

Key messages

# Review of major capital projects in Scotland

## How government works



Prepared for the Auditor General for Scotland  
June 2008

# Auditor General for Scotland

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- NHS bodies
- further education colleges
- Scottish Water
- NDPBs and others, eg Scottish Enterprise.

Note:

Prior to September 2007, the Scottish Administration was generally referred to as the Scottish Executive. It is now called the Scottish Government. When dealing with the earlier period, this report refers to the Scottish Executive. Recommendations for the future refer to the Scottish Government.

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Audit Scotland is a statutory body set up in April 2000 under the Public Finance and Accountability (Scotland) Act 2000. It provides services to the Auditor General for Scotland and the Accounts Commission. Together they ensure that the Scottish Government and public sector bodies in Scotland are held to account for the proper, efficient and effective use of public funds.

# Key messages

## Introduction

**1.** Public investment in infrastructure touches most aspects of Scottish life. It provides new and upgraded facilities, such as hospitals, schools, museums, prisons and major IT projects. In recent years, capital investment by the public sector has hugely increased.

**2.** Between 2002 and 2007, the Scottish Government and its agencies, non-departmental public bodies (NDPBs), and the NHS completed 43 publicly-funded major capital projects valued at £811 million.<sup>1</sup>

**3.** The Scottish Executive's 2005 Infrastructure Investment Plan identified some £7.8 billion capital investment over the period 2004/05 to 2007/08, including many large projects. The Scottish Government's 2008 Infrastructure Investment Plan identifies another £10.5 billion to be invested between 2008/09 and 2010/11.

**4.** There are currently 104 major projects, valued at £4.7 billion, in progress. Most of these are in the transport and health sectors (Exhibit 1). Of these 104 projects, there are:

- seven large transport projects and two large health projects, valued at between £120 million and £692 million each (combined value of £2.8 billion)
- thirty-seven medium projects, mainly in the transport, health and justice sectors, valued at between £15 million and £85 million each (combined value of £1.4 billion).
- fifty-eight smaller projects, valued at less than £15 million each, covering all government portfolios (combined value of £0.5 billion).<sup>2</sup>

**5.** The scale of expenditure, and the importance of the investment in supporting good public services, puts a

premium on ensuring projects are well managed and provide value for money.

## About our study

**6.** This report is the first systematic review of major capital projects in Scotland. It considers the progress of all 43 projects completed in the five years between April 2002 and March 2007, and a sample of current major projects.<sup>3</sup> It looks at progress against cost and time estimates, quality specifications and project management in general.

**7.** It builds on our June 2007 report *Edinburgh transport projects review*, which examined the Edinburgh tram and Edinburgh Airport Rail Link (EARL) projects.<sup>4</sup>

**8.** We examined only major projects which are publicly-funded by traditional capital investment. We did not examine the progress of projects

## Exhibit 1

### Major capital projects by government portfolio

Portfolio	Completed projects 2002-07		Projects in progress		Projects examined by Audit Scotland	
	Number of projects	Actual cost £m	Number of projects	Estimated cost £m	Number of projects	Estimated or actual cost £m
Finance and sustainable growth (mainly transport projects)	10	198	50	3,357	8	1,463
Justice	12	213	11	350	4	181
Rural affairs and environment	1	33	5	53	2	49
Health and well-being	11	258	28	737	3	186
First Minister	1	32	7	127	2	78
Education and lifelong learning	8	77	3	52	1	38
<b>Total</b>	<b>43</b>	<b>811</b>	<b>104</b>	<b>4,676</b>	<b>20</b>	<b>1,995</b>

Source: Audit Scotland

<sup>1</sup> We define a major project as having a capital cost of £5 million or more.

<sup>2</sup> We have defined small, medium and large projects as less than £15 million, £15-100 million and over £100 million respectively.

<sup>3</sup> The review covers direct Scottish Government and NHS investment but does not cover local authorities, further and higher education or Scottish Water.

<sup>4</sup> *Edinburgh transport projects review*, Audit Scotland, June 2007.

