Transport Research Laboratory

EC HARRIS
BUILT ASSET
CONSULTANCY

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European Cost Comparison - Cost differences between English and Dutch Highway Construction

by EC Harris and TRL

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European Cost Comparison

Client: **Highways Agency, Client's Division/Department**
(Gary Thomas)

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	Name	
	Approved	
Project Manager	Stuart Wood	07/12/2009
Technical Referee	Richard Woodward	07/12/2009

Executive summary

A CEDR report in 2007 implied that in England the costs per kilometre for delivering highway projects was amongst the highest when compared with most of the other European countries,,

The Highways Agency (HA) has commissioned TRL and EC Harris to undertake a Cost Comparison Exercise on motorway widening projects in England and The Netherlands to determine whether this implication is correct and if so the reasons why this could be the case

The HA and their Dutch counterpart Rijkswaterstaat (RWS) provided cost information on a number of similar projects, The initial comparison identified that HA motorway construction costs per lane km were higher, However a process was then undertaken to analyse the potential reasons behind this cost difference, This analysis considered the variances and in turn the cost impact of:

= Procurement routes
= Exchange rates
B Preliminary costs
» Technical standards
» Taxes and other costs

On conclusion of the exercise it was found that by analysing the cost differences in a logical process it has been possible to identify the reasons for the higher costs on HA projects,. However In addition it has been found that once these factors are normalised between the two agencies, there is very little difference in costs between the respective lane km costs

It was found that the principle cost differences were as follows:

B Additional preliminary costs on HA projects due to the provision of services such as CCTV, speed enforcements and vehicle recovery which do not form part of RWS construction costs but are funded separately
B Higher technical standards to pavements and structures
* Higher aggregate and soil disposal costs due to the effect of taxes and additional transportation costs
* Simpler drainage provisions on Dutch projects
H More complex ground conditions and consequent design solutions on HA projects
* The impact of exchange rates and comparative price levels

When these factors are taken into account the construction costs per lane km are broadiy comparable between the two countries, This outcome however is based on high level information and a number of broad assumptions,, Further analysis of costs against whole life costs, maintenance standards, design lives, the wider economic benefits of higher standards and the relative efficiency levels of the construction process between the two countries would be required to justify any changes in practice, However some initial analysis of whoie life costs (WLC) indicates that the WLC are broadly similar in England and Netherlands,

1 Introduction

The HM Treasury (HMT) Public Value Programme is seeking productivity improvements and improved efficiency across all Government Departments.

Following a review of previous reports including a CEDR study in 2007 there were implications that highway construction costs in the UK were higher than in other European countries. At the same time HMT have been critica! at the apparent high cost of the delivery of UK highway projects,, DfT as the sponsoring Department has asked the Highways Agency to investigate the reasons for this higher cost, The Highways Agency (HA) has given a commitment to undertake research into cost differences and report during 2009/10.

1.1 Follow on from our initial report

An earlier report commissioned by the Highways Agency and produced by TRL and EC Harris in 2008 identified a wide range of differences in conditions and practice which could contribute to cost differences,, These are summarised below:

1.1.1 Main findings of the Earlier Study

From the earlier study conducted by TRL and EC Harris in June 2008 the following findings were extracted from the Executive Summary,

The costs of labour, plant and materials in the UK were similar to those in Germany and France but higher than in Italy, Spain, Austria and Poland. However when on-costs were included (i.e. supervision costs, contractors' preliminaries and overheads) the relative Comparison between the countries changed and UK costs became higher than in these other countries,

Following analysis of the information received it identified there were considerable variations between countries in the cost items that were included in the cost of road schemes, timescales for the development of road schemes, design standards, design criteria and in the provision of non-pavement features,,

When determining the costs of UK roads, all costs incurred in their construction are included from identification of need to completion of construction ~ this is not the case in all countries with some costs being excluded (i,e, Development & Design costs},, This results in UK costs appearing to be higher when compared with countries that do not include all costs, This illustrated the difficulty of making like for like comparisons between the countries..

