Heathrow

Megaproject outcome drivers

Benchmarking fact base

20 January 2026

Current context and approach for the megaproject outcome drivers for Heathrow Expansion

Context

This document is a benchmarking and fact base for megaproject outcome drivers

The CAA's current regulatory framework for HAL regulates airport business-as-usual operations to promote the efficient delivery of high-quality services to customers

Delivery of an infrastructure megaproject adjacent to main operations is not a focus of this regulatory framework, especially one with multi-faceted green and brownfield sub-projects

The CAA is exploring **alternative regulatory models that would incentivise the timely and efficient delivery** of capacity expansion

The CAA will evaluate alternative regulatory models based on:

- Appropriate support for capacity expansion
- Costs
- Finance
- Practicality
- Promotion of competition
- Service quality

Our approach

Focus on the key characteristics of delivering privately financed megaprojects on time and cost efficiently, ultimately supporting the best outcomes for customers

Developing key criteria:

- Financeability
- Timeliness
- Quality end-result

Overlaid with key regulatory framework elements and choices, including:

- Structure
- Governance
- Incentives

Critical megaproject success and failure modes are identified through triangulation of theory and comparable projects

EXAMPLES SHOWN ARE ILLUSTRATIVE AND NOT EXHAUSTIVE

This perspective is based on publicly available information that can be accessed and verified by the CAA

Megaproject literature

Academic and practitioner research identifying systemic drivers of megaproject success and failure


Survival of the unfittest: why the worst infrastructure gets built—and what we can do about it

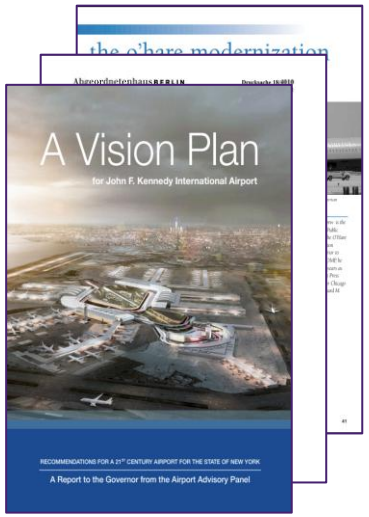
Bent Flyvbjerg

I. Introduction

- Range of academic research
- Practitioner analysis
- Studies by OECD, WEF, World Bank

Comparable airport cases

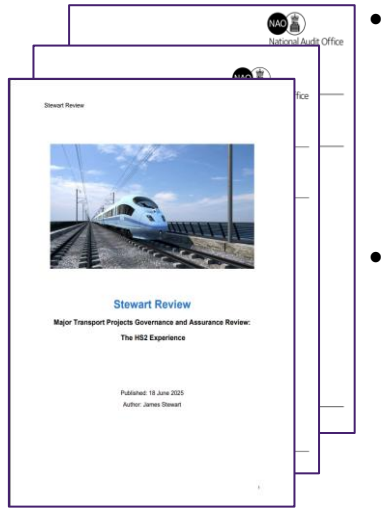
Lessons from comparable airport developments in mature regulatory and delivery environments like Western Europe and North America



- Expert panel report to the New York Governor on JFK Airport redevelopment
- German parliamentary inquiry into BER
- City of Chicago and FAA programme documentation on O'Hare expansion

UK infrastructure cases

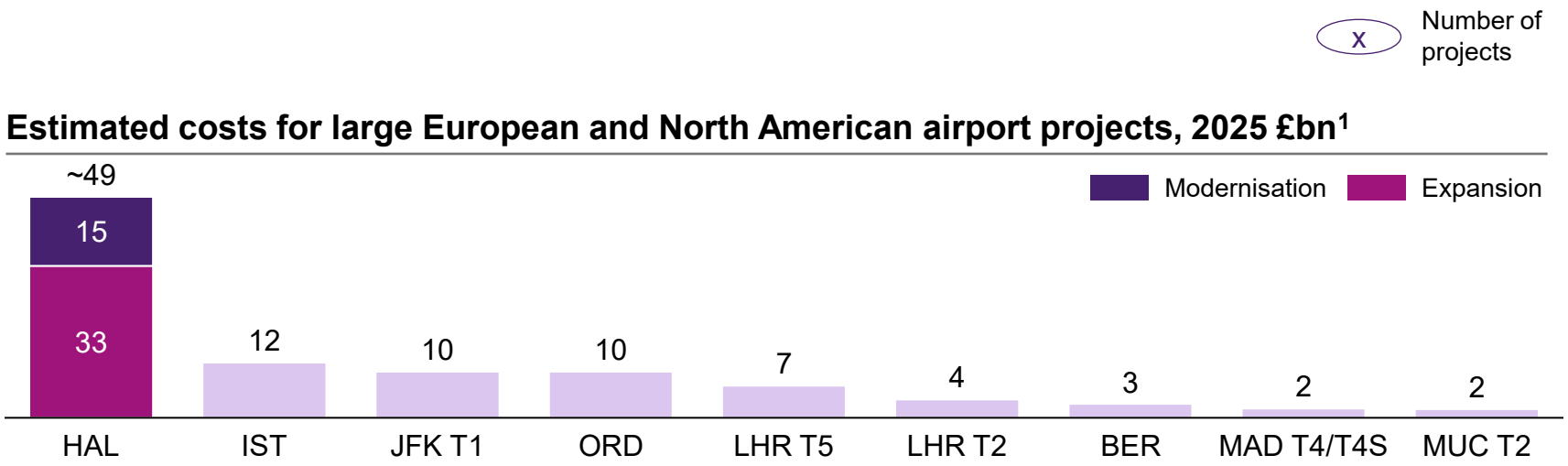
Insights from large UK infrastructure programmes facing similar complexity and scrutiny in regulated industries

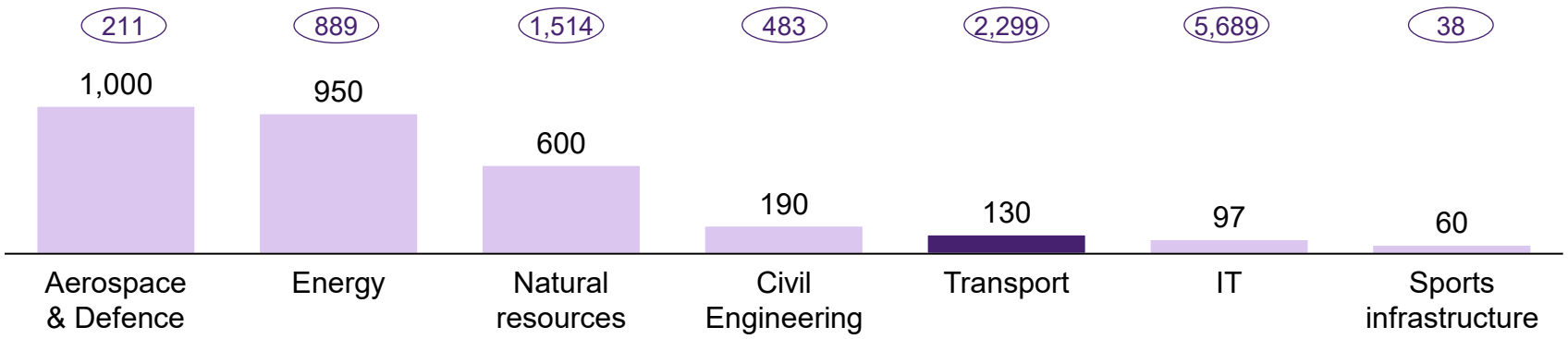


- National Audit Office reviews of cost, schedule and governance of HS2 and Thames Tideway
- Independent review of HS2 delivery and governance (Stewart Review)

Contents

Heathrow's third runway is a megaproject within the context of airport and wider infrastructure projects





1. Based on initial announced budget estimates, converted to GBP and inflated to 2025 based on CPI

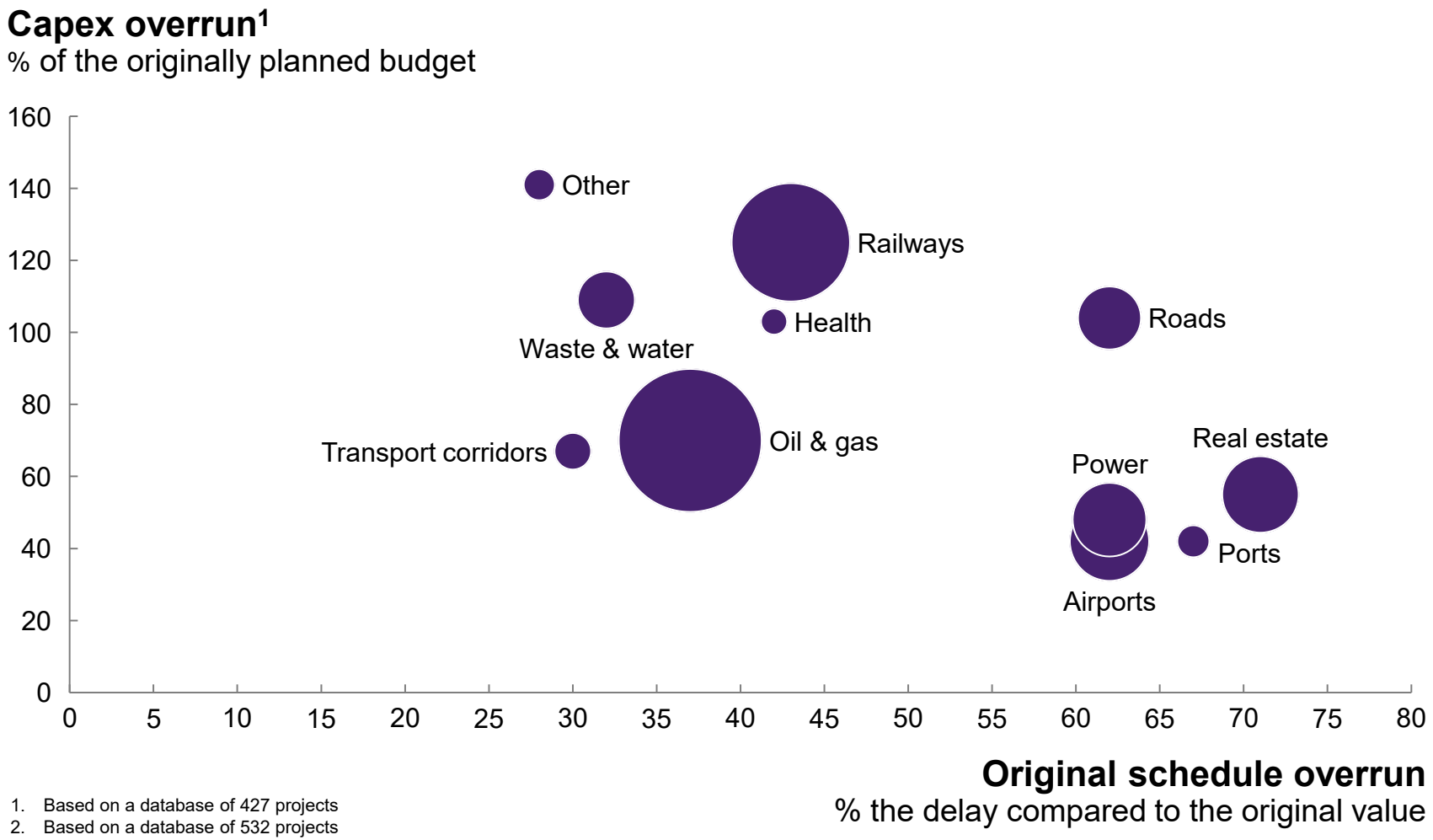
Source: Oxford Global Projects; HAL; https://www.invest.gov.tr/en/news/news-from-turkey/pages/istanbul-airport-worlds-new-hub-officially-opened; http://news.bbc.co.uk/2/hi/business/1666932.stm; https://www.chicago.gov/content/dam/city/depts/mayor/Press%20Room/Press%20Releases/2018/March/0328_HistoricAgreementTransformOHareAirport.pdf; https://www.portauthoritybuilds.com/redevelopment/us/en/jfk/planned-projects/terminal-1/news/governor-hochul-announces-plan-to-build-world-class--9-5-billion.html; https://mediacentre.heathrow.com/pressrelease/detail/4286; https://www.bundestag.de/resource/blob/405502/0bff178b22dc872fd2e6756b465f4214/WD-7-066-13-pdf; https://www.dublinairport.com/latest-news/2025/07/17/daa-statement-regarding-north-runway-planning-decision

Implications

Heathrow's 3rd runway is a megaproject both within aviation / transport and more broadly

It has megaproject characteristics beyond business-as-usual capex expenditure

Most megaprojects “fail”, materialising in large capex and/or schedule overruns



1. Based on a database of 427 projects
2. Based on a database of 532 projects
3. Flyvbjerg, Bent, 'Introduction: The Iron Law of Megaproject Management', in Bent Flyvbjerg (ed.), *The Oxford Handbook of Megaproject Management*, Oxford Handbooks (2017)

Source: Infrastructure project database based on public announcements

91.5%

of megaprojects “fail” due to cost and/or schedule overruns according to Bent Flyvbjerg’s analysis of 16,000 projects[3]

79%

Cost overrun relative to the original budget[2]

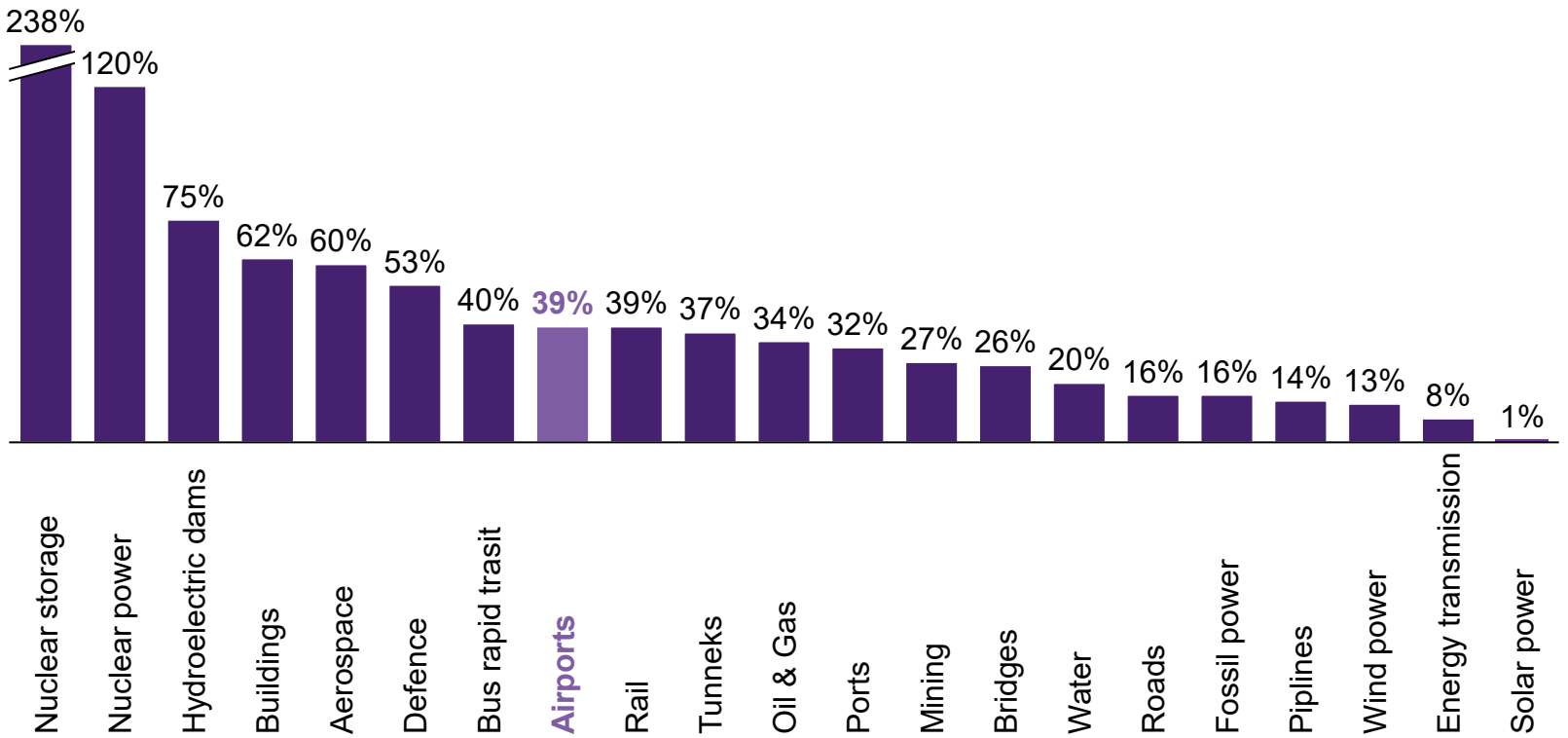
52%

Average delay compared to the original schedule[1]

Heathrow

Most megaprojects have cost overruns across different industries, with airport projects having ~40% cost overruns

Mean cost overrun by project type, %



Key insights

39%

Airports average cost overruns

>120%

Nuclear (storage and power) skew overall cost overrun figures

1. Dataset of 310 post-G3 projects with spend in last 5 years. Excludes projects with erroneous data. Capex overrun compares EAC to approved G3 budget; Portfolio average reflects weighted mean, project average reflects unweighted mean variance

Source: Prof. Bent Flyvbjerg Database, Capital Projects Apr25 full list. Database includes also non-capex related projects like event management, exploration, processing of materials

Three criteria for how to set-up and measure megaproject outcomes: financeability, timeliness, and providing cost-efficient quality

Best practice (not exhaustive)

There is no single source for megaproject success criteria, but academic literature and practitioners point to…

"Success in megaproject management is typically defined as projects being **delivered on budget, time, and with the promised benefits**."

The Iron Law of Megaproject Management, Bent Flyvbjerg, 2017

OXFORD GLOBAL PROJECTS

Moving from the iron triangle of adherence to budget, scope, and schedule to "Delivered value that was worth the effort and expense"

PMBOK® Guide – 7th Edition

Project Management Institute.

Megaproject success criteria	How this is assessed
Financeability The project remains privately financeable and investible across its lifecycle, without requiring extraordinary intervention, and with financing costs broadly aligned to expectation	• Where there any revenue or payback guarantees and were they breached or stressed? • Was the project funded broadly as intended, or did it require bailouts, guarantees, or restructuring, including government intervention? • How did financing costs evolve relative to expectations? • Was access to finance maintained throughout delivery without intervention?
Timeliness The project is delivered within a reasonable range of its original time expectations, with delays actively managed rather than becoming structural	• How did the opening date compare to the original baseline? • Were schedules broadly stable, or repeatedly reset? • Were delays driven by deliverable scope choices or by rework, regulatory failure or readiness issues? • Was the delivery approach practical given governance complexity and decision-making requirements?
Efficient quality The asset provides the intended level of service and performance at opening, without imposing disproportionate cost or disruption on users or the public sector	• Did final costs materially change affordability for users? • Did the delivered asset operate reliably at or near intended capacity at opening? • Were users exposed to material disruption or degraded performance following opening? • Were significant post-opening interventions or restrictions required to maintain service quality?