## Exhibit 2

Achievement of cost and time estimates improves as projects progress



Source: Audit Scotland

funded through Private Finance Initiative (PFI) contracts (14 projects completed and in progress valued at £902 million). The Scottish Government is not using standard PFI for new projects and is developing an alternative method to help fund major capital projects.

9. In the course of the study, we:

- surveyed the public bodies that completed 43 projects between 2002 and 2007
- conducted case study reviews of 20 projects (five completed and 15 current) to provide further detail on performance against cost, time and quality targets, and assess their project management against good practice. These projects cover 36 per cent of recent and current projects by value, and include projects from each main government portfolio.

### Key messages

**1** In general, the achievement of cost and time targets improved significantly as projects progressed.

10. Exhibit 2 presents a high-level summary of our findings on the performance of all projects completed between 2002 and 2007 against cost and time targets. It shows initial estimates of cost and time were often too optimistic. But there is a general picture of improvement in both cost and time estimating after contracts are awarded. At this stage, although some projects do not achieve cost and time targets, the degree of variation is significantly smaller.

11. Exhibit 3 sets out our criteria for assessing cost, time and quality. Exhibits 4 and 5 summarise our findings on the achievement, or progress towards cost, time and quality targets, for the 20 projects we examined as case studies.

**2** Early cost and time estimates at project approval stage were too optimistic for many major projects.

12. It is important that early cost and time estimates, on which initial project approval is given, are as accurate as possible. Inaccurate estimates undermine decision-making, accountability and managers' ability to deliver the projects.

13. Only around two-fifths of projects were completed within the cost estimated at initial approval:

- Twenty-five projects had initial cost estimates that were too low, in most cases by a significant margin. The final cost of these projects shows an average overrun of 39 per cent against the initial cost estimate.
- The combined final cost of 41 projects was £730 million, £84 million (13 per cent) more than their combined initial estimated cost of £646 million.<sup>5</sup>

14. For most projects the forecast project completion date at the initial approval stage was also too optimistic. Only a third of projects were completed on time and most projects overran by between 16 and 200 per cent of the initial time expected.

5 We could not get definitive estimates of cost or time for all 43 completed projects, as detailed in our main report.

### Exhibit 3

Assessment criteria for cost, time and quality

	Significant changes and/or uncertainty <b>R</b>	Relatively minor changes and/or uncertainty <b>A</b>	On target <b>G</b>
Cost	<ul style="list-style-type: none"> <li>Actual or forecast cost materially over initial approval or contract value</li> <li>Cost estimates currently materially uncertain</li> </ul>	<ul style="list-style-type: none"> <li>Delivered just over cost</li> <li>Currently forecasting a small cost overrun</li> </ul>	<ul style="list-style-type: none"> <li>Completion within initial approval and contract value (or forecasting with reasonable certainty)</li> </ul>
Time	<ul style="list-style-type: none"> <li>Actual or forecast delivery well outside timescale</li> </ul>	<ul style="list-style-type: none"> <li>Actual or forecast delivery with a small overrun in time</li> </ul>	<ul style="list-style-type: none"> <li>Actual or forecast delivery to time or ahead of time</li> </ul>
Quality	<ul style="list-style-type: none"> <li>Did not deliver to the required scope</li> <li>Scope has increased or decreased significantly</li> </ul>	<ul style="list-style-type: none"> <li>Delivered to the original scope or minor loss of function</li> <li>Currently minor changes forecast in scope during project</li> </ul>	<ul style="list-style-type: none"> <li>Delivered to scope in the business case</li> <li>No residual issues</li> <li>Forecasting to deliver to business case</li> </ul>

Source: Audit Scotland

**3** Performance against cost and time estimates is better after contracts are awarded, as plans are more certain and risks clearer.

**15.** Although initial cost estimates are important, a key decision point for any project is shortly before a contract is awarded. Once a contract is agreed, significant changes to a project are likely to be costly and disruptive, and may not represent value for money.

**16.** We found that 31 of 38 projects were completed within five per cent of the contract price. The combined final cost for these 38 projects was £754 million, £8 million (one per cent) more than the combined approved contract price of £746 million.

