



OPTIMUM SPEED for HIGH SPEED LINES AND NETWORKS



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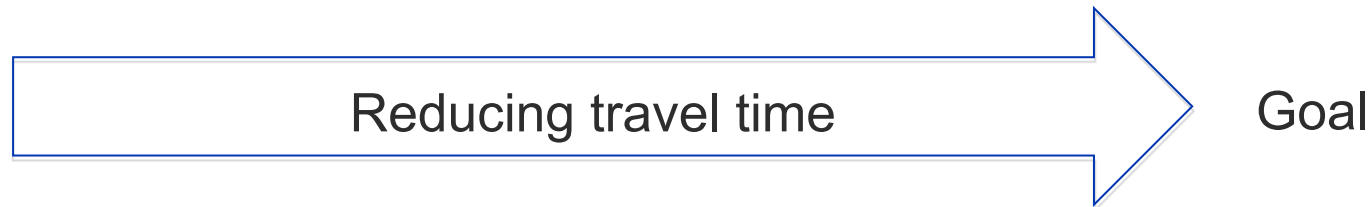


- Worldwide HS experience. From 200 to 350 km/h, fifty years of non-stopping evolution

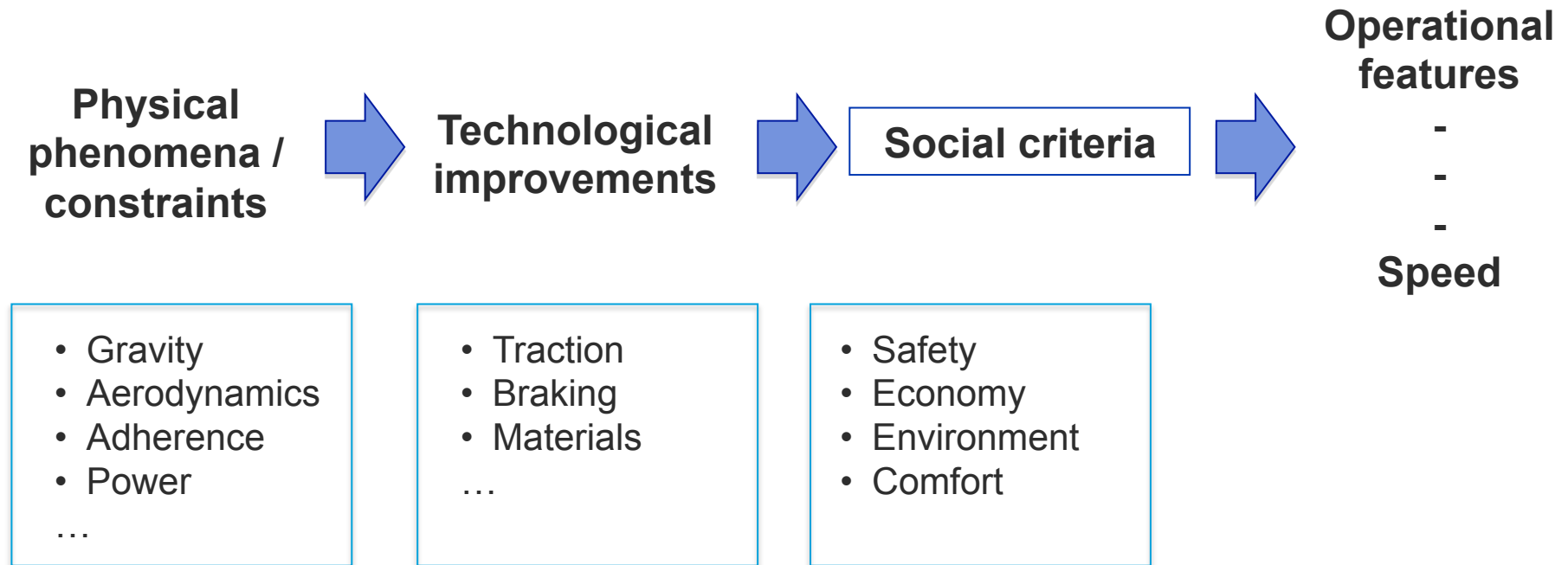
- Speed increasing trend. Need to provide long term technical advice



