed rate should be set approximately one year before the games. The OCOG is, however, not obligated to paying for the rooms. The only financial risk the OCOG faces is the currency risk regarding the fixed rate.

The requirements for all athletes and team officials are more comprehensive. The key

<sup>101</sup>See appendix A6 for more details

<sup>102</sup>Oslo Kommune Olympic Office (2013e) page 78

<sup>103</sup>IOC, Host City Contract (2018a) art. 40

<sup>104</sup>IOC, Host City Contract (2018a) art. 1

<sup>105</sup>See IOC, Host City Contract (2018a) art. 1 for details

points are<sup>106</sup>:

- The host OCOG should provide one bed for each participating athlete and eligible team official within an Olympic or Paralympic Village, which for reasons of legacy, sustainability and cost-efficiency, can consist of one or several existing, new, temporary or demountable residential and/or hotel facility(/-ies). The standard has normally been such that the Olympic host constructs an Olympic Village, but under the New Norm, this is no longer required.
- The host OCOG is responsible for accommodating all athletes and team officials in double or single rooms.
- Athletes and team officials should stay no longer than 50 km or a one hour drive away from their sports venue.
- The accommodation facility should be available to the athletes from four days before the opening ceremony until three days after the closing ceremony.

**5.2.3.4.2 Assumptions/Our approach** In our calculation, we have distinguished between the rooms required by all non-athlete accredited personnel (20 448) and the accommodation needs of athletes and team officials (3 552). As the host OCOG is still obligated to guaranteeing the availability of the rooms for other accredited groups, the the total number (24 000) is used for checking whether or not our suggested location could offer the required number of rooms.

We have assumed that the demand for rooms in each city is proportional to the number of athletes whose sporting events are held there. For example, alpine skiing, held in Narvik, accounts for 10 % of the athletes. According to our assumption, other accredited groups require 10 % of other accredited groups' room demand in Narvik. We assume this logic holds for most of the rooms, but expect a fair portion is not sport-specific, and should be allocated to the main city. Comparing our numbers with the accommodation plans of the 2026 applicants<sup>107</sup>, we find a sports unrelated number of rooms of 6 000 to seem reasonable.

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<sup>106</sup>For all requirements, see IOC, Host City Contract (2018a) art. 40

<sup>107</sup>International Olympic Committee (2019) page 35 and 72

Since the Paralympics is 15 % of the size of the Olympic games<sup>108</sup>, we apply the same logic for the Paralympic games, only scaled down by 85 %.

Although other accredited groups pay for their own rooms, we have assumed (as did Oslo 2022<sup>109</sup>) that the host OCOG charges 10 % of the room rental rate as an administration fee. The only financial consequence is that accommodating this group will generate revenue, see section 5.2.2.6 above.

Costs will however arise from accommodating athletes and team officials. The IOC states that, for planning purposes, the host should plan for 4900 and 2200 athletes and team officials for the Olympic and Paralympic games respectively<sup>110</sup>. As mentioned, the accommodation facilities should be available from four days before the games to three days after. For the Olympic games this would mean a total period of 23 days (4+16+3). We assume there will be a need for inspecting every room and consequently that the rent period is 30 days for the Olympic games. For Paralympics, we assume the rent period to be 10 days.

Furthermore, we assume a rate of NOK 2 200 per night in 2034. This is based on a 2020 rate of 1700 (adjusted for inflation) which is in the higher end of hotel prices<sup>111</sup>. When taking the athletes and team officials extra requirements, such as extra cleaning service, into account, it is reasonable to assume that the hotel room price is in fact in the higher end.

Finally, our plan accommodates 80 % of the athletes and team officials in double rooms, and 20 % in single rooms<sup>112</sup>.

**5.2.3.4.3 Findings** Using the this approach, we have calculated a total accommodation cost of NOK 245 500 000. The administration fee for the other accredited group is recognised as revenue. The cost for each city is shown in the table 5.17 below<sup>113</sup>.

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<sup>108</sup>In 2018 the total number of Paralympic athletes was 15 % of the total number of Olympic Athletes. This is found by adding up all athletes in the 2018 games found at <https://www.olympic.org/olympic-results>

<sup>109</sup>Oslo Kommune Olympic Office (2013d)

<sup>110</sup>IOC, Host City Contract (2018a) art. 40

<sup>111</sup>See for instance [booking.com](https://www.booking.com)

<sup>112</sup>Same assumption as Oslo 2022, Oslo Kommune Olympic Office (2013d)

<sup>113</sup>See appendix A5 for further details

**Table 5.17:** Accommodation

City	Olympics	Paralympics
Narvik	25 344 000	6 824 400
Oslo	79 136 000	11 095 200
Voss	45 144 000	
Bergen	35 640 000	
Trondheim	17 424 000	
Lillehammer	25 344 000	
Total	228 000 000	17 500 000

**5.2.3.4.4 Uncertainty** As a consequence of the 2026 applicants not reporting their total calculated accommodation cost (it is aggregated with all operating costs), we do not have a recent basis for comparison. Oslo 2022 planned to build apartments and use them as the Olympic village. As this model is rather different from our suggestion, a comparison between our calculated number and the Oslo 2022 budget would be misleading at best. Since the IOC explicitly states the number of beds to plan for, and because the market price for a hotel room is more or less given, we are fairly confident in our calculation. The most uncertain factor is the rent period. The range of the sensitivity analysis is therefore set to  $\pm 20\%$ .

**Table 5.18:** Sensitivity analysis - Accommodation costs

Percentage change	NPV (000)
-20 %	-2 900 634
-18 %	-2 903 583
-16 %	-2 906 532
-14 %	-2 909 481
-12 %	-2 912 430
-10 %	-2 915 379
-8 %	-2 918 327
-6 %	-2 921 276
-4 %	-2 924 225
-2 %	-2 927 174
0 %	-2 930 123
2 %	-2 933 072
4 %	-2 936 020
6 %	-2 938 969
8 %	-2 941 918
10 %	-2 944 867
12 %	-2 947 816
14 %	-2 950 764
16 %	-2 953 713
18 %	-2 956 662
20 %	-2 959 611

As shown in table 5.18 above, isolated changes in the accommodation costs will have very little impact on the overall profitability for the project. This is because accommodation only accounts for 2 % of the total cost and occur late in the planning horizon.

### 5.2.3.5 Security

**5.2.3.5.1 Description** One of the most important responsibilities of the host, both the OCOG and the host nation, is to guarantee the safety and security of everyone attending the Olympic and Paralympic Games. The IOC describes the security requirements in great detail<sup>114</sup>, and, as far as we can see, there have been no specific changes to these subsequent to the New Norm.

**5.2.3.5.2 Findings** Seeing as the requirements are more or less the same today as they were at the time of the Oslo 2022 analysis, we are comfortable reusing their number,

<sup>114</sup>IOC, Host City Contract (2018a) art. 30



only adjusted for inflation. We also include the non-OCOG cost of security (police and military), as that is also a cost associated with hosting the Olympics and Paralympics<sup>115</sup>. This leaves a cost from safety and security measures of approximately NOK 3 026 400 in 2034, as shown in table 5.19.

**Table 5.19:** Security

Oslo 2022 estimate	771 000 000	958 600 000
Oslo 2022 non-OCOG	1 663 000 000	2 067 800 000
Total		3 026 400 000

**5.2.3.5.3 Uncertainty** As the Oslo 2022 report points out, there is uncertainty in the estimate of security personnel wages<sup>116</sup>. In addition, there is no certain way of predicting the threat level so far in the future. On top of this, there is also the difference in Games layout between Oslo 2022 and our concept. Spreading the events across several cities could increase the total number of security personnel needed. On the other hand, the same fact may also prove to decrease the need for security personnel, as the crowds of people gathered in one place will be smaller. Summing up, there is no doubt this is an uncertain estimate, which could equally prove to be too small as too high.

