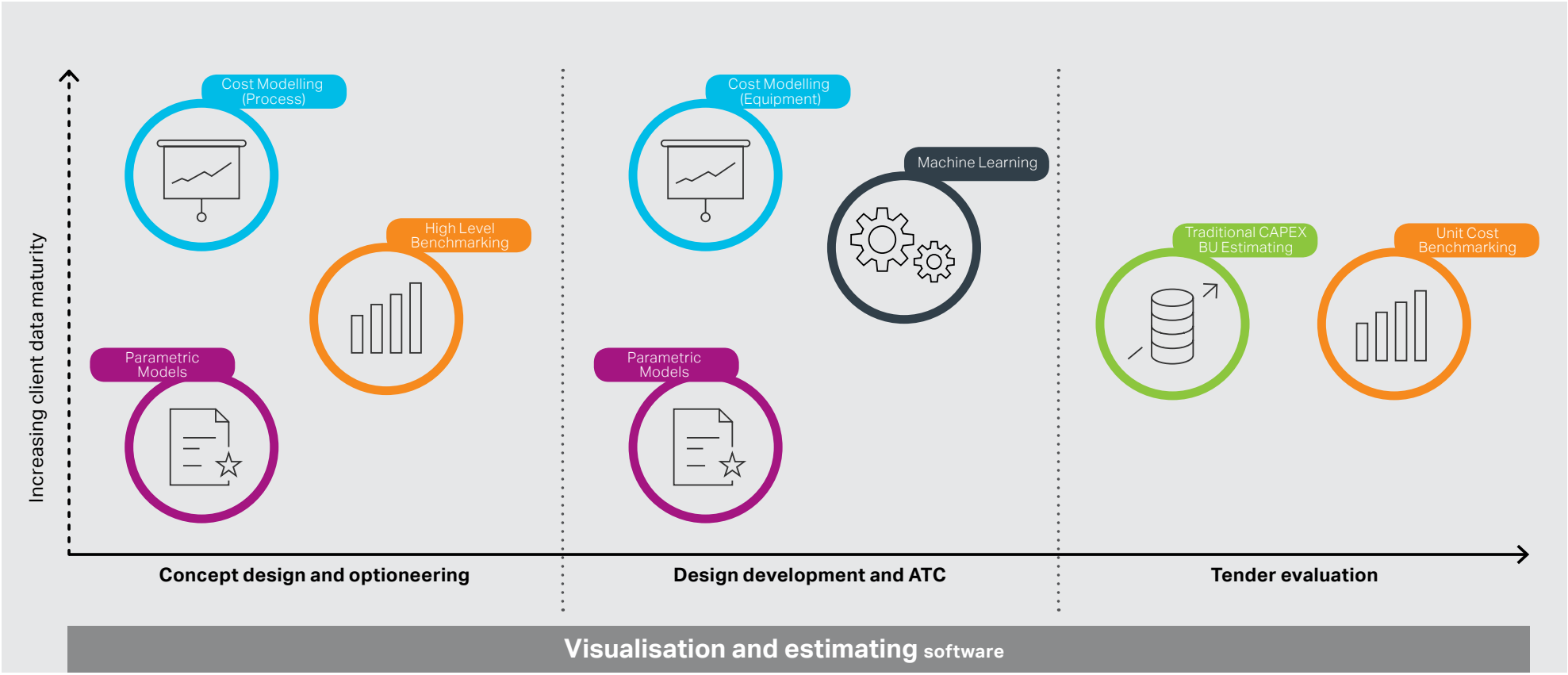
AECOM

Infrastructure cost estimating
Improving cost estimate accuracy

Estimating infrastructure costs is a vital aspect of any project. We are industry leaders in providing a range of tools, techniques and software to enhance our client's estimating accuracy and visualisation of potential efficiencies. With more accurate estimating capabilities our clients can make more intelligent and information-driven business decisions, reduce cost uncertainty across the project lifecycle and ultimately lower solution delivery costs.