LONG DISTANCE PASSENGER TRANSPORT EVOLUTION



EACH TRANSPORT MODE IMPROVING TREND



Technological improvements have to be filtered by social criteria (safety, economy, environment, comfort) before been applied

SPEED AS A CONSEQUENCE OF TECHNOLOGICAL DEVELOPMENT



Technology is continuously providing solutions- mechanics, materials, engines...- for increasing speed

SPEED AS A CONSEQUENCE OF TECHNOLOGICAL DEVELOPMENT

A passenger transport mode is a particular technology applied to a function, the function of transporting people



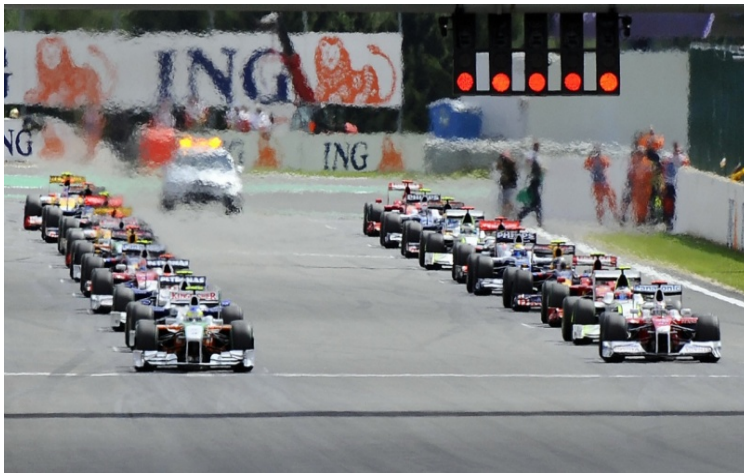
TECHNOLOGIES INTRODUCE CONTINUOUS IMPROVEMENTS

- The optimum speed is not the maximum available in many transportation modes



OPTIMUM SPEED IN DIFFERENT TRANSPORT MODES

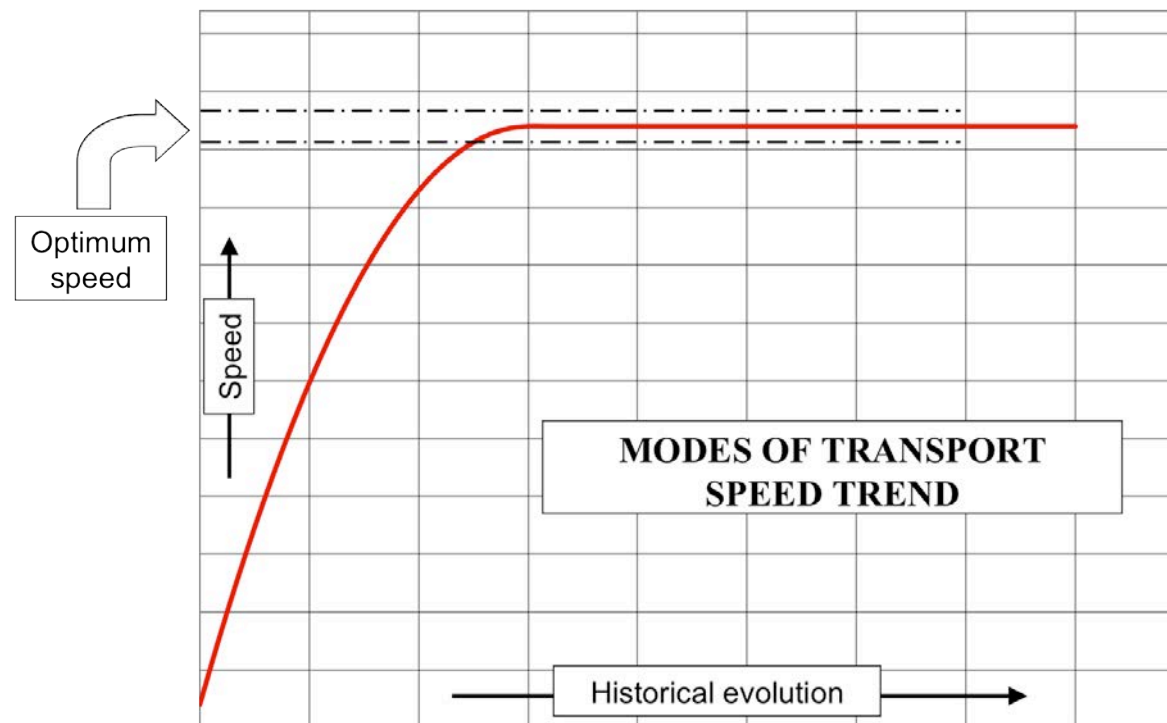
In some cases, the maximum commercial speed not always is following an increasing trend