The study also showed that the demands placed on UK roads both in terms of passenger and freight traffic were greater than in other European countries and that UK roads are constructed to a higher standard,. This does not mean that roads in other countries are of a low standard but that the UK has a higher provision across the board, The high quality of UK roads results in higher costs due to a variety of factors, the most important of which are as follows:

- the use of design standards which are towards the upper end of the range in comparison with other countries
- a comprehensive provision of non-pavement features

- a comprehensive provision of measures to support the construction process eg traffic management, vehicle recovery, accommodation works and diversionary works
- The frequency of intersections and bridges,

The UK Highways Agency also appears to adopt a comprehensive appraisal process in the evaluation of its projects, Whilst such a process ensures that the need for a scheme has to be rigorously justified, it has both time and cost implications,

It was concluded that as a result of these factors, combined with the findings from other reports of higher UK land values and the processes associated with environmental mitigation measures, were the reason for the higher costs of highway construction in the UK.

Whilst the data did not suggest inefficiency or a lack of innovation, discussions with European highway engineers indicated that there may be areas where improvements in efficiency could be made, It was therefore recommended that a further review be undertaken to look at opportunities for efficiency by comparing practices in the UK with other European countries,

There was an opportunity to undertake a cost comparison exercise with RWS highway construction costs in The Netherlands to assist in this further investigation which led to this report.

1.2 The initiative for further investigation

The Highways Agency (HA) has a collaborative agreement with their Dutch counterpart, Rijkswaterstaat (RWS), This relationship provided an excellent opportunity to study in more detail the cost differences in highway construction in England and The Netherlands. The objectives of the study were to:

- Identify direct price comparisons for elements of the selected projects by pricing the projects as if they were carried out in a comparable environment,
- Identify adjustments to those prices for physical features, topography, geology, timing, constraints and any other matters required to ensure as far as possible the projects are similar,,
- Compare outputs with Dutch estimators and agree the findings with the RWS representatives
- Report on the price comparisons and the reasons behind any cost differences
- Report on any potential process and product improvements to the client organisations

It was initially envisaged that these objectives would be achieved by dividing the work into sub-tasks:

Sub-task 1: Undertake a price comparison exercise on a number of HA and RWS highways projects

Sub-task 2: Investigate the reasons behind any cost difference

Sub-Task 3: Provided further commentary on a number of issues highlighted in sub-tasks 1&2

The findings of all these tasks have been brought together in this report,

2 Methodology for Comparison

This section outlines the methodology used for comparison of construction works for English and Dutch motorways,, Whilst every project is unique to its location, time, circumstances and type of works carried out, we have tried to compare as similar projects as possible and therefore a number of motorway widening were selected by HA and RWS,. The final output can only be compared at high level and provides indicative guidance rather than exact numbers which are comparable against each other

2.1 Introduction

The HA and RWS selected a number of motorway widening projects to be used in this study. These were: HA - England:

- Mi J6a-10 Widening
- Ml J21-30 (25-28) Contract 1 Widening
- M25J1B-3 Widening
- A2-A282 Dartford Junction Improvements

RWS - The Netherlands:

- Rondweg Eindhoven - Widening
- A2 Zaltbommel-Maas - Widening
- Aansluiting Ekkersrijt - Junction Improvements

AN these projects had commenced construction within the last five years with the majority commencing in 2006,, They also represented the type of project on which future investment in both countries highway network would be made,,

To achieve a reasonable dataset it was agreed that each country would identify four schemes, In the end only three schemes in The Netherlands were found that met the selection criteria.

