SUPPLEMENTARY GREEN BOOK GUIDANCE

OPTIMISM BIAS

1 INTRODUCTION AND RATIONALE

1.1 There is a demonstrated, systematic, tendency for project appraisers to be overly optimistic. To redress this tendency appraisers should make explicit, empirically based adjustments to the estimates of a project's costs, benefits, and duration.

1.2 As discussed in the Green Book, it is recommended that these adjustments be based on data from past projects or similar projects elsewhere, and adjusted for the unique characteristics of the project in hand. In the absence of a more specific evidence base, departments are encouraged to collect data to inform future estimates of optimism, and in the meantime use the best available data.

2 OBJECTIVES

2.1 The main aims of applying this guidance are to:

- Make adjustments to their estimates of capital and operating costs, benefits values and time profiles; and
- Provide a better estimate of the likely capital costs and works' duration.

2.2 The guidance is not designed to provide comprehensive information on the range of tools that exist to prevent optimism bias, including project management and risk management techniques. Reference should be made to the Green Book and related sources of guidance, including the Office of Government Commerce.

3 MAKING ADJUSTMENTS

Introduction

3.1 Table 1 provides adjustment percentages for generic project categories that should be used in the absence of more robust evidence. It has been prepared from the results of a study by Mott MacDonald into the size and causes of cost and time overruns in past projects.[1]

3.2 Project appraisers should apply the steps set out below to derive the appropriate adjustment factor to use for their projects.

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[1] The guidance was prepared from advice provided by Mott MacDonald (2002), *Review of Large Public Procurement in the UK,* Mott MacDonald (2002), available at www.hm-treasury.gov.uk/greenbook.

Table 1: Recommended Adjustment Ranges

Project Type	Optimism Bias (%)[2]			
	Works Duration		Capital Expenditure	
	Upper	Lower	Upper	Lower
Standard Buildings	4	1	24	2
Non-standard Buildings	39	2	51	4
Standard Civil Engineering	20	1	44	3
Non-standard Civil Engineering	25	3	66	6
Equipment/Development	54	10	200	10
Outsourcing	N/A	N/A	41*	0*

* The optimism bias for outsourcing projects is measured for operating expenditure.

3.3 Project appraisers should note that the upper bound percentages in table 1 relate to the average historic optimism bias found at the outline business case stage for traditionally procured projects. Higher optimism bias adjustments may therefore be required at an earlier stage in the appraisal process, but Table 1 provides a first starting point and reasonable benchmark.

3.4 The following approach should be adopted, and the results reviewed for reasonableness. It helps inform appraisers of their likely optimism bias unless steps are taken to address the contributory factors set out in Tables 2-4, and described in Annex 2. It is designed to complement rather than replace the good practice work which is often currently undertaken to identify project specific risks.[3]

Step One – Decide which project type(s) to use

3.5 Careful consideration needs to be given to the characteristics of a project when determining its project type. For example, a project might satisfy the standard project criteria (e.g. new build on a greenfield site) and also the non-standard criteria (e.g. demolition and build on brownfield site, and refurbishment). It may be best to consider such a project as two different projects under the same programme.

3.6 For ease of determining a project type for building and civil engineering projects, a project is considered "non-standard" if it satisfies any of the following conditions: (a) it is innovative (b) it has mostly unique characteristics; or (c) construction involves a high degree of complexity and/or difficulty.

[2] Note that these values are indicative starting values for calculating optimism bias levels in current projects. The upper bound (U) does not represent the highest possible values for optimism bias that can result and the lower bound (L) does not represent the lowest possible values that can be achieved for optimism bias.

[3] To prevent confusion between work undertaken to mitigate project specific risks, the term ‘contributory factors’ is used to describe those risks that Mott MacDonald found have led to optimism bias, as shown in Annex 2.

3.7 A PFI / PPP project that includes several project types (e.g. an element of standard building, non-standard building, standard civil engineering, outsourcing and equipment / development) should be considered as a programme with five projects.

3.8 The project type should be determined by its dominant characteristics. However, if a building or civil engineering project has a significant amount of standard or non-standard elements (more than 35%) that are not physically separate then this type of project can be considered a combined project.

3.9 Outsourcing and equipment / development elements of a larger project should be considered as separate projects within the same project programme.

