HIGH
SPEED RAIL

SYSTRA

Over 40 years of pioneering and delivering HSR solutions worldwide!

HIGH-SPEED RAIL: A SUSTAINABLE AND PROVEN TRANSPORTATION SOLUTION

High-Speed Rail has transformed our perceptions of time and space, offering significant sociological, economic, and environmental benefits at both national and continental levels. As mobility demands rise and climate concerns intensify, decision-makers are increasingly choosing High-Speed Rail (HSR) for intercity transportation across countries and regions.

Praised for its reliability, efficiency, and sustainability, HSR reduces travel times, connects cities, and opens up new economic opportunities. With transportation playing a crucial role in lowering carbon emissions, High-Speed Rail provides a low-emission alternative, allowing existing railways to accommodate more freight and local passenger services, thus creating sustainable infrastructure for the future.

To address this challenge, it is essential to strike the right balance between established and innovative solutions to achieve all anticipated benefits while fulfilling every safety, performance, operational, and commercial requirement.

CAHSR (California High-Speed Rail), Corcoran (USA)

AN APPROACH DRIVEN BY 8 KEY SUCCESS FACTORS TO ACHIEVE YOUR HIGH-SPEED RAIL VISION

Implementing High-Speed Rail poses unique challenges, affecting many people and places over a timeline that spans several decades, from initial planning to operational launch, and extending beyond standard governmental and political timeframes. It is crucial for both political and public authorities, as well as the railway industry, to collaboratively define and agree on the most effective and mutually beneficial approach for designing, building, and operating any new high-speed rail system. This collaboration will help deliver the anticipated benefits and address the associated technical challenges while minimizing costs (both CAPEX and OPEX) and socio-environmental impacts.


High speed Cairo (Egypt)

1 — DEFINE AND REACH CONSENSUS WITH ALL STAKEHOLDERS ON THE EXPECTED KEY BENEFITS

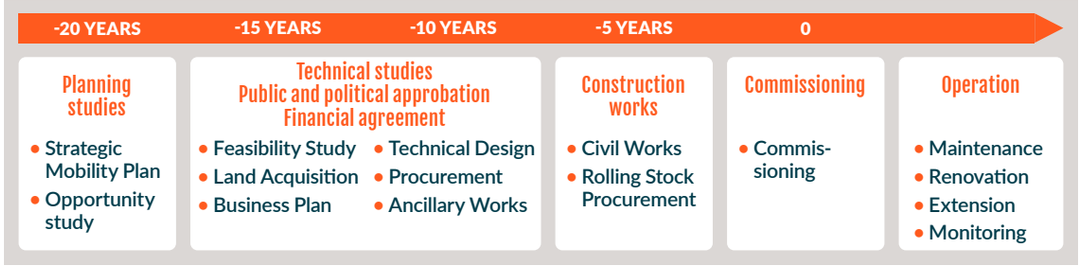
Constructing a high-speed rail system will affect multiple generations and may encounter acceptance challenges from local communities and taxpayers. Reaching an agreement and sharing the key expected benefits with all stakeholders, including the affected populations, before commencing land acquisitions and on-site work, is crucial for ensuring successful delivery later.

Is it about:

- → Reducing travel time between cities?
- → Increasing capacity to transport more people on existing corridors?
- → Facilitating more long-distance travel routes?
- → Promoting a shift from air and road traffic to rail?
- → Allocating more existing railways to local passenger and/or freight traffic?

2 — SET AMBITIOUS YET REALISTIC DELIVERY TIMELINES

- → Identify and agree on a mutually beneficial scheme for project funding, management, delivery, and operation, as this is the primary factor in saving time.
- → Initiate delivery once alignment is reached on the key elements.
- → Establish an efficient organization with clear governance, responsibility, and accountability throughout the engineering and delivery structure.
- → Deliver with an 'end in mind' approach: anticipate and mitigate risks related to construction, testing, commissioning, operation, and maintenance from the very start of the design process, prioritizing end-user needs.
- → Adhere to the plan and limit changes until the handover to operation and maintenance is complete.