<sup>115</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 79-80 and 95-96

<sup>116</sup>Ibid. p. 79-80

**Table 5.20:** Sensitivity analysis - Security costs

Percentage change	NPV (000)
-30 %	-2 384 849
-27 %	-2 439 377
-24 %	-2 493 904
-21 %	-2 548 431
-18 %	-2 602 959
-15 %	-2 657 486
-12 %	-2 712 013
-9 %	-2 766 541
-6 %	-2 821 068
-3 %	-2 875 595
0 %	-2 930 123
3 %	-2 984 650
6 %	-3 039 177
9 %	-3 093 705
12 %	-3 148 232
15 %	-3 202 759
18 %	-3 257 287
21 %	-3 311 814
24 %	-3 366 341
27 %	-3 420 869
30 %	-3 475 396

Table 5.20 shows how the project's NPV is affected by changes in the security cost. Because security counts for 20 % of total expenditures, changes in the security costs would have a noticeable impact on the overall profitability of the games. However, as the largest proportion of the security costs are related to police and military emergency services, we believe that the OCOG has little opportunity of influencing these costs.

### 5.2.3.6 Technology

**5.2.3.6.1 Description** A successful delivery of the Olympic and Paralympic Games requires reliable and efficient power-, telecommunication- and internet infrastructures, as well as a sufficient utilisation and implementation of modern technology<sup>117</sup>.

The New Norm revisions have sought to ease and facilitate this for the OCOG. The emphasis is on using existing infrastructure to as high a degree as possible, and not set the bar any higher than what is the case for similar events such as the World Championships

<sup>117</sup>IOC, Host City Contract (2018a) art. 36

of the different sports. This becomes evident from the numbers we find in the Oslo 2022, Stockholm/Åre 2026 and Milano/Cortina 2026 budgets, one of which was before the New Norm and two after<sup>118</sup>. The latter two are quite a lot lower than the Oslo numbers, if we adjust them all for currency and inflation to 2034 NOK, see table 5.21.

**Table 5.21:** Technology cost - comparison

	2034 NOK
Oslo 2022	3 016 400 000
Stockholm/Åre 2026	2 751 300 000
Milano/Cortina 2026	2 474 500 000

**5.2.3.6.2 Findings and uncertainty** Not to over-state the effect of the New Norm revisions, we have chosen an average of the three technology costs as our estimate. Trying to extrapolate a new figure based on the specific needs of the 2034 Games would require a detailed event and venue plan, detailed information about technological needs and what is lacking, as well as a prediction of how this might change in the future, none of which is available to us.

This approach gives us a technology cost of NOK 2 747 400 000 in 2034.

The main factors of uncertainty in this figure is its reliance upon the uncertain predictions it is based on, as well as the remarkable rate of technological development, making it near impossible to say what a technology concept fourteen years in the future may look like.

### 5.2.3.7 People management

**5.2.3.7.1 Description** The Winter Olympics is a large and complex event requiring a large work-force. People Management incorporates every activity stream related to the strategy, planning and completion of the games, covering all personnel expenses. This includes wages and other social costs for OCOG employees; costs related to external consultants; and all costs related to volunteers (e.g. food, beverage, uniforms, etc.), except accommodation and transport, the first of which is irrelevant, as we assume volunteers to be recruited locally, and the second of which is accounted for under section 5.2.3.2 Transport. The IOC provides guidelines on how the OCOG should form their people

<sup>118</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 76, International Olympic Committee (2019) p. 37 and 74

management strategy in the host city contract<sup>119</sup>.

**5.2.3.7.2 Assumptions/Our approach** Planning and implementing a human resources strategy for a project of Olympic scale is far beyond our scope. Our calculated people management costs are rather based on the budgets from Oslo 2022<sup>120</sup>, Stockholm/Åre 2026<sup>121</sup> and Milano Cortina 2026<sup>122</sup>. As none of these budgets present their presumed personnel need, we have had to make some assumptions.

A large proportion of the personnel expenses from the Oslo 2022 budget is based on the realised costs from the Lillehammer 1994 Olympics. In 2034 these numbers would be 40 years old and likely to be irrelevant due to the rapid technological changes. The work-force required in 2034 is probably very different from the work-force size and functions required in 1994. Furthermore, the Oslo 2022 Olympic office was heavily criticised<sup>123</sup> for their spending on external consultants. The 2034 OCOG should thus aim to reduce these costs compared to Oslo 2022.

Because of the uncertainty mentioned above, we have based our calculation on the most recent budgets. Stockholm/Åre 2026 and Milano/Cortina 2026 have people management costs of USD 321 000 000 and USD 264 000 000 respectively. It is reasonable to assume that the 2034 Olympics would need a similar work-force to the 2026 games. We must, however, take the relative wage differences between the countries into account. The average wage is higher in Norway than both 2026 applicant countries, and similar work-forces would not be equally expensive across the three countries countries.

Furthermore, we had to take into account the real wage growth (wage growth exceeding inflation). The Norwegian Central Bank predicted the nominal annual wage growth to vary between 2 and 3 %<sup>124</sup>. This is close to the inflation goal of 2 % and we have therefore assumed zero real wage growth.

Finally, to properly estimate the cash flow effects of the people management costs, we had to acknowledge the fact that personnel expenses are among the first to occur. The

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<sup>119</sup>IOC, Host City Contract (2018a) art. 26

<sup>120</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 75

<sup>121</sup>International Olympic Committee (2019) p. 37

<sup>122</sup>International Olympic Committee (2019) p. 74

<sup>123</sup>see for example NTB (2014)

<sup>124</sup>Norges Bank (2020)

largest proportion of the costs does still occur in the years leading up to the games.

**5.2.3.7.3 Findings** As a consequence of the our assumptions, our estimated people management expenses are the average of the 2026 applicants' estimated people management costs, adjusted to the nominal wage in NOK. These calculations are shown in table 5.22 below<sup>125</sup>.

**Table 5.22:** People Management

	Norway 2022	Italy 2026	Sweden 2026	Norway 2034
Budget (000)	NOK 3 603 000	USD 263 646	USD 321 124	
2034 <sup>126</sup> (000)	NOK 4 479 900	NOK 2 725 600	NOK 3 319 800	
Adjusted to Norwegian wages <sup>127</sup>		NOK 3 757 600	NOK 3 841 000	
Total cost (000)				NOK 3 799 000

**5.2.3.7.4 Uncertainty** As for all our calculations, the people management expenses are inflicted by uncertainty. The total cost is based on budgeted costs of games yet to be held, leaving a possibility of the realised people management costs in 2026 differing from the budgets. Adjusted to Norwegian wages, the difference between budgets from Stockholm/Åre and Milano/Cortina is relatively small, somewhat reducing uncertainty. We also face uncertainty as to the timing of costs. We do acknowledge the fact that personnel expenses are the first to occur, but seeing as the relevant data is not publicly available, we do not know when what proportion of the personnel expenses occurs. All in all, we range our sensitivity analysis at  $\pm 30\%$ <sup>128</sup>.

<sup>125</sup>See appendix A7 for details

<sup>126</sup>Adjusted for inflation and currency

<sup>127</sup>Wages in Sweden and Italy are 86.4% and 72.5% of Norwegian wages respectively: OECD (2020)

<sup>128</sup>Consistent with the Oslo 2022 Olympic office's uncertainty analysis: DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 75

**Table 5.23:** Sensitivity analysis - People management

Percentage change	NPV (000)
-30 %	-2 104 959
-27 %	-2 187 475
-24 %	-2 269 992
-21 %	-2 352 508
-18 %	-2 435 024
-15 %	-2 517 541
-12 %	-2 600 057
-9 %	-2 682 573
-6 %	-2 765 090
-3 %	-2 847 606
0 %	-2 930 123
3 %	-3 012 639
6 %	-3 095 155
9 %	-3 177 672
12 %	-3 260 188
15 %	-3 342 705
18 %	-3 425 221
21 %	-3 507 737
24 %	-3 590 254
27 %	-3 672 770
30 %	-3 755 287

People management counts for 26 % of the total cost and they are among the first to occur. Naturally, as shown in table 5.23 above, changes in the people management cost could impact the overall profitability of the project quite substantially.

