Australian Government
Department of Infrastructure, Transport, Cities and Regional Development

Infrastructure Investment Program

Cost Estimation Policy and Implementation

Public sector governance

- Central governments, as the primary funding entity, have a desire that major projects should attend to the needs of society, and that the projects that result in greatest benefits should have priority
- Central governments generally don't deliver projects themselves: the objective is to pave the way for structured and effective preparation and implementation through good governance

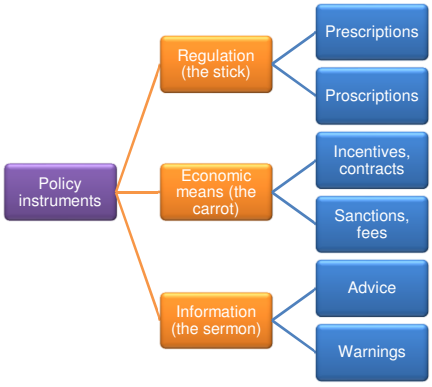
Principles of good governance

Accountability	Transparency	Effectiveness and effect	Responsiveness	Vision	Rule of Law
• authorities have the ability and willingness to show whether decisions and practices are in conformity with clearly defined and adopted objectives.	• decisions and decision-making processes are sufficiently transparent to enable the public sector, as well as civil society, to gain adequate access to information in relation thereto.	• government deliverables are of sufficient quality, and delivered cost effectively and in such manner as to realise the purpose of such deliverables.	• authorities have the capacity and flexibility to respond swiftly to the needs of society and in the public interest.	• authorities are able to anticipate future problems and needs based on existing data and trend information, and to take into account any expected changes and the costs associated therewith (for example demographical, financial, environmental, etc.).	• authorities ensure that projects are implemented in compliance with applicable laws and regulations.

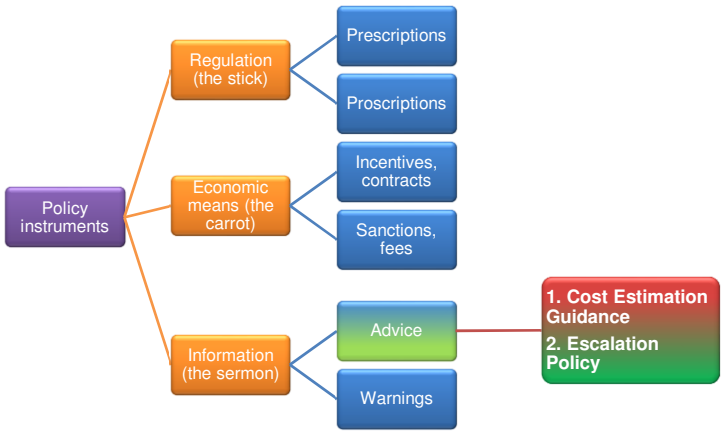
Policy Instruments

In principle, the public sector has three policy instruments at its disposal:

- The Stick (regulation)
- The Carrot (economic means - incentives, contracts, fees, etc)
- The Sermon (information, advice and guidelines, warnings)



Advice and guidance can be a valuable tool



High-level cost estimation requirements

- Probabilistic cost estimates are required for projects greater than $25 million P90 Outturn
- Road projects should be outturned using escalation rates embedded within the Project Cost Breakdown (PCB) template
- Refer to and follow the Department's cost estimation guidance
- Revised estimates are expected for each phase (not applicable if two or more phases are combined)

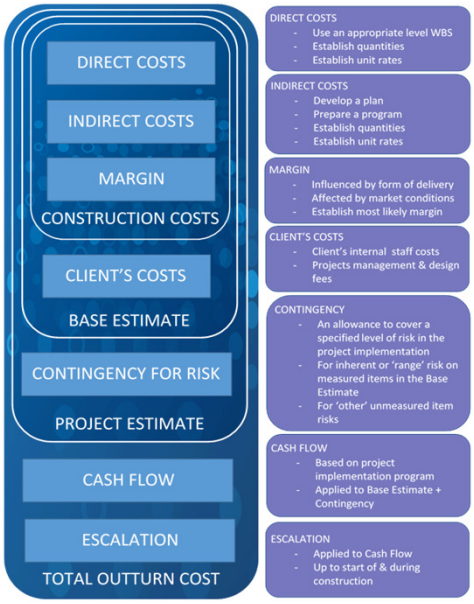
Cost Estimation Guidance

The full suite consisting of six components comprises:

- ➢Overview
- ➢1: Project Scope
- ➢2: Base Cost Estimation
- ➢3A: Probabilistic Contingency Estimation
  - ➢Supplementary guidance
- ➢3B: Deterministic Contingency Estimation
- ➢4: Escalation