3 — DETERMINE THE OPTIMAL FUNDING AND FINANCIAL STRATEGY

- → Perform preliminary financial analysis to estimate investment and operating costs and incorporate them into a dedicated business case that also projects revenue during service and highlights return on investment forecasts.
- → Include socio-economic profitability considerations.
- → Develop a tailored investment plan that, in addition to direct public funding, can leverage financing schemes from international financial institutions, banks, or other private partners.
- → Estimate total investment costs (CAPEX), operating costs (OPEX), and revenue from service fares collected by train operators.
- → Establish appropriate fare levels for users.
- → Define stakeholder management, including organizational and governance models.

4 — CONDUCT A PRELIMINARY TRANSPORTATION PLANNING STUDY TO PROPOSE SUITABLE SOLUTIONS FOR FUTURE NEEDS

- → Confirm the ridership demand between cities along the route. By understanding this demand, we can better plan for efficient and effective transportation solutions that meet the needs of travelers.
- → Explore potential socio-economic benefits, such as improved standards of living, increased working opportunities, and economic growth. It helps to evaluate the most suitable locations for new stations or the potential use and upgrade of existing ones ensuring that infrastructure developments align with community and economic needs.
- → Engage with stakeholders, including local communities and environmental organizations, to ensure projects are not only efficient and effective but meet environmental and social expectations.

5 – ADOPT A NET-ZERO STRATEGY AND AN ECO-CONCEPTION APPROACH FROM THE DESIGN STAGE

- → Develop a sustainability strategy in close collaboration with subject matter experts and national and local authorities. This is crucial to meet the growing demand from regulatory frameworks and public opinion for net-zero carbon projects capable of managing net GHG emissions throughout the entire project timeline.
- → Implement eco-design approach from the start to minimize environmental impact throughout the lifecycle. Specialized solutions and tools, such as SYSTRA's Carbon Tracker, play a key role: they enable the assessment, optimization, and monitoring of operational emissions at every stage, ensuring that the project fulfils its Net-Zero commitments.
- → Use eco-friendly materials and energy-saving technologies if possible during design stage, to cut down on carbon emissions and conserve resources.

6 — CHOOSE THE RIGHT TECHNICAL SOLUTIONS, TAKEN INTO ACCOUNT THE SPEED CHOICE

- → Advocate for safe, affordable, and proven solutions. Consider international standards, such as those from Europe, Asia, or North America, and their varying philosophies. These international standards can be adapted to the capabilities of the country when necessary – when local standards are inadequate or nonexistent.
- → Consider the impact of speed (320km/h vs. 200km/h) on design. Operational speed affects energy consumption, infrastructure costs, alignment, structural dynamics, ground velocity limits, noise reduction, and maintenance expenses. Balancing operational speed with overall project costs is crucial for achieving an optimal outcome. Operational speed is also a critical factor when selecting the appropriate track systems; while a slab track system may offer certain advantages, it may not be suitable for all environments, particularly in open sections on earthworks or viaducts, especially in areas with challenging long-term settlement conditions.
- → Introduce and manage innovation to meet specific requirements, enhance efficiency, and address obsolescence.

7 — DESIGN COST-EFFICIENT HIGH-SPEED RAIL THAT MEETS OPERATIONAL & FUNCTIONAL REQUIREMENTS

- → Define objectives, needs, and technical requirements from the outset and convert them into specific and clear technical standards for design.
- → Implement a proven high-speed rail system to avoid unproven innovative solutions and minimize technical risks. Use standardized structures, precast elements, and reliable systems for signaling, OCS, and railways.
- → Maximize the use of existing networks: for terminal station access, even if it necessitates speed restrictions. In addition, consider upgrading existing networks to allow high-speed trains to operate efficiently on conventional tracks.
- → Promote efficient rolling stock in terms of aerodynamics, weight, and acceleration/braking performance.
- → Control costs through standards and prevent costs overruns: limit operational speed to standard values (300-320 km/h), consider intermediate stations only if they significantly enhance traffic volumes, minimize the number and length of tunnels by using maximum allowable gradients.