INTRODUCTION, PURPOSE AND NEED

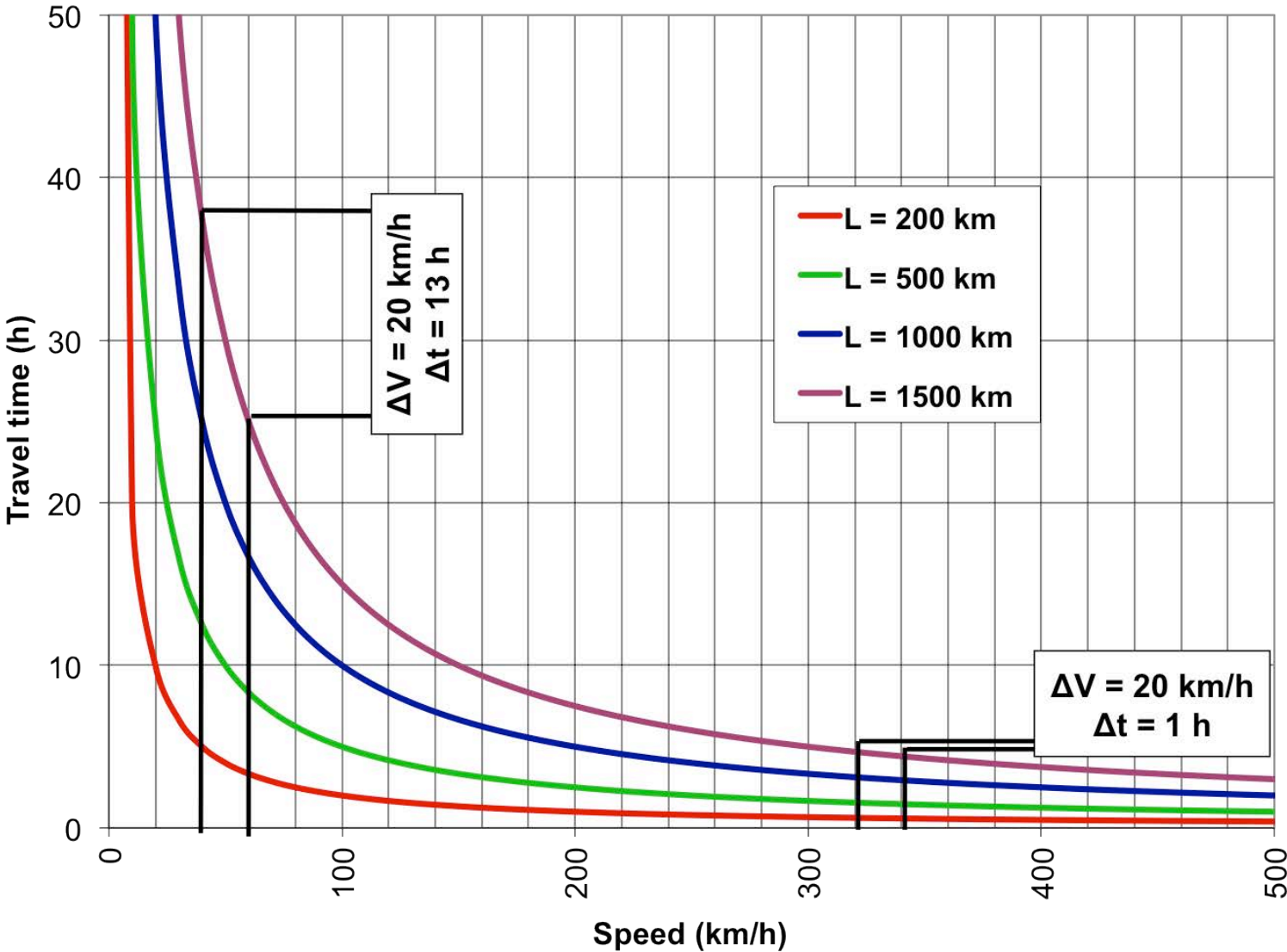
CONCEPTS

- Transport mode (passenger long distance services) → technology / function
- HS system optimum speed → technological system
- HS optimum operational speed → line / corridor