3.10 The definitions of the project types are as follows:

- **Standard building projects** are those which involve the construction of buildings not requiring special design considerations i.e. most accommodation projects e.g. offices, living accommodation, general hospitals, prisons, and airport terminal buildings.
- **Non-standard building projects** are those which involve the construction of buildings requiring special design considerations due to space constraints, complicated site characteristics, specialist innovative buildings or unusual output specifications i.e. specialist/innovative buildings e.g. specialist hospitals, innovative prisons, high technology facilities and other unique buildings or refurbishment projects.
- **Standard civil engineering projects** are those that involve the construction of facilities, in addition to buildings, not requiring special design considerations e.g. most new roads and some utility projects.
- **Non-standard civil engineering projects** are those that involve the construction of facilities, in addition to buildings, requiring special design considerations due to space constraints or unusual output specifications e.g. innovative rail, road, utility projects, or upgrade and extension projects.
- **Equipment & development projects**: Projects that are concerned with the provision of equipment and/or development of software and systems (i.e. manufactured equipment, Information and Communication Technology (ICT) development projects) or leading edge projects.
- **Outsourcing projects** are those that are concerned with the provision of hard and soft facilities management services e.g. ICT services, facilities management or maintenance projects.

Step Two – Always start with the upper bound

3.11 Use the appropriate upper bound value for optimism bias from Table 1 above as the starting value for calculating the optimism bias level.

Step Three – Consider whether the optimism bias factor can be reduced

3.12 Reduce this upper bound optimism bias according to the extent to which the contributory factors have been managed.

3.13 The extent to which these contributory factors are mitigated can be reflected in a mitigation factor. The mitigation factor has a value between 0.0 and 1.0. Where 0.0

means that contributory factors are not mitigated at all, 1.0 means all contributory factors in a particular area are fully mitigated and values between 0.0 and 1.0 represent partial mitigation.

3.14 Optimism bias should be reduced in proportion to the amount that each factor has been mitigated.

3.15 Ideally the optimism bias for a project should be reduced to its lower bound optimism bias before contract award. This assumes that the cost of mitigation is less than the cost of managing any residual risks.

Step Four - Apply the optimism bias factor

3.16 The present value of the capital costs should be multiplied by the optimism bias factor. The result can then be added to the total net present cost (or net present value) of the whole project cost to provide the Base Case.[4]

Step Five - Review the optimism bias adjustment

3.17 Clear and tangible evidence of the mitigation of contributory factors must be observed, and should be independently verified, before reductions in optimism bias are made. Procedures for this include the Gateway Review process.

Using and presenting the results

3.18 Following these steps will provide an optimism bias adjustment that can be used to provide a better estimate of the Base Case. Sensitivity testing should be used to consider uncertainties around the adjustment for optimism bias. Switching values, the values at which decisions are likely to change, should be shown where appropriate. If the adjustment for optimism is shown as a separate piece of analysis, sensitivity analysis should be used to show the range of potential outcomes, not just the single optimism bias adjustment.

3.19 Generally, if the optimism bias at the appraisal stage is appropriately low, then the project should be allowed to proceed. If the optimism bias remains high, then approval should be withheld, or given on a qualified basis, e.g. requiring further research, costing and risk management. For instance, high optimism bias may be acceptable for a strategic outline business case but would not normally be acceptable at the full business case stage.

Reducing optimism bias

3.20 Project appraisers should review all the contributory factors that lead to cost and time overruns, as identified by the research. Tables 2-4 show the percentage contributions to the upper bound of various factors for each type of project, and for two types of optimism bias – capital costs and works duration.

3.21 The main strategies for reducing optimism bias are:

- Full identification of stakeholder requirements (including consultation);

[4] The Base Case, as defined in the Green Book, is the best estimate of how much a proposal will cost in economic terms, including an allowance for risk and optimism.

- Accurate costing; and
- Project and risk management.

3.22 All these should form part have the business case, and all the contributory factors in the Appendix should be covered. For more information on how to develop these strategies, refer to the Green Book and the Office of Government Commerce.

3.23 The lower bound values represent the optimism bias level to aim for in projects with effective risk management by the time of contract award. Ideally by this time, the project' scope should be clearly identified, its costs robustly estimated, its risks identified and valued, and effective project and risk management strategies developed.

Works duration

3.24 The same principles apply for estimating the length of time it will take to complete the capital works. Once an initial estimate is made, the upper bound optimism bias percentage should normally be applied. If the project has advanced, and the contributory factors leading to works duration optimism bias have been addressed, then the percentage optimism bias may be reduced, along the lines set out for capital works optimism bias.