Source: Flyvbjerg, B. (2017). The Iron Law of Megaproject Management. Harvard Business Review, September–October 2017; PMI (2021) A Guide to the Project Management Body of Knowledge

The structure, governance, and incentives are important elements of how a megaproject is set-up…

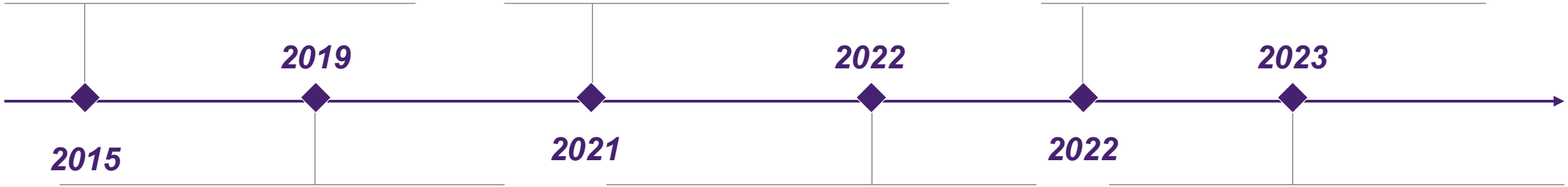
Elements	Sub-elements
1. Structure Defines how assets, roles, risks and decision rights are allocated	**A. Ownership:** Determines who owns major assets over their life cycle and therefore who ultimately bears construction, performance and stranded-asset risk
	B. Operating structure: Sets how design, build, operate and maintain responsibilities are bundled or separated, shaping coordination, interfaces and accountability during delivery
2. Governance Establishes the mechanisms through which investment decisions are approved, challenged and enforced	**A. Capex governance:** Allocates decision rights and veto powers across regulator, operator and users at different cost and risk thresholds to control spend without preventing progress
	B. Capex targets: Defines how and when scope, cost and schedule commitments are set, staged and adjusted over the life of a project
	C. Governance acceleration: Creates potential regulatory mechanisms to enable faster decision-making where delay would materially undermine delivery
3. Incentives Determines how costs are recovered, returns earned, and risks shared	**A. Asset pricing:** Sets how capital is remunerated over time (e.g. RAB, commercial negotiations with airlines), shaping investor confidence and cost of capital
	B. Asset definition (for RAB only): Determines which assets are included in RAB, and how bespoke or ring-fenced investments are treated to manage risk and incentives
	C. Risk sharing mechanism: Sets out how risks are allocated between investors, users, consumers and the state to preserve financeability while maintaining delivery discipline

…the design choices within each sub-element can impact the outcomes of a megaproject

Element	Sub-elements	Design choices (detail in appendix)				
1. Structure Defines how assets, roles, risks and decision rights are allocated	**A. Ownership:** Who owns the assets over its life cycle	Single owner	SPV	3rd party owner	Multi-owner	Public owner
	B. Operating structure: How design, build, operate and maintain are organised	Integrated	Design-Build-Operate	Operate-only	Concession	
2. Governance Establishes the mechanisms through which investment decisions are approved, challenged and enforced	**A. Capex governance:** Who has decision and veto rights, in which cases	Consult-led	User veto	Independent committee		
	B. Capex targets: How scope, cost and schedule are specified and managed	Milestone-based	Schedule-locked	Cost/schedule locked	Stage-gated	
	C. Governance acceleration: What is the dedicated process for acceleration	Dedicated framework	Fast-track approval	Standard process		
3. Incentives Determines how costs are recovered, returns earned, and risks shared	**A. Asset pricing:** How capital is remunerated	RAB	LRIC	Price benchmarking	Commercial	
	B. Asset definition (for RAB only): What sits inside the regulatory perimeter	Single RAB	Dual RAB	Hybrid RAB		
	C. Risk sharing: How construction, demand and regulatory risks are allocated	Investor-led	Shared risk	Consumer-led	Government backstop	

UK infrastructure regulation is trending towards delivery-focused models that prioritise speed, financeability, and long-term outcomes for consumers

TIMELINE NOT TO SCALE - NOT EXHAUSTIVE



2015

DfT / TfL / IPA

Independent reviews identified fragmented sponsorship, weak system integration and late intervention as challenges, reshaping UK regulator approach for megaprojects

2019

Ofwat

Created bespoke project licence for a single-purpose Infrastructure Provider, ring-fencing accountability and enabling low-cost finance

2021

DfT

Review concluded that fragmentation undermined cost control and delivery, recommending a single “guiding mind” to plan, commission and integrate the network[1]

2022

Accelerated Strategic Transmission framework (ASTI)

New framework to fast-track nationally critical electricity transmission projects through earlier funding decisions and accelerated regulatory approvals

2022

BEIS

Implemented a RAB-based model to encourage new nuclear projects, targeting financeability and timely delivery of large, bespoke infrastructure

2023

Project SPEED

Introduced Project SPEED and PACE to streamline rail project development and approvals, reducing assurance burden and accelerating nationally significant enhancements

Source: Ofwat guidance on approach to the economic regulation of the Infrastructure Provider for the Thames Tideway Tunnel (2015); KPMG, Independent review of Crossrail – Governance, Financial, Commercial (2019); NAO, Completing Crossrail (2019); Great British Railways – the Williams-Shapps Plan for Rail (2021); Ofgem, Decision on accelerating onshore electricity transmission investment (2022); BEIS, Nuclear regulated asset base (RAB) model: statement on procedure and criteria for designation (2022); Network Rail (2024) Station Design – Design Manual

In 2025 there were Government reviews across multiple regulated sectors, incl nuclear, water, rail, and wider infrastructure

TIMELINE NOT TO SCALE - NOT EXHAUSTIVE

Department for Energy Security & Net Zero

Fingleton review

Review identified systemic regulatory and planning barriers to nuclear delivery, recommending reforms to improve accountability, financeability and delivery certainty

Department for Environment Food & Rural Affairs

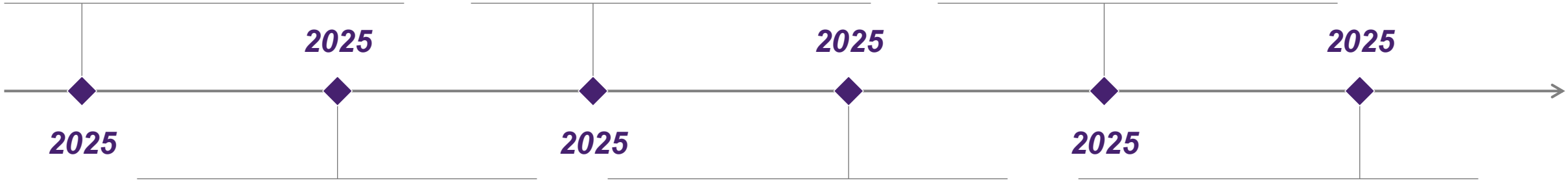
Cunliffe report

Review concluded that prolonged underperformance justified tighter performance targets and company-specific financial supervision, contrasting with delivery-enabling reforms in other sectors

Ministry of Housing, Communities & Local Government

Planning and infrastructure act

Introduced reforms to planning, consent and judicial review to reduce delay for significant national infrastructure, treating delivery speed and certainty as priorities



National Infrastructure & Service Transformation Authority

UK Infrastructure: A 10 Year Strategy

HMT / Cabinet Office

Combined strategic infrastructure planning and delivery assurance to strengthen UK government capability on major projects, and launched 10-year infrastructure strategy to improve certainty

HS2

DfT / HMT

Governance reset post-Stewart review centralised decision-making and reduced layered approvals after recognising that dispersed veto rights delayed cost and schedule recovery

Great British Railways

DfT

Introduced Bill to create single system integrator for rail, bringing planning, contracting and accountability together to reduce fragmentation and improve delivery performance

Source: Major Transport Projects Governance and Assurance Review: The HS2 Experience (2025); UK Infrastructure: A 10 Year Strategy (2025); Planning and Infrastructure Act 2025; All change: The future of British trains arrives as government reforms broken railways (2025); Independent Review of the UK Nuclear Regulatory and Planning Framework (Fingleton Review), 2025; Independent Water Commission (Cunliffe Review), Final Report, 2025

UK regulatory models have been generally trending towards supporting delivery speed, financeability, and system integration

NOT EXHAUSTIVE

x x CAA proposed model, *see appendix for details*

Synthesis of challenges UK regulatory changes have addressed

1 Reducing system fragmentation

Major reforms have responded to fragmentation by re-centralising planning, decision-making, and accountability (Williams Review, GBR, HS2 reset)

2 Simplifying delivery accountability

UK regulation anchoring delivery to a clearly accountable entity or sponsor (Tideway Infrastructure Provider, GBR system integrator, HS2 post-Stewart governance changes)

3 Supporting financing for timely mobilisation

UK regulators prioritising early financeability to unlock fast delivery (Tideway project licence, nuclear RAB, ASTI early funding decisions)

4 Streamlining approvals and assurance

Some reforms have sought to reduce layered approvals and excessive process burden that delay delivery (Crossrail lessons, HS2 reset, ASTI accelerated approvals, planning reform)

5 Treating timeliness as consumer interest

Government and regulators framing delay and uncertainty as economic and consumer harms, prioritising speed and certainty (ASTI, Planning & Infrastructure Act, 10-Year Infra Strategy)

How the CAA's long list of regulatory models could fit in

Models that mention potential structural changes (e.g., separation), stakeholders and interfaces, and ownership:

- 1b *Separation of HAL's system planning function from its operational function*
- 6 *Third party builds and owns assets*
- 7 *Direct competition for airport operation services*
- 8 *Transfer of ownership*

Models that potentially impact how megaprojects are delivered, including responsibilities and accountabilities:

- 5 *Contract for delivery and operation (management contract / DBO variants)*
- 6 *Third-party ownership*
- 7b *Wholesale supplier model*
- 8 *Transfer of ownership*

Models that potentially impact financing and charging:

- 1a *Depending on changes to capex governance requirements*
- 4 *CAA oversight of procurement (including mandated Design & Build)*
- 9 *New frameworks for setting airport charges*

Models that impact approvals and oversight requirements:

- 1a *Depending on changes to capex governance requirements*
- 4 *CAA oversight of procurement (including mandated Design & Build)*

Models that could explicitly or implicitly impact delivery duration:

- 1a *Depending on changes to capex governance requirements (e.g. if onerous)*
- 6 *Where competition is emphasised over speed*
- 7 *Price benchmarking / LRIC-based charging frameworks*
- 9

Where sectors have persistently underperformed, regulators have moved towards more oversight and more granular performance targets to restore credibility

For example, the Cunliffe Review of the water sector recommended stronger performance requirements and a company-specific supervisory function following sustained delivery and environmental failures

Sources: Ofwat guidance on approach to the economic regulation of the Infrastructure Provider for the Thames Tideway Tunnel (2015); KPMG, Independent review of Crossrail – Governance, Financial, Commercial (2019); NAO, Completing Crossrail (2019); Great British Railways – the Williams-Shapps Plan for Rail (2021); Ofgem, Decision on accelerating onshore electricity transmission investment (2022); BEIS, Nuclear regulated asset base (RAB) model: statement on procedure and criteria for designation (2022); Network Rail (2024) Station Design – Design Manual; Major Transport Projects Governance and Assurance Review: The HS2 Experience (2025); UK Infrastructure: A 10 Year Strategy (2025); Planning and Infrastructure Act 2025; All change: The future of British trains arrives as government reforms broken railways (2025); Independent Review of the UK Nuclear Regulatory and Planning Framework (Fingleton Review), 2025; Independent Water Commission (Cunliffe Review), Final Report, 2025

There are a set of megaproject failure modes that should be taken into consideration, with key findings on how to mitigate them

Element	Megaproject failure modes within each element	Key findings on how to mitigate them *(evidence follows)*
Structure	Fragmentation of stakeholders is a key failure point given competing interests and potential for poor communication This includes ownership fragmentation or fragmentation within delivery teams, all obscuring accountabilities and responsibilities	1. **Single "owner" with integrated operating company** is associated with better delivery and more reliable performance by bringing clear roles, responsibilities, and accountabilities to parties and empowering decision making
Governance	Misaligned stakeholders can slow down decision making, delaying timelines, and can dilute ultimate benefits. Misalignment can arise through weak stakeholder governance with unclear roles and responsibilities	2. **Appropriately calibrated stakeholder engagement, including tightly defined veto rights,** support timely delivery while protecting consumer interests
	Premature lock-in of cost, schedule or delivery targets before design is sufficiently mature can drive late change, re-approval and rework, reducing cost and schedule reliability	3. **Sufficient time to achieve design maturity before delivery targets are locked in**, as mature design before building is associated with improved cost and schedule reliability and fewer late changes
	Megaproject delays are often driven by slow, numerous, fragmented approval and decision-making processes, especially when regular reapprovals are required for changes	4. **Dedicated or fast-tracked regulatory oversight** for nationally significant infrastructure can reduce delay and improve cross-stakeholder coordination
Incentives	Overly novel, bespoke, and / or complex remuneration and incentive structures can be difficult to raise cost effective capital against and can cause financeability difficulties	5. **RAB-based remuneration**, combined with streamlined quality governance and assurance, supports financeability and timely delivery for large, bespoke infrastructure

Sources: Flyvbjerg, B. & Gardner, D. (2023), *How Big Things Get Done*, Penguin; Flyvbjerg, Bent, 'Introduction: The Iron Law of Megaproject Management', in Bent Flyvbjerg (ed.), *The Oxford Handbook of Megaproject Management*, Oxford Handbooks (2017); Denicol, J., Davies, A., & Krystallis, I. (2020). What Are the Causes and Cures of Poor Megaproject Performance? A Systematic Literature Review and Research Agenda. *Project Management Journal*, 51(3), 328-345.; Shenhar, A., & Holzmann, V. (2017). The Three Secrets of Megaproject Success: Clear Strategic Vision, Total Alignment, and Adapting to Complexity. *Project Management Journal*, 48(6), 29-46.; Garemo, N., Matzinger, S., & Palter, R. (2015). Megaprojects: The good, the bad, and the better. McKinsey & Company

High level benchmarking indicates elements of the framework which could support megaproject delivery and avoid challenges

Element	Key findings on mitigations	How the regulatory models could link to the findings	
Structure	1. **Single "owner" with integrated operating company** is associated with better delivery and more reliable performance than fragmented models by bringing clear roles, responsibilities, and accountabilities to parties and empowering decision making	1a 6 7b 1b 7a 8	Model 1a discusses changes to governance within existing integrated delivery structure, while models 1b, 6, 7, and 8 discuss ownership structures and the number of interfaces
Governance	2. **Appropriately calibrated stakeholder engagement, including tightly defined veto rights,** support timely delivery while protecting consumer interests	1a 4a 1b	Models 1a, 1b, and 4 could change veto thresholds and requirements for stakeholder engagement
	3. **Sufficient design maturity before delivery targets are locked in** is associated with improved cost and schedule reliability and fewer late changes	1a 3 2	Models 1a and 2 (and 3 depending on long-term changes) could embed staged "design maturity" gates in capex governance before committing binding delivery targets
	4. **Dedicated or fast-tracked regulatory oversight** for nationally significant infrastructure can reduce delay and improve cross-stakeholder coordination	1a 3	Models 1a and 3 would change the regulatory focus within the existing framework, including price-controls and governance processes
Incentives	5. **RAB-based remuneration**, combined with streamlined quality governance and assurance, supports financeability and timely delivery for large, bespoke infrastructure	1a 3 9b 2 9a 9c	Models 1a, 2 and 3 evolve the existing RAB-based framework, while model 9 would be a departure from the RAB model

The key findings on how to mitigate megaproject challenges are grounded in observed quantitative evidence

Element	Key findings on mitigations	Quantitative evidence
Structure	1. **Single "owner" with integrated operating company** is associated with better delivery and more reliable performance by bringing clear roles, responsibilities, and accountabilities to parties and empowering decision making	***Costs increase by ~33% on average with each additional "owner" added to a megaproject*** *This estimate is based on a regression analysis of over 90 component-year observations across nine components in three UK megaprojects (Heathrow Airport Terminal 2, London 2012 Olympics, Crossrail) tracked annually during implementation (Gil & Fu, 2022)* ***Integrated Project Delivery shows a ~15 pp reduction in project cost overruns compared with Design–Bid–Build** (which averages ~20% overruns) (Ibrahim et al., 2020; Lovallo et al., 2023)*
Governance	2. **Appropriately calibrated stakeholder engagement, including tightly defined veto rights,** support timely delivery while protecting consumer interests	***Each new stakeholder to a megaproject raises total costs on avg by 0.7-1.2%*** *This estimate is based on a regression analysis of over 90 component-year observations across nine components in three UK megaprojects (Heathrow Airport Terminal 2, London 2012 Olympics, Crossrail) tracked annually during implementation (Gil & Fu, 2022)*
	3. **Sufficient time to achieve design maturity before delivery targets are locked in**, as mature design before building is associated with improved cost and schedule reliability and fewer late changes	***Cost growth declines by ~0.5 p.p. per one-point increase in front-end engineering design accuracy*** *Based on a regression analysis of 33 large capital projects, higher front-end engineering design accuracy at the point delivery targets were set was statistically associated with lower cost overruns (El Asmar & Gibson, 2018)*
	4. **Dedicated or fast-tracked regulatory oversight** for nationally significant infrastructure can reduce delay and improve cross-stakeholder coordination	***Each additional year of delay increases project costs by an average of ~4.6%,** with effects compounding over time (Flyvbjerg et al., 2004)* *A World Bank review of 312 infrastructure works contracts from 2007 to 2019 found that permit and clearance approvals account for approximately 13% of procurement delays in contracts above US$100 million (World Bank, 2024)*
Incentives	5. **RAB-based remuneration**, combined with streamlined quality governance and assurance, supports financeability and timely delivery for large, bespoke infrastructure	***Loan spreads for projects with availability-based payment structures are about 28bps lower than demand-based*** *An analysis of ~700 global infrastructure project-finance debt deals from 2006 to 2016, found that availability-based payment structures, where the private party is paid for making the asset available at agreed performance levels rather than for usage or demand, are associated with lower financing costs (Thierie and De Moor, 2019)*

Source: Gil, N., & Fu, Y. (2022). Megaproject performance, value creation, and value distribution: An organizational governance perspective; Ibrahim, M. W., & Hanna, A. S. (2019). Quantitative comparison of project performance between project delivery systems; Lovallo, D., Cristofaro, M., & Flyvbjerg, B. (2023). Governing large projects: A three-stage process to get it right; El Asmar, M., & Gibson, G. E. (2018). Front-end engineering design accuracy and its impact on project cost performance; Park, J. E. (2021). Curbing cost overruns in infrastructure investment: Has reference class forecasting delivered its promised success?; Flyvbjerg, B., Skamris Holm, M. K., & Buhl, S. L. (2004). What causes cost overrun in transport infrastructure projects?; World Bank. (2024). Drivers of delays in procurement of infrastructure projects; Thierie, W., & De Moor, L. (2019). Determinants of bank loan spread in project finance

Airport and UK infrastructure project cases consistently support five core delivery findings

Degree of support for each key finding

✓ Supportive ⊗ Possible challenge ● Neutral

Key findings

1 **Single "owner" with integrated operating company** is associated with better delivery and more reliable performance than fragmented models by bringing clear roles, responsibilities, and accountabilities to parties and empowering decision making

2 **Appropriately calibrated stakeholder engagement, including tightly defined veto rights,** support timely delivery while protecting consumer interests

3 **Sufficient design maturity before delivery targets are locked in** is associated with improved cost & schedule reliability & fewer late changes

4 **Dedicated or fast-tracked regulatory oversight** for nationally significant infrastructure can reduce delay and improve cross-stakeholder coordination

5 **RAB-based remuneration**, combined with strong governance and assurance, supports financeability and timely delivery for large, bespoke infrastructure

	Airports						UK Infrastructure							
	BER	JFK	ORD	MUCT2	MADT4	HALT2	TTT	HS2	ASTI	Nuclear SPEED		HARP	GBR	Fibre
1	✓	✓	●	⊗	●	✓	✓	●	●	●	●	●	✓	✓
2	✓	●	✓	●	●	●	●	✓	●	●	●	●	●	●
3	✓	●	●	●	✓	●	●	✓	●	●	✓	●	●	●
4	●	●	●	●	●	●	✓	✓	✓	●	✓	⊗	●	✓
5	●	●	●	●	●	●	✓	●	●	✓	●	●	●	✓

Does not contradict the value of a single owner, but shows that minority-ownership structures can still deliver strong performance

First-of-kind delivery under DPC required bespoke regulation and extended pre-construction lead times

Source: Abgeordnetenhaus Berlin (2018) BER II Final Report; PANYNJ (2017) – A Vision Plan for JFK (Governor's Advisory Panel); FAA (2005) O'Hare Modernization Program; Fichert, F., & Klophaus, R. (2004). Munich Airport Terminal 2: A successful airport–airline cooperation; Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas; APM (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2; NAO (2017) Review of the Thames Tideway Tunnel; DfT (2025) Stewart Review; Ofgem (2022) Decision on the Accelerated Strategic Transmission Investment (ASTI) framework; BEIS (2020) RAB Model for Nuclear: Government response to the consultation on RAB model for new nuclear projects; DfTt and Network Rail (2021) Launch of Project SPEED challenges rail industry to cut time and costs of rail upgrades; Ofwat (2025) Guidance on Ofwat's regulation of the HARP being delivered by United Utilities Water Limited; DfT consultation (2025), "A railway fit for Britain's future; Ofcom (2025) Connected Nations UK Report 2025

Finding 1: Deep dive on evidence

Structure

1. **Single "owner" with integrated operating company** is associated with better delivery and more reliable performance than fragmented models by bringing clear roles, responsibilities, and accountabilities to parties and empowering decision making

Evidence base	Observation	Reference
Megaproject literature	Stakeholder **fragmentation is a key driver of the "Iron Law of Megaprojects"** as it multiplies the principal-agent problem through misaligned incentives and diffused responsibilities	Flyvbjerg, Bent. (2017), The Iron Law of Megaproject Management; McKinsey (2015), Megaprojects: The good, the bad, and the better
	The **most critical factor for a megaproject is that it's "led by a Master Builder"** – a single point of integrated leadership with the authority and capability to oversee the entire project start to finish	Flyvbjerg, B., & Gardner, D. (2023). *How big things get done: the surprising factors that determine the fate of every project, from home renovations to space exploration and everything in between*
JFK inter-terminal coordination	**Fragmented terminal ownership under long-term leases enabled private financeability but diffused accountability for whole-airport outcomes.** The lack of a 'single owner' has led to a mix of terminals without easy connection, offering inconsistent passenger experiences, especially from the older terminals	*"Today's airport is fragmented. It has an unbalanced terminal configuration with inconsistent levels of service across six different terminals"* — Airport Advisory Panel, *A Vision Plan for JFK Airport*
BER functional separation	**Design and construction were fragmented across multiple contractors,** with no single entity accountable for end-to-end system integration and readiness, following the termination of the general planner As a result, integration risks were not resolved early leading to repeated certification failure	*"The fragmentation of planning, construction and technical responsibility meant that no party retained overall responsibility for the functional capability of the airport as a system"* — Berlin House of Representatives, BER Inquiry Final Report (translated)
Thames Tideway integrated ownership	**A standalone SPV created single-point accountability** for design, construction, integration and commissioning, eliminating sponsor–operator ambiguity and enabling early resolution of system-wide risks without escalation	"*Government decided that the Thames Tideway Tunnel should be delivered by an independent infrastructure provider, responsible for designing, building, financing and maintaining the tunnel"… "The infrastructure provider model places responsibility for delivery risks with the company best able to manage them, rather than with government or the incumbent water company*" — National Audit Office, *Review of the Thames Tideway Tunnel*

Source: Flyvbjerg, B. (2017), The Iron Law of Megaproject Management; Abgeordnetenhaus Berlin (2018) BER II Final Report; Port Authority of New York & New Jersey (2017) – A Vision Plan for JFK (Governor's Advisory Panel); National Audit Office (2017), Review of the Thames Tideway Tunnel