We offer estimating solutions for infrastructure clients across multiple sectors, including: water, rail, highways, aviation and nuclear. Our approach is to tailor the estimating solution to the project life cycle stage, available design scope and the bespoke client needs rather than universally apply traditional bottom up estimating or a standard top down solution.

Due to the scale and - for most infrastructure sectors — the need to operate under a regulatory framework, the existing collation of structured historic and estimate cost data presents a unique opportunity for clients to transform this cost data and leverage it into more accurate estimating tools for future projects. Our class-leading experience in this field and the combination of our estimating and cost intelligence teams mean we are well-placed to assist our clients with a range of innovative solutions.

Concept design and optioneering

High level cost modelling (CAPEX and OPEX)

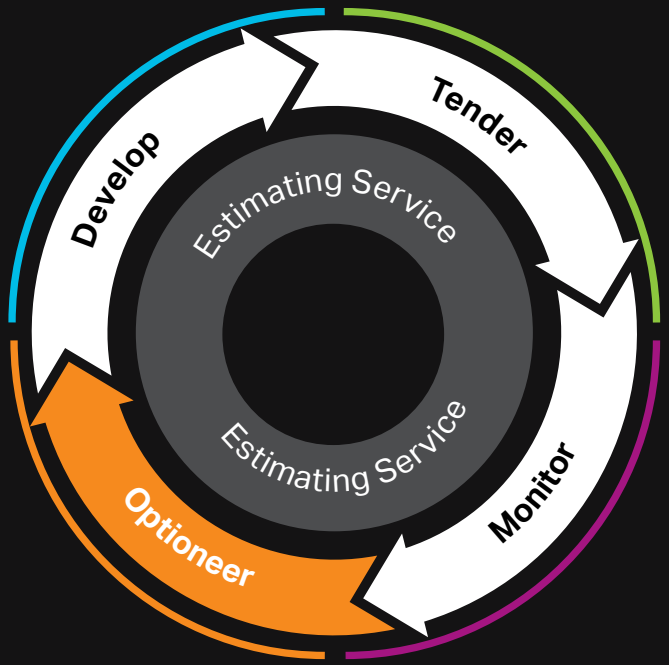
Early stage cost modelling provides an auditable method of rapidly establishing budgetary figures in the absense of project scope, and when based on a client's own historical data is a robust approach to developing future business plans.

Assemblies

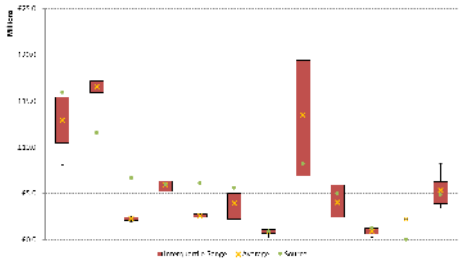
Infrastructure clients may not always hold or have access to a historic dataset of project costs from which to create models for estimating purposes. Assemblies accept the bare minimum of asset details to provide an auditable cost estimate based on a rates library, allowing for the creation of repeatable and consistent costing across programmes.

Benchmarking

Benchmarking is an essential service for infrastructure clients to establish early stage funding requirements and to ensure contractor returns and estimates align with market expectations. AECOM as one of the largest multi-disciplinary consultancies in the world is uniquely placed to assist clients with benchmarking, especially international and pan-sector analyses.



High level cost modelling (CAPEX and OPEX)



Key services

Early-stage whole life estimating using top-down industry models under flexible processes to accomodate varying client requirements, applications or data.

Cost data capture: Understanding the value of consistent data capture against a well-defined breakdown structure can support both the creation of a breakdown structure to facilitate the future estimating and/or the mining of data against an established structure.

Selected experience

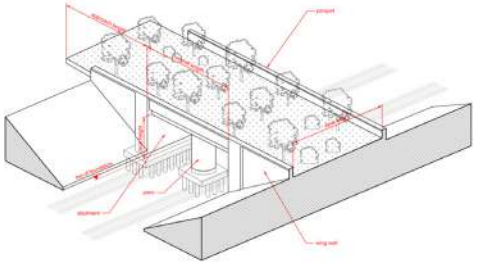
To assist Affinity Water in the creation of auditable cost models for their PR19 Business Plan, AECOM created a range of capex and opex cost models from historic company data and third party sources to enable accurate top down estimates to be created for a range of project solutions.