### 5.2.3.8 Ceremonies and Culture

**5.2.3.8.1 Description** The winter Olympics is not only two weeks of top level sporting competitions. The Games also include ceremonies and a cultural programme. Ceremonies provide some of the most memorable moments of the Olympic and Paralympic Games. They showcase the Olympic and Paralympic values, celebrate the athletes' achievements, contribute to the spirit of solidarity and highlight the cultural traditions of the Host City and nation. Successful Ceremonies aim to ensure that the Olympic and Paralympic Games are much more than just another sporting event. The cultural programme is meant to enhance the games' festival atmosphere and showcase the local culture. As for all other aspects of the games, the IOC provides the host OCOG with requirements and guidelines

on how to organise the ceremonies and cultural programme<sup>129</sup>.

The opening and closing ceremonies take place on the first and last day of the Games<sup>130</sup>. Furthermore, the host OCOG is obligated to honour every medallist in a victory ceremony. For the Winter Games, unlike the Summer Olympics, the New Norm has removed the requirement of holding these victory ceremonies at a dedicated medals plaza<sup>131</sup>.

The host OCOG is free to create the cultural programme at their own will, but the master-plan should be approved by the IOC, and must include a plan for bringing the Olympic torch from the previous host to the Games<sup>132</sup>.

**5.2.3.8.2 Assumptions/our Approach** Our calculations are based the Oslo 2022 budget. Even though medals plazas are no longer a requirement set by the IOC, we have decided to include it in our calculations, seeing as a medals plaza takes the role of a centre for the Olympic Games in each city, thus serving as an important part of the cultural programme. Oslo 2022 calculated the medals plaza cost (provisionals and operating cost) to 30 mNOK (2022). We assume it will be somewhat lower as the number of events per medals plaza will be lower.

Because we suggest another layout than the Oslo 2022 committee did, we have to scale these costs to fit our suggested layout. Apart from this scaling, we assume that the ceremonies and cultural costs are unchanged, except subjected to inflation.

**5.2.3.8.3 Findings** The cost of ceremonies and culture are displayed in table 5.24 below<sup>133</sup>. Event specific costs are the costs of the ceremonies themselves (e.g. artists and costumes).

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<sup>129</sup>IOC, Host City Contract (2018a) art. 6 and art. 10

<sup>130</sup>Ibid. art. 6

<sup>131</sup>This is due to the Winter Games more often being spread across a wider area, see IOC, Host City Contract (2018a) art. 39

<sup>132</sup>IOC, Host City Contract (2018a) art. 10

<sup>133</sup>See appendix A8 for details

**Table 5.24:** Ceremonies and Culture

	Location	Event-specific costs
Opening and Closing Ceremony	Oslo	373 012 000
Medals Plaza 1	Oslo	12 433 000
Medals Plaza 2	Trondheim	12 433 000
Medals Plaza 3	Narvik	12 433 000
Medals Plaza 4	Voss	12 433 000
Medals Plaza 5	Bergen	12 433 000
Medals Plaza 6	Lillehammer	12 433 000
Cultural Programme		248 647 000
Total 2034 NOK		621 800 000

**5.2.3.8.4 Uncertainty** Our calculated number seems reasonable, yet uncertain. Having based the opening and closing ceremony cost on the Oslo 2022 cost, it seems reasonable to infer that the costs can be reduced significantly, seeing as the Oslo 2022 committee states their ceremonies and cultural programme being planned at a high level of ambition<sup>134</sup>. Additionally, our estimation is higher than both 2026 applicants' ceremonies and culture budgets<sup>135</sup>. As a result, our sensitivity analysis for ceremonies and culture examines a larger potential for savings than for greater costs.

<sup>134</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 106

<sup>135</sup>International Olympic Committee (2019) p. 37 and 74



**Table 5.25:** Sensitivity analysis - Ceremonies and culture

Percentage change	NPV (000)
-40 %	-2 779 535
-38 %	-2 788 947
-35 %	-2 798 358
-33 %	-2 807 770
-30 %	-2 817 182
-28 %	-2 826 594
-25 %	-2 836 005
-23 %	-2 845 417
-20 %	-2 854 829
-18 %	-2 864 240
-15 %	-2 873 652
-13 %	-2 883 064
-10 %	-2 892 476
-8 %	-2 901 887
-5 %	-2 911 299
-3 %	-2 920 711
0 %	-2 930 123
2 %	-2 939 534
5 %	-2 948 946
8 %	-2 958 358
10 %	-2 967 770

However, since the ceremonies and culture costs count for only 4 % of the total costs, and these costs occur late in the planning horizon, the overall profitability is not very sensitive to changes in ceremonies and culture costs.

### 5.2.3.9 Communication, marketing and look

**5.2.3.9.1 Description** The host OCOG is obligated to creating a communications programme aiming to deliver the core messages and values of the Olympic and Paralympic games to a global audience. Effective, clear and consistent communication throughout the Games lifecycle generates support for the Games in the Host City and beyond. It also mitigates risks and establishes credibility aiding the OCOG in successfully managing any unexpected occurrences. Furthermore, the communication programme accounts for the games look (e.g. logo and other graphical elements). The organisation and implementation of this programme naturally generate costs.

Similarly to the people management strategy, the host OCOG are free to create their own

communication and marketing strategy. The IOC guidelines in this regard are simply suggestions<sup>136</sup>. The strategy must include a plan for acquiring all necessary legal rights, such as the right to use the Olympic rings<sup>137</sup>. The IOC guidelines in this regard are simply suggestions<sup>138</sup>.

**5.2.3.9.2 Assumptions/Our Approach** As for the people management costs, communication, marketing and look costs are based on the 2026 applicants' budgets. There is no information available about the contents of their programmes. In terms of content and scope, it is reasonable to assume that the communication programme will be fairly similar in 2026 and in 2034. Furthermore, we assume that the cost difference, if any, between the countries is negligible.

Our calculated communication, marketing and look cost is therefore the average of the Stockholm/Åre and Milano/Cortina communication, marketing and look budgets, adjusted for inflation and converted to NOK. We assume that the costs occur after the host of the 2034 has been announced, and that most marketing efforts will be made in the years closely leading up to the Games.

**Table 5.26:** Communcation, Marketing and Look

	Stockholm/Åre 2026	Milano/Cortina 2026	Norway 2034
Communcation, Marketing and Look	536 000 000	704 000 000	620 000 000

**5.2.3.9.3 Findings and uncertainty** Our calculation is shown in table 5.26 above<sup>139</sup>. Naturally, this number seems reasonable compared to the 2026 applicants. The uncertainty of our estimation mainly relates to the estimations on which it is based, as well as its comparability to them.

### 5.2.3.10 Corporate Administration and Legacy

**5.2.3.10.1 Description** A well organised event is crucial for the athletes', spectators' and other stakeholders' experience and perception of the Games. Well organised games

<sup>136</sup>IOC, Host City Contract (2018a) art. 9

<sup>137</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013)

<sup>138</sup>IOC, Host City Contract (2018a) art. 9

<sup>139</sup>All numbers are nominal 2034 NOK

require an efficient and skilled administration, as they are responsible for meeting all requirements in the host city contract. Corporate administration and legacy costs cover the costs related to all activities in the administration, except the cost of the personnel, which is covered in people management.

One key change under the New Norm is the IOC's obligation to contribute to the games. As part of this contribution, the IOC shall make available to the OCOG the expertise from the IOC's and IOC Controlled Entities' staff and advisors in the areas most relevant for the planning, organising, financing and staging of the Games<sup>140</sup>. For the 2026 Winter Olympics, the value of this contribution is estimated to 83 mUSD<sup>141</sup>.