4 OPERATING COSTS AND BENEFITS

4.1 Due to a lack of available data, Mott MacDonald was unable to recommend sound upper and lower bound optimism bias levels for operating expenditure (except for outsourcing projects) or benefits shortfall. Optimism bias should still be considered for these parameters. If there is no other evidence to support adjustments to operating costs or benefits, appraisers should use sensitivity analysis to check switching values. This should help to answer key questions such as:

- By how much can we allow benefits to fall short of expectations, if the proposal is to remain worthwhile? How likely is this?
- How much can operating costs increase, if the proposal is to remain worthwhile? How likely is this to happen?
- What will be the impact on benefits if operating costs are constrained?

Example 1 (Part 1) – Capital Expenditure

Suppose we examine the capital expenditure and works duration optimism bias levels for a non-standard building (e.g. a specialist hospital). For simplicity, suppose the initial estimated NPC of capital expenditure (i.e. the project estimate for capital expenditure) is £100 m. The upper bound capital expenditure optimism bias value for a non-standard building project is 51 % (see Table 1)

If contributory factors are not effectively managed, the estimated Final NPC capital expenditure, taking into account optimism bias, is calculated as follows:

£100 m + (51 % x £100m) = £151 m

For this example the mitigation factors have been identified for each of the contributory factors listed in the table below and effective risk management strategies are in place to manage them. Note that the '% contribution to Optimism Bias' values in the table below have been taken from Table 2 and the 'Mitigation factor' represents the degree to which contributory factors are managed.

Contributory Factor	***% Contribution to Optimism Bias***	***Mitigation Factor***	***Cost of Risk Management***
Poor Contractor Capabilities	*5*	*1.0*	*£0*
Design Complexity	*3*	*1.0*	*£140,000*
Inadequacy of the Business Case	*23*	*0.4*	*£700,000*
Poor Project Intelligence	*6*	*1.0*	*£10,000*
Site Characteristics	*1*	*1.0*	*£40,000*

The following are simple examples of successful strategies for effectively managing each of the five contributory factors identified in the table above:

- *Only contractors that have successfully delivered this type of project before are to be considered (cost of managing this risk £0).*
- *The design has recently proven successful on a project of a similar size and nature and key design team members are appointed that have successfully produced and supervised the implementation of this design (cost of managing this risk is £140,000 say).*
- *Treasury/OGC best practice is being used to prepare and develop the business case and all areas of the strategic outline case have been competently addressed (only 40% mitigated in the example, as more detail is required – the cost of managing this risk reduction in OB is £700,000 say). Sufficient time is to be allowed to adequately define the project scope (this may result in major changes to a project and its costs that require a review of project estimates), identify contributory factors and develop appropriate risk management strategies.*
- *Detailed research has already been performed to confirm current and future demand and project sensitivities, although a review of the research should be performed to confirm the results/recommendations are sound (cost of managing this risk is £10,000 say).*
- *The Trust has owned the proposed site for at least 20 years during which comprehensive site investigations were performed within the last five years. Therefore only a site inspection, desk study of existing records and a limited site investigation are required to confirm the site ground characteristics (cost of managing this risk is £40,000 say).*

The resultant capital expenditure optimism bias (i.e. the upper bound optimism bias minus the managed optimism bias contribution) is calculated as follows:

*Managed optimism bias contribution = Reduction in optimism bias = 5 + 3 + (23 * 0.4) + 6 + 1 ≈ 24 %*

*Resultant capital expenditure optimism bias = (100 % – 24 %) * 51 ≈ 39 %*

Therefore the forecast NPC capital expenditure for this example (excluding the cost of risk management), taking into account optimism bias, is £139 m, which is calculated as follows:

£100 m + (39 % x £100m) = £139 m

Whereas the estimated final NPC capital expenditure for this example taking into account optimism bias and the cost of risk management, is approximately £140 m, which is calculated as follows:

£139 m + £(0.0 + 0.14 + 0.70 + 0.01 + 0.04) = £139 m + £0.89 m = £139.89

This figure for the final NPC capital expenditure after implementing risk management strategies is lower than the £151 m calculated for final NPC capital expenditure if contributory factors are not effectively managed.