**17.** Two-thirds of projects were completed on time or within ten per cent of the total forecast time when the contracts were awarded.

**4** Most completed projects have successfully delivered the required roads, hospitals and other assets, and all current projects are forecast to do so. However, few projects have been evaluated to demonstrate that they have delivered the expected wider benefits which originally justified the investment.

**18.** There are no simple and universal measures of the achievement of quality which can be applied to all projects.

**19.** In our survey of 43 completed projects, we looked at whether the required project outputs were delivered without significant defects. Eight completed projects (almost one in five) reported significant defects in the first year after completion.

**20.** With the exception of one project, where the problem is now resolved, none of the defects represent a fundamental failure.<sup>6</sup> In all cases, project teams have pursued or are pursuing

remedies for defects. The project costs have been protected by retaining some contract payments pending resolution of the defects.

**21.** Technical quality control, such as defects reporting, is not enough to ensure that a project delivers the maximum benefit. It is also good practice to specify criteria against which the finished project can be assessed to ensure it provides good quality design, is functional and meets the business requirements. Few projects reported using detailed quality measures, and fewer could provide documents to evidence this.

**22.** The Scottish Public Finance Manual requires project teams to complete post-project evaluations, but there is no requirement to report the results back to the Scottish Government. Twenty-one projects had not been evaluated to assess if they had delivered the expected wider benefits which originally justified the investment.

<sup>6</sup> A significant defect appeared in the Clyde Arc Bridge, in January 2008, 16 months after opening.

## Exhibit 4

Summary of five completed projects against cost, time and quality targets

Project	Final cost £m	Completed	Procured by	Description	Outcome compared to plan		
					Cost	Time	Quality
Beatson Oncology Unit	87	2007	NHS Greater Glasgow & Clyde	New build regional centre of excellence for oncology services for the West of Scotland.	R	R	A
Upgrade to Polmont Prison – Phase 2	39	2007	Scottish Prison Service	Provision of new cell block and regimes accommodation.	G	G	G
New SASA HQ at Gogarbank	33	2006	Scottish Agricultural Science Agency	New headquarters building and facilities for specialist scientific, technical and support services.	R	A	G
Playfair project phases 1 & 2	32	2004	National Galleries of Scotland	Refurbishment of the Royal Scottish Academy building and provision of a new underground link to the National Gallery of Scotland with education facilities and visitor services.	R	G	A
A80 - Auchenkilns	22	2006	Scottish Executive Transport Group	Upgrade of the existing road in preparation for future M80 motorway works and the removal of an existing junction.	G	A	G

Note: See Exhibit 3 for definitions of R-A-G.

On 1 January 2006, parts of the Scottish Executive Transport Group became part of the newly formed Transport Scotland, which then became accountable for all trunk roads projects.

Source: Audit Scotland

**5** Nine current projects examined had awarded the main construction contract, which should increase cost certainty. However, four projects had significant increases in estimated cost before reaching this stage.

**23.** We reviewed 15 projects in progress, which have an estimated cost of £1.8 billion (38 per cent of the £4.7 billion value of all current projects).

**24.** The largest increase in estimated costs before contract affected two transport projects.<sup>7</sup> In these cases, the estimated cost has more than doubled and completion has been significantly delayed.

**25.** The remaining current projects we reviewed are on schedule to achieve the initial completion date.

**26.** It is too early to assess the quality of projects in progress. Three are at a relatively early stage of development, which increases the possibility of changes in scope. One has experienced significant changes in scope since inception.

**6** Project management and governance arrangements within individual projects are broadly effective, although room for improvement remains. A more strategic approach to managing the programme of capital projects could improve value for money.

**27.** From our case study reviews of 20 projects, we assessed project management and governance arrangements against good practice. On a scale ranging from basic to advanced, we found most projects were adequate or better.