Regulatory business plan support, Anglian Water
AECOM are providing a range of PR19 analytics and cost intelligence commissions which have included client data auditing and production of hundreds of capital cost models.

Assemblies

Key services

AECOM are the market leaders in the creation of bespoke assembly templates for infrastructure clients. Our services include the creation of a rates library based on client historic data or utilising our own infrastructure rates library, estimating logic and standard design parameters and logic for a range of infrastructure assets.



Selected experience

HS2 Phase 1 Structures Assemblies
AECOM developed 25 assemblies for a variety of above- and below-ground structures identified as key cost drivers on the Phase 1 programme of works. Working closely with HS2's design team to establish standard designs and parameters, estimating logic was developed and combined with a centralised rates library to derive a full bill of quantities at any stage of design maturity.

Benchmarking

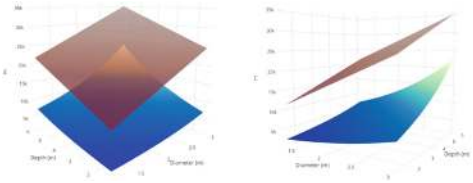
Key services

AECOM can provide benchmarking at all levels:

- International
- High Level Metrics (Cost/km of high speed rail)
- Structures and Assets (Viaduct, Tunnels etc.

Selected experience

HS2
AECOM has undertaken a range of benchmarking commissions for HS2 Phase 1 including international and indirect cost benchmarking, resource, and unit rate benchmarking. AECOM collated all unit benchmarks into a benchmark book which could be used by the estimating and leadership teams to quote benchmark rates ensuring that one source of rates were being utilised by HS2.



Heathrow Southern Rail
As part of the design optioneering services provided, AECOM also developed early stage costs for tunnelling, International benchmarks of tunnelling costs for rail projects were utilised to ensure the current estimate for tunnelling costs were within the accepted norms..

Design development and target cost setting

Process and equipment cost modelling (CAPEX and OPEX)

Process and equipment level cost models can provide an efficient source for rapidly setting initial project budgets, and an auditable means of updating budgets as the scope evolves. Maintaining a library of models allows estimates to be based on the clients own historic data and tailored to the environment and site complexities that most impact their cost certainty.

Assemblies

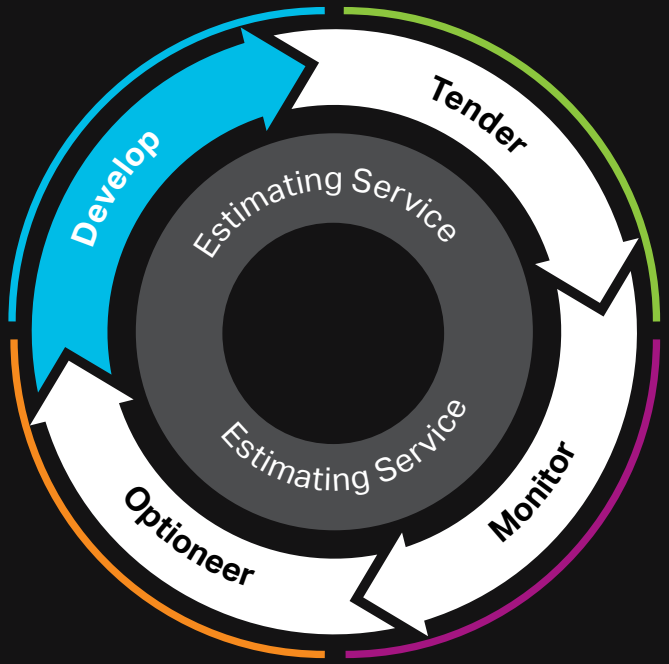
Assemblies provide the ability to utilise emerging scope details as design maturity increases and so increase the accuracy of the estimates produced by the model while providing full transparency of the impact of cost- and scope- change.