The total cost for projects in England exceeded £740m while the Dutch schemes cost a total of around 400m Euros. It should be noted, however, that 75% of the Dutch cost lies with one scheme, the Rondweg Eindhoven project, which had a total cost in excess of 300m Euros., This high cost was due to the provision of parallel collector distributors alongside the existing motorway carriageway rather than traditional on-line widening,, This solution is assumed to result in lower construction costs but increased land costs and may cause some problems when projects are compared.

The total additional provision of lanes and hard shoulder lengths in England was 190 lane km, whereas in The Netherlands the total was 154 lane km,

The cost comparison only focused on construction costs and excluded all indirect project costs such as statutory undertaker diversions, land purchase, preparation and all preliminary design costs

Following initial discussions with the HA and RWS representatives and a review of the project information a number of reasons for potential cost differences were agreed, These were:

1, Different number of crossings and junctions on schemes (T)
2, Variances in design of junctions (T)
3 Differences in land purchase (T/S)
4, Ground conditions and geology (T)
5, Different levels of ground water (T)
6, Pavements - standards for PSV - type of pavements used (T)
7, Architectural input (T/S)

8 Prices of Materials - Taxes on Aggregates, Landfill Tax (S)
9 Prices of Labour (S)
10, Prices of equipment (T)
11,, Margins and efficiency (T/S)
12 Type of contracts (T/S)
13. Risk and handling of risks (T)
14, Maintenance period - however both sides have 1 year (T)
15,Testing, Quality assurance, Paperwork required T/S
16.Philosophy in design - Design life, etc. (S) 17. Projects Overheads, On-cost inclusion (T/S) 18,Traffic Management costs, safety measures (T) 19.Health and Safety (T/S)

These differences fail into two distinct categories; 1) (T) technical such as specification, design standards, risk transfer etc, and 2) (S) socia! such as taxes, cost of living etc,

2.2 Visiting the Dutch RWS Team:

The review team visited RWS offices in Utrecht from 19th to 21st of August 2009 and met with RWS' designated estimator Mr Ton Arninkhof who provided all the necessary information and the background knowledge of the Dutch schemes,,

2.3 HA schemes, background information:

This section introduces the projects that were selected for comparison in more detail,. The combined value of the English schemes is over £740m in 1Q2009. The schemes selected for comparison are: Ml 36A-10 Widening, Ml J21-30(J25-28 Contract 1) A2-A282 Dartford Junction Improvements and the M26 Jlb-3 Widening,

The selected projects represent a mixture of widening, hard shoulder running upgrade within a Managed Motorway system and junction improvements which together represent typical examples for Highways Agency Major Project work, It is also anticipated that these types of works will remain the main focus for HA Major Projects in the future,,

2.3,1 Ml J6a-10 Widening

The Ml is one of the busiest motorways in Britain and is a strategic link between London, the Midlands and the North,, The section between Junctions 6A and 10 is approximately 10 miles (17 km) long, stretching from the M25 through to Luton, Widening works add an extra lane to the existing three lanes on both directions.

Work to widen the Ml Junctions 6A - 10, commenced mid March 2006 and was carried out on both carriageways to provide a dual four lane motorway with continuous hard shoulders

Work included:

- Construction of new parallel roads between Junctions 7 and 8 to cater for local traffic travelling between Hemei Hempstead and St., Albans,
- Widening or replacement of 11 underbridges on one or both carriageways,
- Replacement of 7 overbridges,

The motorway was opened for traffic on 19 December 2008,, Formal completion of all works - 8 May 2009 with contract handover into maintenance - 22 June 2009

6 Conclusions and Recommendations

The figure below summarises the adjustments made to the initial project costs through the course of this report, This graphically identifies that the difference is negligible once all the adjustments are taken into account

However it is worth noting that it has only been possible to make this comparison from a high level perspective based on a selected number of projects. Broad based assumptions have had to be made in determining the number of additional lanes provided,.