Finding 2: Deep dive on evidence

Governance **2.** **Clearly defined decision rights and appropriately calibrated veto thresholds** support timely delivery while protecting consumer interests

Evidence base	Observation	Reference
 Megaproject literature	**Megaprojects succeed when decision rights are clear, aligned, and exercised at the right level**, and fail when diffuse stakeholder power and poorly structured governance create friction, re-litigation of decisions, and delay **"Total alignment"** can help establish clear rules, roles, and governance mechanisms early, enabling fast decision-making while still reflecting the interests of sponsors, users, and affected communities	"*To achieve total alignment, megaprojects must create clear rules, policies, and guidelines about communication, reporting, terminology, common tools, and so forth, and make sure all parties are following them. Lack of alignment is quickly noticed, since it can cause conflict and huge delays.*" — Shenhar, A., Holzmann, V., (2017), *The Three Secrets of Megaproject Success*
 **Berlin Brandenburg (BER)** decision rights	**Technical investment decisions sat with political shareholders,** rather than an empowered engineering authority. This limited the ability to resolve engineering trade-offs, delaying corrective action once safety-critical issues emerged	*"Technical decision-making was repeatedly subordinated to political considerations within the shareholder structure, resulting in delayed or ineffective responses to escalating safety and systems risks."* — Berlin House of Representatives, BER Inquiry Final Report (translated)
 **High Speed 2 (HS2)** decision complexity and planning veto's	**Investment decisions required approvals across HS2 Ltd, DfT Sponsor, HMT, Cabinet Office, Parliament and local authorities,** dispersing decision rights and delaying timely resolution of cost and delivery issues **Schedule 17 embedded local authority vetoes** over detailed design approvals, adding numerous sequential approval interfaces (e.g. Bromford tunnel legal challenge)	"(there are) *"eight levels of approvals… two within HS2 Ltd, four within the DfT and two in HMT and the Cabinet Office"… "the number of approvals makes it very difficult to predict the time… to receive a final green light*" — Stewart Review, *Major Transport Projects Governance and Assurance Review: The HS2 Experience* *"There is… the risk that these* (local council) *rights are used to frustrate the delivery of consented projects, with legal challenges and planning powers used in a way that drives up costs to both local and national taxpayers, rather than protecting local interests"* — Alexander, H., *HS2 Parliamentary Report*

Source: Shenhar, A., & Holzmann, V. (2017). The Three Secrets of Megaproject Success: Clear Strategic Vision, Total Alignment, and Adapting to Complexity. Project Management Journal, 48(6), 29-46; Alexander, H., (2025) , HS2 Parliamentary Report; Stewart Review (2025), Major Transport Projects Governance and Assurance Review: The HS2 Experience; Abgeordnetenhaus Berlin (2018) BER II Final Report

Finding 3: Deep dive on evidence

Governance **3.** **Sufficient design maturity before delivery targets are locked in** is associated with improved cost and schedule reliability and fewer late changes

Evidence base	Observation	Reference
Megaproject literature	**In the megaproject literature, "think slow, act fast" describes a repeatable pattern observed across successful large infrastructure project.** Speed in delivery is enabled by patience upfront. Projects that rush early commitment typically experience slower delivery overall due to redesign, re-approval and dispute later	"*The first rule of megaproject management is: Think slow, act fast… Projects that succeed take the time needed upfront to get planning and design right, and then move quickly during delivery because there is less rework, fewer surprises, and fewer changes*" — Flyvbjerg, B. & Gardner, D. (2023), *How Big Things Get Done*
Berlin Brandenburg (BER) schedule-lock	**Publicly committing to opening dates before design and regulatory compliance had reached sufficient maturity constrained engineering flexibility**, forcing repeated redesign and re-approval cycles that increased cost and delay rather than resolving issues	"*The specification and implementation of the fire protection system were not sufficiently planned and coordinated at the time the opening date was announced"* — Berlin House of Representatives, BER Inquiry Final Report (translated)
HS2 design maturity	**HS2 proceeded to cost, schedule and scope commitments through the Hybrid Bill process at a point when design, ground conditions and statutory requirements were not sufficiently mature**, leading to extensive redesign, re-approval and cost escalation during delivery	*"In 2013 the Hybrid Bill was launched off a business case with a very low design maturity. I understand that this was 4%... The constraints of taking a Hybrid Bill through Parliament meant that there was no ability to iterate the requirements, scope, cost and schedule."* — Department for Transport, Major Transport Projects Governance and Assurance Review: The HS2 Experience (Stewart Review, 2025)
Network Rail project SPEED	**Project SPEED replaces Network Rail's traditional GRIP process** which had a fixed sequence of detailed requirements applied to every project, **with PACE,** a phased approach that explicitly defers firm delivery commitments until sufficient design maturity is achieved, recognising that premature lock-in increases rework, delay and cost risk	"*PACE allows for a principles based, rather than rules based approach to project delivery, allowing project sponsors to overlap tasks where this provides benefit. The process includes regular 'phase readiness' and gate review processes to provide assurance that projects do not proceed at risk"* — Network Rail, *Station Design – Design Manual*

Source: Flyvbjerg, B. & Gardner, D. (2023), How Big Things Get Done, Penguin; Abgeordnetenhaus Berlin (2018) BER II Final Report; Department for Transport (2025) Stewart Review; Network Rail (2024) Station Design – Design Manual

Finding 4: Deep dive on evidence

Governance

4. Dedicated or fast-tracked regulatory oversight for nationally significant infrastructure can reduce delay and improve cross-stakeholder coordination

Evidence base	Observation	Reference
 Megaproject literature	**Megaproject delays are often driven by slow, fragmented approval and decision-making processes;** prioritised, fast-tracked, and time-bound regulatory decisions for strategically important projects materially reduce delay and improve delivery outcomes	"*Best practices in issuing permits involve prioritizing projects, defining clear roles and responsibilities, and establishing time limits all along the way, including on public review… providing 'one stop shop' permitting can help*" — McKinsey & Company, *Megaprojects: The good, the bad, and the better*
Ofgem **Accelerated Strategic Transmission Investment (ASTI)**	**Dedicated accelerated regulatory pathway for strategically critical onshore electricity transmission investments** (initially for 26 projects worth £19.8bn), enabling earlier decisions on need, scope and funding, including explicit escalation and regulatory determination to resolve disputes on scope, cost or timing quickly. This is enabling early and predictable cost recovery	"*A new regulatory framework is required that can accelerate the regulatory process*" — Ofgem, *Accelerated Strategic Transmission Investment Guidance and Submission Requirements Document* *"The new ASTI framework streamlines the regulatory approval process… by reducing the number of regulatory assessment stages… [and] allows… earlier access to project funding to accelerate delivery*" — Ofgem, *Accelerated Strategic Transmission Investment Guidance and Submission Requirements Document*
 **HS2** lack of fast-tracked governance	**The absence of a dedicated, fast-tracked coordination and escalation framework across Government, Parliament and delivery bodies** led to slower decision-making, constrained flexibility and prolonged delivery timelines	"*The HS2 Programme is of an unprecedented scale and complexity in the UK. However, the delivery, governance structures and the wider government system in which the project operates have followed a relatively standard approach. It should have been recognised that a different approach was needed*" — Department for Transport, Major Transport Projects Governance and Assurance Review: The HS2 Experience (Stewart Review, 2025)

Source: Ofgem (2023) – ASTI Guidance and Submission Requirements, Garemo, N., Matzinger, S., & Palter, R. (2015). Megaprojects: The good, the bad, and the better. McKinsey & Company

Finding 5: Deep dive on evidence

Incentives

5. **RAB-based remuneration**, combined with streamlined quality governance and assurance, supports financeability and timely delivery for large, bespoke infrastructure

Evidence base	Observation	Reference
Thames Tideway RAB model	**The Thames Tideway Tunnel was delivered under a RAB-based funding model**, which enabled **long-term, low-cost private sector investment** by reducing construction and financing risk through regulated returns and government support. This improved financeability and investor confidence, whilst also helping to control customer costs throughout construction	*"What has been completed to date is testament not just to the tens of thousands of people who have contributed to the project, but to the financing model. Consideration of this model for other major infrastructure investment is a clear endorsement of its utility and success - alongside a cleaner river, this is central to Tideway's legacy"* — Thames Tideway Tunnel (2024) Tideway Annual Report *"Tideway has been delivered differently. Its innovative funding model encourages long-term, low-cost private sector investment in critical infrastructure. With government protections in place, Tideway has been able to secure competitive financing, keeping costs to customers down "* — Thames Tideway Tunnel (2025) Funding
Sizewell C RAB model	**The UK's first wave of nuclear new build used a Contract for Difference (CfD) model (Hinkley Point C),** under which developers bore full construction and financing risk, contributing to high strike prices and weak investability **Government introduced a RAB model for Sizewell C** to reduce financing risk, lower cost of capital and support delivery of large, sunk investments	"*A RAB model has the potential to reduce the cost of capital compared to a CfD by both sharing the risks of constructing a new nuclear power plant with consumers and providing a return to investors during construction*" "*A CfD requires developers to include high levels of contingency in the Strike Price… Under a RAB, the cost would only be passed on to consumers if the risk were to materialise*" — BEIS, *RAB Model for Nuclear,* (UK) *Government Response to the consultation on a RAB model for new nuclear projects*

Source: Thames Tideway Tunnel (2024) Tideway annual report charts successful year as super sewer testing begins; Thames Tideway Tunnel (2025) Funding; BEIS (2020) RAB Model for Nuclear, Government Response to the consultation on a RAB model for new nuclear projects

Contents

Synthesis of key success factors in delivering megaprojects from across megaproject research and literature

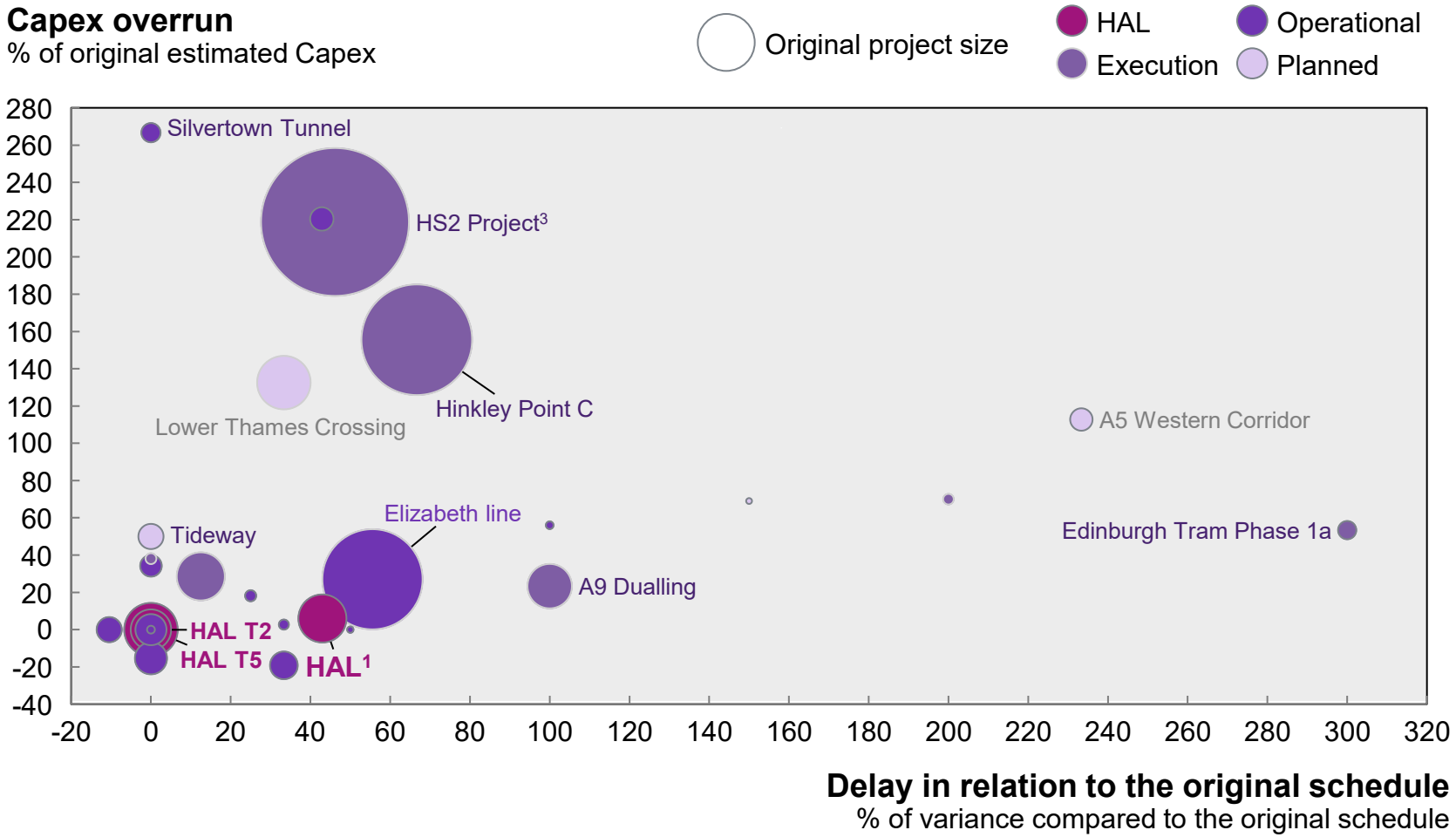
Efficient quality

Affecting key megaproject success criteria of financeability, timeliness, and efficient quality

Megaproject key success contributors	Description	Influences megaproject elements
Clear strategic vision	• Simple and compelling articulation of the desired benefits and therefore the megaproject's end goals and outcomes, used to build buy-in, alignment, and direction for all stakeholders	**Structure**
Integrated, capable delivery teams with strong leadership	• Project delivery teams, both individuals and partners, should be built with the appropriate competencies and capabilities to deliver the specific project and overcome its challenges • The project team should function as a united team drawn together with common goals and understandings even if delivering different aspects • Strong leadership from the executive can build a delivery-oriented culture, sense of purpose across the delivery team and stakeholders. Running the project like a business rather than a project	
Alignment and accountability through supportive governance	• Fragmentation of stakeholders, from owners, to sponsors, contractors, customers, and communities is often cited as a key failure point given competing interests and potential for poor communication • Governance structures with formal and informal coordination mechanisms are important to aligning stakeholders • Clear roles, responsibilities, and accountabilities are critical to delivery	**Governance**
Adapting to complexity	• Megaprojects must understand their unique challenges across technological novelty, organizational interfaces, and external uncertainty, then adapt management approaches accordingly • There should be clear structures, processes, and the required transparency to deal with complexity to make decisions to overcome challenges from stakeholders to delivery	
Modularity and standardisastion	• Break the megaproject into small repeatable "building blocks" that can be standardized across the wider project and allow the right teams to tackle specific challenges • The iteration and rapid learning of modularity generate efficiency gains in approvals and construction	

Sources: Flyvbjerg, B. & Gardner, D. (2023), How Big Things Get Done, Penguin; Flyvbjerg, Bent, 'Introduction: The Iron Law of Megaproject Management', in Bent Flyvbjerg (ed.), The Oxford Handbook of Megaproject Management, Oxford Handbooks (2017); Denicol, J., Davies, A., & Krystallis, I. (2020). What Are the Causes and Cures of Poor Megaproject Performance? A Systematic Literature Review and Research Agenda. Project Management Journal, 51(3), 328-345.; Shenhar, A., & Holzmann, V. (2017). The Three Secrets of Megaproject Success: Clear Strategic Vision, Total Alignment, and Adapting to Complexity. Project Management Journal, 48(6), 29-46.; Garemo, N., Matzinger, S., & Palter, R. (2015). Megaprojects: The good, the bad, and the better. McKinsey & Company

HAL has strong capex delivery with T5/T2 delivered on time and budget and seen as UK best practice



1. 310 post-G3 H7 projects in last five years; Capex overrun compares EAC to approved G3 budget; Schedule overrun compares G5 deviation to project duration, proxied from difference between G3 and G5 baseline. 18% portfolio average reflects weighted mean, 6% project average reflects unweighted mean variance
2. Unweighted average of 24 projects
3. Additional delays announced in June 2025, without specifying expected date for completion

Source: Infrastructure project database based on public announcements

Key insights

UK infra. average[2]

Cost	Schedule
56%	50%

The “iron law” of megaprojects is that they’re “over budget, over time, under benefits, over and over again”

SUMMARY OF: “THE IRON LAW OF MEGAPROJECT MANAGEMENT”, BENT FLYVBJERG (2017)

Measuring success

Cost: staying within or close to the original real-terms budget

Time: delivering near the original schedule

Budget: realising the originally planned socio-economic benefits

*The **“iron law” of megaprojects** is that they’re **“over budget, over time, under benefits, over and over again”*** based on a review of over 16,000 projects

8.5% of these projects achieve planned cost and time and only 0.5% achieve all three

Factors for better megaproject outcomes

Realistic front-end definition and forecasting

- Robust, reference-class forecasting and independent review to counter optimism bias and strategic misrepresentation in cost–benefit estimates.

Proven technology and modular design

- Avoiding unnecessary technological novelty, breaking work into repeatable, modular elements to reduce complexity and risk

Strong governance and accountability

- Independent scrutiny of business cases, clear allocation of risk and accountability, and clear and well-structured governance that constrains pressures from stakeholders

Professionalised, stable leadership

- Experienced megaproject leaders and key partners with stable teams across the life of the project, supported by transparency and systematic risk management and learning from past projects

Typical failure modes

Optimism bias and strategic misrepresentation

- Costs and risks are systematically underestimated and benefits overstated benefits to secure approval (“survival of the unfittest”)

Complexity and long horizons

- Large, long-lived, multi-stakeholder systems with many interfaces increase exposure to “black swan” events, scope creep, and cascading coordination failures.

Technological and design overreach

- Pursuit of the “technological sublime” and iconic designs introduces unproven technology and bespoke solutions, raising both cost and schedule risk

Weak governance and misaligned incentives

- Fragmented accountability, contractual structures that reward volume over value, and political incentives for announcing ambitious projects while externalizing downside risks

Source: Flyvbjerg, B. & Gardner, D. (2023), How Big Things Get Done, Penguin; Flyvbjerg, Bent, 'Introduction: The Iron Law of Megaproject Management', in Bent Flyvbjerg (ed.), The Oxford Handbook of Megaproject Management, Oxford Handbooks (2017)

There are 6 themes of megaproject poor performance based on a comprehensive review of >6,000 titles and 86 academic papers

SUMMARY OF: "WHAT ARE THE CAUSES AND CURES OF POOR MEGAPROJECT PERFORMANCE? A SYSTEMATIC LITERATURE REVIEW AND RESEARCH AGENDA" DENICOL, DAVIES, & KRYSTALLIS (2020)

Themes of megaproject poor performance	Description	Proposed "cures"
1. Decision-making behaviour	Psychological and political biases in the front-end led to poor forecasting and decision-making, including optimism bias, strategic misrepresentation, and escalating commitment	• Ensure transparency and accountability for decisions • Establish clear criteria for project cancellation to avoid escalating commitment to a failing venture
2. Strategy, governance, & procurement	An inadequate definition of roles and responsibilities and a lack of accountability often plague projects from the start and they are unable to solve issues as they arise	• Clearly define the roles and responsibilities of all stakeholders throughout the project lifecycle and design a robust governance structure that balances formal rules with adaptive mechanisms • Adopt an integrated delivery model with early contractor involvement and collaborative relationships
3. Risk and uncertainty	In ability to adapt in a dynamic and complex environment, especially while trying to manage technological novelty often causes challenges that cause knock-on delays and an inability to overcome quickly	• Build flexibility into designs, contracts, and financing to allow for adaptation to unforeseen changes
4. Leadership and capable teams	Strong personal and institutional leadership is needed including skilled and knowledgeable individuals across the delivery organisation coupled with effective organizational capabilities and a sense of united purpose.	• Cultivate strong project leadership that establishes a clear vision and a collaborative culture • Focus on building a team with the right competencies and skills that can adapt to the requirements of different project phases
5. Stakeholder engagement & management	An inadequate understanding of the stakeholders involved, including the institutional context and diverse interests, led to poor management and collaboration	• Foster transparent and continuous engagement with stakeholders and proactively work to align interests
6. Supply chain integration & coordination	Management of the vast network of suppliers and contractors involved in delivering the project without the right level of coordination without the right level over data or insights	• Implement robust program management systems to ensure visibility and coordination / integration across all project aspects • Foster collaborative commercial relationships rather than transactional, adversarial ones

Source: Denicol, J., Davies, A., & Krystallis, I. (2020). What Are the Causes and Cures of Poor Megaproject Performance? A Systematic Literature Review and Research Agenda. Project Management Journal, 51(3), 328-345.