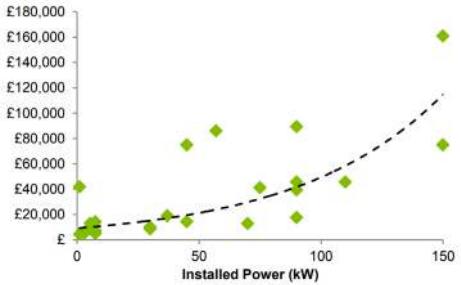
Machine learning

The use of machine learning techniques such as decision trees can significantly increase the cost accuracy of estimates where a large cleansed data set exists. The use of machine learning is at present most applicable to mature infrastructure clients with 5-10 years of structured cost data from which machine learning has several advantages to traditional cost modelling techniques:

- Big-data solutions have been commoditised and are now accessible to clients, allowing enormous datasets to be processed.
- Machine learning allows all available data to be analysed, with an order of magnitude increase in the number of variables that can feasibly be explored for relationships.

Significant efficiences in the resources associated with data cleansing, analysis and model production, and subsequent model usage, can be realised through integrated machine learning and big data solutions.





Process and equipment cost modelling (CAPEX and OPEX)

Key services

Scope level estimating to consistently and efficiently develop costs for entire programmes of work covering CAPEX, OPEX, carbon and whole life cost forecasts.

Selected experience

AMP7 Benchmarking, Tier 1 Contractor
Comparison of costs at a process and unit rate level compared to industry in general and specifically against the client's own cost data to quantify inflationary risks over a contract period.

Estimate Cost Assurance,
UK County Council
Wishing to re-purpose the land on which a sewage treatment works was sited, the council approached the owning Water Company for an estimate of the costs of relocating the works. Using their suite of industry cost models, AECOM were able to efficiently provide a detailed comparison of the Water Company's estimate against industry, highlighting areas of potential efficiency.

Assemblies

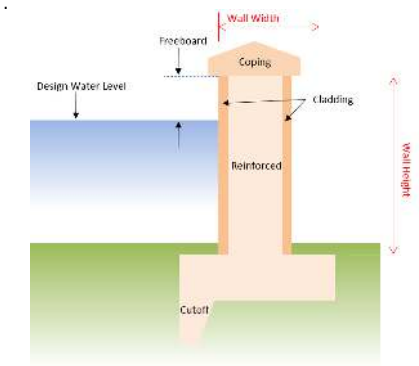
Key services

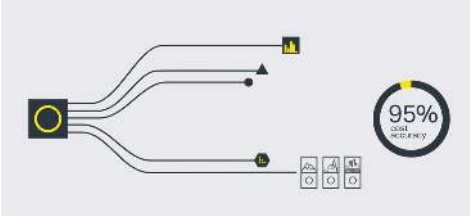
AECOM are the market leaders in the creation of bespoke assembly templates for infrastructure clients, having provided bespoke assemblies to multiple clients in water, rail and aviation sectors.

Selected experience

Environment Agency
The Environment Agency sought a trial of assembly models based on their current design standards and historic costs, supplemented by third party rates where applicable. AECOM has developed assemblies as part of this trial, with the intention to expand this across numerous assets in future.

Gatwick Airport
AECOM have provided a range of assemblies, including several car park assemblies to assist in their optioneering and whole life costing calculations as well as benchmarking market tenders.





Machine learnings

Key services

AECOM can implement machine learning techniques to estimate costs at an increased accuracy to traditional cost modelling methods. Our trials produced a 50% increased cost accuracy from machine learning in comparison to traditional cost modelling. Increased accuracy has the advantages of more accurate investment decisions and increased confidence in target cost setting for both client and contractor.

Selected experience

AECOM are currently trialling various techniques against our infrastructure industry data sets to establish the most accurate technique to employ for our clients. Our trials associated with water sector pipe laying historic cost information has provided encouraging outputs in comparison to the traditional cost modelling approaches adopted by the sector to create business plans and to set target costs for programme of works.