**5.2.3.10.2 Assumptions/Our Approach** We have assumed the administration needs to be similar to the Oslo 2022 needs. The Oslo 2022 budget is based on the realised costs of the Lillehammer 1994 which, as mentioned, might be outdated and imprecise. The Oslo 2022 Olympic office did, however, significantly adjust the numbers for a more modern Olympic administration. We assume that the cost difference between 2022 and 2034 are more or less negligible, and apply the inflation adjusted number as our estimate.

Similarly, we have adjusted the value of the IOC contribution for inflation, assuming that the real value of the contribution will remain unchanged.

Finally, we have assumed that the administration costs follow the same distribution as the people management costs. In doing so, we acknowledge that administrative costs are among the first to occur.

**5.2.3.10.3 Findings** As a consequence of the our assumptions, we have calculated the following corporate administration and legacy costs (table 5.27).

**Table 5.27:** Corporate Administration and Legacy

Oslo 2022 NOK	1 114 000 000
Gross 2034 NOK	1 385 100 000
IOC Contribution 2034 NOK	858 000 000
Net 2034	527 100 000

<sup>140</sup>IOC, Host City Contract (2018b) §12.b

<sup>141</sup>Ibid.

**5.2.3.10.4 Uncertainty** As our input is based on 30-year-old costs, there are naturally uncertainty regarding the input of our calculation. Furthermore, there is uncertainty regarding the timing of the IOC contribution. Even though we are fairly certain about the value, we have no information about when the host OCOG will receive the IOC contribution. This will naturally have a cash flow effect and thus influence the NPV. For this reason, we have selected a sensitivity interval of  $\pm 20\%$ , examining a possible estimation error in both directions<sup>142</sup>.

**Table 5.28:** Sensitivity analysis - Corporate administration and legacy

Percentage change	NPV (000)
-20 %	-2 853 797
-18 %	-2 861 429
-16 %	-2 869 062
-14 %	-2 876 694
-12 %	-2 884 327
-10 %	-2 891 960
-8 %	-2 899 592
-6 %	-2 907 225
-4 %	-2 914 857
-2 %	-2 922 490
0 %	-2 930 123
2 %	-2 937 755
4 %	-2 945 388
6 %	-2 953 020
8 %	-2 960 653
10 %	-2 968 286
12 %	-2 975 918
14 %	-2 983 551
16 %	-2 991 184
18 %	-2 998 816
20 %	-3 006 449

Since the corporate administration and legacy cost is 4 % of the total cost, the overall profitability is not very sensitive to it changing. Administrative costs are among the first to occur, somewhat increasing the sensitivity.

<sup>142</sup>Consistent with the Oslo 2022 committee DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 81

### 5.2.3.11 Other expenses

**5.2.3.11.1 Description** We have defined other expenses as "other expenses" and all "Non-OCOG Operating" costs from the Oslo 2022 budget, serving as a proxy for the costs we have not identified elsewhere<sup>143</sup>.

"Other expenses" in the Oslo 2022 budget include ticket costs, technical services, acquiring the rights of the Olympic rings, IOC royalties from revenue, environmental costs, loss on sponsor services and compensation of fees related to visas. We have assumed all these costs are still relevant, except for the following:

- **Ticket costs**, which are mainly generated by the production and printing of every ticket. In 2034 we assume that all tickets are distributed digitally.
- **IOC Royalties**, which is not relevant under the New Norm. The IOC does not receive royalties from ticket sales, official merchandise and domestic sponsors<sup>144</sup>.

NON-OCOG operating costs are all costs arising from the Olympics, which are not assigned to the OCOG, for example costs related to environmental projects and planning costs for the use of public services as a consequence of the Games.

**5.2.3.11.2 Findings and uncertainty** Adjusted for inflation, we have the calculated the following other expenses (table 5.29).

**Table 5.29:** Other costs

OCOG-related	
Oslo 2022 Other costs	745 000 000
Adjustment for digital tickets	- 44 900 000
Adjustment for IOC royalties	- 167 900 000
Not OCOG related	
Environmental costs	183 000 000
Public planning costs	141 000 000
<b>Total</b>	<b>856 200 000</b>

As a result of the lack of available data, these costs are highly uncertain. However, counting for only 6 % of the total costs, they make a fairly small item, leaving a small

<sup>143</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 82-83 and 95-97

<sup>144</sup>IOC, Host City Contract (2018b) p. 21

impact on the overall profitability.

## 6 Expanded net present value

### 6.1 Introduction

The purpose of a project analysis is to compute a decision basis for the relevant decision makers<sup>145</sup>. So far, we have evaluated the consequences of winter Olympics 2034 based solely on the cash flow. We have seen that the project cash flow is not profitable in itself.

Our analysis so far has resulted in a static net present value, under the assumption the project is owned passively over its duration. As mentioned under section 4.4, this assumption is a simplification. In the real world, the project owner will often have the opportunity to behave actively, exploiting opportunities arising during the project's lifetime. This flexibility is what we have described as real options. Valuating real options for the Olympic project is beyond our scope, but we will undertake a discussion of what potential options might exist and how they might influence the decision of whether or not hosting the 2034 Winter Olympics is worthwhile.

In addition, our static net present value only accounts for the direct costs and benefits of the project. In the eyes of this project's owner, the country of Norway, the indirect, external effects are just as, if not more important. Ignoring these, we run the risk of ignoring factors which could have an impact, but are not part of the project's cash flow. The proper identification and valuation of such effects is also beyond our scope, but we will take this opportunity to comment some potential external effects and discuss their possible influence on the decision.

The discussion under this section will aim to give some indication as to what the expanded net present value of the Olympic project might amount to under our examples of potential real options and external effects. In other words, it aims to illuminate the question of whether Norwegian Authorities should support the Games with NOK -2 930 123 000 in exchange for the net value of potential real options and external effects.

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<sup>145</sup>Bøhren and Gjørnum (2009)

## 6.2 Flexibility and real options

After the host city contract is signed, the applicant OCOG is responsible for organising and staging the Games at the time agreed upon<sup>146</sup>. The IOC requires a third-party guarantee that the Games will be held. This guarantee is normally given by the host country, but could also be given by a financial institution. Any options related to suspending or cancelling the Games altogether are therefore none-existent; once the host city contract is signed, the Games shall be held according to the specified terms.

There could, however, exist several real options for following up with further investments. According to the operational requirements, the host OCOG should adapt all venues to fit the current and future needs, but could improve the venues at the IOC's approval<sup>147</sup>, implying that if the current or future needs change between the bid period and the Games, the host OCOG has the opportunity to adapt the venues to the updated needs. For example, say the host OCOG plans on hosting the sliding events (bobsleigh, luge and skeleton) in a venue with a capacity of 6 000 people. In the years leading up to the Games, the national interest in bobsleigh increases significantly, leading the host OCOG to believe they could sell 15 000 tickets to the sliding events. As long as the IOC approves an upgrade of the arena, the host OCOG is free to implement it. Selling 15 000 tickets will naturally be more profitable than selling 6 000 tickets, making such upgrades opportunities for increasing the project's value, and should thus be considered a real option. For such an option to have relevant influence on the decision of going for the project, an indication of its probability of occurring would of course need to be evident at the time of making the decision.

Similar examples could be made for all sports and venues. Because the host city contract regulates how the Games should be held, the room for other options, such as options to abandon or suspend the project, are however small. In any case, the presence of one or more real options would have the effect of increasing the expanded net present value relative to the static one.

This is not an exhaustive discussion of all real options involved in the project. It is merely intended to illustrate the need to include the value of flexibility in the basis for deciding

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<sup>146</sup>IOC, Host City Contract (2018b) part I.

<sup>147</sup>IOC, Host City Contract (2018a) art. 39



whether or not to host the 2034 Winter Olympics.