8 — INVOLVE OPERATORS AND MAINTAINERS AS EARLY AS POSSIBLE

- → Operators are key partners, focusing on operations and aspects beyond technical considerations, such as human resource management and energy contracts. Their role may extend to include conception, policy, and planning.
- → Consider asset management during the investment programming phase. The technical and/or financial choices made at the start of a project can have lasting effects for the next 40 years.
- → Invest wisely in a network (whether greenfield or brownfield) or fleet to acquire the physical assets necessary to meet stakeholders' objectives in terms of performance, cost, and risk.
- → Maintain corrective or preventive maintenance of assets to a standard that aligns with the expected performance throughout the asset's lifecycle.
- → Make informed maintenance decisions by leveraging digital technology to enhance the physical world, transforming the physical asset into a Digital Twin. Gaining comprehensive knowledge about your assets enhances data analytics and performance insights.

Al Boraq in Tangier train station in Morocco

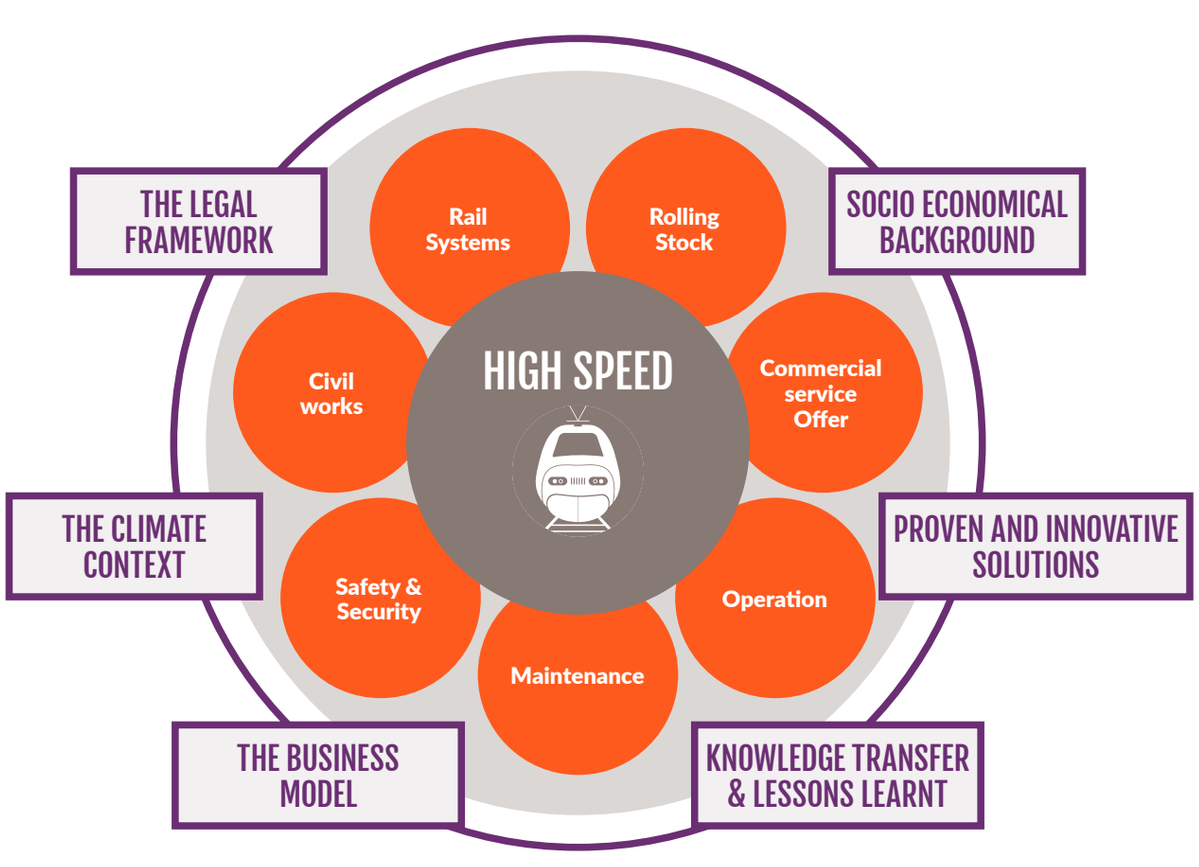

HS2, Colne Valley Western Slopes (United Kingdom)


Taiwan high-speed rail

360° SERVICE PROVEN ENGINEERING EXPERTISE

High-speed rail (HSR) is not just about fast trains. It's a complex system that relies on the coordination of multiple, interdependent components to ensure success. High-Speed Rail is at the center. This is the core of the system of Environmental, contextual/legal factors and of technical elements. Everything revolves around it and contributes to its effectiveness. SYSTRA has already successfully demonstrated on various worldwide projects it can manage all constituents of this eco-system.