Heathrow

Three ingredients for a successful megaproject: clear strategic vision, total alignment, and adapting to complexity

SUMMARY OF: "THE THREE SECRETS OF MEGAPROJECT SUCCESS" SHENHAR & HOLZMANN (2017)

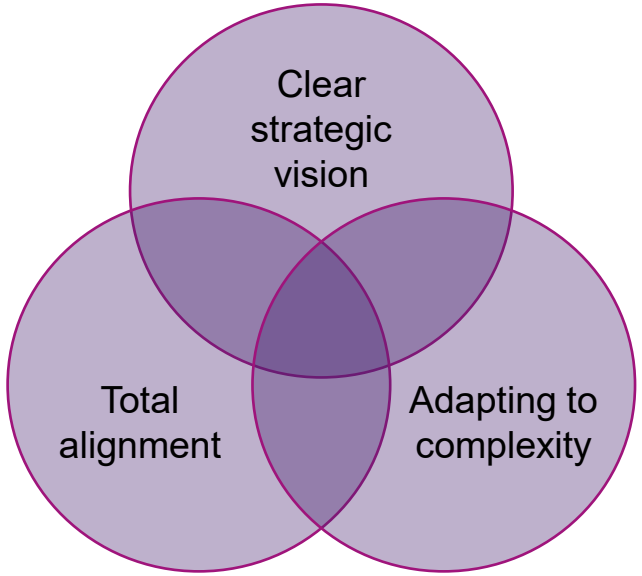
Megaproject success criteria

Efficiency: Whether the project met its schedule and budget constraints

Impact on customer/user: Whether the project delivered its intended scope and satisfied the needs of its end-users

Financial success: Whether investors have made a return

Impact on society: Whether there were positive long-term effects on society



Clear strategic vision: A strong vision helps unify all stakeholders towards a common goal and communicate the project's value

Total alignment: Cultivation of a shared understanding and commitment through clear roles and responsibilities promotes accountability

Adapting to complexity: Successful projects recognize reality and tailor their resources, processes, and responses to the challenges at hand rather than rigidly follow standard practices or previous commitments

Based on an analysis of 14 megaprojects across industries, countries, and level of success

Source: Shenhar, A., & Holzmann, V. (2017). The Three Secrets of Megaproject Success: Clear Strategic Vision, Total Alignment, and Adapting to Complexity. Project Management Journal, 48(6), 29-46.

Megaprojects: The good, the bad, and the better

SUMMARY OF: "MEGAPROJECTS: THE GOOD, THE BAD, AND THE BETTER" GAREMO, MATZINGER, & PALTER (2015)

Why megaprojects fail…		…How to deliver them better
Overoptimism and Overcomplexity	• Costs and timelines get biased downward and benefits upward to secure approval • This optimism bias leads to unrealistic budgets that cannot handle the complexity of multi-jurisdictional projects, where a single issue can stall progress indefinitely	• Start with societal/economic priorities first, then pick projects, backed by independent, robust cost–benefit analysis • Use reference-class forecasting (compare with truly similar, completed projects) as a reality check on cost/time • Make project selection fact-based and transparent to force accountability
Poor Execution	• To protect slim margins after submitting low bids, firms often cut corners • Execution is further hampered by incomplete designs and declining construction productivity, which has remained flat while manufacturing productivity has doubled.	• Do the engineering and risk analysis before construction starts (front-end definition), cutting cost/time by ~20% • Fund early design properly, spending about 3–5% of capex on early-stage engineering/design • Build real controls with consistent baselines, shared metrics, and real-time progress data tied to physical progress rather than lagging indicators
Organisational weakness	• Projects often suffer from excessive bureaucratic layers where decision-makers are removed from the action. • The temporary nature of these projects means teams often lack the specialized skills and experience needed for such massive undertakings	• Build a project team with the full capability mix, not just a strong project manager, legal, technical, contract management, reporting/controls, regulatory approvals, stakeholder management, and government/community relations • Owners/investors should take an active role in assembling this system

Source: Garemo, N., Matzinger, S., & Palter, R. (2015). Megaprojects: The good, the bad, and the better. McKinsey & Company

Contents

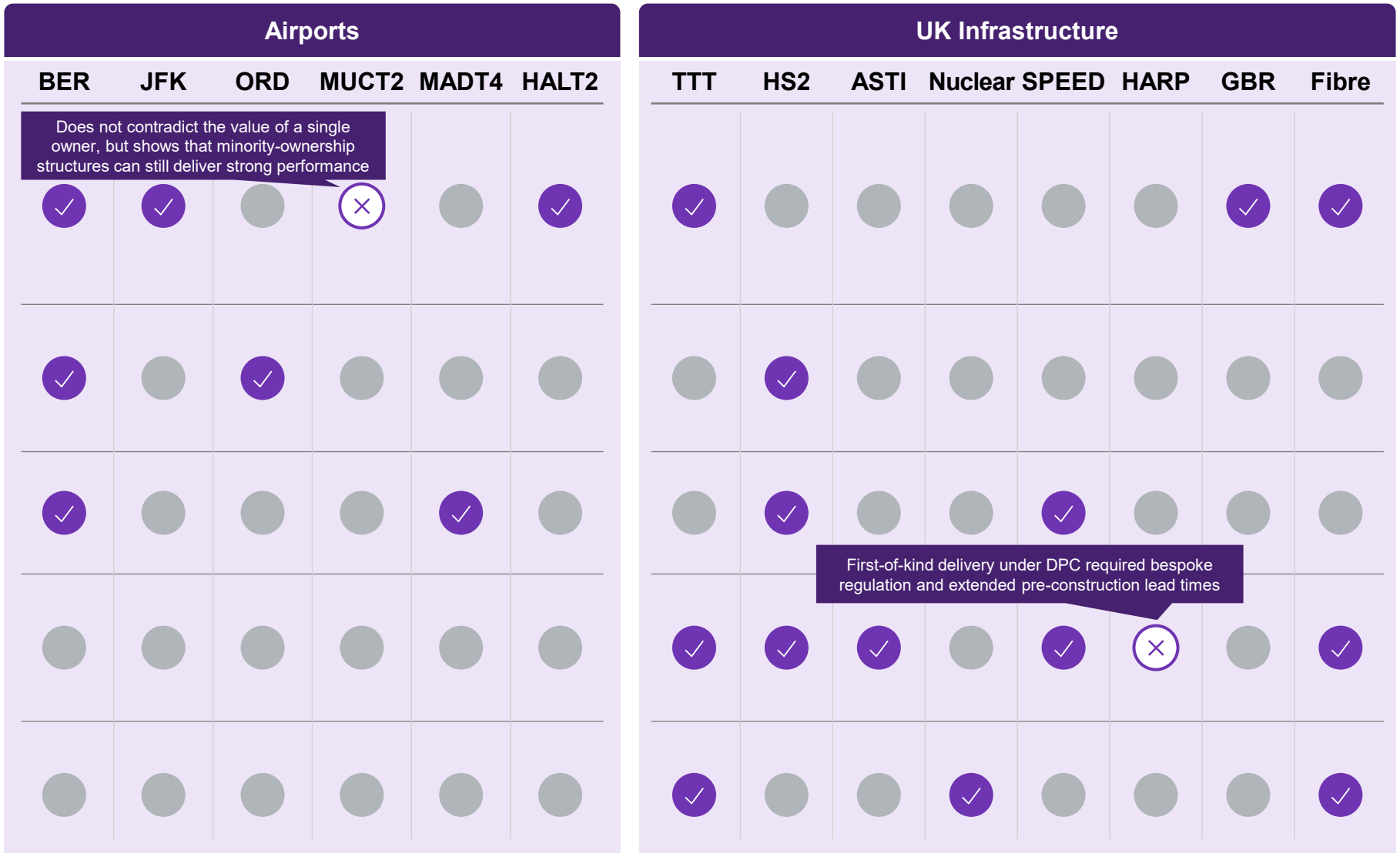
Airport and UK infrastructure project cases consistently support five core delivery findings

Degree of support for each key finding

✓ Supportive ⊗ Possible challenge ● Neutral

Key findings

1. **Single "owner" with integrated operating company** is associated with better delivery and more reliable performance than fragmented models by bringing clear roles, responsibilities, and accountabilities to parties and empowering decision making
2. **Appropriately calibrated stakeholder engagement, including tightly defined veto rights,** support timely delivery while protecting consumer interests
3. **Sufficient design maturity before delivery targets are locked in** is associated with improved cost & schedule reliability & fewer late changes
4. **Dedicated or fast-tracked regulatory oversight** for nationally significant infrastructure can reduce delay and improve cross-stakeholder coordination
5. **RAB-based remuneration**, combined with strong governance and assurance, supports financeability and timely delivery for large, bespoke infrastructure



Source: Abgeordnetenhaus Berlin (2018) BER II Final Report; PANYNJ (2017) – A Vision Plan for JFK (Governor's Advisory Panel); FAA (2005) O'Hare Modernization Program; Fichert, F., & Klophaus, R. (2004). Munich Airport Terminal 2: A successful airport–airline cooperation; Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas; APM (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2; NAO (2017) Review of the Thames Tideway Tunnel; DfT (2025) Stewart Review; Ofgem (2022) Decision on the Accelerated Strategic Transmission Investment (ASTI) framework; BEIS (2020) RAB Model for Nuclear: Government response to the consultation on RAB model for new nuclear projects; DfTt and Network Rail (2021) Launch of Project SPEED challenges rail industry to cut time and costs of rail upgrades; Ofwat (2025) Guidance on Ofwat's regulation of the HARP being delivered by United Utilities Water Limited; DfT consultation (2025), "A railway fit for Britain's future; Ofcom (2025) Connected Nations UK Report 2025

Key takeaways from comparative airport deep-dives

Case study	Key takeaways
Berlin Brandenburg Airport (BER)	• Fragmented planning and delivery responsibility, following termination of the general planner, left **no single entity accountable for end-to-end system integration**, contributing to a ~9-year delay • Public opening dates were repeatedly announced **before integrated systems (e.g. fire safety) were fully designed, tested, and approved**, resulting in at least seven cancelled openings • **Continuous public funding weakened incentives** for early corrective action, enabling cost escalation of ~3–4× versus initial estimates following repeated re-baselining
John F. Kennedy International Airport (JFK)	• Terminal-by-terminal ownership enabled substantial private finance (>US$15bn since 2017), but **no single sponsor was accountable for whole-airport integration and performance** • Fragmented terminal development, undertaken without an airport-wide master plan, produced **persistent system-level coordination issues and inconsistent service quality** • While the 2017 Vision Plan **introduced an integrated master plan**, its largely **consultative governance and unchanged terminal ownership model** limited enforceability, and airport-level **passenger experience metrics continued to underperform**
Chicago O'Hare International Airport (ORD)	• **Airline-disciplined governance and commercial agreements** delivered strong financeability and coherent system design, but shifted effective control to airlines • **Supermajority airline approval** introduced **high coordination thresholds** that slowed decision-making and may have contributed to extended delivery timelines, particularly for Phase 2 • **Lighter-touch regulation and airline-backed financing** avoided regulatory gating and **supported long-term efficiency**, but **lacked mechanisms to accelerate** delivery or prioritise short-term passenger outcomes when consensus broke down

Source: Abgeordnetenhaus Berlin (2018) BER II Final Report; Hertie School (2015) The case of the BER Airport in Berlin-Brandenburg; Gemünden, H.G. (2024) Impact of and causes for poor economic performance of BER Airport; Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel); Port Authority of New York & New Jersey (2025) JFK T1 Builds; Federal Aviation Administration (2005) O'Hare Modernization Program; Federal Aviation Administration (2015) Re-Evaluation of the O'Hare Modernisation Environmental Impact Statement

Key takeaways from comparative airport deep-dives

Case study	Key takeaways
Munich International Airport – Terminal 2 (MUC)	• **Joint-venture governance** (FMG-Lufthansa) aligned airport owner and anchor airline incentives, creating a **single decision-making forum** for scope, phasing, and quality • **Direct airline participation in design and funding reduced demand risk** and ensured terminal configuration matched operational needs at opening • **Risk allocation focused on lifecycle performance**, not just construction cost, incentivising design choices that minimised operational disruption and post-opening rework
Adolfo Suárez Madrid–Barajas Airport – Terminal 4 (MAD)	• **Single public owner-operator (AENA)** with unified planning, funding, and delivery authority enabled **coherent airport-wide integration** • **Approval-stage plans did not adequately account for the duration and uncertainty of land expropriation and environmental approvals**, which later emerged as binding constraints outside the sponsor's control, driving delays • **Initial cost estimates were understated at approval**, as delivery progressed, construction and programme pressure intensified
London Heathrow Airport – Terminal 2 (LHR)	• **Single, technically credible sponsor (LHR)** retained **end-to-end system accountability**, including integration, safety certification, and operational readiness • Strong sponsor-led governance and visibility mechanisms (programme dashboards, routine escalation forums, independent assurance) enabled **early identification and resolution of issues** • **Operational Readiness & Transfer** treated as a core programme workstream**, preventing regulatory or operational surprises** at opening • Heathrow T2 was delivered **without project-specific incentive adjustments** to regulation

Source: Fichert, F., & Klophaus, R. (2004). Munich Airport Terminal 2: A successful airport–airline cooperation; Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2; Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas, aprobado el 19 de noviembre de 1999, y de su situación a 31 de diciembre de 2004; Heathrow (2014) Heathrow Annual Report; Vine, R. (2019). Riskwork in the construction of Heathrow Terminal 2; APM (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2

BER: Case study on Berlin Brandenburg Airport (1/2)

Industry | Aviation

At BER, fragmented accountability led to late-stage system failure, repeated delays and major cost escalation

Context

Berlin Brandenburg Airport (BER) was a **publicly funded** programme to consolidate Berlin's air traffic into a single airport

Conceived in the early 1990s and launched in 2006, the project was **owned and financed by Berlin, Brandenburg and the German federal government**, and delivered through a multi-contract design-and-build model within Germany's national planning and safety regime

Outcomes

Despite secure public funding, BER suffered **extreme delays** and **late-stage quality failures**, driving major cost escalation and value erosion

Financeability

Low | Medium | High

N/A – *publicly funded throughout*

Timeliness

Low | Medium | High

~9 year schedule delay from planned opening in 2011 versus actual opening in 2020

4 major cancellations of scheduled public openings after late-stage readiness failures

Efficient quality

Low | Medium | High

~3-4x cost escalation from ~€2.0Bn initial planned cost (2006) to ~€7-10Bn final est. cost (2020)

>4 formal programme re-baselines with repeated resets of budget, schedule and refinancing 2011-2020

Regulatory model implications

1a Changes to capex governance processes

- Capital oversight exercised primarily through shareholder and supervisory-board processes, diluting clear delivery ownership
- Governance emphasis on approvals, reporting and re-baselining crowded out continuous system-readiness accountability
- Funding continuity maintained despite deteriorating delivery performance, reducing pressure for early corrective intervention
- Escalation of delivery issues often occurred after problems materialised

1b Separation of system planning and ops delivery

- Planning approval and safety certification separated from delivery
- Regulatory approval functioned as a late-stage gate, not a continuous constraint
- Preserved regulatory independence and statutory compliance
- Allowed misalignment between built and certifiable systems to persist, leading to late rework (e.g. fire safety, smoke extraction)

Source: Abgeordnetenhaus Berlin (2018) BER II Final Report; DW (2020) Berlin's new airport: A story of failure and embarrassment (October 31 2020); Hertie School (2015) The case of the BER Airport in Berlin-Brandenburg; Gemünden, H.G. (2024) Impact of and causes for poor economic performance of BER Airport

BER: Case study on Berlin Brandenburg Airport (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	Public owner	= **Public ownership by Berlin, Brandenburg and the federal government** placed strategic control, funding decisions and intervention within public-sector governance processes
	B. Operating structure	Operate-only	−− **Design and construction were fragmented across multiple contractors,** with no single entity accountable for end-to-end system integration and readiness. As a result, integration risks were not resolved early leading to certification failure
2. Governance	A. Capex governance	Consult-led	−− **Oversight and key decisions were heavily influenced by public-sector shareholder governance.** This limited the ability to resolve engineering trade-offs, delaying corrective action once safety-critical issues emerged
	B. Capex targets	Schedule-locked	− **Once safety certification failed,** publicly committed opening dates constrained engineering flexibility, with remediation proceeding through repeated redesign and re-approval cycles, escalating delay and cost rather than enabling early resolution
	C. Governance acceleration	Standard process	− **Delivery was managed through standard public-sector governance and change processes.** Programme acceleration measures were introduced at a later stage, once material delays had already emerged
3. Incentives	A. Asset pricing	Mixed	− Without ex-ante price regulation, **delivery incentives were not directly linked to cost efficiency**, with project execution prioritising continuity and completion over price discipline
	B. Asset definition	Construction was publicly funded outside any ex-ante asset-pricing or incentive regime, while capitalised costs are subsequently recovered ex post through regulated cost-recovery once the asset is operational	**N/A – RAB only**
	C. Risk sharing	Backstop	− **Financial risk was retained on the public balance sheet with limited predefined downside caps or performance conditionality,** limiting cost and schedule incentives

Source: Abgeordnetenhaus Berlin (2018) BER II Final Report; DW (2020) Berlin's new airport: A story of failure and embarrassment (October 31 2020); Hertie School (2015) The case of the BER Airport in Berlin-Brandenburg; Gemünden, H.G. (2024) Impact of and causes for poor economic performance of BER Airport

BER: Deep dive on evidence base from case studies

Case study Berlin Brandenburg Airport

Key insight	Source
Fragmented planning responsibility and the lack of a single 'master builder' contributed to BER's 9-year delay BER opened ~9 years later than planned; the parliamentary inquiry identified the lack of a single 'master builder' – following termination of the general planner – as fragmenting responsibility and driving coordination and system-integration failures that delayed delivery	"*The termination of the general planner led to the revision of the deficient planning having to be carried out by a large number of individual planning offices. However, coordination in this area was insufficient, with the consequence that interfaces between individual trades were often not taken into account"* — Berlin House of Representatives, BER Inquiry Final Report; A.I. Planung und Projektorganisation (translated) *"At the same time, planning services were provided alongside the construction works, accompanying the build. This led to delays insofar as planning and as-built status repeatedly had to be reconciled and repair planning had to be produced"* — Berlin House of Representatives, BER Inquiry Final Report; A.I. Planung und Projektorganisation (translated) *"Due to the significant structural changes, the requirements for coordinating the different trades increased. Such interface collisions represented a substantial problem for construction progress… The reason for this was planning that was uncoordinated insofar as each trade was planned independently of the others"* — Berlin House of Representatives, BER Inquiry Final Report; A.II.1 Brandschutz / Entrauchungsanlage (translated)
Differing incentives and political pressure to announce opening dates before technical readiness led to 4 major cancelled openings At least 4 formally announced BER opening dates were cancelled between 2011 and 2020; the inquiry found that opening dates were repeatedly set under supervisory-board pressure, before construction and safety systems had been technically validated	*"The rapid announcement of new opening dates under pressure from the supervisory board, without a final analysis of the condition of the construction site, led to the opening dates in autumn 2012 and spring 2013 having to be cancelled again…"* — Berlin House of Representatives, BER Inquiry Final Report; D.I Widerholte Benennung und Aufhebung von Eröffnungsterminen (translated) *"As of December 2013, eight of the ten supervisory board members sent by the shareholders were politicians on premier/cabinet minister or state secretary level"* – Fiedler and Wendler (2015) Public infrastructure project planning in Germany: The case of the BER Airport in Berlin-Brandenburg

Source: Abgeordnetenhaus Berlin (2018) BER II Final Report; Hertie School (2015) The case of the BER Airport in Berlin-Brandenburg; Gemünden, H.G. (2024) Impact of and causes for poor economic performance of BER Airport

JFK: Case study on JFK Airport (1/2)

Industry: Aviation

Fragmented terminal ownership and delivery enabled private financing but undermined system integration, leading to weaker customer outcomes

Context

John F. Kennedy International Airport (JFK) is owned by the Port Authority of New York and New Jersey (PANYNJ)

Historically developed through **terminal-by-terminal, airline-led or consortium-led PPP concessions**, with terminals separately financed, built and operated under long-term leases

In response to **persistent service experience underperformance**, PANYNJ launched ambition for ~$19bn JFK Vision Plan (2017) to improve coordination and common infrastructure

Outcomes

JFK's delivery model has historically produced **fragmented outcomes, weak system integration** and persistent **customer experience challenges**

Financeability

Low — Medium — High

>$15bn privately financed since 2017 across individual terminal redevelopments with additional public-sector funding

Timeliness

Low — Medium — High

0 high profile cancelled terminal openings

Frequent delays e.g. Delta T4 overruns

Efficient quality[1]

Low — Medium — High

Ranked 4th "most stressful airport" globally due to poor scores in customs, security and access

Fingleton reflect that passenger service outcomes at airports cannot be attributed solely to terminal structure or competition; they are influenced by multiple factors, including third-party service providers such as TSA

Regulatory model implications

7a Wholesale supplier model

- Terminals owned or controlled by separate airline or private concessionaires under long-term leases
- PANYNJ retained ownership of the airfield and common infrastructure but limited direct authority over terminal-level delivery decisions
- No single sponsor accountable for end-to-end system integration
- Fragmented ownership diluted accountability for whole-airport outcomes, increasing interface risk and coordination costs

1b Separation of system planning and ops delivery

- Airport-wide planning and standards set centrally, but delivery executed independently by terminal sponsors
- System interfaces (baggage, security, curbside access, wayfinding) resolved through coordination rather than directive control
- Separation increased reliance on negotiation and alignment across sponsors, slowing resolution of system-level issues and contributing to variation in passenger outcomes

4b Mandated design-and-build contracts

- Terminal projects delivered as standalone design-and-build megaprojects, optimised at asset level
- Procurement/supply-chain leverage fragmented across multiple buyers
- Parallel terminal delivery improved asset-level progress but amplified interface risk

Source: iSelect (2026) World's most stressful airports; Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel); Fingleton – Heathrow Named Promoter Deck, Reflections from an airline perspective