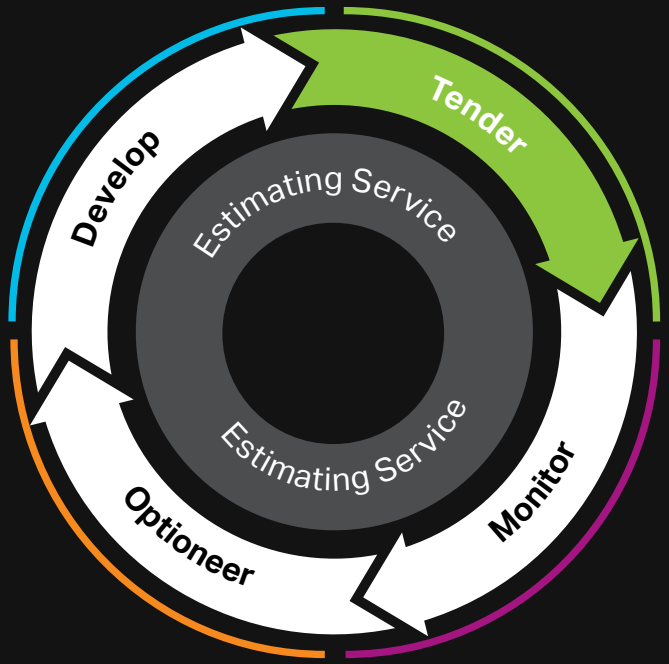
Tender evaluation

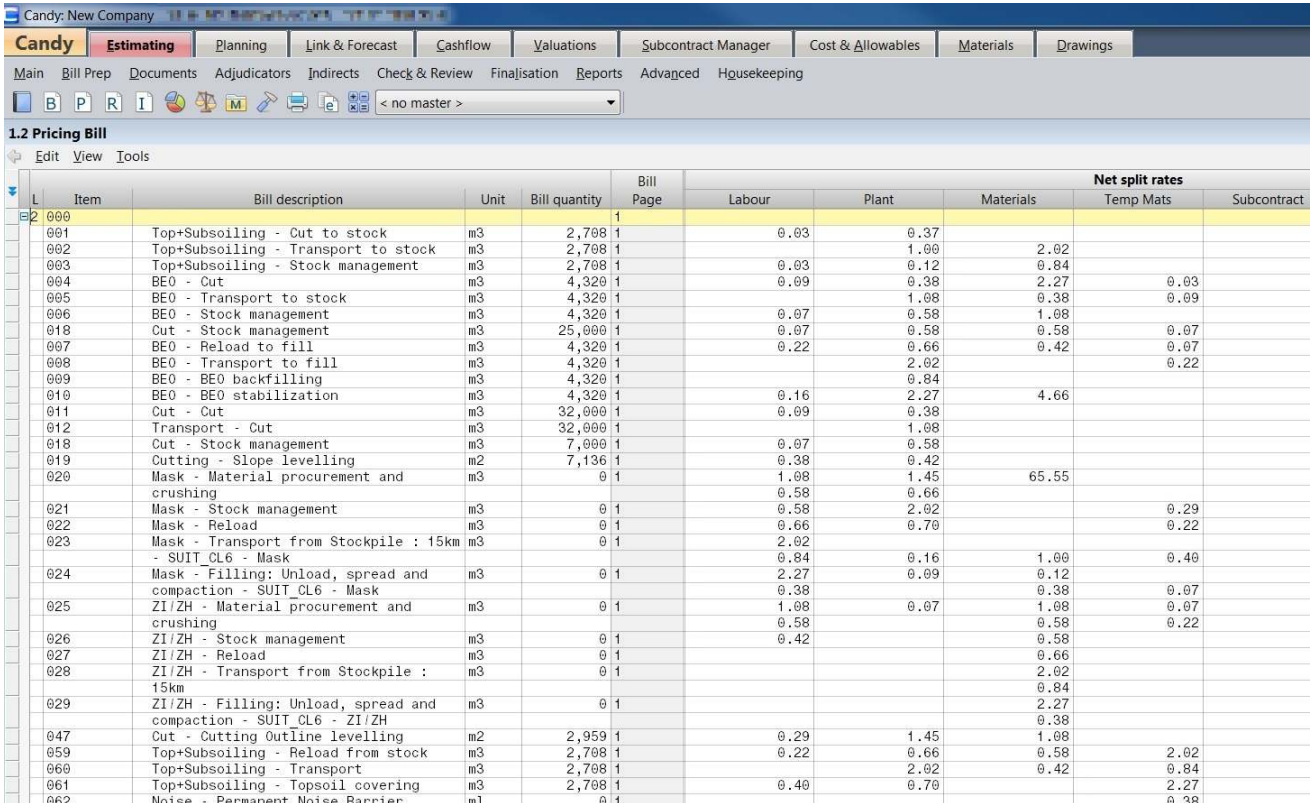
Bottom-up estimating (CAPEX, OPEX, whole life cost, carbon)