Before land acquisition, SYSTRA provides at early stage concept design to help for the choice of the system.



WHY SYSTRA IS YOUR TRUSTED AND RELIABLE PARTNER

SYSTRA is a pioneer in high-speed rail, leading the field for over 40 years by planning, designing, overseeing, and testing nearly half of the world's high-speed rail lines. We support projects from the earliest phases, including appraisals, engineering feasibility studies, traffic forecasting, and socio-economic and environmental assessments. We collaborate with clients from early modeling to determining high-speed routes. Our specialists prepare robust patronage forecasts and successful business cases for new routes, line extensions, and stations. We support clients throughout project execution and completion, overseeing construction phases, testing, and commissioning.

SYSTRA teams are committed to advancing high-speed rail to make it more affordable and faster to build, with resilient and easier-to-maintain infrastructure. We continually develop new concepts, such as short-span bridges for train speeds up to 350-400km/h. Innovations include standardizing and prefabricating elements to reduce material consumption, accelerate work schedules, and cut construction costs.

OUR ADDED-VALUE

- → Holistic approach, including environmental studies and public consultation.
- → Capability to manage the entire project lifecycle, with strong Testing & Commissioning and Operation & Maintenance knowledge.
- → Knowledge transfer from operational and successful projects underpins the design of our HSL projects.
- → Diverse roles: client-side, contractor-side, PMC/delivery, design/construction.
- → Through our subsidiary MESEA, we have access to real-time knowledge, feedback and lessons learned of the operation and maintenance on a HSR we have designed and built.
- → SNCF legacy and world record in high-speed rail.
- → We have helped write the European standards for ultra-high-speed railways and adapt them to local contexts.


Yongsan Station, Seoul (Korea)

WE DELIVER PROVEN HIGH-SPEED RAIL REFERENCES WORLDWIDE

OUR KEY FIGURES

ENGINEERING NEWS-RECORD (ENR) RANKING 2024

#2
MASS TRANSIT & RAIL

#6
TRANSPORTATION

SYSTRA INVOLVED IN

→ **58**
NUMBER OF LINES

→ **7,300** KM
LINES IN OPERATION

→ **22,000** KM
TOTAL LINES

SYSTRA

SYSTRA Australia
Level 15, Chifley Tower,
2 Chifley Square,
Sydney NSW 2000 – AUSTRALIA

SYSTRA Canada
1100 René-Lévesque Blvd. W.,
10th Floor, Montreal,
Quebec H3B 4N4 – CANADA

SYSTRA Indonesia
Cyber 2 Tower 18th Floor Unit M05,
Jl. H.R. Rasuna Said No.13,
Jakarta 12950 – INDONESIA

SYSTRA India
Vatika Mindscapes,
Mathura Road,
Faridabad – INDIA

SYSTRA Italy
Via Casilina 3,
Rome,
RM 00182 – ITALY

SYSTRA Korea
6F & 10F, Samsung Building,
623, Teheran-ro, Gangnam-gu,
Seoul, 06173 – KOREA

SYSTRA Malaysia
Unit 31-01, Level 31, Q Sentral, 2A,
Jalan Stesen Sentral 2, Kuala Lumpur
Sentral, 50470 – KUALA LUMPUR

SYSTRA Singapore
333 North Bridge Road
#05-01 KH KEA
Singapore 188721 – SINGAPORE

SYSTRA MVA Thailand
37th Floor, Unit F, Payatai Plaza Building,
128/401 Payathai Road, Rajthewee,
Bangkok 10400 – THAILAND

SYSTRA UK
3rd Floor, 1 Carey Lane,
London,
England EC2V 8AE – ENGLAND

SYSTRA USA
60 Broad Street,
34th Floor,
New York, NY 10004 – USA

www.systra.com

CONFIDENCE MOVES THE WORLD