1.1 Example 1 (Part 2) - Capital Expenditure

Ideally at contract award, the lower bound optimism bias for capital expenditure should be achieved through sufficient risk mitigation (if the cost of risk mitigation is less than the cost of the residual risk).

If we now consider the above example at contract award ideally the resultant capital expenditure optimism bias after effective management of contributory factors should be equal to the lower bound optimism bias, 4 %, for non-standard buildings. In this case the estimated final NPC capital expenditure, taking into account optimism bias and cost of risk management, is £104 m plus the cost of risk management, which is calculated as follows:

(£100 m x ((100 % + 4 %) / 100 %)) + cost of risk mitigation = £104 m + cost of risk mitigation

Therefore if say for example the total cost of managing project risk is £7million, then the final NPC capital expenditure would be £111 m (i.e. £104 m + £7 m).

1.2 Example 2 (Part 1) – Works Duration

A similar process as in the example of section 1.1 can be performed to calculate works duration optimism bias levels at outline business case for our non-standard building, where the upper bound works duration optimism bias value for a non-standard building project is 39 %. Suppose the estimated works duration is 28 months.

If contributory factors are not effectively managed, the estimated works duration taking into account optimism bias, is calculated as follows:

28 months + (39 % x 28 months) ≈ 38.9 months (a delay of approximately 11 months)

If we now apply the same risk management strategies as in Example 1 (Part 1) for each of the contributory factors listed in the table below. Note that, the '% Contribution to Optimism Bias' values in the table below have been taken from Table 2 and the mitigation factor represents the degree to which the contributory factors are managed.

Contributory Factor	***% Contribution to Optimism Bias***	***Mitigation Factor***
Poor Contractor Capabilities	*5*	*1.0*
Design Complexity	*2*	*1.0*
Inadequacy of the Business Case	*22*	*0.4*
Poor Project Intelligence	*5*	*1.0*
Site Characteristics	*3*	*1.0*

The resultant works duration optimism bias (i.e. the upper bound optimism bias minus the managed optimism bias contribution) is approximately 30%, calculated as follows:

*Managed optimism bias contribution = Reduction in optimism bias = 5 + 2 + (22 * 0.4) + 5 + 3 = 23.8 %*

*Resultant works duration optimism bias = (100 % - 23.8 %) * 39 ≈ 29.7 %*

Therefore, the estimated works duration, for this example taking into account optimism bias, is approximately 36.3 months, calculated as follows:

28 months + (29.7 % x 28 months) ≈ 36.3 months

This figure for the works duration after implementing risk management strategies is lower than the 39-month duration calculated if contributory factors are not effectively managed.

This method of assessment can be applied throughout the project life cycle for a project (e.g. strategic outline case, outline business case and full business case).

1.3 Example 2 (Part 2) – Works Duration

Ideally at contract award, the lower bound optimism bias for works duration should be achieved through sufficient risk mitigation (if the cost of risk mitigation is less than the cost of managing the residual risk).

Assume that the above applies to this example and the resultant works duration optimism bias is equal to the lower bound optimism bias, 2 %, for non-standard buildings.

In this case the estimated works duration, is approximately 28.6 months, which is calculated as follows:

28 months x (100 % + 2 %) ≈ 28.6 months

1.4 Calculating Upper Bound Values for Combined Projects

Where a building or civil engineering project has significant standard and non-standard elements that cannot be physically separated it is considered a combined project (where one of the elements is not significant the project should be identified according to its dominant project type characteristics). To calculate the appropriate upper bound values for combined projects the following approach is recommended:

(a) Determine the percentage split for standard and non-standard parts of the capital value of the building or civil engineering project (use best judgement).

(b) Identify the upper bound values for the standard and non-standard parts.

(c) Multiply each percentage of CAPEX by the appropriate upper bound optimism bias.

(d) Add the OB contributions together to determine the resultant optimism bias percentage.

The following table shows a worked example of the calculated resultant upper bound optimism bias level for capital expenditure for a combined building project:

Project Type	***Percentage of CAPEX (%)***	***Upper bound OB (%)***	***OB Contribution (%)***	***Resultant OB (%)***
Non-standard building	*30*	*51*	*15.3*	*-*
Standard building	*70*	*24*	*16.8*	*-*
Combined building	*100*	*-*	*-*	*32.1*

The works duration optimism bias can be determine in the same way. The following table shows a worked example of the calculated resultant upper bound optimism bias level for works duration for a combined building project:

Project Type	***Percentage of Works Duration (%)***	***Upper bound OB (%)***	***OB Contribution (%)***	***Resultant OB (%)***
Non-standard building	*30*	*39*	*11.7*	*-*
Standard building	*70*	*4*	*2.8*	*-*
Combined building	*100*	*-*	*-*	*14.5*

Experienced appraisers can use their best judgment.