38

JFK: Case study on JFK Airport (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	Multi-owner	−− **Fragmented terminal ownership** under long-term leases supported asset-level finance but eliminated whole-airport accountability, creating interface and coordination risks that constrain system performance and delivery optimisation
	B. Operating structure	Operate-only	− **Terminal delivery and operations were integrated within individual assets but not across the airport system.** This limited the ability to optimise sequencing, passenger flows, passenger experience, baggage etc.
2. Governance	A. Capex governance	Consult-led	= **Terminal sponsors held primary decision rights, with the Port Authority influencing outcomes through consultation and lease approvals.** This enabled sponsor-led delivery but slowed resolution of cross-terminal issues
	B. Capex targets	Mixed	− **Pre-Vision Plan, JFK's mixed capex approach enabled airline-led flexibility but led to multi-year delays** (e.g., Delta T4 overruns) and uneven delivery, lacking unified milestones
	C. Governance acceleration	Standard process	− **Delivery decisions followed standard approval and coordination processes across multiple sponsors.** Without a single accelerated, airport-wide decision framework, issues were resolved incrementally, extending delivery timelines
3. Incentives	A. Asset pricing	Commercial	= **Terminal charges are set through negotiated airline agreements rather than a regulated pricing framework,** supporting asset-level financeability but not incentivising whole-airport cost or capacity optimisation
	B. Asset definition	N/A – RAB only	
	C. Risk sharing	Investor-led	− **Financing risk was borne by individual terminal sponsors rather than pooled at airport level,** leaving system-wide integration and sequencing risks unmanaged and weakening coordinated delivery

Source: Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel); Fingleton – Heathrow Named Promoter Deck, Reflections from an airline perspective

JFK: Deep dive on evidence base from case studies

Case study	JFK Airport

Key insight

Fragmented terminal ownership has contributed to JFK ranking outside the global top 50 airports[1] for over a decade

In 2016, JFK was ranked 59th among the world's top 100 airports; the Airport Advisory Panel attribute poor passenger experience to fragmented, airline/terminal-operator-led development without an airport-wide master plan, producing inconsistent levels of service across terminals

Source

"The evolution of JFK's terminal buildings has been a history of separate projects with private airlines or private terminal operators designing and building individual terminals at the Airport, with no overall master plan to guide development. As a result, today's Airport is fragmented. It has an unbalanced terminal configuration with inconsistent levels of service across six different terminals" – Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel)

"Without a guiding master planning framework, the Airport's lack of easy connection between terminals coupled with the current mix of older and newer terminals will never yield a consistent world-class aviation experience for all passengers using JFK" – Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel)

"JFK is ranked by passengers as low as 59th among the world's top 100 airports[1]… The airport is in the condition that it is today due to: 1) the lack of a coordinated, cohesive airport plan; 2), terminals that were developed on a piece-meal, ad-hoc basis resulting in varying levels of quality and passenger service across the airport; and 3) a confusing on-airport roadway system…" – Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel)

Even after an integrated master plan was developed in 2017, JFK's global ranking has deteriorated while the terminal ownership has remained fragmented

In 2025, JFK was ranked 89th among the world's top 100 airports, falling 30 places from the start of the Vision Plan for JFK

"The purpose of the Vision Plan is to establish a comprehensive, unified master plan for John F. Kennedy International Airport" – Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel)

The 2017 Vision Plan is still being implemented, with several major facilities scheduled to open between 2026–2030. While it is therefore too early to assess the full impact of the Vision Plan, Skytrax rankings indicate that overall passenger experience has not yet materially improved

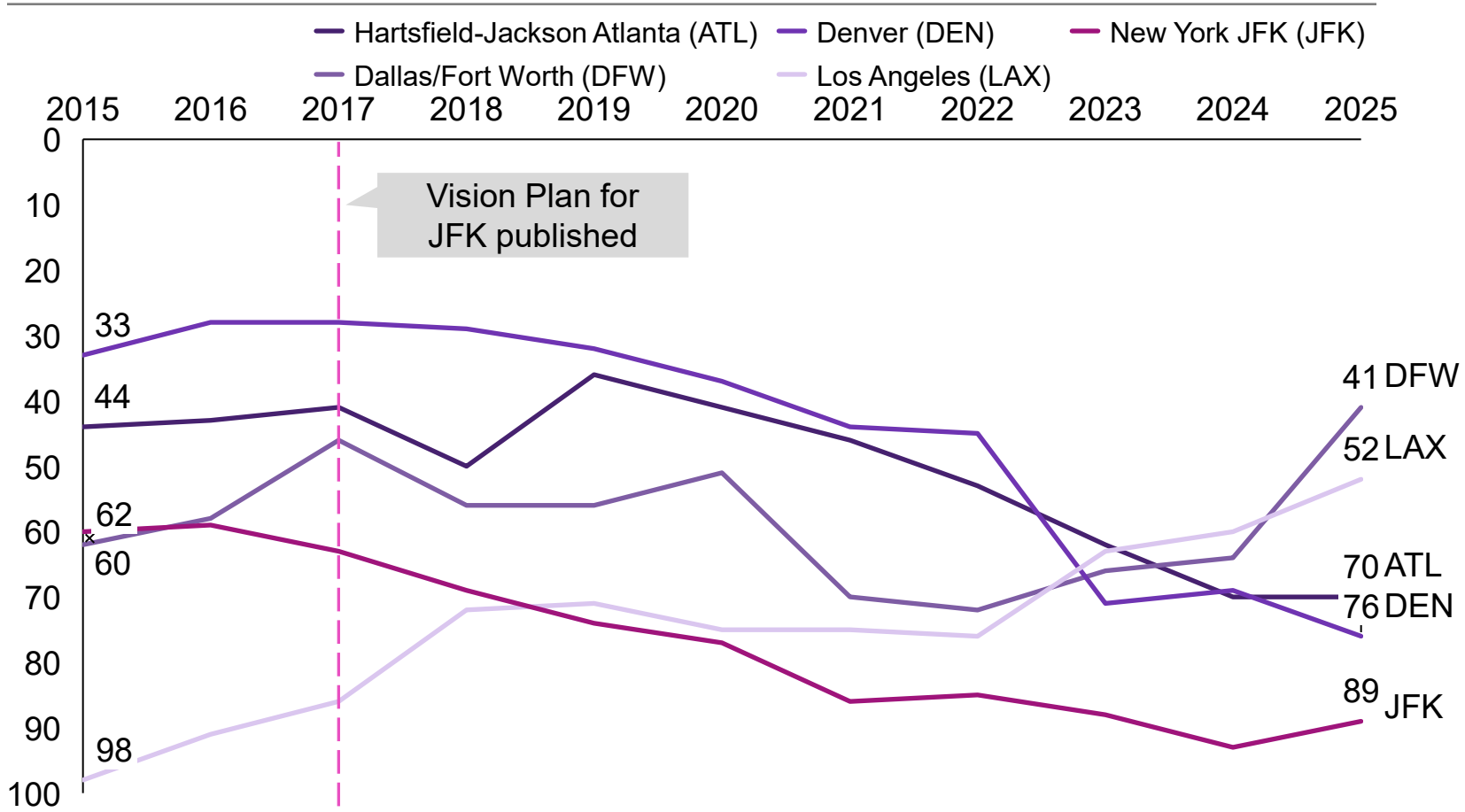
1. Skytrax is an independent international air transport rating organisation. Its World Airport Awards are based on an annual global passenger satisfaction survey, collecting feedback from travellers of over 100 nationalities. The survey assesses passenger experience across the end-to-end airport journey, including check-in, security, immigration, arrivals, transfers, shopping, facilities, and gate departure

Source: Port Authority of New York & New Jersey (2017) A Vision Plan for JFK (Governor's Advisory Panel); Skytrax (2016) World Airport Awards; Skytrax (2025) World Airport Awards; Port Authority of New York & New Jersey (2025) JFK T1 Builds

8 of the 10 largest US airports have dropped in Skytrax top-100 airport ratings over the past decade[1] or were not included

Airports ranked from 1-100, with 1 being best performing according to Skytrax World Airport Survey

Top 10 US airports (by traffic) in Skytrax top 100 global airport ratings, 2015-2025



What is a Skytrax rating:

Skytrax runs the **World Airport Survey**, typically covering 12–18 million passenger questionnaires per cycle, across 500+ airports worldwide

This provides a **comparative passenger experience indicator**, useful for benchmarking customer perception of airport performance over time.

Airports are scored across multiple dimensions, including:

- Check-in and security processes
- Immigration and border control
- Wayfinding and terminal layout
- Cleanliness and comfort
- Staff courtesy and efficiency
- Wi-Fi, lounges, and transfer experience

1. Top 10 largest airports (as of 2024) also include Chicago O'Hare (ORD), Charlotte Douglas (CLT), Las Vegas (LAS), Orlando (MCO) and Miami (MIA). Only O'Hare features in top 100 in past decade (at 92 in 2015, and 96 in 2025)

Source: Skytrax top 100 airports (2015-2025)

JFK includes multiple terminals managed under diverse ownership models, leveraging PPP and long-term agreements

Feature	JFK Airport	Typical U.S. Hub
Airport ownership & investment model	Public authority modernization with multiple private partners and airline-specific arrangements (each terminal effectively run as a separate business) under a mega-redevelopment plan	Airport authority usually leads investment centrally; individual carriers don't run terminals as separate businesses; investment driven by central airport planning and airline lease/use agreements
Role of major carriers	No single dominant carrier controlling a majority of capacity – multiple carriers (JetBlue, Delta, American/Oneworld, foreign carriers) anchor distinct terminals	Typically, one dominant carrier at a hub airport drives network capacity and often influences terminal layout
Terminal operation/management	Terminals may be operated via public/private partnerships or by private firms under long-term agreements, each with commercial independence	Terminals are usually owned and operated by the airport authority, and airlines participate via leases rather than terminal ownership/PPP
Airline investment risk/ reward	Airlines and private terminal partners have direct interest in terminal amenities, branding, and concessions (e.g., JetBlue's T5 enhancements)	Carriers at traditional hubs invest indirectly via long-term leases; they do not usually operate or co-finance individual terminal infrastructure beyond tenant improvements
Airport modernization model	Massive multi-terminal redevelopment ($19B+) with coordinated investment across public and private stakeholders; includes new terminals and expansions driven by airport authority and private consortia	Airport modernization typically funded by federal/state grants (FAA Airport Improvement Program, PFCs), airport bonds, and general airport revenue; airline influence is mainly through long-term use agreements

Source: Port Authority of New York & New Jersey (2017) – A Vision Plan for JFK (Governor's Advisory Panel); FAA – Airport Improvement Program; Port Authority of New York & New Jersey (2024) – PANYNJ and JFK Millenium partners mark one year since breaking ground on JFK T6

ORD: Case study on Chicago O'Hare Airport (1/2)

Industry: Aviation

Airline-disciplined governance enabled strong financeability but conditional airline approvals introduced decision risk and slowed delivery pace

Context

Chicago O'Hare International Airport (ORD) is owned and operated by the City of Chicago, with terminals occupied by incumbent airlines under long-term use-and-lease agreement

The **O'Hare Modernization Program** (OMP) was a centrally planned, airport-wide megaproject to reconfigure the airfield and expand capacity, delivered under a model requiring Majority-In-Influence airline approval, giving carriers significant influence over scope, phasing and capital commitments

OMP was financed through airport revenue bonds, passenger facility charges and airline-backed leases, with investment discipline provided by commercial negotiation with airlines

Outcomes

OMP demonstrates that airline-backed, non-regulated models can finance and deliver system-scale expansion, but at the cost of slower delivery and weaker short-term customer outcomes

Financeability

100% of OMP capital funding raised through investment-grade airport revenue bonds and user charges; no City of Chicago general-obligation debt

Timeliness

~4-8 year schedule delay from planned opening in 2009 (Phase 1) and 2013 (Phase 2) versus actual opening in 2013 and 2021 respectively

Efficient quality

~1.3x cost escalation from ~$6.6bn initial public estimates to final reported cost ~$8-8.5bn

Regulatory model implications

9c Lighter-touch regulation

- No sector-specific economic regulator or price control
- Investment decisions governed through commercial negotiation under long-term airline use-and-lease agreements
- Airlines had material influence over scope, phasing, and affordability, acting as de facto economic discipline
- Enabled rapid access to capital markets and avoided regulatory gating delays, but provided no external mechanism to enforce delivery pace or accelerate decisions when consensus broke down

7a Wholesale supplier model

- City of Chicago acted as central system infrastructure provider, with airlines underwriting capacity through lease commitments
- Supermajority airline consent required for major capital commitments, embedding high coordination thresholds
- Model reduced demand and revenue risk, strengthening financeability
- However diffused accountability across multiple airlines diluted authority to resolve disputes quickly, contributing to schedule slippage

1b Separation of system planning from operations

- Centralised airfield planning by the City, with delivery and cost control constrained by airline consent under long-term leases
- Separation enabled coherent system design but weakened authority to enforce delivery pace, contributing to schedule slippage

Source: Federal Aviation Administration (2005) O'Hare Modernization Program; Federal Aviation Administration (2015) Re-Evaluation of the O'Hare Modernisation Environmental Impact Statement

ORD: Case study on Chicago O'Hare Airport (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	Public owner	+	**Public ownership by the City enabled coherent, airport-wide airfield planning** and avoided fragmented asset strategies, but did not alone provide sufficient authority to enforce delivery pace when airline consent was required
	B. Operating structure	Integrated	=	**An integrated sponsor-led structure supported technically coherent airfield delivery,** but reliance on airline influence through leases limited the sponsor's ability to accelerate decisions, muting benefits for timeliness
2. Governance	A. Capex governance	User veto	−	**Majority-In-Interest airline approval rights** over project phases and financing strengthened cost discipline and financeability, but limited the sponsor's ability to unilaterally commit to delivery pace, particularly for phase 2
	B. Capex targets	Milestone-based	=	**Milestone-based targeting allowed flexibility under live-airport constraints and evolving scope,** but absence of schedule-locked commitments enabled incremental delay without triggering corrective intervention
	C. Governance acceleration	Standard process	−	**The absence of an accelerated decision mechanism** meant that issues were resolved through negotiation, limiting the sponsor's ability to compress delivery timelines
3. Incentives	A. Asset pricing	Commercial	=	**Commercially negotiated pricing delivered strong financeability** and investor confidence. However, it may have limited incentive to accelerate delivery or prioritise passenger-facing quality, as airlines focus on affordability
	B. Asset definition	N/A – RAB only	
	C. Risk sharing	Investor-led	+	**Airlines and users bore demand and affordability risk,** underpinning investment-grade financing and cost control, but reinforced airline influence over scope and pace, constraining schedule performance

Source: Federal Aviation Administration (2005) O'Hare Modernization Program; Federal Aviation Administration (2015) Re-Evaluation of the O'Hare Modernisation Environmental Impact Statement

ORD: Deep dive on evidence base from case studies

Case study	Chicago O'Hare

Key insight

~8-year gap between planned and actual delivery of OMP Phase 2, with airline Majority-In-Interest approval identified as a potential constraint

Phase 2 of the O'Hare Modernization Program was completed in 2021 approximately eight years later than originally scheduled (2013), with airline Majority-In-Interest approval identified by the FAA as a potential constraint on Phase 2 financing and timing

Source

"The City plans to implement the OMP in two phases over an 8-year period. Phase 1 and Phase 2 are scheduled to be completed by 2009 and 2013, respectively" – Federal Aviation Administration (2005) Chicago's O'Hare Modernization Program

"Mayor Lori Lightfoot today [September 9 2021] joined the Chicago Department of Aviation (CDA), government officials and airline executives at O'Hare International Airport to mark the completion of construction for the O'Hare Modernization Program (OMP), concluding the 16-year, $6 billion investment that transforms the airfield into a modern configuration, reduces delays and paves the way for future terminal redevelopment" – City of Chicago, Department of Aviation (2021) Official press release

"Majority-In-Interest is defined in the O'Hare Airport Use Agreement. During a fiscal year, the Majority-In-Interest is either (a) any five or more airline parties that together paid 60 percent or more of the preceding fiscal year's airport fees and charges or (b) any majority of airline parties that together paid 50 percent or more of the preceding fiscal year's airport fees and charges" – Federal Aviation Administration (2005) Chicago's O'Hare Modernization Program

"GARBs are bonds backed by the revenues generated by the airport, such as airline rates and charges. The City must get approval from O'Hare's Majority-In-Interest airlines to issue GARBs" – Federal Aviation Administration (2005) Chicago's O'Hare Modernization Program

"Majority-In-Interest rights allow dominant carriers to delay—or cancel—Phase 2 projects… Phase 2 approval from the Majority-In-Interest airlines is contingent on the support of either United or American, the dominant carriers at O'Hare" – Federal Aviation Administration (2005) Chicago's O'Hare Modernization Program

Source: Federal Aviation Administration (2005) O'Hare Modernization Program; City of Chicago, Chicago Department of Aviation (2021) "Mayor Lightfoot Marks Completion of O'Hare Modernization Program," press release, September 9, 2021

MUC: Case study on Munich Terminal 2 (1/2)

Industry | Aviation

Munich T2 illustrates that an integrated delivery model – with an ultimate accountable entity and aligned airport–airline incentives – can enable timely delivery

Context

Munich Airport Terminal 2 was developed in the late 1990s – early 2000s to support Munich's emergence as a major European hub, anchored by Lufthansa and Star Alliance growth

The project was delivered through a **dedicated joint venture between Flughafen München GmbH (FMG) and Deutsche Lufthansa AG,** created specifically to plan, finance, and deliver the terminal

With a terminal-specific joint venture (FMG 60% / Lufthansa 40%) operating Terminal 2, accountability and ownership were structured at terminal level.

Lufthansa's role gave it direct influence over development to align the terminal with airline handling processes at a hub

Outcomes

Munich T2 opened relatively on-time, demonstrating how concentrated accountability and collaborative expertise can support reliable delivery

Financeability

Successfully financed on a commercial basis, underpinned by Lufthansa's long-term commitment

Timeliness

Delivered on time in 4.5 years from design to construction

Efficient quality

High operational readiness at opening, supporting hub transfer operations

Regulatory model implications

7 Third Party continues to own and operate assets

- The third party in this case is a JV formed by the airport and an airline
- Operational requirements are integrated early, as the user and operator are also part-owners
- Seamlessness is ensured, reducing handover gaps between construction and operations
- Commercial risk is retained by the delivery entity and shared among JV stakeholders

Source: Fichert, F., & Klophaus, R. (2004). Munich Airport Terminal 2: A successful airport–airline cooperation; Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2

MUC: Case study on Munich Terminal 2 (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	SPV	+ **The structure avoided fragmented terminal ownership** while preserving strong airline commitment to capacity, operational design, and quality standards
	B. Operating structure	Integrated	+ **JV entity itself (FMG–Lufthansa) was responsible for design, build**, with operations handed to Lufthansa / FMG operating arms at opening
2. Governance	A. Capex governance	Independent committee	+ **Investment and design decisions were taken within a professionally well governed JV structure**, rather than through broad processes
	B. Capex targets	**Lack of publicly available evidence**	
	C. Governance acceleration	Standard process	= **No specific accelerated processes were outlined**, although the planning and execution saw significant involvement from FMG's owners, including the state of Bavaria, the Federal Republic of Germany, and the city of Munich
3. Incentives	A. Asset pricing	Commercial	= **Munich Airport Terminal 2 was financed on a commercial basis, with revenues underpinned by long-term airline commitments** rather than regulated asset base remuneration
	B. Asset definition	**N/A – RAB only**	
	C. Risk sharing	Shared risk	+ **Construction, operational readiness, and demand risks were shared between FMG and Lufthansa through the JV**, aligning incentives to control cost, manage interfaces, and prioritise operational performance

Source: Fichert, F., & Klophaus, R. (2004). Munich Airport Terminal 2: A successful airport–airline cooperation; Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2; Luftverkehrsgesetz

MUC: Deep dive on evidence base from case studies

Case study	MUC Terminal 2

Key insight	Source
Munich Terminal 2 was delivered on time in ~4.5 years under a 60/40 airport-airline JV, with some cost escalation While Terminal 2 was delivered through a joint airport–airline vehicle, fragmentation was contained rather than system-wide. FMG retained majority ownership of T2 and full ownership of Terminal 1, preserving a single system steward for the airport and limiting interface risk between terminals	*"After only four-and-a-half years' planning and construction time, it went into operation smoothly and on schedule"* – Lufthansa (2004) Annual Report 2003 *"FMG is contributing 60 percent of the construction costs, while Lufthansa is contributing 40 percent to the financing of the new terminal building, which is scheduled to open at the start of the 2003 summer flight schedule"* –Baunetz (2000) Ready for take-off foundation stone laid for Terminal 2 at Munich Airport (translated) *"Terminal started operating in June 2003"* - Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2 *"In July 2003, BayernLB and KfW concluded a supplementary loan agreement to the loan agreement of 13 September 2000 to cover the additional financing needs of Terminal 2 due to the increase in construction costs"* - Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2 *"The participation of the DLH in the project Terminal 2 has no effect on intra-airport competition since there is no terminal competition whatsoever. The main reason is that Terminal 2 falls under the influence of the majority shareholder, the FMG, which is also the sole owner of Terminal 1"* – Kuchinke & Sickmann (2007) The Joint Venture Terminal 2 at Munich Airport and its consequences: An analysis of competition economics
Despite timely delivery, the T2 JV triggered a 4-year EU competition investigation putting operation at risk Terminal 2 was subsequently subject to an EU state-aid and competition investigation into its JV financing and risk-sharing arrangements. Although ultimately cleared, the case illustrates how airport–airline JV structures can attract heightened regulatory scrutiny, creating prolonged uncertainty (c. 4 years, 2008–2012) during early operations	*"… the risks incurred by the T2 Companies are borne in accordance with the allocation of the shares between FMG and LH… FMG and LH have concluded profit-and loss transfer agreements with the T2 Companies. They cover the losses in proportion to their shareholding (60:40). Under German law, FMG and LH are therefore liable for all debts contracted by the T2 Companies..."* - Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2

Source: Baunetz (2000) Ready for take-off foundation stone laid for Terminal 2 at Munich Airport; Fichert, F., & Klophaus, R. (2004). Munich Airport Terminal 2: A successful airport–airline cooperation; Official Journal of the European Union (2012) Financing arrangements for Munich Airport Terminal 2; Bjorn Kuchinke and Jorn Sickmann (2007) Competition Policy in Network Industries Volume 3: The Joint Venture Terminal 2 at Munich Airport and its consequences: An analysis of competition economics; Lufthansa (2004) Annual Report 2003

MAD: Case study on Madrid Terminal 4 (1/2)

Industry | Aviation

Early planning assumptions at Madrid-Barajas were compounded by external roadblocks, including judicial land acquisition and environmental approvals, driving delay and cost escalation despite single owner model

Context

Madrid-Barajas Terminal 4 was delivered as part of a major airport expansion programme led by AENA, Spain's state-owned airport operator

The project aimed to transform Barajas into a hub-airport, supporting Iberia's growth while maintaining airport-wide operational and architectural coherence

T4 was planned, financed, and delivered under single-owner public sponsorship, with AENA retaining full authority over design, sequencing, and system integration

Outcomes

Despite a strong single public owner and secure funding, Madrid-Barajas suffered major schedule delays driven by immature planning and external land and environmental constraints, leading to cost escalation and delayed value realisation

Financeability

Fully financeable under airport-wide public ownership, with cross-subsidy across assets

Timeliness

~2-3 year schedule delay from planned opening in 2003 versus actual opening in 2006

Efficient quality

~35% cost escalation amounting to more than €1Bn

Regulatory model implications

1a Changes to capex governance processes

- Master Plan approved on optimistic cost, schedule and scope assumptions, with material risks (land, environmental mitigation) insufficiently provisioned
- Cost and schedule baselines required progressive re-forecasting as execution realities emerged, rather than early corrective intervention
- Risk materialisation (expropriation delays, DIA scope expansion) addressed after approval, driving reactive cost and schedule escalation

1b Separation of system planning and ops delivery

- Environmental Impact Declarations (DIAs) functioned as subsequent regulatory gates, not constraints embedded continuously in delivery planning
- Judicial land expropriation processes operated outside the delivery organisation's control, with timelines incompatible with the approved programme

4b Mandated design-and-build contracts

- Delivery executed through multiple major construction and assistance contracts, managed centrally by AENA but let against immature designs
- Planning and scheduling arrangements resulted in ambiguities across construction packages and coordination challenges between concurrent works

Source: Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas, aprobado el 19 de noviembre de 1999, y de su situación a 31 de diciembre de 2004; Cortes Generales. Comisión Mixta para las Relaciones con el Tribunal de Cuentas. (2007). Diario de Sesiones, núm. 89. Congreso de los Diputados.