The overall outcome of the comparison exercise is that if the HA were to build the same product to the same specification under similar ground conditions then it is likely that the costs would be broadly similar,

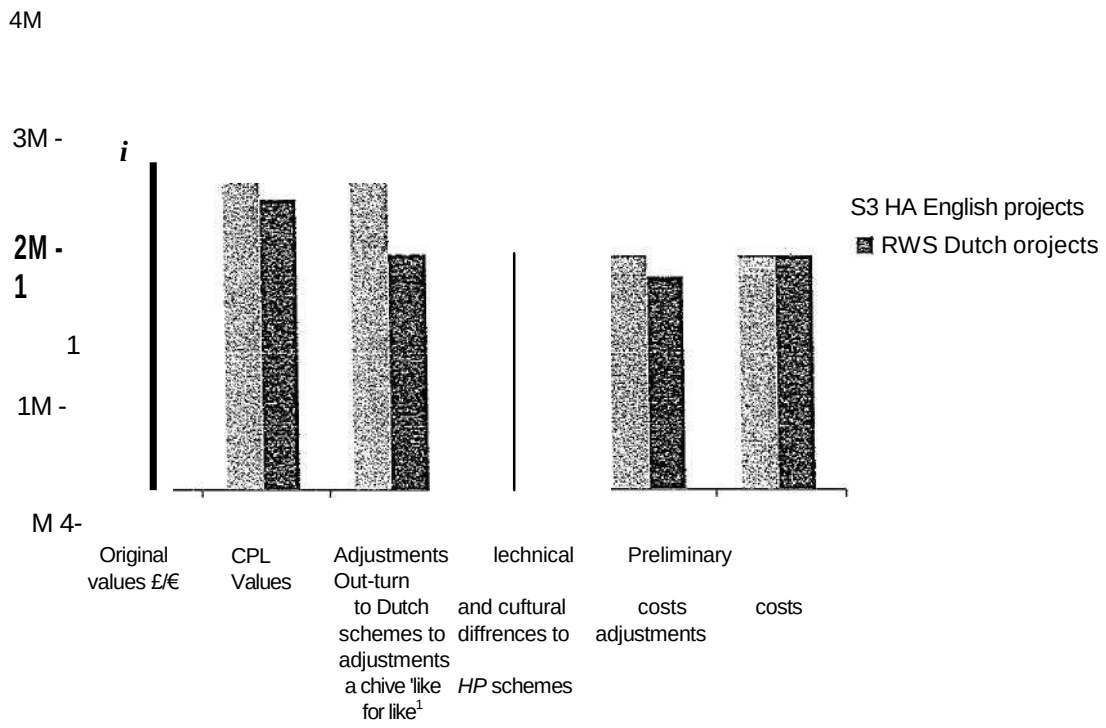

Figure 5 - Summary of findings

In summary, the following cost differences were identified:

- Additional preliminary costs on HA projects which are excluded from RWS projects
- Pavement costs vary due to specification and aggregate tax rules
- Higher specifications to structures with additional provisions on HA projects to achieve improved durability and longer design lives as well as minimal disruption during construction periods,
- Difference in earthworks caused by the variances in the availability and transportation of aggregates and taxation rules on aggregate supply and soil disposal
- Variances to drainage requirements
- Different gantry solutions on Dutch motorways

- The impact of exchange rates and comparative price level indices

Although these factors lead to higher costs on HA schemes it is noteworthy to highlight that these higher costs deliver additional economic benefits to the wider economy as well as having benefits to whole life costs

As part of the HA's appraisal process projects are analysed against their economic benefits as they move through the approval process,, Maintenance and whole life costs are also taken into account, Some initial analysis of whole life costs (WLC) indicates that the WLC are broadly similar in England and Netherlands,,

Recommendations for future analysis would include further analysis on:

» Whole life cost benefits
3 Economic benefits of the higher standards
a Relative efficiency levels in the construction process

The final point would also address the labour culture within construction and the relative efficiency levels between the two countries as although Dutch labour rates appear-higher, their working hours are less yet outturn costs are similar,.