Downloadable at https://investment.infrastructure.gov.au/about/funding_and_finance/cost_estimation_guidance.aspx

Components of an estimate



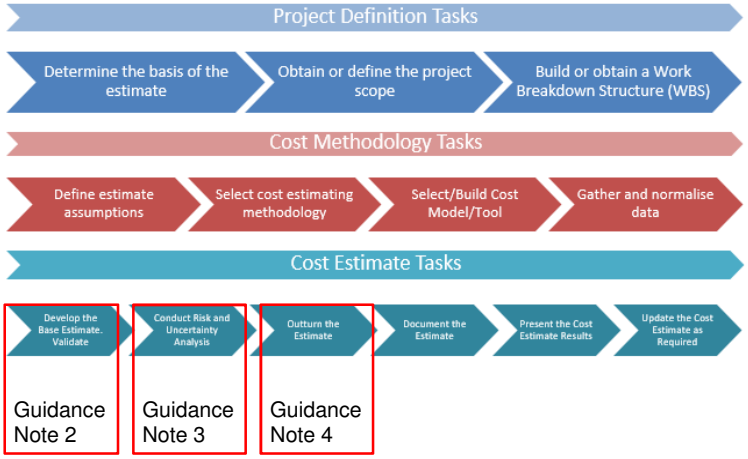
Different representations of project cost

Different representations of a project cost	Cost Components	Total ($ Millions)
Base Estimate	Base Estimate	100.00
Project Estimate (P50)	Base Estimate + P50 project risk	115.00
Project Estimate (P90)	Base Estimate + P90 project risk	140.00
Outturn Estimate (P50)	Base Estimate + P50 project risk + escalation	124.33
Outturn Estimate (P90)	Base Estimate + P90 project risk + escalation	151.36

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	TOTAL
Project Cash Flows	**2016-17**	**2017-18**	**2018-19**	**2019-20**	
	($ Millions)	($ Millions)	($ Millions)	($ Millions)	
Base Estimate	5.00	15.00	40.00	40.00	**100.00**
P50 Contingency Allowance (e.g. 15%)	0.75	2.25	6.00	6.00	15.00
P50 Risk Adjusted Estimate	5.75	17.25	46.00	46.00	**115.00**
P50 Outturn Estimate*	5.89	18.12	49.54	50.78	**124.33**
P90 Contingency Allowance (e.g. 40%)	2.00	6.00	16.00	16.00	40.00
P90 Risk Adjusted Estimate	7.00	21.00	56.00	56.00	**140.00**
P90 Outturn Estimate*	7.18	22.06	60.31	61.81	**151.36**

** The P50 and P90 Outturn Estimates reflect a hypothetical annual escalation rate of 2.5%*

The Cost Estimation Process

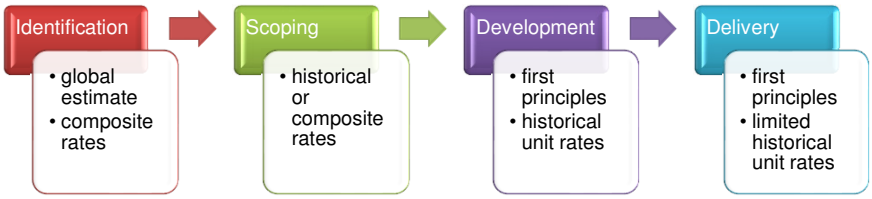


Guidance Note 2 – Base Cost Estimation

Discusses estimating methods:

- First Principles Estimating (sometimes called a point estimate)
- Unit Rate Estimating
- Global Estimating

Applicability at each phase of the project lifecycle:



Contingency

Current Departmental policy:

- Probabilistic estimates for projects > $25 million
- Deterministic estimates for projects < $25 million

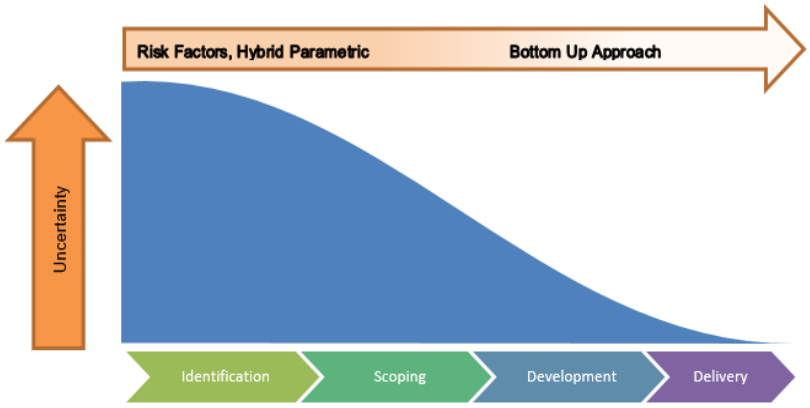
- Because there are no “standards” as such for cost estimation/risk quantification (in the same way there are Australian Standards for engineering designs), it is important that the Department provide robust guidance