AECOM offer a range of bottom-up estimating services for our infrastructure clients covering capital and operational expenditure, whole life cost and carbon, covering the UK and Ireland with offices in Manchester, Birmingham, Dublin and London with a wealth of experience in both government and private clients. Clients such as HS2, Environment Agency, Transport for London, National Rail and Colas Rail, to name just a few. We provide all levels of experience from Graduate to Estimating Managers fully trained and client facing.

Benchmarking

Benchmarking can be undertaken at all stages of a project life cycle for the earliest design stages through to benchmarking of resource rates within tender returns.





Candy: New Company

Candy | Estimating | Planning | Link & Forecast | Cashflow | Valuations | Subcontract Manager | Cost & Allowables | Materials | Drawings

Main | Bill Prep | Documents | Adjudicators | Indirects | Check & Review | Finalisation | Reports | Advanced | Housekeeping

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1.2 Pricing Bill

Edit | View | Tools

L	Item	Bill description	Unit	Bill quantity	Bill Page	Net split rates				
						Labour	Plant	Materials	Temp Mats	Subcontract
2	000				1					
	001	Top+Subsoiling - Cut to stock	m3	2,708	1	0.03	0.37			
	002	Top+Subsoiling - Transport to stock	m3	2,708	1		1.00	2.02		
	003	Top+Subsoiling - Stock management	m3	2,708	1	0.03	0.12	0.84		
	004	BEO - Cut	m3	4,320	1	0.09	0.38	2.27	0.03	
	005	BEO - Transport to stock	m3	4,320	1		1.08	0.38	0.09	
	006	BEO - Stock management	m3	4,320	1	0.07	0.58	1.08		
	018	Cut - Stock management	m3	25,000	1	0.07	0.58	0.58	0.07	
	007	BEO - Reload to fill	m3	4,320	1	0.22	0.66	0.42	0.07	
	008	BEO - Transport to fill	m3	4,320	1		2.02		0.22	
	009	BEO - BEO backfilling	m3	4,320	1		0.84			
	010	BEO - BEO stabilization	m3	4,320	1	0.16	2.27	4.66		
	011	Cut - Cut	m3	32,000	1	0.09	0.38			
	012	Transport - Cut	m3	32,000	1		1.08			
	018	Cut - Stock management	m3	7,000	1	0.07	0.58			
	019	Cutting - Slope levelling	m2	7,136	1	0.38	0.42			
	020	Mask - Material procurement and crushing	m3	0	1	1.08 0.58	1.45 0.66	65.55		
	021	Mask - Stock management	m3	0	1	0.58	2.02		0.29	
	022	Mask - Reload	m3	0	1	0.66	0.70		0.22	
	023	Mask - Transport from Stockpile : 15km - SUIT_CL6 - Mask	m3	0	1	2.02 0.84	0.16	1.00	0.40	
	024	Mask - Filling: Unload, spread and compaction - SUIT_CL6 - Mask	m3	0	1	2.27 0.38	0.09	0.12 0.38	0.07	
	025	ZI/ZH - Material procurement and crushing	m3	0	1	1.08 0.58	0.07	1.08 0.58	0.07 0.22	
	026	ZI/ZH - Stock management	m3	0	1	0.42		0.58		
	027	ZI/ZH - Reload	m3	0	1			0.66		
	028	ZI/ZH - Transport from Stockpile : 15km	m3	0	1			2.02 0.84		
	029	ZI/ZH - Filling: Unload, spread and compaction - SUIT_CL6 - ZI/ZH	m3	0	1			2.27 0.38		
	047	Cut - Cutting Outline levelling	m2	2,959	1	0.29	1.45	1.08		
	059	Top+Subsoiling - Reload from stock	m3	2,708	1	0.22	0.66	0.58	2.02	
	060	Top+Subsoiling - Transport	m3	2,708	1		2.02	0.42	0.84	
	061	Top+Subsoiling - Topsoil covering	m3	2,708	1	0.40	0.70		2.27	
	062	Noise - Permanent Noise Barrier	ml	0	1				0.38	