Table 2 Optimism Bias Upper Bound Guidance for Buildings Projects

		Non-standard Buildings		Standard Buildings	
Upper Bound Optimism Bias (%)[5]		**39**	**51**	**4**	**24**
		Works Duration	**Capital Expenditure**	**Works Duration**	**Capital Expenditure**
Contributory factors to Upper Bound Optimism Bias (%)[6]		**Non-standard Buildings**		**Standard Buildings**	
Procurement	Complexity of Contract Structure	3	1	1	
	Late Contractor Involvement in Design	6	2	3	2
	Poor Contractor Capabilities	5	5	4	9
	Government Guidelines				
	Dispute and Claims Occurred	5	11	4	29
	Information management				
	Other (specify)				
Project Specific	Design Complexity	2	3	3	1
	Degree of Innovation	8	9	1	4
	Environmental Impact				
	Other (specify)	5	5		
Client Specific	Inadequacy of the Business Case	22	23	31	34
	Large Number of Stakeholders			6	
	Funding Availability	3		8	
	Project Management Team	5	2		1
	Poor Project Intelligence	5	6	6	2
	Other (specify)	1	2		< 1
Environment	Public Relations			8	2
	Site Characteristics	3	1	5	2
	Permits / Consents / Approvals	3	< 1	9	
	Other (specify)	1	3		
External Influences	Political	13			
	Economic		13		11
	Legislation / Regulations	6	7	9	3
	Technology	4	5		
	Other (specify)		2		

[5] Note that these are only indicative starting values for calculating optimism bias contributions, because a project's optimism bias profile will change during its project life cycle.

[6] Contributions from each area are expressed as a % of the recorded optimism bias. Note: The sum of individual percentages contributions in each column may not add up to 100% due to rounding errors.

Table 3 Optimism Bias Upper Bound Guidance for Civil Engineering Projects

		Non-Standard Civil Engineering		Standard Civil Engineering	
Upper Bound Optimism Bias (%)[7]		**25**	**66**	**20**	**44**
		Works Duration	**Capital Expenditure**	**Works Duration**	**Capital Expenditure**
Contributory factors to Upper Bound Optimism Bias (%)[8]		**Non-Standard Civil Engineering**		**Standard Civil Engineering**	
Procurement	Complexity of Contract Structure	4			
	Late Contractor Involvement in Design	< 1			3
	Poor Contractor Capabilities	2		16	
	Government Guidelines				
	Dispute and Claims Occurred	16			21
	Information management				
	Other (specify)	1	2		
Project Specific	Design Complexity	5	8		
	Degree of Innovation	13	9		
	Environmental Impact		5	46	22
	Other (specify)	3			18
Client Specific	Inadequacy of the Business Case	3	35	8	10
	Large Number of Stakeholders				
	Funding Availability		5	6	
	Project Management Team		2		
	Poor Project Intelligence	3	9	14	7
	Other (specify)				
Environment	Public Relations				9
	Site Characteristics		5	10	3
	Permits / Consents / Approvals				
	Other (specify)				
External Influences	Political	19			
	Economic	24	3		7
	Legislation / Regulations		8		
	Technology	6	8		
	Other (specify)	< 1	1		

[7] Note that these are only indicative starting values for calculating optimism bias contributions, because a project's optimism bias profile will change during its project life cycle.

[8] Contributions from each area are expressed as a % of the recorded optimism bias. Note: The sum of individual percentages contributions in each column may not add up to 100% due to rounding errors.