## 6.3 External effects

### 6.3.1 In general

One of the key arguments justifying expensive Olympic Games has traditionally been that the Games have a large economic impact and leaves a positive footprint for the host region. Some estimates from the Vancouver 2010 Olympics claimed that the benefits would increase GDP by more than \$ 10 billion, and that the Games would generate more than 240 000 new jobs<sup>148</sup>.

We do not have the ambition of undertaking a full scale cost/benefit analysis, but we will discuss some important external effects and highlight the importance of including such factors in a decision of whether or not to host the Winter Olympics.

### 6.3.2 Tourism

The Winter Olympics represent a large opportunity to showcase Norway as a tourist destination. Increased tourism was seen as the most important Olympic effect on Norwegian businesses<sup>149</sup> by the Oslo 2022 Olympic office. This is also the ambition of Idrettens Olympiade, who seek to activate a potential for winter tourism to complement the summer counterpart<sup>150</sup>. It does not seem unlikely that the Olympics will increase activity in businesses such as restaurants, hotels and tourist attractions<sup>151</sup>. The Oslo 2022 Olympic Office found an increase in foreign hotel nights in Lillehammer after the 1994 Games<sup>152</sup>.

As one of the largest and most prestigious sporting events, The winter Olympics is often seen as a catalytic force driving tourism in the host country. Milan/Cortina 2026 states in their Olympic bid that "games would boost tourism and stimulate the rural mountain economy"<sup>153</sup>. Similarly, the Vancouver 2010 OCOG said an increase of 2.7 million tourists over a 7-year period around the games was achievable<sup>154</sup>.

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<sup>148</sup>InterVISTAS Consulting Inc (2002)

<sup>149</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 128

<sup>150</sup>Idrettens Olympiade, presentasjon (2020)

<sup>151</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 128

<sup>152</sup>Ibid.

<sup>153</sup>International Olympic Committee (2019) p. 55

<sup>154</sup>InterVISTAS Consulting Inc (2002)

Increased tourism is, however, not documented for any Winter Olympics after 1994 (or any other mega-event). Fourie and Santana-Gallego (2011) studied mega-events' impact on tourism in the host country and its neighbour countries. Out of all their observations, a statistically significant positive impact was only found in the event year. For the years following the Games, a weak negative correlation was found. Owen (2005) strongly suggests that the Olympics had a significant crowding out effect on the rest of the tourism industry, leaving no net impact on total tourism in the Olympic host country. These findings suggest that the tourism effects often used to justify seemingly unprofitable mega events might be overestimated or assigned an over-ambitious probability.

Norwegian tourism is facing a rapid growth, and NHO predicts that tourism in Norway will increase by almost 20 % in the next 10 years<sup>155</sup>. It is likely that organisations such as Visit Norway or Fjord Norge will use the Olympics to launch a campaign intended to increase tourism. If such a campaign succeeds, there is a potential for realising an increase in tourism similar to the observation after the Lillehammer 1994 Olympics.

The Oslo 2022 Olympic office calculated a real economic impact of 1.7 billion NOK<sup>156</sup>. If this calculation is correct, increased tourism would greatly increase the expanded NPV of the 2034 Olympics.

### 6.3.3 Environment

The IOC emphasises the importance of green Olympics and requires all Olympic activities to be held in accordance with sustainability best practices<sup>157</sup>. Nevertheless, hosting emission free games, also taking biodiversity into account, and at the same time fulfilling all IOC's operational requirements, seems an immense challenge.

As we have mentioned, there are needs for technical upgrades in some of the venues in order to meet the technical requirements. For example, we suggest building a new field of play and a new lift for the snowboard and freestyle events. Even though the construction of these upgrades will have to be done with a minimum of environmental impact, some impact must be expected.

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<sup>155</sup>NHO Reiseliv (2020)

<sup>156</sup>?

<sup>157</sup>See for instance IOC, Host City Contract (2018a) art. 39

Furthermore, we suggest an extensive transportation plan involving cars, planes and buses. Even though the host could use the most sustainable transportation fleet available, it is unlikely, with the current technology, to transport hundreds of thousands of people without emitting climate gases.

These are two examples of how the winter Olympics can have a negative environmental impact. Naturally, the monetary value of these external effects is difficult to measure and they are naturally uncertain due to the progress of sustainable technology. Whether or not this cost should be assigned to the 2034 Olympics depends of the alternatives at hand, or in other words whether the Olympics has a larger impact than “business as usual”, considering a great portion of these effects are global. Nevertheless, the winter Olympics’ environmental impact should be considered upon deciding whether or not to apply for the winter Olympics 2034.

#### 6.3.4 Security

A crucial responsibility for the Olympic host is to guarantee the safety for everyone who attend the Olympics. Naturally, this involves emergency services (medical, police, military). This responsibility involves both negative and positive external effects.

The Olympics (and other mega-events) draw massive international media attention which makes the Games a potential target of terrorism. This could create a sense of uncertainty and concern in the population. The Oslo 2022 Olympic Office found that this was the case for the Vancouver 2010 Olympics<sup>158</sup>. It is important to bear in mind that the external part of this effect is that which is not already accounted for through an increased preparedness.

To handle this terror threat, the host country must increase their security and prepare the emergency services for critical events. The winter Olympics could thus serve as training ground for the emergency services, providing valuable knowledge and experience.

Similarly to the environmental effects, the monetary value of the external security effects arising from the Olympics is difficult to measure. Still, they should be considered.

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<sup>158</sup>Oslo Kommune Olympic Office (2013f) p. 67

### 6.3.5 Oslo 2022

As part of the quality control of the Oslo 2022 application for a state guarantee, DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) conducted an analysis of the economic impact from the Oslo 2022 Olympics. A large proportion of the economic impact is related to investments in venues, villages and infrastructure (e.g. increased capacity on the Oslo metro). Because we suggest maximising the re-use of existing venues, villages and infrastructure, the economic impact related to these investments is not relevant.

The DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) findings, without economic effects from investments in venues, villages and infrastructure are displayed in table 6.1 below.

**Table 6.1:** Oslo 2022 external effects - updated

Monetary value	
Police	660 000 000
Volunteers	180 000 000
Domestic sponsorship	-490 000 000
Tourism	1 780 000 000
Net monetary economic impact	2 130 000 000
Non-monetary valued	
Perceived happiness	+ + + +
Security and preparedness	±
Environmental impact	- -
Option value of other interests	+

- **Police:** the value of investments in police vehicles and equipment which has a value in post-Games use.
- **Volunteers:** the monetary value of the volunteers' utility of working at the Olympic and Paralympic Games. It is valued to the cost of food, clothes and other services provided to the volunteers<sup>159</sup>
- **Domestic sponsorship:** the negative value of domestic sponsor funds being allocated away from other events, to the Olympics.

<sup>159</sup>DNV GL, Samfunns- og Næringslivsforskning AS, ÅF Advansia AS (2013) p. 37

- **Tourism:** the value of increased tourism in Norway before, during and after the games.

This is not an exhaustive list of external effects. They serve as examples of how a mega-event, such as the winter Olympics influences other stakeholders and the society as a whole. Estimating the monetary value of all external effects is outside our scope, but they should certainly be included in the basis for the decision of whether to host the Olympics.

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## 7 Conclusion

The aim of this study has been assessing the profitability of launching a project, hosting the 2034 Winter Olympics in Norway, focusing mainly on the direct cash flow effects. The resulting static net present value represents the basis for what indirect implications of the project, the value of flexibility and external effects, are required for making the project a sound one to undertake.

Our analysis shows the project has a static net present value of NOK -2 930 123 000, over the sixteen years until it ends. This means, over the same period, Norway, as the project owner, is inflicted a negative effect on its cash flow. It is important to keep in mind this result relies heavily upon uncertain estimates and assumptions. Where several alternative and equally reasonable assumptions have been available to us, we have generally chosen the more conservative one. Nevertheless, our result comes out negative by such a large margin that we regard the likelihood of finding a positive one based on more accurate information to be small.