Bottom-up estimating (CAPEX, OPEX, WLC, carbon)

Selected experience

HS2

Providing central estimating services to the wider HS2 team with Estimators embedded within the Project teams, services include: Cost planning, detailed estimating and validation services to the £27bn programme.

Transport for London

Providing estimating services within the surface transport programme (£20m) validating supplier estimates for both accuracy and value for money.

Wessex Water

AECOM provided Wessex Water with CAPEX and OPEX estimates for a range of projects as part of their PR19 Business Plan submission. A standardised estimating template and a cloud based rates library were created to ensure consistency and robust updating of costs.

Dublin Airport

As part of Dublin Airport's CIP2020 capital investment programme, AECOM lead the feasibility process to optimise the Dublin Airport Authority's (DAA) investment plan to meet projected future passengers demand and regulatory targets. AECOM's combined team worked alongside the DAA to develop optimal solutions.

Benchmarking

Key services

AECOM can provide benchmarking at the following levels:

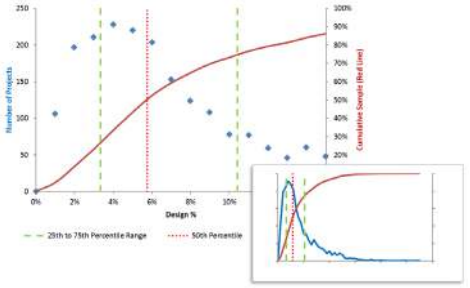
- Unit rates
- Resource rates (direct and indirect)
- Programme durations
- Indirect costs.

Selected experience

Tier 1 Contractor

A Tier 1 Contractor required industry benchmarks against a range of Water Company cost models as part of a tender process assurance.

To give the Contractor our view of industry costs against the Water Company models, AECOM utilised our industry cost models, normalised appropriately to reflect the standard specification used by the Water Company. The resulting output visually identified which models were outside of AECOM's view of industry costs and enabled the Contractor to understand the risks associated as part of the tender process.