Table 4 Optimism Bias Upper Bound Guidance for Equipment/ Development and Outsourcing Projects

		Equipment / Development		Outsourcing		
Upper Bound Optimism Bias (%)[9]		**54**	**200**	**-**	**-**	**41**
		Works Duration	**Capital Expenditure**	**Works Duration**	**Capital Expenditure**	**Operating Expenditure**
Contributory factors to Upper Bound Optimism Bias (%)[10]		**Equipment / Development**		**Outsourcing**		
Procurement	Complexity of Contract Structure	13	7	-	-	
	Late Contractor Involvement in Design		7	-	-	
	Poor Contractor Capabilities	11	4	-	-	
	Government Guidelines			-	-	
	Dispute and Claims Occurred			-	-	
	Information management		5	-	-	
	Other (specify)			-	-	
Project Specific	Design Complexity		10	-	-	
	Degree of Innovation	20	17	-	-	
	Environmental Impact	9		-	-	
	Other (specify)			-	-	3
Client Specific	Inadequacy of the Business Case	20	18	-	-	52
	Large Number of Stakeholders			-	-	
	Funding Availability			-	-	
	Project Management Team		5	-	-	
	Poor Project Intelligence	4	4	-	-	32
	Other (specify)			-	-	
Environment	Public Relations			-	-	
	Site Characteristics			-	-	
	Permits / Consents / Approvals			-	-	
	Other (specify)			-	-	
External Influences	Political			-	-	
	Economic			-	-	
	Legislation / Regulations	4	5	-	-	
	Technology	19	18	-	-	9
	Other (specify)			-	-	

[9] Note that these are only indicative starting values for calculating optimism bias contributions, because a project's optimism bias profile will change during its project life cycle.

[10] Contributions from each area are expressed as a % of the recorded optimism bias. Note: The sum of individual percentages contributions in each column may not add up to 100% due to rounding errors.

APPENDIX

CONTRIBUTORY FACTORS

<u>Procurement</u>

1. Complexity of Contract Structure

- Details of risk transfer had to be clarified
- Payment mechanism had to be defined
- Unforeseen amount of negotiation required on terms of contract

2. Late Contractor Involvement in Design

- Value management was necessary but contractor was not involved early enough to allow for it
- The design could not be built due to construction problems (e.g. access)
- Contractor provided design / construction feedback at a late stage resulting in a redesign

3. Poor Contractor Capabilities

- Contractor was inexperienced
- Site health and safety standards were not met
- Construction was not carried out to the necessary standards
- The contractor had insufficient resources

4. Government Guidelines

- No precedent or guideline had been developed to procure a leading edge project

5. Dispute and Claims

- Dispute over interim payments
- Claims for changes in scope
- Claims for late release of information by other stakeholders

6. Information Management Systems

- The interfaces between the stakeholders were not managed efficiently resulting in information not being transferred effectively.

<u>Project Specific</u>

7. Design Complexity

- The construction was to take place over an existing mine, thus requiring complicated foundations.
- The design had to be built in difficult conditions e.g. a hydropower station

8. Degree of Innovation

- New generation design
- Unusual site conditions requiring innovative solutions e.g. large wind forces, chemical nature of soil and soil contamination

9. Environmental Impact

- Contamination e.g. nuclear power station, Incinerator
- Noise pollution e.g. airports
- Impact on wildlife e.g. new road through protected area

<u>Client Specific</u>

10. Inadequacy of the Business Case

- Number of services were not anticipated
- Output specifications were not defined clearly
- Oversight in facilities required
- All stakeholders were not involved and so their needs were not defined and included in business case

11. Large Number of Stakeholders

- Different public sector parties having differing interests in the project
- Process of obtaining approval took longer than expected due to number of parties involved

12. Funding availability

- Difficulties in obtaining financial backing for project
- Additional funding was made unexpectedly available later on in the project thus changing project scope

13. Project Management Team

- The project management team was inexperienced in delivering a project of this nature.
- Inadequate review of drawings by the project manager before construction

14. Poor Project Intelligence

- Insufficient ground investigation
- The detailed design was based on insufficient site information
- Insufficient surveying of existing conditions e.g. for refurbishment of buildings

Environment

15. Public relations

- Opposition from the local community (with regards to traffic and construction noise and environmental impact)
- Environmental protests

16. Site Characteristics

  - The presence of badger setts within construction site
- Underground stream requiring protection during construction
- Archaeological findings

17. Permits / Consents / Approval

- Parliamentary Bill required for project initiation
- Difficulties in obtaining planning permission, possibly resulting in an appeal to the Secretary of State

External Influences

18. Political

  - Opposition by a major political party
  - Impact on sensitive constituencies
  - Lacks support from key political stakeholders

19. Economic

- Change in market demand resulting in a change in funding priorities
- Crash in stock markets

20. Legislation / Regulations

- Change in required standards

21. Technology

- Unanticipated technological advancements
- Computer virus
- Limits in technology