Certain measures could, however, aid in improving the project value. As our findings rely on the processes and strategies chosen by the organisers of the Games concepts we have used as our sources, optimising and improving on these can potentially help decrease certain costs. Perhaps most importantly, we have found the effects of the New Norm to have had a noticeable impact on several cost items compared to what was the case for Oslo 2022. With access to better and more detailed information, the full cost savings potential of the New Norm revisions could be more readily available to the decision maker.

However, the decision of launching a national project such as this would not depend on the static net present value alone. Whenever a discussion of hosting the Olympics comes up, the main focus is on its indirect and future impacts on the economy. Our study touches on this subject with a brief discussion of the potential effects imposed on the expanded net present value by real options and external effects.

Before any confident decision can be made, we would suggest a further study into the real options and external effects of the project. Based on our own findings, the present value of these impacts, as well as the effects of any cost saving measures, would need to exceed NOK 2 930 123 000.

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# Appendix

## A1 Scaling

Table A1.1: Accredited groups - Olympics

Sport	Arena		Athletes / staff		Media			Volunteers	
	Capacity	City	Athletes	Staff	Press	Broadcasting	Total	Per arena/day	
Alpine skiing - Speed	10000	Narvik	320	320	500	400	900	840	
Alpine skiing - Technical	10000	Narvik				320	820	840	
Icehockey 1	9000	Oslo	500	500	500	400	900	780	
Icehockey 2	5000	Oslo			300	200	500	780	
Freestyle - Aerials	6000	Voss	50	50	450	300	750	320	
Freestyle - Moguls	6000	Voss	60	60	450	300	750	320	
Freestyle - SX	6000	Voss	70	70	450	300	750	320	
Freestyle - Slopestyle	6000	Voss	50	50	450	300	840	320	
Freestyle - Big Air	6000	Voss	50	50	450	300	750	320	
Freestyle - Halfpipe	6000	Voss	60	60	450	300	750	320	
Snowboard - Big Air	6000	Voss	70	70	450	300	750	320	
Snowboard - Halfpipe	6000	Voss	60	60	450	300	750	320	
Snowboard - SX	6000	Voss	50	50	450	300	750	320	
Snowboard - Slopestyle	6000	Voss	50	50	450	300	750	320	
Snowboard - Parallell GS	6000	Voss	50	50	450	300	750	320	
Figure skating	3000	Bergen	150	150	500	400	900	610	
Short track speed skating	3000	Bergen	120	120	200	200	400	610	
Speed skating	9000	Bergen	180	180	200	200	400	720	
Curling	3000	Oslo	110	110	200	200	400	460	
Nordic - XC	28000	Oslo	310	310	500	400	900	880	
Nordic - XC sprint	18000	Oslo						880	
Nordic - ski jump K120 (HK)	32000	Oslo	100	100				1580	
Nordic - ski jump K90 (MS)	12000	Oslo	100	100				370	
Nordic combined K120	32000	Oslo	60	60				1580	
Nordic combined K90	12000	Oslo	60	60				370	
Biathlon	20000	Trondheim	220	220	400	400	800	590	
Bob/Luge/Skeleton	10000	Lillehammer	320	320	300	280	580	680	

Table A1.2: Audience - Olympics

Sport	City	Event days	Presumed avg coverage	Capacity	Estimated tickets sold
Alpine skiing	Narvik	8	1	10000	80000
Biathlon	Trondheim	9	1	20000	180000
Sliding	Lillehammer	14	0.6	10000	84000
XC	Oslo	10	1	28000	280000
Nordic combined	Oslo	3	1	28000	84000
Ski jumping	Oslo	4	1	32000	128000
Curling	Oslo	18	0.6	3000	32400
Figure skating	Bergen	12	0.6	3000	21600
Freestyle skiing/SB	Voss	16	1	6000	96000
Ice hockey	Oslo	16	0.6	7000	67200
Short track	Bergen	5	0.6	3000	9000
Speed skating	Bergen	12	1	9000	108000

Table A1.3: Accredited groups - Paralympics

Sport	Arena		Athletes/staff		Media		Volunteers	
	Capacity	City	Athletes	Staff	Press	Broadcasting	Total	Per arena/day
Alpine skiing	10000	Narvik	200	240	310	150	460	358
Icehockey	9000	Oslo	120	144	180	90	270	275
Snowboard	3000	Narvik	35	42	50	30	80	100
Curling	3000	Oslo	50	60	80	40	120	193
Nordic - XC	28000	Oslo	150	180	230	110	340	330
Biathlon	20000	Oslo	100		150	80	230	

**Table A1.4:** Audience - Paralympics

Sport	% Of tickets sold	% of paralympic tickets	Estimated tickets sold
Alpine skiing	6.84%	11.63%	39600
Biathlon	15.38%	26.18%	89000
Sliding	7.18%		
XC	23.93%	40.72%	138500
Nordic combined	7.18%		
Ski jumping	10.94%		
Curling	2.77%	4.71%	16000
Figure skating	1.85%		
Freestyle skiing/SB	8.20%	6.98%	23700
Ice hockey	5.74%	9.77%	33200
Short track	0.77%		
Speed skating	9.23%		

## A2 Revenue



Table A2.1: Revenue

Source	USD2026	NOK 2022	Excess growth	NOK2034	Comment
IOC Contribution	452 000 000			4 672 900 000	Contribution from 2026 games
TOP programme	200 000 000			2 067 600 000	Contribution from 2026 games. Broadcasting and international sponsors
Domestic sponsorship		960 000 000	2 %	1 477 900 000	NTB (2017)
Ticket sales (sport events)		970 000 000		1 642 200 000	Based on estimated tickets sold. Average price of 1087
Ticket sales (ceremonies)				39 100 000	Based on estimated tickets sold. Average price of 1087
Licensing and Merchandising	568 305 000	320 000 000		397 900 000	Sale of official Olympics products (e.g. pins, clothes)
Revenue from Paralympics		128 000 000		159 200 000	Revenue from paralympics (e.g. sponsors, ticketsales)
Revenue from test events		49 000 000		60 900 000	Revenue from required test events
Administration fees accommodation				136 300 000	10 % administration fee for accommodation bookings
Other revenue		185 000 000		230 000 000	Revenue from cultural events, sale of assets after games and rent of OCOG assets (rate card)

**Calculations:**

Adjusting for inflation and growth:

$$A = r \cdot (1 + I + g)^t \quad (\text{A2.1})$$

$r$  = input revenue in NOK

$I$  = Inflation goal

$g$  = excess growth

$t$  = years of inflation

## A3 Venues

Table A3.1: Competitional venues

Sport	Region	Venue name	Ownership (public/private)	Rent	Technical upgrades	Change in operating costs	Provisionals	Total	Comment
Alpine skiing - Speed	Narvik	Narvikfjellet	Private non-profit	18 900 000	-	-	74 600 000	93 500 000	WC standards OK, rent is average of Kvitfjell/Norefjell
Icehockey 1	Oslo	Oslo Spektrum	Private non-profit	17 400 000	-	-	7 500 000	24 900 000	Ice production and maintenance covered in provisionals. Technical solutions ok
Icehockey 2	Oslo	Jordal Amfi	Public	11 200 000	-	-	7 500 000	18 700 000	New hockey arena (2020)
Icehockey training 1	Oslo	Furuset forum	Public	3 000 000	-	-	-	3 000 000	Hockey arena used for "fordkräftigøen"
Icehockey training 2	Oslo	Manglerudhallen	Private non-profit	3 000 000	-	-	-	3 000 000	Hockey arena used for "fordkräftigøen"
Freestyle/Snowboard	Voss	Voss resort	Private	17 400 000	124 300 000	2 500 000	72 100 000	216 300 000	New fields of play + upgrade of lifts. Rent is approx. of Kvitfjell
Figure skating/short track	Bergen	Bergenshallen	Public	8 700 000	14 900 000	11 200 000	14 400 000	49 200 000	Required permanent upgrades. Lights, dressing rooms etc.
Figure/short track training	Bergen	Iskanten	Private	3 000 000	-	-	-	3 000 000	Rent is for generic ice hall (KVU)
Speed skating	Bergen	Slåtthaug ishall	Public	16 200 000	-	-	16 200 000	32 400 000	Planned new speed skating arena. Assume top standard
Curling	Oslo	Risenga ishall	Public	8 500 000	-	-	17 400 000	25 900 000	New ice hockey arena under construction
Nordic	Oslo	Holmenkollen	Public	17 400 000	-	-	203 900 000	221 300 000	Worlds best venue for nordic events
Biathlon	Trondheim	Granåsen	Public	10 200 000	-	-	68 400 000	78 600 000	WC standards ok, rent is FDV for a new venue in Oslo
Bob/Luge/Skeleton	Lillehammer	Hunderfossen	Public	6 200 000	161 600 000	-	42 300 000	210 100 000	Technical upgrades from KVU Oslo. Rent is FDV for new arena