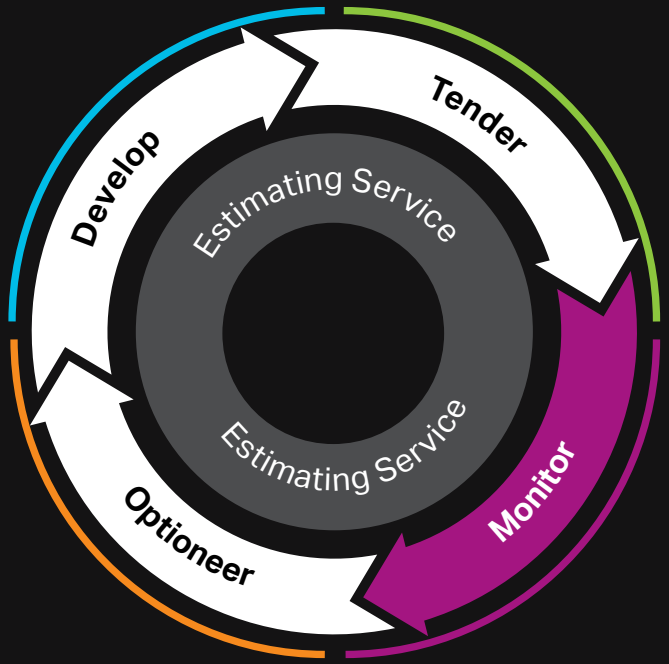
Estimating software and visualisation

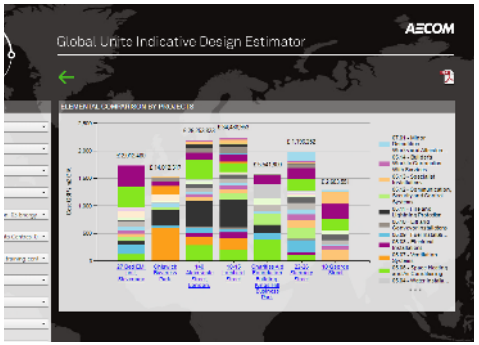
Estimating software

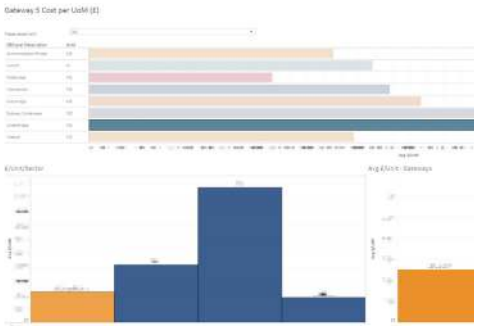
Estimating software platforms such as CostOS, Candy and CostX provide clients with the ability to create robust estimates using centrally managed contemporary cost data and build a historical cost database from which visualisation and benchmarking can be produced. Leveraging all the features of these packages can increase commercial assurance and provide powerful integration opportunities with procurement and programming workstreams as part of a multi-dimensional BIM solution.

Visualisation

With ever increasing cost data being collated by infrastructure clients the need to store, analyse and visualise this data to enable intelligent client decisions is turning into an essential service. Modern cloud-based tools such as Tableau and PowerBI provide powerful capabilities but often require specialist knowledge to successfully connect to corporate databases and unlock live automated reporting. However, when used to their full potential these visualisation platforms can enable rapid and transformative insights into cost data that assist clients in understanding and reacting to cost performance changes.







Estimating software

Key services

AECOM can offer support, training and implementation of all key estimating software packages.

Selected experience

HS2

After a National Audit Office report on the use of Excel spreadsheets to hold estimates, HS2 appointed AECOM to implement an estimating platform and process to increase the integrity of the estimates for Phase One.

AECOM worked with HS2 to utilise Prism Estimator (an estimating software package based on CostOS) across the estimating team and to ensure that business as usual practice of uploading cost information into Prism Estimator was implemented at each gateway, bringing consistency in the breakdown structures and resource rate coding used across all contributing contractors. The unified system provides a single source of up to date estimates for the entire programme and facilitates rapid identification of significant changes in costs or quantities.

Environment Agency

AECOM utilized CostX to undertake an initial measure from provided drawings and worked closely with both the client team and the AECOM water engineering team to ensure that the estimate accurately reflected the scope of works.

AECOM worked with the client team to determine the level of detail required. By implementing this approach AECOM were able to clearly demonstrate the assumptions made within the estimate in terms of coverage and measurement. As changes were made to the required scope AECOM were able to quickly and easily access the measure to demonstrate the impact of these changes.

Visualisation

Key services

AECOM have extensive experience in the provision of visualisation solutions using both client tools and industry leading applications. Our visualisation services for business decision making, performance tracking and business plan development are keenly sought by our clients.

Selected experience

HS2

HS2 appointed AECOM to develop a visualisation process to provide live dashboard reporting on Phase 1 estimating and to assist in the visualisation and benchmarking of contractor rates. AECOM utilised Tableau to visualise the cost information contained within Prism Estimator and combined with HS2's GIS systems to provide interactive maps and visualisations showing programme expenditure and enabling interactive interrogation of the estimates and comparisons of contractors at all levels of cost breakdown structure.

About AECOM
AECOM is built to deliver a better world. We design, build, finance and operate critical infrastructure assets for governments, businesses and organizations. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A *Fortune 500* firm, AECOM had revenue of approximately $20.2 billion during fiscal year 2018. See how we deliver what others can only imagine at aecom.com and @AECOM.

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