**28.** In most cases, projects were addressing the strategic aims of Scottish Government and demonstrated this in their business cases. However, four projects had no authoritative business case and there is scope to improve the quality of project appraisals more generally.<sup>8</sup>

**29.** Effective governance structures were in place in most projects, with good engagement with external partners and stakeholders, and clear sponsor commitment.

**30.** Most projects had appropriate personnel in key positions and there was generally a culture of positive project management.

**31.** The overall approach to estimating costs, including the treatment of risk and uncertainty, and consideration of whole-life costs at the project appraisal stage,

<sup>7</sup> M74 completion, Stirling-Alloa-Kincardine Rail Link.

<sup>8</sup> M74 completion, eCare, Scottish Crime Campus and Erskine Bridge maintenance.

could be improved. Explicit consideration of whole-life costing within project appraisals and benchmarking project costs remains relatively unusual.<sup>9</sup>

**32.** There is evidence of a sound approach to competition in most cases, but not all projects got a high degree of competition from the outset. This is partly due to increasing national and international demand for contractors. Projects are also experiencing higher levels of construction inflation, reflecting high demand for construction services.<sup>10</sup> The current market means that suppliers may be less willing to compete for capital projects. This increases the risk to value for money.

**33.** Gateway reviews provide an independent assessment on the state of projects. The Scottish Public Finance Manual requires that high-risk projects undergo gateway reviews. However, only nine current projects had used the process or any other form of independent testing, reducing the scope for positive assurance.

**34.** The NHS, Transport Scotland and the Scottish Prison Service are responsible for large capital investment programmes and use their own systems for monitoring and overseeing projects. But across the Scottish Government there is no standard system for monitoring and appraising the current status of projects and how they are forecast to perform against cost, time and quality requirements.

**35.** For the Scottish Parliament and the public there is no consistent published information about either major project performance or the wider effectiveness of the investment.

**36.** The Scottish Government has a strategic group with a remit to improve project delivery. However, there is a case for additional leadership and more deliberate coordination and management of the investment programme across government, to ensure that it matches market capacity and capability. This would promote good competition and value for money in the medium and long term.

**37.** In May 2008, the Scottish Government proposed the further development of the Scottish Futures Trust initiative. This includes plans to provide a focal point for coordinated public sector infrastructure planning and investment. If approved and implemented, this coordination may help address our recommendations below.

## Recommendations

The Scottish Government should:

- collect information on all projects and get explanations for cost, time and quality changes, and lessons learned. It should report performance publicly
- strengthen strategic direction and investment planning through a senior, government-wide, investment coordination and challenge function
- ensure robust procurement strategies and cost estimates have been developed prior to awarding funding to projects
- take account of market conditions and construction inflation when developing its capital programme.

Public bodies should:

- prepare robust business cases for every project. These should be clear about the project aims and benefits, and include assessment of: risks; the range of options to be considered; and a clear basis for assessing, reviewing and reporting
- build whole-life costs into business cases and subsequent project reporting
- ensure cost, time and quality targets are clear from the outset, and properly recorded

- improve early-stage estimating of the cost and time of projects. They need to ensure better assessment and quantification of risk and uncertainty, and should include a specific risk allowance, optimism bias allowance and take account of construction cost inflation in early cost estimates
- develop an appropriate procurement strategy which considers all procurement routes, competitiveness and capacity within the construction industry. Ensure that risk management strategies explicitly consider and mitigate the risk of changes in scope after the contract has been awarded
- make more use of tools available to assess and confirm both the quality of design and environmental sustainability to get the best benefits from the available funding
- ensure appropriate project management and governance arrangements are put in place for every project
- from the outset, ensure they have project managers with appropriate experience and knowledge of effectively managing major projects
- ensure project budgets are sufficient to allow for post-project evaluation in all projects
- carry out post-project evaluations within a reasonable timescale to determine whether projects have delivered the benefits intended. Evaluations should consider performance against cost, time and quality targets
- set a clear plan with regard to the need for independent gateway or similar reviews at key stages in projects

<sup>9</sup> Whole-life costing is an economic appraisal, which considers all costs and benefits from installing, owning, operating, maintaining, and ultimately disposing of an asset.