Heathrow

MAD: Case study on Madrid Terminal 4 (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	Single owner	+ **AENA's role as single airport owner and operator** enabled airport-wide optimisation of capacity, layout, and phasing
	B. Operating structure	Integrated	+ **AENA acted as the single accountable player for design and construction, procuring architecture, engineering and works** through coordinated packages, but with readiness constrained by external land and regulatory approvals
2. Governance	A. Capex governance	Consult-led	+ **Investment and scope decisions sat with AENA rather than incumbent airlines,** while airlines influenced outcomes through consultation
	B. Capex targets	Milestone-based	= **Capital delivery was guided by a planned opening date and phased milestones**, but without evidence of formal schedule-lock penalties or externally enforced completion incentives
	C. Governance acceleration	Standard	− **Delivery proceeded through standard public-sector governance processes**, with no dedicated fast-track for land or environmental approvals
3. Incentives	A. Asset pricing	Commercial	= **Airport charges were set at system level**, enabling cross-subsidy and long-term capacity investment rather than terminal-specific cost recovery
	B. Asset definition	N/A – RAB only	
	C. Risk sharing	Investor-led	= **Construction and demand risks were largely retained by AENA** on the public balance sheet, placing risks with the sponsor

Source: Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas, aprobado el 19 de noviembre de 1999, y de su situación a 31 de diciembre de 2004; Cortes Generales. Comisión Mixta para las Relaciones con el Tribunal de Cuentas. (2007). Diario de Sesiones, núm. 89. Congreso de los Diputados; Gobierno de España. (2003). Ley 21/2003, de 7 de julio, de Seguridad Aérea. Boletín Oficial del Estado.

MAD: Deep dive on evidence base from case studies

Case study	MAD Terminal 4

Key insight	Source
Land expropriation delays and environmental impact approval setbacks extended the delivery of MAD Terminal 4 by 2 years The official inquiry revealed that land eviction occurred one year later than scheduled and environmental approvals were received around two years after approval of Master Plan coupled with deficiencies in the planning and programming of the work packages	*"The delay in the commissioning of the expansion has been caused by various factors, given the complexity of the project; however, among them, those related to delays in carrying out the following activities stand out in particular. In December 1999, these activities were defined as critical to meeting the schedule, as they were considered difficult to control by the Barajas Plan Directorate and, in fact, experienced significant delays:* *- **Expropriation of land** for the Satellite Building, Satellite platform, and taxiways (file 35/99). In December 1999, the date scheduled as the end of the eviction process through judicial means was August 1, 2001. The eviction of the last plot took place on November 13, 2002.* *- **Expropriation of land** for the development of the Master Plan Phase 2 (file 37/00), intended for the two new runways, urban development, and parking. In December 1999, the date scheduled as the end of the judicial eviction of the land was August 21, 2002. The eviction of the last plot occurred on August 8, 2003.* ***- Environmental Impact Statement** for the runways and for the channeling of streams. It was approved on November 30, 2001, two years after approval of the Master Plan.* ***- Environmental Impact Statement** for the cogeneration plant. It was approved on August 1, 2002, 2 years and 8 months after approval of the Master Plan."* *"Deficiencies in the planning and scheduling of actions that led to ambiguities in the construction projects and to interference in the execution of one work with another"* – Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas, aprobado el 19 de noviembre de 1999, y de su situación a 31 de diciembre de 2004 (translated)
By the end of 2024, cost overruns reached approximately 35%, exceeding one billion euros, driven primarily by rising contract expenses during execution and underestimation of environmental costs The official inquiry revealed that AENA misjudged both contractor costs and expenses associated with environmental measures almost doubled to reach an estimated EUR 297 mn	*"As of 31 December 2004, that cost had increased by more than one billion euros, representing an increase of 35%."* *"This deviation… has its principal origin in increases in contract costs that occurred during execution, as well as in the fact that in some cases the costs initially budgeted were significantly lower than the amounts at which the corresponding contracts were awarded."* *"AENA's forecasts at the time of approval of the 1999 Master Plan proved to be clearly disproportionate compared with the cost actually generated by the environmental actions."* *"At the time of approval of the 1999 Master Plan, AENA had estimated that the environmental commitments would amount to a minimum of €72 million and a maximum of €120 million; however […] as of 31 December 2004, the forecast cost had risen to €296.827 million."* – Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas, aprobado el 19 de noviembre de 1999, y de su situación a 31 de diciembre de 2004 (translated)

Source: Tribunal de Cuentas. (2007). Informe de fiscalización de las principales actuaciones realizadas por AENA en desarrollo del Plan Director del Aeropuerto de Madrid-Barajas, aprobado el 19 de noviembre de 1999, y de su situación a 31 de diciembre de 2004

LHR T2: Case study on Heathrow T2 (1/2)

Industry | Aviation

Heathrow T2's delivery performance was associated with concentrated authority and the continuous adjustment of risk and assurance practices during delivery

Context

Heathrow Terminal 2 was delivered by **Heathrow Airport Limited (HAL)** as a major terminal replacement programme, modernising ageing infrastructure

T2 was delivered within Heathrow's **regulated airport framework**, with funding recovered through the regulated asset base (RAB) and oversight provided by the Civil Aviation Authority (CAA)

Outcomes

Heathrow T2 is viewed as a **positive delivery case**, demonstrating how a strong single sponsor, operating within a regulated framework, can improve megaproject delivery outcomes

Financeability

Fully financeable under an airport-wide regulated framework, with costs recovered through the RAB across Heathrow's asset base

Timeliness

Opened in line with planned schedule

Efficient quality

High operational readiness at opening, with no post-opening system failure or regulatory re-approval required

Regulatory model implications

1a Changes to capex governance processes

- Heathrow T2 shows that single-sponsor decision authority, exercised by the airport operator, can materially reduce interface risk and enable rapid re-sequencing where late operational complexity emerges
- Regulatory oversight functioned as boundary-setting and assurance, rather than fragmenting decision rights or introducing user vetoes
- The case shows that economic regulation can coexist with adaptive risk governance, including evolving assurance mechanisms, increased transparency, and shared visibility of emerging risks

2 Targeted adjustments to the existing incentive regime

- Heathrow T2 was delivered without project-specific incentive adjustments
- CAA's regulatory framework did not permit recovery of inefficient capital expenditure, increasing pressure on HAL to manage cost, risk and readiness

Source: Heathrow (2014) Heathrow Annual Report; Vine, R. (2019). Riskwork in the construction of Heathrow Terminal 2; APM (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2

LHR T2: Case study on Heathrow T2 (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	Single owner	+ **HAL's role as single asset owner and system sponsor** enabled clear accountability for design, delivery, and operational readiness
	B. Operating structure	Integrated	+ **HAL acted as the single accountable player for design, construction, and readiness**, procuring architecture, engineering, and construction through coordinated packages
2. Governance	A. Capex governance	Consult-led	+ **Capital investment decisions sat with HAL**, within a regulated framework, rather than requiring airline majority approval
	B. Capex targets	Milestone-based	= **Capital delivery was guided by a planned opening date and phased milestones** with adaptive control
	C. Governance acceleration	Standard	= **T2 did not benefit from statutory fast-track approvals** or external acceleration mechanisms
3. Incentives	A. Asset pricing	RAB	+ **T2 capex was incorporated into Heathrow's regulated asset base**, supporting low-cost financing
	B. Asset definition	Single RAB	+ **Clearly defined terminal asset within airport-wide RAB**
	C. Risk sharing	Shared risk	= **Risk on T2 was shared but conditional** – costs were recoverable from users only if deemed efficient, leaving exposure to disallowance risk

Source: Heathrow (2014) Heathrow Annual Report; Vine, R. (2019). Riskwork in the construction of Heathrow Terminal 2; APM (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2

LHR T2: Deep dive on evidence base from case studies

Case study	LHR Terminal 2

Key insight	Source
Heathrow T2 opened on-time, with risk governance, operational-readiness routines, and sponsor authority preventing escalation into cost or operational overruns This was supported by explicit risk-visibility mechanisms, including shared dashboards, regular reporting, and open cross-party forums used to surface and act on emerging risks during delivery and transition to operations	*"Terminal 2 was opened on time and on budget and attained a high safety record during the construction phase"* – Heathrow (2014) Heathrow Annual Report *"On T2, rather than executing the plan within the boundaries of a fixed appetite for risk, we observed an iterative model of project control"* – Vine, R. (2019). Risk work in the construction of Heathrow Terminal 2 *"T2 case specifically highlights the importance of enrolment spaces (IBRs, MPRs) in enabling integrated debates about risk and accountability management. Rather than placing suppliers into a defensive narrative to justify performance deviations, reporting forums provided mediatory spaces to enrol others into agreeing which risks were most worthy of management and protection."* – Vine, R. (2019). Risk work in the construction of Heathrow Terminal 2 *"The dashboard created a space to problematise ways of improving productivity whilst making judgements about risk mitigation strategies."* – Vine, R. (2019). Risk work in the construction of Heathrow Terminal 2
Heathrow T2 absorbed a late increase from 18 to 26 airline occupiers through the reconfiguration, adaptation, and maintenance of project capabilities that enabled operational readiness and transition to operations on-time	*"Adapting project capabilities is related to how the project responded to an unforeseen key event that affected the T2 operational business case – the BMI merger – and the change from having to accommodate the shift from the original 18 to the final 26 airline occupiers"* – APM (2018) *Project* capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2

Source: Heathrow (2014) Heathrow Annual Report; Vine, R. (2019). Riskwork in the construction of Heathrow Terminal 2; APM (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2

Contents

Key takeaways from other regulated UK infrastructure projects (1/2)

Case study	Key takeaways
Thames Tideway Tunnel (TTT)	• **Single-point system accountability** was established through a standalone SPV with end-to-end responsibility for design, construction, integration and commissioning • **A long-term, bespoke regulatory settlement** locked in revenue certainty early, supporting investor confidence and delivery continuity • **Downside risk was explicitly capped and** shared (separate RAB, government support), preserving delivery authority and discipline while avoiding stop–start intervention
High Speed 2 (HS2)	• **Political commitments to opening dates and scope were made before design maturity**, with the Hybrid Bill launched at ~4% design maturity • **Extensive veto and approval powers** (including Schedule 17 local authority approvals and other statutory consents) introduced thousands of sequential decision points • Decisions were subject to multi-layer approval processes, prioritising statutory compliance and process over pace, with **no bespoke acceleration or escalation mechanism** • **With no investor or regulatory performance discipline**, cost and schedule overruns accumulated without early corrective intervention
Ofgem's ASTI	• **Dedicated accelerated framework** for system-critical transmission projects, streamlining need, scope, and funding • Enables **early regulatory commitment** and up to 20% pre-construction funding, with portfolio example EGL2 achieving up to 2 years faster approvals
UK Nuclear	• Under the **CfD model**, delays at Hinkley Point C increased expected consumer top-up payments from ~£6bn to ~£30b • Government concluded that **placing full construction and financing risk on developers under CfD contributed to high cost of capital and weak investability** • The **RAB model for Sizewell C** was adopted to share construction risk and allow revenue during construction, with the explicit aim of **reducing the cost of capital**

Source: NAO (2017) Review of the Thames Tideway Tunnel; DfT (2025) Stewart Review; Ofgem (2022) Decision on the Accelerated Strategic Transmission Investment (ASTI) framework; BEIS (2020) RAB Model for Nuclear: Government response to the consultation on RAB model for new nuclear projects

Key takeaways from other regulated UK infrastructure projects (2/2)

Case study	Key takeaways
Network Rail – Project SPEED	• **Funding and approvals were decoupled from fixed opening dates** until sufficient design maturity was reached • Project SPEED introduced a distinct, **accelerated decision pathway** for complex, system-critical rail projects • The framework was explicitly introduced to **address delay and cost escalation associated with premature lock-in** under previous governance
Haweswater Aqueduct	• The project was designated as the **first major Direct Procurement for Customers (DPC) scheme**, requiring a **bespoke, project-specific regulatory framework** and guidance • Designation in 2021 and financial close in 2025 indicate a **prolonged pre-construction phase**, with delivery outcome evidence not yet observable.
Great British Railways (GBR)	• Reforms are explicitly motivated by evidence that **fragmentation across multiple bodies undermined accountability and efficiency** • **GBR is designed to create a single system "directing mind",** consolidating planning, contracting and operational accountability • Government estimates suggest **potential efficiency gains of ~£1.5bn per year**, based on reduced fragmentation
UK Fibre	• Ofcom pivoted to a **long-term, investment-focused regulatory framework** for high-capex FTTP deployment • Ofcom **relaxed price controls** and **introduced targeted pricing flexibility** to improve investment incentives, reduce deployment risk, and support sustained private capital mobilisation

Source: DfT and Network Rail (2021) Launch of Project SPEED challenges rail industry to cut time and costs of rail upgrades; Ofwat (2025) Guidance on Ofwat's regulation of the HARP being delivered by United Utilities Water Limited; DfT consultation (2025), "A railway fit for Britain's future; Ofcom (2025) Connected Nations UK Report 2025

TTT: Case study on Thames Tideway Tunnel (1/2)

Industry: Water

At Tideway, clear system accountability, long-term regulatory commitment and managed downside risk enabled delivery continuity despite scale, complexity and cost escalation

Context

The Thames Tideway Tunnel is a ~25km megaproject to intercept combined sewer overflows in London and transfer them for treatment, delivered as a standalone regulated infrastructure project

The project was **explicitly removed from Thames Water's balance sheet** and designated a Specified Infrastructure Project (SIP) in 2014, following concerns of its scale, complexity and risk profile

Construction began in 2016, with the **delivery model and regulatory framework intentionally designed to address megaproject risks** around financing, system integration, and delivery accountability

Outcomes

Tideway has maintained **delivery control** and **avoided late-stage system failures** within a stable regulatory and financing framework

Financeability

~£4.5bn privately financed under regulated revenue model secured throughout construction, supported by contingent government guarantees

Timeliness

<1 year delay construction completion date

~8 year gap between early development and regulatory licensing

Efficient quality

No late- stage failures requiring regulatory re-approval

~1.3x cost escalation from regulatory baseline (£3.5bn) to latest forecast (£4.5bn)

Regulatory model implications

3 Long-term regulatory framework for expansion

- Project delivered under a bespoke, long-term regulatory settlement
- Reduced re-determination risk and provided stable investor expectations across construction
- Enabled continued delivery despite cost escalation, without stop–start

7a Wholesale supplier model

- A single licensed Infrastructure Provider accountable for design, construction, integration, commissioning and readiness
- Clear ownership of end-to-end system performance, rather than fragmented responsibility across sponsors or contractors
- Reduced ambiguity over accountability for outcomes

2 Targeted adjustments to the existing incentive regime

- Delivery supported by contingent government support for low-probability, high-impact risks within a bespoke regulatory structure
- Extreme downside risk capped, while day-to-day cost and delivery risk remained with investors, preserving delivery discipline
- Ring-fenced project RAB reduced contagion risk to the wider Thames Water RAB and protected core network customers
- Long-term, predictable regulated revenues under the separate RAB enabled continued private financing and avoided stop–start

Source: National Audit Office (2017) Review of the Thames Tideway Tunnel; Ofwat (2020) Annex E: Terms of reference of the Thames Tideway Tunnel Committee; Infrastructure and Projects Authority (2016) Annual Report on Major Projects 2015-26

TTT: Case study on Thames Tideway Tunnel (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	SPV	++ **A standalone SPV created single-point accountability** for design, construction, integration and commissioning, reducing sponsor–operator ambiguity and enabling early resolution of system-wide risks without escalation
	B. Operating structure	Integrated	++ **Integrated responsibility for design, construction, testing and commissioning aligned incentives around end-to-end system performance,** reducing interface risk and avoided late-stage integration failures
2. Governance	A. Capex governance	Independent committee	+ **Capital decisions were approved by Tideway's board with a majority of independent directors,** bolstered by expert assurance from the Independent Technical Assessor's technical reviews
	B. Capex targets	Milestone-based	+ **Delivery was defined as a functioning, commissionable system, not construction completion by a fixed date.** This reduced pressure for premature "go-live" commitments and rework driven by schedule optics
	C. Governance acceleration	Dedicated framework	++ **A project-specific governance and assurance framework was established from the outset,** supporting earlier escalation and clearer decision-making, rather than reactive intervention once delays emerged
3. Incentives	A. Asset pricing	RAB	+ **The RAB model provided revenue certainty and financing continuity,** supporting delivery stability. However, the bespoke structure was complex and relied on extensive upfront alignment to establish
	B. Asset definition	Dual RAB	= **A separate RAB isolated megaproject risk from Thames Water's core utility, strengthening delivery focus and financeability**, but required substantial equity commitment and regulatory complexity to establish
	C. Risk sharing	Shared risk	++ **Financial risk was shared between investors, customers and government,** with regulated revenues and UK government guarantees capping downside. This materially reduced tail risk, enabling the SPV to retain delivery authority

Source: National Audit Office (2017) Review of the Thames Tideway Tunnel; Ofwat (2020) Annex E: Terms of reference of the Thames Tideway Tunnel Committee; Infrastructure and Projects Authority (2016) Annual Report on Major Projects 2015-26

TTT: Deep dive on evidence base from case studies

Case study	Thames Tideway

Key insight	Source
Government risk support – within a regulated revenue framework – enabled £3.5bn of private finance to be raised at a low regulated return of 2.497% Securing this support likely contributed to the ~8-year gap between Thames Water's 2005 tunnel proposal and the 2013 Bazalgette licence award. While the regulated return was below the prevailing WACC at the time (~3.8%), it is unclear whether this ultimately represented the lowest achievable cost of capital in hindsight. Nonetheless, the NAO confirms that the Government Support Package enabled large-scale private financing to be mobilised quickly, limiting delivery risk and helping to contain consumer bill impacts	*"By reducing potential risks to investors, the GSP was key to Bazalgette financing the project on a lower regulated return than would have been possible otherwise (2.497%) …*The lower than expected cost of finance has helped to reduce the expected impact of Tunnel costs on household bills from the 2011 prediction of between £70 and £80 a year…" – NAO (2017) Review of the Thames Tideway Tunnel *"The Department concluded that private delivery of the project would not be financially viable without some form of government support, because of the scale of the project risks and the implications for financing costs that customers would ultimately fund."* – NAO (2017) Review of the Thames Tideway Tunnel *"The treasury ruled out public financial support for what it considered to be a private-sector responsibility. Implementation was thus stalled"* – Findeisen (2024) Building an Island of state capacity
Delivery incentives constrained delay to ~6-9 months within a ~8-10 year construction programme, with Ofwat finding no drivers of delay beyond COVID-19 Ofwat concluded that COVID-19 was the sole cause of the recognised delay; regulatory penalties and a 1% WACC step-down for late delivery ensured incentives to remain on-time	*"If there is a delay to the project such that acceptance of the completed asset is not achieved by the Planned System Acceptance Date, Tideway will incur a penalty for the delay… If the project is delayed beyond 28 February 2027, the Bid WACC will decrease by 1% from that date."* – Ofwat (2022) Reasons for amending Tideway's project license *"We are now satisfied that Tideway has provided sufficient evidence that Covid-19 was the sole cause of five months of delay to the project"*– Ofwat (2022) Reasons for amending Tideway's project license
Bespoke regulation reduced expected customer bill impacts by ~£50–60 per year Specified Infrastructure Project Regulations (SIPR), combined with government risk support, enabled private delivery and competitive procurement at scale, contributing to lower financing costs and more constrained project costs	*"The use of SIPR for TTT reduced costs to customers. Initially, the project was expected to increase Thames Water's customer bills by £70-£80 annually in the worst case scenario. Following the SIPR procurement competition, the estimated average annual bill increase was reduced to £20-£25"* - Independent Water Commission (2025) Review of the water sector
Independent technical assurance supported effective cost and schedule oversight during delivery, keeping total delays minimal at 6-9 months The Commission also identified the use of an Independent Technical Assessor as a successful governance approach	*"There are key lessons to be learnt from the use of an Independent Technical Assessor during the construction of the Thames Tideway Tunnel. This was a successful approach to supervising the delivery of infrastructure, and the assessor was able to objectively and independently review and assess the ongoing project performance and delivery, primarily in relation to project costs and schedule"* – Independent Water Commission (2025) Review of the water sector