Table A3.2: Non-competitional venues

Venue	Region	Venue name	Rent	Provisionals	Total	Comment
Opening and Closing Ceremony	Oslo	Ullevål Stadion		26000000	326000000	ESC is based on high ambition Oslo ceremonies Rent is 1/4 of the total income of Norges varemesse in Lillestrøm.
International Broadcast Center (IBC)	Oslo	Norges varemesse	104 400 000	636 600 000	741 000 000	Provisionals contains all costs related to inventories, energy, broadcasting, internet for all locations, and is based on Oslo 2022.
Main Press Center (MPC)	Oslo	Generic medal plaza	-	12 400 000	24 800 000	
Medal plaza 1	Oslo	Generic medal plaza	-	12 400 000	24 800 000	
Medal plaza 2	Trondheim	Generic medal plaza	-	12 400 000	24 800 000	
Medal plaza 3	Narvik	Generic medal plaza	-	12 400 000	24 800 000	
Medal plaza 4	Voss	Generic medal plaza	-	12 400 000	24 800 000	
Medal plaza 5	Bergen	Generic medal plaza	-	12 400 000	24 800 000	
Medal plaza 6	Lillehammer	Generic medal plaza	-	12 400 000	24 800 000	
Mountain Media Center 1	Trondheim	Generic media center	52 200 000	-	52 200 000	Oslo ESC and provisionals: 12.4 MNOK. Assumed somewhat lower due to fewer events. Assume that each host city make a suitable location available to the games. Similar assumption for Oslo.
Mountain Media Center 2	Narvik	Generic media center	52 200 000	-	52 200 000	
Mountain Media Center 3	Voss	Generic media center	52 200 000	-	52 200 000	
Mountain Media Center 4	Bergen	Generic media center	52 200 000	-	52 200 000	
Mountain Media Center 5	Lillehammer	Generic media center	52 200 000	-	52 200 000	

**Calculations:**

$$\text{Venue rent and provisional} = \text{venue rent} + \text{provisionals} \quad (\text{A3.1})$$

$$\text{Venue rent} = \text{Rent} + \text{Change in operating costs} \quad (\text{A3.2})$$

$$\text{Venue infrastructure} = \text{Technical upgrades} \quad (\text{A3.3})$$

## A4 Transport

**Table A4.1:** Transport demand - Olympics

Route		Sport	Athletes and support	Media	Staff			Spectators
Departure	Destination				Volunteers	Security	Health/medic	
Oslo	Lillehammer	Sliding	640	580				
Oslo	Bergen	Skating						
Oslo	Narvik	Alpine skiing	640	900				
Oslo	Trondheim	Biathlon	440	800				
Bergen	Voss	Freestyle, SB	1 140	750				
	<b>Inner city</b>							
	Oslo	Nordic, curling, hockey	2 160	2 700	610			591 600
	Lillehammer	Sliding	640	580	170			84 000
	Voss	Freestyle, SB	1 140	750	80			96 000
	Bergen	Skating	900	1 300	330			138 600
	Narvik	Alpine skiing	640	900	210			80 000
	Trondheim	Biathlon	440	800	150			180 000

**Table A4.2:** Transport plan - Olympics

Route		Aeroplane	Train	Bus	Public transport	Car
Departure	Destination					
Oslo	Lillehammer	-	1 280	-	-	-
Oslo	Bergen	-	-	-	-	-
Oslo	Narvik	3 080	-	-	-	-
Oslo	Trondheim	2 480	-	-	-	-
Bergen	Voss	-	2 280	-	-	-
	<b>Inner city</b>					
	Oslo	-	-	1 475	616 510	219
	Lillehammer	-	-	341	90 270	62
	Voss	-	-	473	105 530	106
	Bergen	-	-	695	149 930	94
	Narvik	-	-	482	87 910	67
	Trondheim	-	-	411	186 350	49
	Total	5 560	3 560	3 877	1 236 500	597
	Cost	5 560 000	1 424 000	100 802 000	85 318 500	28 656 000

**Table A4.3:** Transport demand - Paralympics

Departure	Destination	Sport	Athletes and support	Media	Volunteers	Spectators
Oslo	Narvik	Alpine, SB	517	540		
	<b>Inner city</b>					
	Oslo	XC, biathlon, curling, ice hockey	804	960	798	276700
	Narvik	Alpine, SB	517	540	458	63300

**Table A4.4:** Transport plan - Paralympics

Route		Aeroplane	Train	Bus	Public transport	Car
Oslo	Narvik	2 114				
	Oslo Narvik			558 323	277 498 63 758	14 8
	Demand	2 114	-	881	341 256	22
	Cost	2 114 000	-	22 906 000	23 546 664	1 056 000

**Table A4.5:** Transport prices

	Aeroplane	Train	Bus	Public transport	Car
Unit	Ticket	Ticket	One bus for 8 hours	Ticket	One 9 seater for 1 month
Average cost per unit	1 000	400	26 000	69	48 000

**Calculations:****Sets:**

$C1$  = set of cities

$C2$  = set of departure cities

$C3$  = set of destination cities

$G$  = set of stakeholder groups

$V$  = set of vehicles

(A4.1)



**Parameters:**

$D_{gde}$  = amount of people from stakeholder group  $g$  departing from city  $d$ ,  
having city  $e$  as their destination

$T_{vde}$  = 1 if vehicle  $v$  is used for transport between city  $d$  and city  $e$ , 0 otherwise

$I_{gc}$  = amount of people from stakeholder group  $g$   
requiring inner city transport in city  $c$

$P_v$  = price per unit of vehicle  $v$

$M_{gv}$  = proportion of stakeholder group  $g$  allocated vehicle type  $v$

(25% of athletes/support, 87% of media personnel

and 10 % of volunteers require buses;

75% of athletes/support and 13% of media personnel require cars;

everyone gets public transport, athletes and media get 5 each (one month))

$N_v$  = amount of units of vehicle  $v$  serving on person

$$\text{Transportation cost} = \sum_{d \in C1} \sum_{e \in C2} \sum_{c \in C3} \sum_{g \in G} \sum_{v \in V} P_v N_v (2D_{gde} T_{vde} + I_{gc} M_{gv}) \quad (\text{A4.2})$$

## A5 Accommodation

**Table A5.1:** Accommodation demand - Olympics

Sport	Athletes/support	Media	Volunteers	Region
Alpine skiing	640	900	210	Narvik
Icehockey	1000	1400	275	Oslo
Freestyle/Snowboard	1140	750	80	Voss
Figure skating	300	450	76	Bergen
Short track speed skating	240	450	76	Bergen
Speed skating	360	400	180	Bergen
Curling	220	400	115	Oslo
Nordic	940	900	220	Oslo
Biathlon	440	800	148	Trondheim
Bob/Luge/Skeleton	640	580	170	Lillehammer