Risk quantification techniques (a selection)

Guidance Notes 3A and 3B

- 3B Deterministic contingency estimation
  - Techniques for assessing and quantifying uncertainty on lower value projects
  - Example template on website
- 3A Probabilistic contingency estimation
  - Three different techniques explained
  - Assessed using Monte Carlo simulation
  - Theory and background provided with Supplementary Guidance

Risk quantification techniques through the project lifecycle



A number of worked examples appear throughout the text with working models also available for download from the website:

Guidance notes

The cost estimation guidance, published following a thorough public consultation process, comprises the following key components which are available for download:

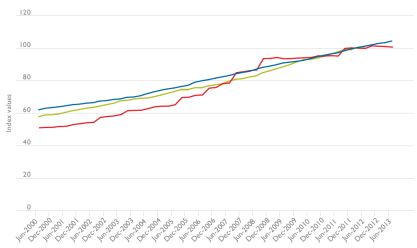
- Guidance Note – Overview, Version 1.0, August 2018 PDF: 1.6 MB
- Guidance Note 1 — Project Scope, Version 1.0, March 2017 PDF: 354 KB
- Guidance Note 2 — Base Cost Estimation, Version 1.0, March 2017 PDF: 514 KB
- Guidance Note 3A – Probabilistic Contingency Estimation, Version 1.0, November 2018 PDF: 2.5 MB
- Guidance Note 3A – Supplementary Guidance, Version 1.0, November 2018 PDF: 4.6 MB
  - Risk Factor model 1 XLSX: 84 KB
  - Risk Factor model 2 XLSX: 96 KB
  - Risk Factor model 3 XLSX: 129 KB
  - Risk Factor model 4XLSX: 92 KB
- Guidance Note 3B – Deterministic Contingency Estimation, Version 1.0, August 2018 PDF: 1.4 MB
  - Range based model XLSX: 870 KB
- Guidance Note 4 – Escalation, Version 1.0, November 2018 PDF: 1.4 MB

Technical policy/guidance - considerations

- Regulations and guidelines can be an impediment to creative thinking
- If every analyst had their own individual model, it would be impossible to ensure any quality standard
- To maintain consistency you could fill in a template of three-point estimates with standard ranges
- But templates and set ranges ensure that the standard of analysis is very low
- Risk analysis is not a packaged commodity
- Each project is unique (although likely to have commonalities)
- Policy should allow for flexibility within a core set of theoretically sound assumptions

Part II

Closer look at the oversight and implementation of the Department's Escalation policy



Escalation policy - background

- Choice of escalation rate can be a major driver of the outturn estimate for a multi-year project
- Prior to 2015 jurisdictions submitting funding proposals were free to nominate their own escalation rates
- Justifiably, it was felt that rates being nominated at the time (6% per annum or more) were unrealistic in a deflationary environment
- No consistency between jurisdictions
  - Equity and transparency is important where there is competition between delivery agencies for scarce public funds

Escalation policy - development

- In 2014/15 the Department embarked on a significant journey of escalation policy development
- Development is ongoing

Aim:

- Develop a composite index series using an appropriate weighting of each input for a typical road construction project
- Provide a logically built, jurisdiction-specific escalation series for road construction projects
  - Convert cost estimates, developed in today's dollars, into outturn dollars for budgetary purposes

Principles of an index series

I. Provide robust estimates of movements in actual costs (materials, labour, profit margins) for road construction
II. Be available for all Australian jurisdictions
III. Be based on sound, logical and transparent foundations
IV. Can be calculated using regularly published and publicly available data
V. Recognise costs borne by jurisdictions outside of the construction process itself

Component weights for road construction projects

Component	Weight
Construction Wages	29%
Engineering Design & Consulting Services	14%
Plant & Equipment Hire	14%
Concrete, Cement & Sand	22%
Bitumen	12%
Diesel	4%
Reinforcing Steel	6%
Project Base Cost	***100%***

Escalation Forecasts

- Forecasts for inputs consider a number of factors:
  - Enterprise bargaining agreements
  - Supply/demand for materials across the construction sector more broadly
  - Commodity prices (iron ore, oil)
  - Exchange rates
  - Overall level of aggregate demand (market conditions) within the economy to predict contractor margins
  - Changes in technology and general industry-wide productivity

Implementation

- Department engages BIS Oxford Economics to update forecasts (for the next seven years) on an annual basis
- Jurisdictions are provided with rates and accompanying narrative for comment before forecasts are finalised (collaborative approach)
- A template is provided with escalation rates embedded
  - Outturn estimate is automatically calculated from the project cashflow