<sup>10</sup> Construction inflation measures the change in the underlying costs of labour, raw materials etc, required in construction and it often rises faster than general inflation.

## Exhibit 5

Summary of 15 current projects' progress towards cost, time and quality targets

Project	Latest cost £m	Stage at review	For delivery in	Procured by	Description	Progress compared to plan		
						Cost	Time	Quality
M74 completion	692	Procurement (now at delivery)	2011	Transport Scotland* (Glasgow City Council)	New-build, six-lane urban motorway, extending the M74 west from the eastern edge of the Glasgow built-up area to the M8 near the south end of the Kingston Bridge.	R	R	G
Glasgow Airport Rail Link Project	300-400	Procurement	2011	Transport Scotland* (Network Rail)	A new rail link to Glasgow Airport, combined with upgrading of a section of the Network Rail Paisley Corridor Route.	R	A	A
Edinburgh Waverley Infrastructure Works	150	Delivery	2008	Transport Scotland* (Network Rail)	Rail capacity enhancements to provide four extra train paths an hour through Waverley Station and enable other projects, eg Airdrie-Bathgate and Stirling-Alloa-Kincardine.	G	G	G
A876 Upper Forth Crossing at Kincardine	120	Delivery	2008	Transport Scotland	A new bridge to reduce congestion at Kincardine and allow refurbishment, with minimal disruption, to existing bridge.	G	A	G
Stirling-Alloa-Kincardine Rail Link	85	Delivery	2008	Transport Scotland* (Clackmannanshire Council)	Reopening of disused railway to provide passenger services from Stirling to Alloa and allow diversion of coal from the Forth Bridge to be replaced by commuter services.	R	R	R
A898 Erskine Bridge	29	Delivery	2010 & ongoing	Transport Scotland	Long-term strengthening and maintenance programme commenced in 1996.	R	A	G
Scottish Crime Campus	63	Inception	2011	Scottish Government	A new purpose-built crime campus facility at Gartcosh.	R	A	A
Edinburgh Prison Phase 3	25	Delivery	2008	Scottish Prison Service	A new gatehouse, games hall, stores and administration accommodation, and upgrade to the main link corridor for the prison.	R	A	A
Parliament House Masterplan	62	Procurement (now at delivery)	2012	Scottish Court Service	Major essential maintenance and some refurbishment within Parliament House, a complex of very important historic and grade A-listed buildings.	R	R	G
State Hospital redevelopment	85	Procurement (now at delivery)	2010	The State Hospitals Board for Scotland	Redevelopment of a high-security residential and patient treatment centre through new-build construction/adaptation on the existing hospital site near Carstairs.	G	G	G

## Exhibit 5 (continued)

Summary of 15 current projects' progress towards cost, time and quality targets

Project	Latest cost £m	Stage at review	For delivery in	Procured by	Description	Progress compared to plan		
						Cost	Time	Quality
Golden Jubilee Heart & Lung Centre	14	Delivery	2007	National Waiting Times Centre Board	Fitting out and reconfiguring the shell of an empty floor and providing and equipping new medical facilities within an existing hospital.	A	A	G
Royal Museum Masterplan	46	Procurement	2011	National Museums Scotland	Complete refurbishment of the Royal Museum in Edinburgh.	G	G	G
National Intranet	38	Delivery	2010	Scottish Government	The national schools intranet for Scotland's 800,000 teachers and pupils.	G	A	G
eCare	33	Delivery	2009 & ongoing	Scottish Government	IT project to enable information sharing and collaboration between health boards and councils (to support single shared assessments and child protection messaging).	A	A	G
Royal Botanic Garden Visitor Centre	16	Delivery	2009	Royal Botanic Garden Edinburgh	A new purpose-built visitor centre at the west gate entrance to the existing site.	G	A	G

Note: See Exhibit 3 for definitions of R-A-G.

\* Transport Scotland became the principal funder and decision maker for transport projects on its creation in 2006. In most cases, it has delegated contracting authority and delivery to third parties, as indicated in the table.

Source: Audit Scotland

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