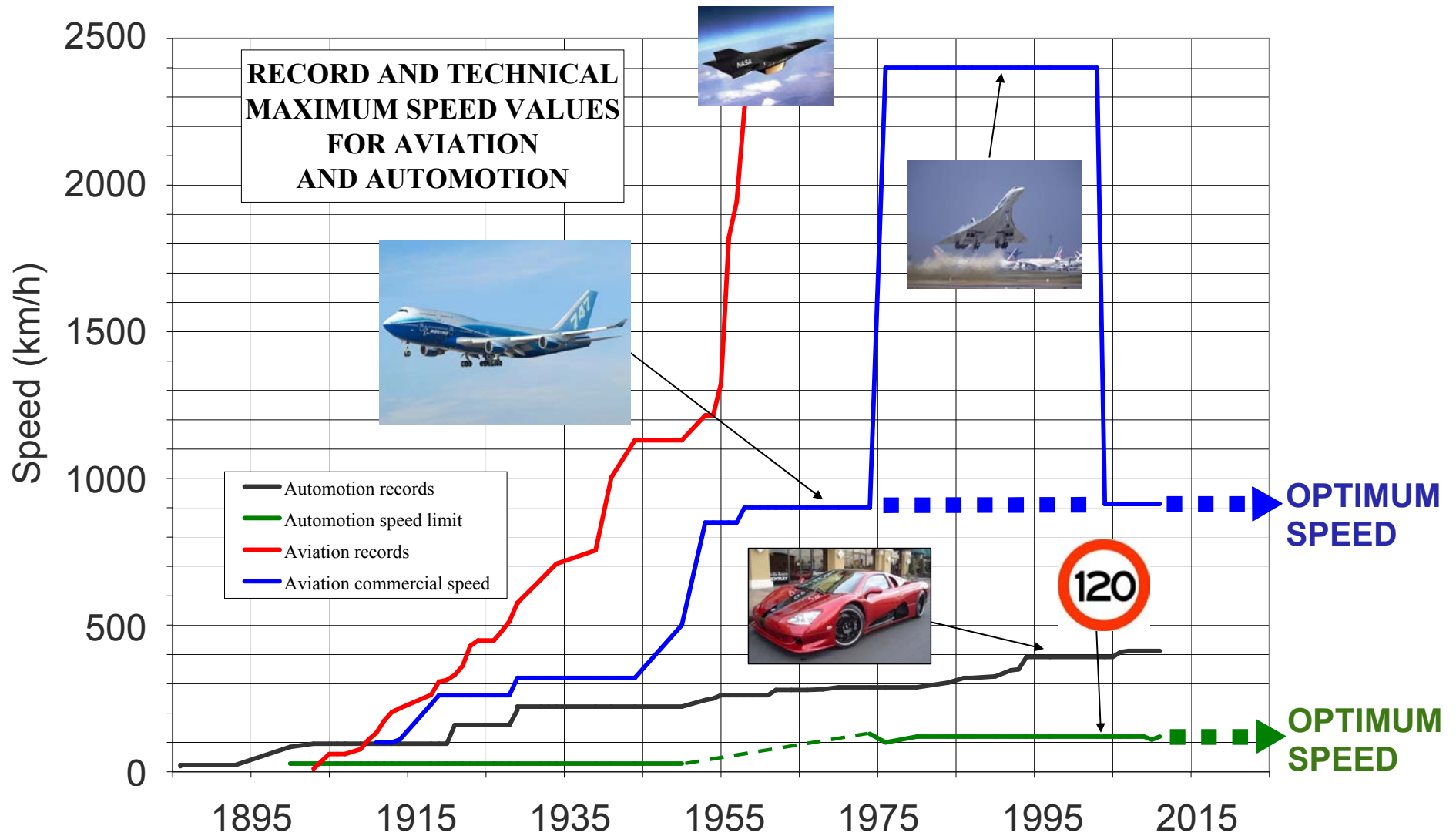


Different "speed efficiency" regarding time reductions