Source: National Audit Office (2017) Review of the Thames Tideway Tunnel; Ofwat (2022) Reasons for amending Tideway's project license; Independent Water Commission (2025) Independent Water Commission: Review of the water sector; Findeisen (2024) Building an island of state capacity: How the UK state implemented the Thames Tideway Tunnel with market-based finance

HS2: Case study on High Speed 2 (1/2)

Industry: Rail

Standard governance for HS2 lacked the ability to move at pace or enforce cost discipline, contributing to early commitments and scope instability to drive major delay and overspend

Context

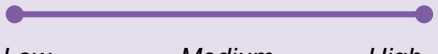
High Speed 2 (HS2) was a nationally sponsored UK rail megaproject, funded and overseen by central government and delivered by HS2 Ltd, an arm's-length body of the Department for Transport

Delivery followed a **centralised public-sector model**, outside an economic regulatory regime and without third-party equity, progressing through standard government approvals and assurance frameworks

Outcomes

HS2 experienced **major delay** and **overspend**, culminating in the **cancellation of Phase 2** and delivery of a reduced Phase 1

Financeability



N/A – *publicly funded throughout*

Timeliness

~7-10+ year schedule delay from planned 2026 Phase 1 opening, now expected early-mid 2030s

Multiple formal re-baselines and scope resets

Efficient quality

~3x cost escalation for Phase 1 from early baseline assumptions ~£17bn to ~£50bn

Phase 2 cancellation materially reduces service scope and value vs. expectations

Regulatory model implications

1a Changes to capex governance processes

- Multiple approval / assurance layers diluted delivery accountability
- Schedule 17 embedded local authority involvement in detailed design approvals, introducing numerous sequential approval interfaces
- Governance arrangements prioritised statutory compliance and process, with limited mechanisms to accelerate design approvals, contributing to slower decision-making, increased redesign risk, and cost and schedule pressure

4a Enhanced scrutiny of procurement

- HS2 Ltd could approve contracts <£50m; most contracts exceeded £50m and required DfT (and often HMT and Cabinet) approval
- As a result, the majority of procurements were subject to multi-stage cross-government approvals, extending approval timelines

4b Mandated design-and-build contracts

- Delivery structured around large design-and-build civils packages (MWCCs), strategic choice (not externally mandated)
- HS2 Ltd retained system integration responsibility but lacked sufficient capability and leverage
- Contracts enabled early construction but locked in immature designs
- Resulted in significant cost overruns, which became driver of programme underperformance

Source: Department for Transport (2025) Stewart Review; National Audit Office (2020) HS2: A progress update; National Audit Office (2020) Lessons from Delivering Major Programmes

HS2: Case study on High Speed 2 (2/2)

Degree of impact: −− − = + ++

Element	Sub-elements	Design choice	Impact on project delivery
1. Structure	A. Ownership	Public owner	= **Public ownership ensured continuous funding via DfT but concentrated cost and schedule risk with government**, removing investor discipline and reducing incentives for early cost containment
	B. Operating structure	Design-Build	−− **Large MWCC design–build contracts were let before route designs were mature,** locking in scope and interface risk while HS2 Ltd lacked the capability to manage system integration, embedding rework, delay and cost escalation
2. Governance	A. Capex governance	Independent committee	−− **Investment decisions required approvals across HS2 Ltd, DfT Sponsor, HMT, Cabinet Office, Parliament and local authorities,** dispersing decision rights and delaying timely resolution of cost and delivery issues
	B. Capex targets	Cost/schedule-locked	−− **Political commitments to opening dates drove early Notice to Proceed and contract awards before design maturity,** embedding unrealistic schedules and triggering rework, delay and cost escalation
	C. Governance acceleration	Standard process	− **HS2 relied on standard departmental, statutory and assurance timelines, with no fast-track or empowered escalation route**, preventing decisions from keeping pace with delivery risk
3. Incentives	A. Asset pricing	No price regulation	− **With no RAB, user charges or regulated return, cost discipline depended on periodic Treasury funding decisions,** slowing intervention and allowing overruns to accumulate before corrective action
	B. Asset definition	N/A – RAB only	
	C. Risk sharing	Government backstop	− **Government ultimately absorbed construction and schedule overruns** without predefined performance conditions, weakening delivery discipline and shifting adjustment into scope reduction and Phase 2 cancellation

Source: Department for Transport (2025) Stewart Review; National Audit Office (2020) HS2: A progress update; National Audit Office (2020) Lessons from Delivering Major Programmes

HS2: Deep dive on evidence base from case studies

Case study	High Speed Rail 2

Key insight	Source
Proceeding at ~4% design maturity contributed to delay of at least 3 years and up to 10 years relative to the original plan Parliamentary and Government reviews attribute Phase One delays to the commitment to major construction before design and consents were sufficiently mature	*"In 2013 the Hybrid Bill was launched off a business case with a very low design maturity. I understand that this was 4%... The constraints of taking a Hybrid Bill through Parliament meant that there was no ability to iterate the requirements, scope, cost and schedule."— DfT, Stewart Review: The HS2 Experience (2025)*
Local consent powers required over 7,000 individual approvals, with local bodies contributing to 3-10 years of overall delays Government reports note that veto and planning powers delayed delivery and drove higher costs; HS2 Ltd evidence cites over 7000 individual consents required for civil engineering	*"Aligned to design is that we have had to get over 7,000 individual consents for the civil engineering… The hybrid Bill did not gain us local consent for section 17 to actually build the structure… We have simply been blocked by not having the design and not having the permission to do it."* — UK Parliament, Transport Committee, Oral Evidence on HS2, 9 July 2025 *"There is, however, the risk that these [veto] rights are used to frustrate the delivery of consented projects, with legal challenges and planning powers used in a way that drives up costs to both local and national taxpayers, rather than protecting local interests."* — High Speed Two (HS2) 6-monthly report to Parliament: July 2025, Written Statement transcribed in Hansard (UK Parliament)
Evolving political decisions led to Phase Two cancellation and resulted in impairments exceeding £1bn Phase Two and HS2 East cancellation resulted in ~£100m in close-down costs and over £1bn of impairments; the Stewart Review identifies the pace of political decision-making as a key disruptor	*"Politics and the pace of political decision-making have been a disruptor and there has been no buffer…The HS2 Programme has been subject to evolving political aims, which pushed forward on the schedule before there was sufficient design maturity and caused progressive removals of scope."— DfT, Stewart Review: The HS2 Experience (2025)*
A non-project specific governance framework with blurred accountability contributed to 3x cost escalation from early baseline assumptions ~£17bn to ~£50bn The Stewart Review found that HS2 operated under an overly complex governance framework not designed for a programme of this scale, with blurred accountability weaking cost control	*"…the governance structure needs to change. It is too complicated, multi-layered, blurs accountabilities… The lack of clear accountability between the Department, HS2 Ltd and the wider sponsorship arrangements weakened effective control over cost, schedule and scope.""— DfT, Stewart Review: The HS2 Experience (2025)* *"The governance framework was not designed specifically for HS2 and did not evolve sufficiently as the Programme grew in scale, cost and complexity" – DfT, Stewart Review: The HS2 Experience (2025)*

Source: UK Parliament Transport Committee (2025) Oral evidence on HS2; Department for Transport (2025) HS2 6-monthly report to Parliament: July 2025; Department for Transport (2025) Stewart Review

ASTI: Case study on Ofgem's ASTI framework

Industry | Energy

Degree of impact: −− − = + ++

Context

Ofgem's Accelerated Strategic Transmission Investment (ASTI) framework launched in 2022 is a dedicated regulatory pathway for system-critical projects where delay would impose material costs on consumers

It is used **where standard RIIO processes are too slow or sequential** to support timely delivery of nationally important infrastructure (e.g. net zero–enabling transmission reinforcements)

Regulatory model

Element	Sub-element	Design choice	Impact on project delivery
2. Governance	**C. Governance acceleration**	**Dedicated framework**	+

Key design features

- **Dedicated accelerated regulatory** pathway for strategically critical projects, enabling earlier decisions on need, scope and funding
- **Explicit escalation and regulatory determination** to resolve disputes on scope, cost or timing through formal regulatory determination
- **Early and predictable cost** recovery (including anticipatory investment) allowing delivery to proceed in parallel with later-stage design

Impact on project delivery

- **Intended to reduce regulatory delay on system-critical megaprojects**, enabling earlier progression to delivery for schemes such as Eastern Green Link 1 & 2 (HVDC)
- **Can improve financeability** and supplier mobilisation for providing earlier and more predictable cost recovery
- **Has the potential to lower stop–start and re-scoping risk** through explicit escalation and regulatory determination
- **Delivery evidence remains limited**, given the early stage of ASTI deployment

Implications for CAA regulatory models

1a Changes to capex governance processes

- **Explicit governance acceleration, clear decision rights and escalation mechanisms** can materially improve timeliness by reducing regulatory critical-path risk and preventing prolonged disputes or repeated re-scoping
- **Earlier regulatory commitment to need, scope and funding** can improve financeability for large, irreversible investments by reducing uncertainty during the most capital-intensive phases of delivery

3 Long-term regulatory framework for expansion

- **Long-term regulatory stability alone is insufficient** for expansion megaprojects; ASTI shows that stable frameworks are most effective when combined with defined fast-track pathways for time-critical investments

Source: Ofgem (2022) Decision on the Accelerated Strategic Transmission Investment (ASTI) framework; Ofgem (2023) ASTI Guidance and Submission Requirements; Department for Energy Security and Net Zero (2023) – Accelerating electricity transmission network deployment: Electricity Networks Commissioner's Recommendations (Nick Winser Review)

ASTI: Deep dive on evidence base from case studies

Case study	Ofgems's ASTI

Key insight	Source
Accelerated regulatory framework can bring delivery forward by several years (up to ~6 years relative to RIIO deferral scenarios) ASTI is enabling a portfolio of 26 system-critical electricity transmission projects to secure early regulatory commitment and up to 20% pre-construction funding within RIIO-2 (2021–26), potentially avoiding deferrals to RIIO-ET3 (up to ~6 years earlier price control certainty for some projects)	*"We decided to introduce an Accelerated Strategic Transmission Investment (ASTI) framework to assess, fund and incentivise the accelerated delivery of large, strategic onshore electricity transmission projects."— Ofgem, Decision to modify electricity transmission licences – ASTI* *"The ASTI framework enables ASTI project developers to apply for Early Construction Funding (ECF). These allow project developers to apply for up to 20 per cent of total forecast project costs to fund early construction activities including land purchases, early procurement purchases and preparatory works, such as ground preparation"*– Ofgem (2024) Press release
ASTI has accelerated the funding and regulatory approval process for EGL2 by up to 2 years ASTI accelerated Eastern Green Link 2 (EGL2) – the UK's largest subsea interconnector – by up to 2 years versus the baseline LOTI re-opener processes under RIIO-ET2	*"Eastern Green Link 2 (EGL2) is the first of 26 projects to complete a fast-track process to secure funding through Ofgem's new ASTI framework. ASTI accelerates the funding process by up to two years, allowing electricity generated by offshore wind to be delivered to British consumers sooner"* – Ofgem (2024) Press release

Source: Ofgem (2023) Decision to modify the special licence conditions in the electricity transmission licences: Accelerated Strategic Transmission Investment; Ofgem (2024) Press release "Proposed Anglo-Scottish electricity superhighway is first to clear final fast-track funding hurdle" (13 August 2024)

UK Nuclear case study

Industry | Energy

Degree of impact: − − − = + + +

Context

The UK's first wave of nuclear new build used a Contract for Difference (CfD) model (Hinkley Point C), under which developers bore full construction and financing risk, contributing to high strike prices and weak investability

Following stalled and cancelled projects, Government introduced a RAB model for Sizewell C to reduce financing risk, lower cost of capital and support delivery of large, sunk investments

Regulatory model

Element	Sub-element	Design choice	Impact on project delivery
3. Incentives	A. Asset pricing	RAB	+ + • **CfD placed excessive construction risk on developers,** driving high contingencies, financing costs, and weak delivery outcomes • **RAB was preferred because it reduces financing risk during construction,** lowering cost of capital and improving investability for large, sunk assets
	C. Risk sharing	Shared risk	+ + • **Investor-led risk sharing judged unviable** for nuclear megaprojects, contributing to cancellations and sponsor withdrawal • **Shared risk was preferred** - between developers and consumers with government backstop - to reduce risk premia while retaining regulatory scrutiny

Implications for CAA regulatory models

9 New frameworks for setting airport charges

- Government nuclear evidence suggests that successful megaproject financing and delivery is supported by regulated asset pricing with revenue during construction

3 Long-term regulatory framework for expansion

- Nuclear RAB demonstrates that **upfront, long-term regulatory commitment materially reduces financing risk** and cost of capital without removing delivery discipline

Source: Department for Business, Energy & Industrial Strategy (2020) RAB Model for Nuclear: Government response to the consultation on RAB model for new nuclear projects; Department for Energy Security & Net Zero (2025) Sizewell C (SZC) Final Investment Decision; Department for Energy Security and Net Zero (2025) Annex 4 Key differences with Hinkley Point C Relating to the FAP; National Audit Office (2017) Hinkley Point C; Fingleton (2025) Nuclear Regulatory Review 2025: Enabling nuclear delivery through regulatory reform

UK Nuclear: Hinkley Point C vs. Sizewell C

As highlighted by the Fingleton Review (2025), UK nuclear project outcomes are driven by multiple systemic factors — including regulatory complexity, risk aversion, planning and legal challenge — of which financing and regulatory structure are only one part

Hinkley Point C

Key design choices (CfD)

- **Risk allocation**: Investors primarily bear construction and financing risk
- **Revenue timing:** Fixed strike price payable only after commissioning
- **Incentives:** High risk priced upfront into long-term CfD strike price

Sizewell C

Key design choices (RAB)

- **Risk allocation**: Investors and consumers share construction and financing risk
- **Revenue timing:** Regulated revenue allowed during construction & operation
- **Incentives:** Lower cost of capital via risk sharing and regulatory oversight

Outcomes

	Hinkley Point C	Sizewell C
Financeability	• Financeable but via an atypically long and high-value CfD • Unlike standard UK CfDs (typically ~15 years), Hinkley Point C was awarded a £92.50/MWh, reflecting NAO and BEIS acknowledgment that investor risk and financing constraints drove the strike price and contract structure	• FID reached in 2024 under a RAB model with ~£1/month avr. household impact during construction • RAB structure expected to materially reduce financing costs compared to CfD
Timeliness	• ~4-6 year delay relative to early post-FID schedules with original 2025 target now expected 2029-2031	• Construction performance not yet observable • FID achieved using construction-period revenue reduces known drivers of schedule delay
Efficient quality	• Schedule delays directly increased CfD top-up payments from ~£6bn to ~£30bn • Strike price set at 2x wholesale prices • NAO found that value for money weakened materially as delays accumulated	• Cost efficiency and delivery quality not yet observable • Safety and quality standards unchanged from Hinkley Point C

Low Medium High

Source: Department for Business, Energy & Industrial Strategy (2020) RAB Model for Nuclear: Government response to the consultation on RAB model for new nuclear projects; Department for Energy Security & Net Zero (2025) Sizewell C (SZC) Final Investment Decision; Department for Energy Security and Net Zero (2025) Annex 4 Key differences with Hinkey Point C Relating to the FAP; National Audit Office (2017) Hinkley Point C; Fingleton (2025) Nuclear Regulatory Review 2025: Enabling nuclear delivery through regulatory reform; UK Parliament (2024) Contracts for Difference

UK Nuclear: Deep dive on evidence base from case studies

Case study	Hinkley Point C vs. Sizewell C

Key insight	Source
The CfD model required unexpected top-up payments up to £24bn (going from £6bn to £30bn, ultimately paid by customers) Hinkley Point C delays increased expected consumer top-up payments from £6bn to £30bn; the NAO concluded that placing full construction risk on the developer under the CfD structure exposed consumers and taxpayers to a high-cost, high-risk outcome as delays accrued	*"Delays have pushed back the nuclear power plant's construction, and the expected cost of top-up payments under the Hinkley Point C's contract for difference has increased from £6 billion to £30 billion… The Department has committed electricity consumers and taxpayers to a high cost and risky deal in a changing energy marketplace."*— NAO, *Hinkley Point C (2017)*
RAB risk-sharing reduced Sizewell expected cost by ~20% vs. Hinkley and capped consumer exposure during construction For Sizewell C, Government adopted a RAB-based model that shares construction risk and embeds downside discipline; Sizewell reached Final Investment Decision with a £38bn cost target—around 20% lower than the estimated cost of Hinkley Point C—and consumer charges capped at ~£1/month during construction, with Government explicitly linking this structure to reduced cost of capital while preserving delivery incentives	"*The Government concluded that a CfD is not an appropriate model for new nuclear projects, because it places too much construction risk on the developer and leads to a higher cost of capital."*— UK Government, *Nuclear RAB Consultation: Government Response* (2022) *"Under the RAB model, construction risk is shared between consumers, investors and the Government, rather than being borne solely by the developer…The RAB model can reduce the cost of capital by allowing investors to start receiving revenue during construction, while maintaining incentives to deliver efficiently"* - UK Government, *Nuclear RAB Consultation: Government Response* (2022) *"The framework includes robust incentives and penalties… including reducing investor returns if the project overruns cost thresholds… and the ability to 'lock up' shareholder dividends in certain scenarios."*— UK Parliament Written Statement (22 July 2025) *"The investment deal builds on lessons learnt from the construction of Hinkley Point C to provide a funding model that spreads the around £38 billion cost of constructing Sizewell C between consumers, taxpayers and private investors. This represents a saving of around 20% compared with Hinkley Point C and demonstrates the value of building a virtual replica project"* - UK Parliament Written Statement (22 July 2025)

Source: National Audit Office (2017), Hinkley Point C; UK Government (2022), Nuclear RAB Consultation: Government Response; UK Parliament Written Statement (22 July 2025), Sizewell C Final Investment Decision

SPEED: Case study on Network Rail *Project SPEED*

Industry | Rail

Degree of impact: − − − = + + +

Context

Historic Network Rail enhancement programmes were characterised by repeated cost overruns and delays, **reflecting early schedule** and **scope lock-in, immature definition at commitment,** and the application of **uniform governance** to projects with very different levels of complexity and risk

Project SPEED was introduced in 2021 as a system-wide delivery acceleration initiative, designed to address these shortcomings by simplifying planning and approval processes, reducing procedural friction, and enabling more proportionate, timely decision-making within existing statutory and regulatory frameworks.