Table 5: PROJECT CASHFLOW AND ESCALATION CALCULATION TABLE

Total Scoping and Development Phase Expenditure		Scoping and Development Phase expenditure		Project Cashflow 2018/19 onwards										TOTAL Project Costs
Click for simplified view		Scoping Phase	Development Phase	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	If this cell is Red, it indicates that the Total Base Estimate (below) is different to the Total Base
				2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	
Base Estimate	$11,594,000	$1,103,021.00	$10,490,979.00	$12,551,823	$15,999,803	$44,078,684	$93,830,364	$26,490,720	$23,770,570					$228,315,964
P50 Project Estimate	$11,594,000	$1,103,021.00	$10,490,979.00	$13,077,676	$21,556,722	$51,772,869	$79,908,742	$67,420,818	$13,534,807	$20,306,319				$279,171,953
P90 Project Estimate	$11,594,000	$1,103,021.00	$10,490,979.00	$15,196,326	$21,057,483	$50,621,323	$83,812,967	$60,827,629	$24,192,523	$24,963,100	$3,007,206			$295,272,557
Uplift Factor				0.920	0.920	0.920	0.920	0.920	0.920	0.920	0.920	0.920	0.920	
Base Estimate (FY 0)		$1,103,021.00	$10,490,979.00	$11,551,307	$14,724,446	$40,565,136	$86,351,069	$24,379,123	$21,875,798	$0	$0	$0	$0	$211,040,879
P50 (FY 0)		$1,103,021.00	$10,490,979.00	$12,035,244	$19,838,418	$47,646,011	$73,535,151	$62,046,650	$12,455,337	$18,687,686	$0	$0	$0	$257,843,095
P90 (FY 0)		$1,103,021.00	$10,490,979.00	$13,985,014	$19,378,973	$46,586,256	$77,132,167	$55,973,008	$22,264,118	$22,973,271	$2,767,439	$0	$0	$272,660,307
Annual Escalation Rate %				8.27%	1.98%	0.15%	1.65%	2.40%	1.86%	2.20%	1.70%	1.70%	1.70%	
Escalation %				108.27%	101.98%	100.15%	101.65%	102.40%	101.86%	102.20%	101.70%	101.70%	101.70%	
Cumulative Escalation Factor (%)				1.083	1.104	1.106	1.124	1.151	1.172	1.198	1.219	1.239	1.260	
P50 Escalation ($)				994,303.09	2,064,843.75	5,036,325.19	9,113,454.82	9,364,515.25	2,148,288.41	3,702,427.43	0.00	0.00	0.00	$32,422,758
P50 Outturn Cost ($)	$1,103,021	$1,103,021.00	$10,490,979.00	13,030,146.61	21,903,261.35	52,682,335.91	82,652,605.62	71,411,164.89	14,602,225.29	22,390,113.37	0.00	0.00	0.00	$290,265,853
P90 Escalation ($)				1,156,082.45	2,017,023.38	4,324,305.96	9,558,724.95	8,448,744.31	3,836,340.70	4,551,492.83	604,773.31	0.00	0.00	$35,097,488
P90 Outturn Cost ($)	$1,103,021	$1,103,021.00	$10,490,979.00	15,141,096.85	21,395,996.82	51,570,561.96	86,690,831.55	64,427,752.78	26,100,458.32	27,524,763.85	3,372,272.57	0.00	0.00	$307,757,795

Concluding remarks

Sound guidance and policy regarding project cost estimates ensure principles of good governance are being followed

Accountability	Transparency	Effectiveness and effect	Responsiveness	Vision	Rule of Law
• authorities have the ability and willingness to show whether decisions and practices are in conformity with clearly defined and adopted objectives.	• decisions and decision-making processes are sufficiently transparent to enable the public sector, as well as civil society, to gain adequate access to information in relation thereto.	• government deliverables are of sufficient quality, and delivered cost effectively and in such manner as to realise the purpose of such deliverables.	• authorities have the capacity and flexibility to respond swiftly to the needs of society and in the public interest.	• authorities are able to anticipate future problems and needs based on existing data and trend information, and to take into account any expected changes and the costs associated therewith (for example demographical, financial, environmental, etc.).	• authorities ensure that projects are implemented in compliance with applicable laws and regulations.
Accountability	**Transparency**	**Effectiveness and effect**	**Responsiveness**	**Vision**	**Rule of Law**
• Projects must be justified and demonstrate benefits to the community	• Escalation forecasts are reproducible	• rigourous project submissions • due diligence activities • incentives to achieve value for money			• Payments made under NLT Act (2014) • PGPA Act

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Australian Government
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