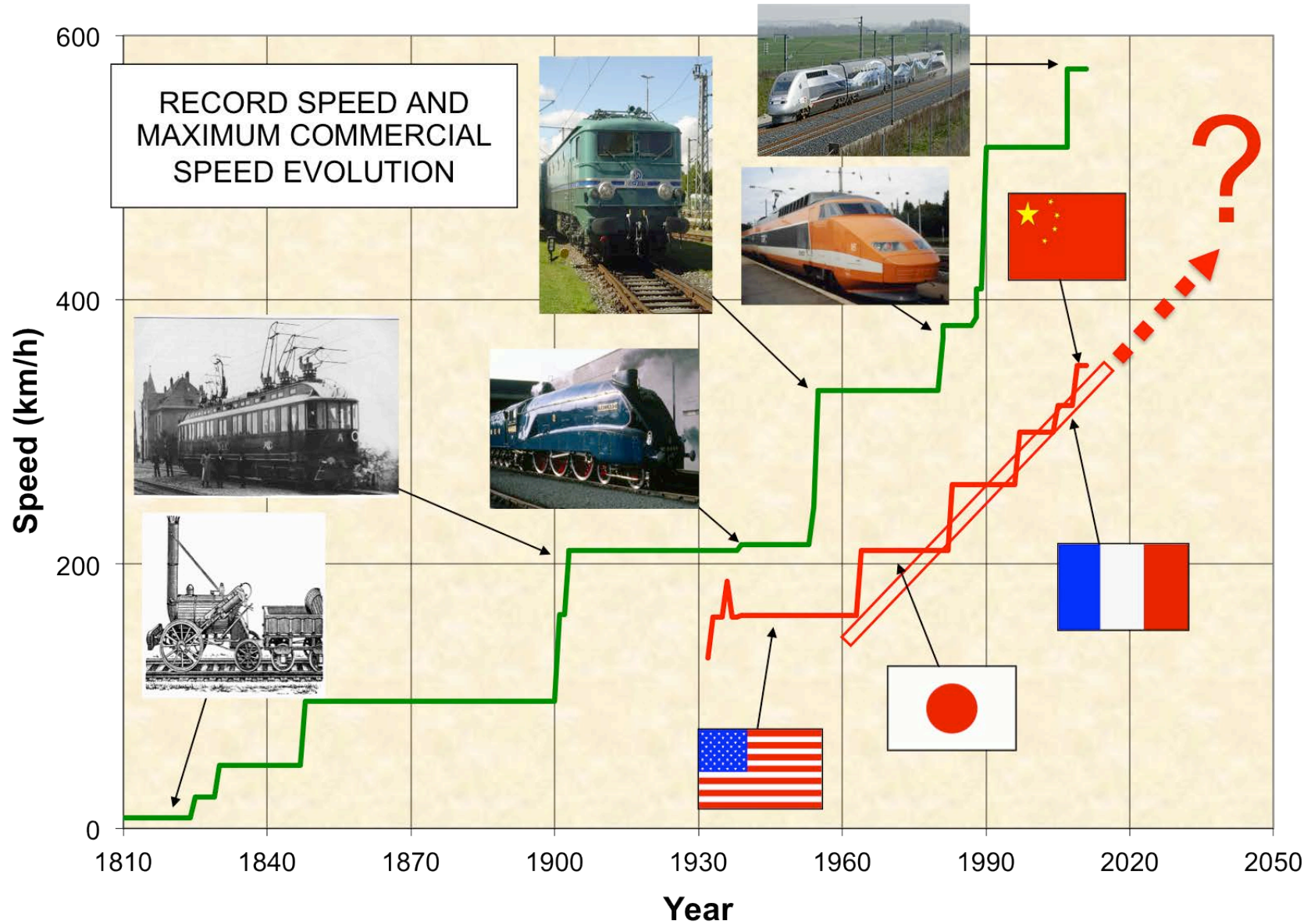
TRAVEL TIME FOR SEVERAL SPEEDS AND DISTANCES