Regulatory model

Element	Sub-element	Design choice	Impact on project delivery
2. Governance	C. Governance acceleration	**Dedicated framework** While **not a bespoke or project-specific framework**, Project SPEED — together with delivery frameworks developed alongside it (e.g. PACE) — **enables a more differentiated and flexible approach to governance and delivery** across projects of different scale, risk and complexity	+

- **Established Project SPEED as a distinct system-wide delivery acceleration initiative,** enabling faster and more proportionate decision-making by simplifying planning and approval processes that had previously delayed complex rail projects
- SPEED **works within existing statutory and regulatory structures**, to support all projects — so not dedicated but accelerated
- Delivery frameworks developed alongside SPEED (e.g., PACE) illustrate how **proportionate, risk-based controls and more flexible delivery management** can replace rigid uniform processes while improving time and cost efficiency
- Delivery evidence remains limited, given the early stage of SPEED deployment

Implications for CAA regulatory models

1a **Changes to capex governance processes**

- **Network Rail's experience highlights that uniform early capex and schedule lock-in on complex projects can undermine delivery,** and that governance arrangements must allow proportionate scrutiny and escalation rather than relying on one-size-fits-all commitment models

Source: Department for Transport and Network Rail (2021) Launch of Project SPEED challenges rail industry to cut time and costs of rail upgrades; Network Rail (2025) Rail SPEED; International Railway Journal (2021) British government unveils results of 'Project Speed' initiative

SPEED: Deep dive on evidence base from case studies

Case study	Project SPEED

Key insight	Source
Up to a ~50% reduction in delivery time and cost is targeted through system-wide streamlining of planning and approvals, without bespoke regulation or project-specific incentives The introduction of Project SPEED indicates that streamlining approvals and enabling faster, more proportionate decision-making could unlock significant potential time and cost savings at portfolio level, even in the absence of formal changes to capex governance	*"Rail Project SPEED, forged alongside Network Rail, is a call to arms to cut unnecessary red tape, be bold and purposeful, and empower the railway to be radical in its thinking to halve the time and reduce the cost of delivering infrastructure projects" – DfT (2021) News story* *"A project already benefitting from Project SPEED principles is the scheme to reopen the Northumberland line … this could take months off the schedule and deliver efficiencies that save millions from the programme" – DfT (2021) News story*
Proportionate, risk-based delivery controls can improve time and cost efficiency by replacing rigid, uniform project management frameworks PACE was introduced to replace GRIP, which was widely viewed as overly rigid. It allows delivery controls and assurance to be tailored to project risk and complexity, providing flexibility in how projects are managed while maintaining rigour. The case demonstrates how differentiated delivery frameworks can support faster and more efficient execution	*"We are replacing GRIP, the tool previously used to manage project delivery and which is seen as inflexible, with PACE, a new tool that allows project managers to adapt their approach, make decisions that best meet the needs of their project and delivery time and cost efficiencies whilst maintaining rigour"* – Network Rail (2023) Overview of CP7 efficiency initiatives

Source: Department for Transport (2021) "Launch of Project SPEED challenges rail industry to cut time and costs of rail upgrades" (26 Feb 2021); Network Rail (2023) Overview of CP7efficiency initiatives

HARP: Case study on Haweswater Aqueduct

Industry | Water

Delivery outcome evidence remains limited at this stage; it is not yet possible to robustly assess positive or negative delivery impacts attributable to the design choices

Degree of impact: −− − = + ++

Context

Haweswater Aqueduct Resilience Programme (HARP) is a nationally significant water infrastructure scheme led by United Utilities

Pre-2019, large water infrastructure was typically delivered by incumbent companies under the standard price control framework. **At PR19, Ofwat introduced Direct Procurement for Customers (DPC)** to increase competition for large projects by requiring delivery by a competitively appointed third-party provider (CAP)

HARP was designated as the first project to be delivered under DPC in 2021, with financial close reached in 2025, necessitating a bespoke regulatory framework

Regulatory model

Element	Sub-element	Design choice	Impact on project delivery
1. Structure	A. Ownership	3rd party owner	= • **Intended to ring-fence delivery vehicle for third-party finance** through competitive tendering and bespoke revenue recovery framework
	B. Operating structure	Design-Build-Operate	= • Bundling delivery with long-term operational responsibilities under the CAP was **intended to align construction and operational incentives** and support long-term financing
3. Incentives	A. Asset pricing	Commercial*	= • Competition-set costs paired with a regulated revenue recovery mechanism were **intended to provide sufficient revenue certainty** to support third-party financing

*Competition-set costs with revenues recovered through an Allowed Revenue Direction (regulated revenue envelope)

Implications for CAA regulatory models

1a **ii. Onerous changes to capex governance**

- A shift to third-party delivery under DPC introduced additional regulatory and contractual approval stages prior to financial close relative to traditional regulated delivery; this possibly contributed to the extension of the pre-construction phase to ~4 years

Source: Ofwat (2025) Reasons for various regulatory decisions in relation to the HARP; Ofwat (2025) Guidance on Ofwat's regulation of the HARP being delivered by United Utilities Water Limited; Ofwat (2025) DPC allowed revenue direction issue to United Utilities Water Limited

HARP: Deep dive on evidence base from case studies

Case study	Haweswater Aqueduct (HARP)

Key insight

Changing the delivery model to DPC required a new regulatory framework, increasing regulatory design efforts and contributing to pre-construction phase of ~4 years

Direct Procurement for Customers (DPC) is an Ofwat delivery model introduced at PR19 to increase competition by requiring large infrastructure projects to be competitively tendered to third-party providers rather than delivered directly by water companies. DPC delivery was designated in 2021 but financial close was not completed until 2025

Source

"As HARP is the first DPC project to be procured under the DPC initiative, we consider that project specific guidance is desirable to provide clarity to the CAP and to United Utilities as to our approach to the regulation of the project." – Ofwat (2025) Guidance on Ofwat's regulation of the HARP being delivered by United Utilities Water Limited

"HARP is being delivered under a delivery model introduced by Ofwat at the 2019 Price Review (PR19) – Direct Procurement for Customers (DPC). DPC aims to introduce greater competition into the delivery, financing, ownership, operations and maintenance of large infrastructure projects" – Ofwat (2025) Reasons for various regulatory decisions in relation to the HARP

"We accepted the need for the scheme and determined that it was suitable to be delivered by way of DPC. We therefore did not provide an allowance for the company to deliver the scheme itself but instead required the company to put the project out to competitive tender for a third party to deliver the scheme" – Ofwat (2025) Reasons for various regulatory decisions in relation to the HARP

Source: Ofwat (2025) Reasons for various regulatory decisions in relation to the HARP; Ofwat (2025) Guidance on Ofwat's regulation of the HARP being delivered by United Utilities Water Limited; Ofwat (2025) DPC allowed revenue direction issue to United Utilities Water Limited

GBR: Case study on Great British Railways

Industry | Rail

Degree of impact: −− − = + ++

Context

Great British Railways (GBR) is the proposed public body intended to bring together rail infrastructure management, system planning and the specification of passenger services

Its development follows a **series of independent reviews** and official reports which **identified fragmentation in the rail system as contributing to weak accountability**, inefficiency and inconsistent delivery outcomes

Recent reforms have increasingly emphasised the **need for a single system "guiding mind",** with the current government proposing GBR as the most integrated expression to date

Regulatory model

Element	Sub-element	Design choice	Impact on project delivery
1. Structure	A. Ownership	Single owner	+ • **Expected stronger cost control and accountability** by aligning ownership, revenue and planning in one body • **Improved value for money at system scale,** with a previous government estimating c.£1.5bn p.a. efficiency gains from simplifying and integrating previously fragment ownership • Delivery evidence remains limited
	B. Operating structure	Integrated	+ • **Intended to support faster and more reliable delivery** through fewer interfaces between planning, construction, operations and maintenance, reducing negotiation, escalation and rework • Delivery evidence remains limited

Implications for CAA regulatory models

1a **Changes to capex governance processes**

- Governance is most effective when applied within a single, integrated system owner, reinforcing accountability rather than compensating for fragmented ownership; GBR suggests this has strong implications for cost control and value for money

1b **Separation of system planning and ops delivery**

- GBR rejects separating system planning from operational accountability, instead bringing planning, operational direction and asset stewardship under a single "guiding mind" to reduce interface risk and improve delivery

Source: Department for Transport consultation (2025), "A railway fit for Britain's future"; UK transport secretary says full electrification of railways 'not affordable right now', Financial Times, 5 Nov 2025, reporting Transport Secretary remarks on fragmentation and GB; Williams-Shapps (2021) The Williams-Shapps Plan for Rail; Department for Transport (2019) Rail in the future transport system

GBR: Deep dive on evidence base from case studies

Case study	Great British Railways

Key insight

Overcoming fragmentation via a single system ‘guiding mind’ could unlock ~£1.5bn p.a. in efficiency gains (~15% of pre-COVID fares)

The Williams–Shapps Plan for Rail estimated that simplifying and integrating the rail system — explicitly to end historic fragmentation — could unlock efficiency savings of around £1.5bn per year within five years; the current government has since reaffirmed this integrated, single-system approach and taken it further through public ownership and implementation of Great British Railways

Source

“A simpler, more integrated structure will cut duplication, increase Great British Railways’ purchasing power and economies of scale…These and other efficiencies will take time to bear fruit, but after five years it is expected that they could be saving around £1.5 billion a year, equivalent to 15% of the network’s pre-pandemic fares income.” – Williams-Shapps (2021) The Williams-Shapps Plan for Rail

“…we will establish Great British Railways (GBR), a single ‘directing mind’ bringing together responsibility for the rail network itself and for the publicly-owned passenger services that run on it… consolidating functions currently spread across Network Rail, the Department for Transport (DfT) and 14 separate rail operators into a single organisation with a single, cohesive strategy.” — Department for Transport consultation (2025), “A railway fit for Britain’s future”

“We could never improve the railway while it’s fractured between 17 different industry bodies, each with their own opinions, none incentivised to work together and all blaming each other when things go wrong. It’s hardly an ideal environment for you or any business to operate within or plan ahead” – Transport Secretary quoted in Financial Times, UK transport secretary says full electrification of railways ‘not affordable right now’, 5 Nov 2025

“Under single national leadership, our railways will be more agile: able to react quicker, spot opportunities, make common-sense choices, and use the kind of operational flexibilities normal in most organisations… A simpler, more integrated structure will cut duplication, increase Great British Railways’ purchasing power and economies of scale.” – Williams-Shapps (2021) The Williams-Shapps Plan for Rail

Source: Department for Transport consultation (2025), “A railway fit for Britain’s future”; UK transport secretary says full electrification of railways ‘not affordable right now’, Financial Times, 5 Nov 2025, reporting Transport Secretary remarks on fragmentation and GB; Williams-Shapps (2021) The Williams-Shapps Plan for Rail; Department for Transport (2019) Rail in the future transport system

UK Fibre case study

Industry | Telecom

Degree of impact: −− − = + ++

Context

The UK full-fibre rollout is a national infrastructure programme, anchored in Openreach's multi-year FTTP build from the late-2010s, complemented by the Government's £5bn Project Gigabit programme

Financing combines **large-scale private capital** (Openreach and competing altnets like CityFibre) with **targeted public subsidies**

Ofcom has **progressively shifted from legacy LRIC-based price controls for fibre to a lighter-touch, pro-investment regulatory** regime—strengthening Openreach independence while preserving fair wholesale access—to accelerate nationwide deployment

Regulatory model

Element	Sub-element	Design choice	Impact on project delivery
1. Structure	B. Operating structure	Integrated	++ • Ofcom did not mandate DBO or concessions; **Openreach retained end-to-end responsibility for design, build, operation and maintenance** • Integrated responsibility helped reduce interface risk and supported optimisation
2. Governance	C. Governance acceleration	Dedicated framework	+ • **Multi-year regulatory certainty** (e.g. WFTMR 2021–26) reduced stop–start risk and sustained investment momentum • **Functional separation resulted in a clearly ringfenced Openreach** but took >2 years to complete initially
3. Incentives	A. Asset pricing	Mixed	+ • Regulatory safeguards protecting Openreach's ability to earn a fair return in slow-compete zones, **supporting financial viability** for most challenging 30% of rollout • Commercial "fair pricing" **enabled fibre premiums** in competitive areas

UK fibre rollout used a **mixed model**: **RAB-based** charge controls in low-competition areas and **commercial "fair and reasonable" pricing** in competitive areas

Implications for CAA regulatory models

9b **Long-run incremental cost (LRIC)**

- Ofcom shifted from strict LRIC to lighter-touch regulation to address its limitations for high-capex fibre: cost caps risked under-recovery over long paybacks amid demand uncertainty

9c **Lighter-touch regulation**

- Ofcom prioritised lighter-touch regulation to enhance fibre financeability: high capex (£15bn+), long paybacks, and demand risks made strict LRIC caps unviable for private funding

Source: Clark (2024) Gigabit broadband in the UK:Government targets, policy, and funding; Ofcom (2025) Connected Nations UK Report 2025; Ofcom (2020) Statement: Promoting investment and competition in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26; Fletcher, 'BT under increasing pressure from Ofcom to split from Openreach', The Guardian, 29 November 2016; Addleshaw Goddard (2020) Ofcom wholesale fixed telecoms market review; BT (2020) BT Group responses to Ofcom's Wholesale Fixed Telecoms Market Review 2021-26

UK Fibre: Deep dive on evidence base from case studies

Case study	UK Fibre

Key insight	Source
Ofcom made a deliberate policy pivot to prioritise rapid nationwide gigabit deployment, aligning regulation with the government's 85% by 2025 ambition. Deployment subsequently exceeded this level, reaching ~87% of premises by 2025 The 2021–26 review marked a shift from cost-oriented regulation of legacy copper networks toward an investment-led framework for full fibre, explicitly prioritising nationwide gigabit deployment and aligning regulation with the government's 85% by 2025 targeti	*"The coverage of full-fibre and gigabit-capable services continues to increase, with gigabit-capable networks now available to 87% of UK residential premises, up from 83% last year"* – Ofcom (2025) Connected Nations UK Report 2025 *"The government's target is for next-generation, gigabit broadband to be available to 85% of the UK by 2025 and nationwide by 2030"* – Clark (2024) Gigabit broadband in the UK *"These decisions are designed to promote competition and investment in gigabit-capable networks – bringing faster, better broadband to people across the UK"* – Ofcom (2020) Wholesale Fixed Telecoms Market Review 2021-26
As part of its policy pivot, Ofcom deliberately relaxed price controls and allowed pricing flexibility for full fibre to improve investment incentives and reduce deployment risk The Wholesale Fixed Telecoms Market Review removed cost-based price caps for full fibre, allowed pricing flexibility for Openreach, and applied differentiated remedies by competitive area	*"In more competitive areas, setting Openreach's wholesale prices in a way that encourages competition from new networks but also gives a fair return to Openreach, encouraging it to invest – capping the wholesale price for Openreach's entry-level 40Mbit/s broadband to inflation but allowing it to charge a small premium for full fibre"* Addleshaw Goddard (2020) Ofcom wholesale fixed telecoms market review
The lighter-touch, long-term regulatory framework was viewed by market participants as providing clarity, predictability, and reduced regulatory friction—supporting accelerated delivery and large-scale private investment The five-year WFTMR period (2021–26) provided a stable regulatory horizon, reduced the frequency of intervention, and increased predictability around pricing and remedies	*"BT welcomes the direction of Ofcom's consultation on its approach to regulation from 2021-2026. It is critical that we have a clear, predictable and transparent long-term regulatory framework to create the right conditions for investment in digital infrastructure across the whole of the UK"* – BT (2020) BT Group responses to Ofcom's Wholesale Fixed Telecoms Market Review 2021-26

Source: Clark (2024) Gigabit broadband in the UK:Government targets, policy, and funding; Ofcom (2025) Connected Nations UK Report 2025; Ofcom (2020) Statement: Promoting investment and competition in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26; Fletcher, 'BT under increasing pressure from Ofcom to split from Openreach', The Guardian, 29 November 2016; Addleshaw Goddard (2020) Ofcom wholesale fixed telecoms market review; BT (2020) BT Group responses to Ofcom's Wholesale Fixed Telecoms Market Review 2021-26

Contents

Overview of the CAA's long-list of potential regulatory models (1/2)

Regulatory model	Description
1 **Changes to Capital Expenditure Governance Framework**	Strengthens the scrutiny and governance of capital expenditure through enhanced processes while maintaining HAL's central operational role.
1a Changes to capex governance processes	Implements stricter information requirements, appointing independent assessors, requiring airline sign-off procedures with escalation mechanisms, and establishing enforcement procedures to ensure compliance with capital investment standards
1b Separation of system planning and ops delivery	Functional or legal separation of HAL's planning operations from its day-to-day operations to avoid conflicts of interest between planning and operational responsibilities (e.g., like the National Energy Systems Operator)
2 **Targeted adjustments to the existing incentive regime**	Fine-tunes the ex ante capital expenditure incentives, including tailored risk-sharing and incentive rates for specific projects or phases
3 **Long-term regulatory framework for expansion**	Reduces redetermination risk though long-term regulatory commitments for expansion assets (e.g., consistent approaches across price control periods) to enhance stability and investor confidence
4 **CAA Oversight/Mandate of Procurement**	Increases competitive pressures in the design and construction of infrastructure assets through competitive procurement processes
4a Enhanced scrutiny of procurement	Maintains HAL's primary responsibility for procurement decisions but establishes CAA oversight incl. review of procurement strategy, monitor major tenders, and provide observations, to ensure competition, transparency, and value-for-money
4b Mandated design-and-build contracts	Requirement to competitively tender specified work packages through design and build contracts, with the CAA or an independent capital governance process determining which activities should be outsourced

Source: CAA, "CAP 3195: Working paper on regulatory model" (Nov 2025)

Overview of the CAA's long-list of potential regulatory models (2/2)

Regulatory model	Description
5 Contract for delivery and operation	Brings third parties into both delivery and long-term operation of infrastructure assets through contracting
5a Operation (management contracts)	Operations and maintenance through a 3rd party management contract, with costs recovered through availability or performance-based fees
5b Design, Build, Operate (DBO)	Third party responsible for design, construction, and long-term operation
6 Third party builds assets then transfers ownership to HAL	A third party would design, finance, and construct infrastructure, with ownership transferring to HAL upon completion, entering its RAB. Pricing could be pre-agreed through fixed or risk-sharing arrangements, or determined ex post
7 Third Party continues to own and operate assets	Permanent third-party ownership and operation of infrastructure
7a Wholesale supplier model	Third party operates as an upstream supplier charging HAL for use of assets, with the CAA regulating the third party's charges
7b Direct competition for airport operation services	Allows for third parties to compete directly with HAL for passenger and airline customers, requiring a transparent wholesale product and non-discrimination principles
8 Transfer of ownership and operation of an existing asset	Enables divestment of operations and maintenance of existing assets to 3rd parties, turning into either suppliers or direct competitors
9 New frameworks for setting airport charges	Fundamental restructure of regulatory remuneration model
9a Price benchmarking	Sets maximum airport charges by reference to comparable airports globally
9b Long-run incremental cost (LRIC)	Bases charges on forward-looking cost of providing additional output, seeking to mimic competitive market pricing
9b Lighter-touch regulation	Minimal regulatory intervention, relying on voluntary commitments and airline negotiation power to constrain charges

Source: CAA, "CAP 3195: Working paper on regulatory model" (Nov 2025)

1. Structure: Design choices for sub-elements

Design choices per sub-element		Relevant CAA models
A. Ownership: Who owns the assets over its life cycle		
Single owner	A single regulated entity owns and finances all assets, concentrating accountability for delivery and performance	6 Third party builds assets then transfers ownership to HAL 7a Wholesale supplier model 7b Direct competition for airport operation services 8 Transfer of ownership and operation of an existing asset
SPV	A special purpose vehicle owns and delivers the programme, isolating risk while retaining clear accountability	
3rd party owner	Independent entities own specific assets, shifting risk off incumbent but increasing interfaces and complexity	
Multi-owner	Multiple owners of different assets within overall project (e.g. terminals, infrastructure like tunnels, runways)	
Public owner	Assets are publicly owned with private delivery or operation, reducing investor risk but introducing other constraints	
B. Operating structure: How design, build, operate and maintain are organised		4a Enhanced scrutiny of procurement 4b Mandated design-and-build contracts 5a Operation (management contracts) 5b Design, Build, Operate (DBO)
Integrated	A single entity is responsible for design, build, operation and maintenance, enabling delivery optimisation	
Design-Build-Operate	Design, construction and operation are bundled, mitigating build risk but reducing owner control	
Operate-only	Operations are contracted separately from asset delivery, limiting influence over design decisions	
Concession	A private party designs, builds, operates and owns an asset for a fixed period on behalf of an ultimate owner	

2. Governance: Design choices for sub-elements

Design choices per sub-element		Relevant CAA models
A. Capex governance: Who has decision and veto rights, in which cases		1a Changes to capex governance processes 1b Separation of system planning and delivery 3 Long-term regulatory framework for expansion
Consult-led	The operator has decision rights and gets input via consultation, enabling speed but relying on regulatory oversight	
User veto	Users have blocking rights over decisions, strengthening cost control but materially increasing delay risk	
Independent committee	Independent committee approves or directs investment decisions, potentially including users and led by regulator	
B. Capex targets: How scope, cost and schedule targets are specified and managed		6 Third party builds assets then transfers ownership to HAL 7a Wholesale supplier model
Milestone-based	Capex targets are defined around phased outcomes and readiness milestones, allowing scope, cost and schedule to mature over time while preserving delivery momentum	
Schedule-locked	Schedule targets are fixed upfront (at whole-project or critical-path level), increasing time certainty but creating rework risk if design or market assumptions evolve	
Cost & schedule	Both budget and timeline are fixed upfront, maximising apparent control but create risk of false precision and repeated renegotiation in complex projects	
Stage-gated	Capex targets are set progressively at defined stage gates, with increasing cost and schedule certainty as design maturity, consents and risks are resolved	
C. Governance acceleration: What is the dedicated process for acceleration		3 Long-term regulatory framework for expansion
Dedicated	Dedicated regulatory framework or entity for faster investment decisions and project delivery	
Fast-track	Certain decisions are subject to accelerated review, reducing delay where risks are well understood	
Standard	Decisions follow normal regulatory or governance timelines, prioritising due process over speed	

3. Incentives: Design choices for sub-elements

Design choices per sub-element		Relevant CAA models
A. Asset pricing: How capital is remunerated		
RAB	Costs are added to an asset base with an allowed return, supporting low-cost finance and long-term investment	9a Price benchmarking 9b Long-run incremental cost (LRIC) 9c Lighter-touch regulation
LRIC	Prices are set by incremental cost, promoting efficiency but potentially affecting recovery of large sunk investments	
Bench-marking	Charges are linked to comparator airports or sectors, constraining prices but weakening the link to efficient costs	
Commercial	Prices are set commercially or are negotiated, relying on competition or countervailing power	
B. Asset definition (for RAB only): What sits inside the regulatory perimeter		
Single RAB	Costs are added to an asset base with an allowed return, supporting low-cost finance and long-term investment	**N/A**
Dual RAB	Different asset classes earn differentiated returns, aligning risk with remuneration but increasing complexity	
Hybrid RAB	The operator retains primary decision rights, enabling speed but relying on regulatory oversight	
C. Risk sharing mechanism: How construction, demand and regulatory risks are allocated		
Investor-led	The regulated entity and its investors bear the majority of cost, schedule and demand risk	2 Targeted adjustments to the existing incentive regime
Shared risk	Risks shared with investors, users and potentially the state (e.g. through caps/floors, cost-sharing bands)	
Consumer-led	In cases of overspend where regulated entity was efficient, consumer bears risk (e.g. through airport charge)	
Backstop	Risks are partially or fully underwritten by users or the government, such as backstops for capex overruns	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