**Table A5.2:** Accommodation plan - Olympics

Location	Required no of rooms	Existing hotel rooms	Hotel rooms 2034	Cruise ships	Cabins	New rooms
Narvik	1 900	0	0	2	0	0
Oslo	12 600	17 000	17 340	0	0	0
Voss	3 500	900	918	0	750	0
Bergen	2 700	6 000	6 120	0	0	0
Trondheim	1 300	1 400	1 428	0	0	0
Lillehammer	1 900	2 600	2 652	0	0	0

**Table A5.3:** Accommodation demand - PL

Sport	Location	Athletes/support	Media
Alpine skiing	Narvik	440	460
Icehockey	Oslo	264	270
Snowboard	Narvik	77	80
Curling	Oslo	110	120
Nordic	Oslo	330	340
Biathlon	Oslo	100	230

**Table A5.4:** Accommodation plan - Paralympics

Location	Required no of rooms	Existing hotel rooms	Hotel rooms 2034	New rooms
Narvik	1100	1500	1530	0
Oslo	1700	17000	17340	0

**Table A5.5:** Accommodation cost - Olympics

Cost	Rooms OCOG must pay for	Hotel rooms
Narvik	384	25 344 000
Oslo	1296	79 136 000
Voss	684	45 144 000
Bergen	540	35 640 000
Trondheim	264	17 424 000
Lillehammer	384	25 344 000

**Table A5.6:** Accommodation cost - Paralympics

Cost	Hotel rooms
Narvik	6 824 400
Oslo	10 612 800
Total	17 437 200

**Table A5.7:** Accommodation - Premises

	Rate 2020: room/day	Rate 2034 NOK	Rent Oympics	Rent Paralympics
Hotel room	1 700	2 200	30 days	10 days

**Calculations:**

Sets and parameters:

 $C$  = Set of host cities $G$  = Set of games $d_c$  = Accommodation demand in city  $C$  $a_c$  = Athletes who compete in city  $C$  $y_c$  = Binary (1 if city  $c$  is the main city, 0 otherwise) $r_c$  = Rooms OCOG must pay for in city  $c$  $T_g$  = rent period for games  $g$  $P$  = price per room/day

Calculating accommodation demand:

$$d_c = (24000 - 6000) \cdot \frac{a_c}{\sum_{c \in C} a_c} + 6000 \cdot y_c, \quad \forall c \in C \quad (\text{A5.1})$$

Calculating the number of rooms OCOG must pay for:

$$r_c = \frac{0.8 \cdot a_c}{2} + 0.2 \cdot a_c, \quad \forall c \in C \quad (\text{A5.2})$$

Total cost:

$$TC = \sum_{c \in C} \sum_{g \in G} r_c \cdot P \cdot t_g \quad (\text{A5.3})$$

## A6 Medical services

**Table A6.1:** Medical services - input for adjustments

Personell	Yearly (Oslo 2022 estimate)	Hours per year	Hours per shift
Medical doctors	1 500 000	1 700	8
Nurses/optitians /administrative positions	1 000 000	1 700	8
Medical vehicles	Per shift	Per day	Operative days
Helicopter		50 000	25
Ambulance	15 000	45 000	25

### Calculations:

Sets and parameters:

$MV$  = Set of medical vehicles

$NC$  = Set of host cities that was not part of the Oslo 2022 concept

$P$  = Set of medical personnel

$c_{mv}$  = Daily operating cost of medical vehicle  $mv$

$d_{nc}$  = Operating days for medical services in new city  $nc$

$w_p$  = Hourly cost of personnel  $P$

$s_p$  = Lenght of shifts for personell  $P$

$q_p$  = Required number of presonell  $P$

Extra medical vehicles in four additional cities:

$$\text{Additional vehicle cost} = \cdot \sum_{mv \in MV} \sum_{nc \in NC} c_{mv} \cdot d_{nc} \quad (\text{A6.1})$$

Extra personnel in four additional cities.

$$\text{Additional personnel cost} = \cdot \sum_{p \in P} \sum_{nc \in NC} q_p \cdot w_p \cdot s_p \cdot d_{nc} \quad (\text{A6.2})$$

## A7 People management

**Table A7.1:** People management - Adjustment

Wages	Norway	Sweden	Italy
Budget (2034 NOK)	4 479 900 000	2 725 600 000	3 319 800 000
Average annual wages	54 027	46 695	39 189
Index	1	0.864	0.725
Adjusted to Norwegian wages		3 841 100 000	3 757 600 000

### Calculations:

Sets and parameters:

$c$  = Set of examined countries

$w_c$  = average annual wages in country C

$b_c$  = People management budget of applicant country C

Adjusting to Norwegian wages:

$$\text{Adjusted to Norwegian wages} = \frac{b_c \cdot w_{Norway}}{w_c} \quad (\text{A7.1})$$

## A8 Ceremonies and culture

Event/Venue	Location	Cost
Opening and Closing Ceremonies	Oslo	373 000 000
Medal plaza 1	Oslo	12 400 000
Medal plaza 2	Trondheim	12 400 000
Medal plaza 3	Narvik	12 400 000
Medal plaza 4	Voss	12 400 000
Medal plaza 5	Bergen	12 400 000
Medal plaza 6	Lillehammer	12 400 000
Cultural programme		248 700 000





## A10 Cash flow

Table A10.1: Cash flow

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Revenue	-	-	-	-	-	-	-	-	-	-	-	-	2 290 637	2 336 450	-	-
IOC Contribution	-	-	-	-	-	-	-	36 719	37 454	95 507	253 285	258 351	304 059	1 033 800	-	-
TOP Programme	-	-	-	-	-	-	-	26 247	26 772	68 268	181 046	184 666	217 338	738 950	-	-
Domestic sponsorship	-	-	-	-	-	-	-	-	-	-	-	-	989 000	672 520	-	-
Ticket sales	-	-	-	-	-	-	-	-	-	-	-	19 122	58 515	318 320	-	-
Licensing and merchandising	-	-	-	-	-	-	-	-	-	-	-	28 181	143 725	351 840	59 813	-
Other revenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Expenditure	-	-	-	-	-	-	-	-	-	69 496	141 772	72 304	-	-	-	-
Venue infrastructure	-	-	-	-	-	-	-	-	-	-	-	-	671 961	1 028 100	-	-
Venue rent and provisionals	-	-	-	-	-	-	-	-	-	-	-	-	-	268 500	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-	-	-	245 500	-	-
Accommodation	-	-	-	-	-	-	-	-	-	-	-	-	-	134 200	-	-
Medical services	-	-	-	-	-	-	-	-	-	-	-	-	-	3 026 400	-	-
Security	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Technology	-	-	-	-	-	-	-	-	-	-	258 894	528 143	808 059	1 098 960	-	-
People management	-	-	-	31 165	47 682	64 848	66 145	168 670	172 044	175 484	429 586	474 692	558 676	1 899 500	116 249	79 050
Ceremonics and culture	-	-	-	-	-	-	-	-	5 632	5 744	5 859	11 953	152 402	435 260	-	-
Communication, marketing and look	-	-	-	-	-	-	-	-	16 847	28 639	58 424	119 185	243 137	124 000	12 648	-
Corporate admin. and legacy	-	-	-	4 324	6 616	8 997	9 177	23 402	23 871	24 348	59 604	65 862	77 515	263 550	16 129	10 968
Other expenses	-	-	-	-	-	73 076	74 537	76 028	77 549	79 100	80 682	82 295	83 941	85 620	87 332	-
Cash flow	-	-	-	-35 489	-54 298	-146 922	-149 860	-205 135	-231 716	-219 037	-600 490	-864 114	1 407 583	-3 157 710	-172 546	-90 017
PV	-	-	-	-31 550	-46 414	-120 759	-118 437	-155 886	-169 312	-153 893	-405 670	-561 312	879 172	-1 896 439	-99 641	-49 984