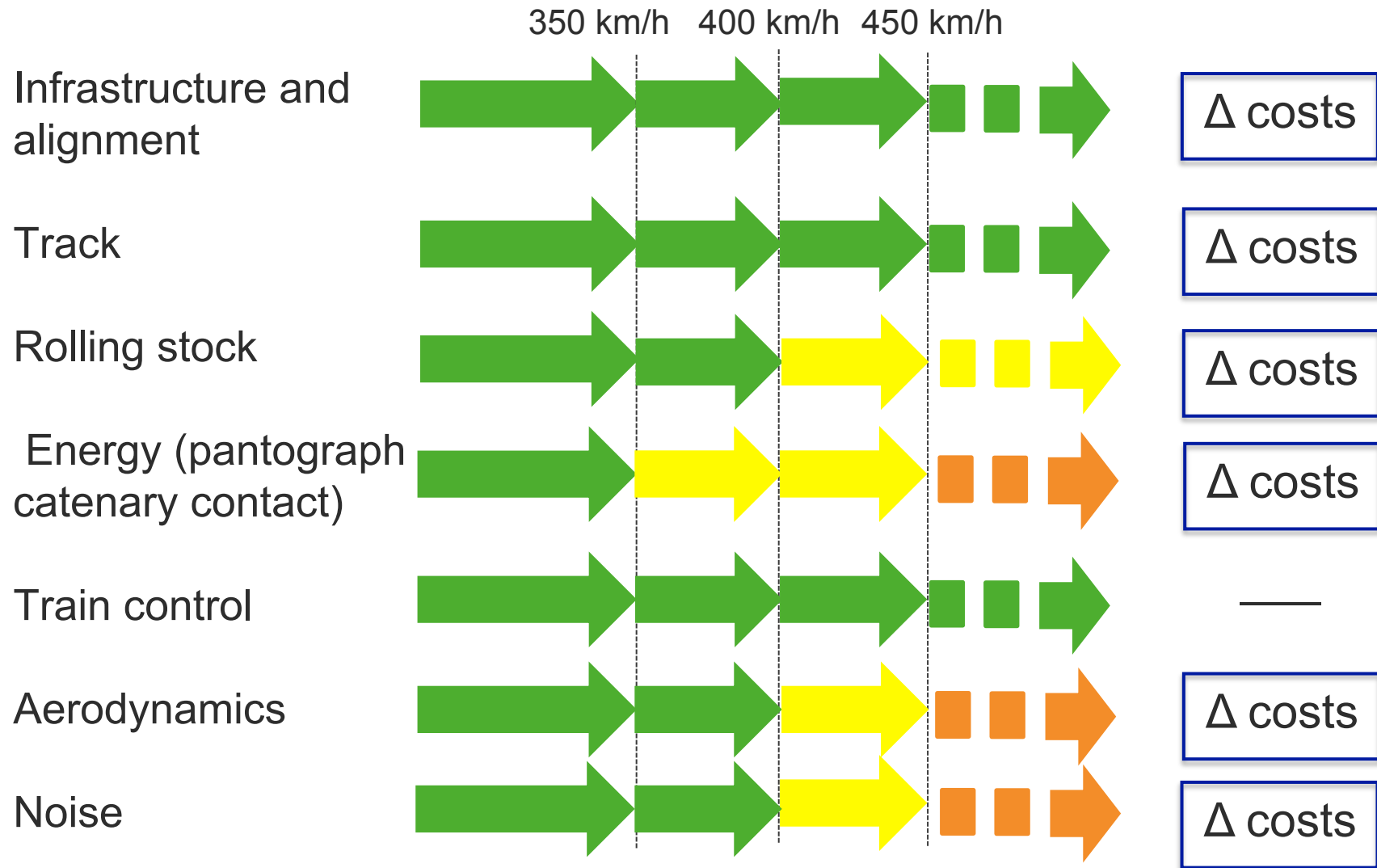
HISTORICAL EVOLUTION. OTHER TRANSPORT MODES



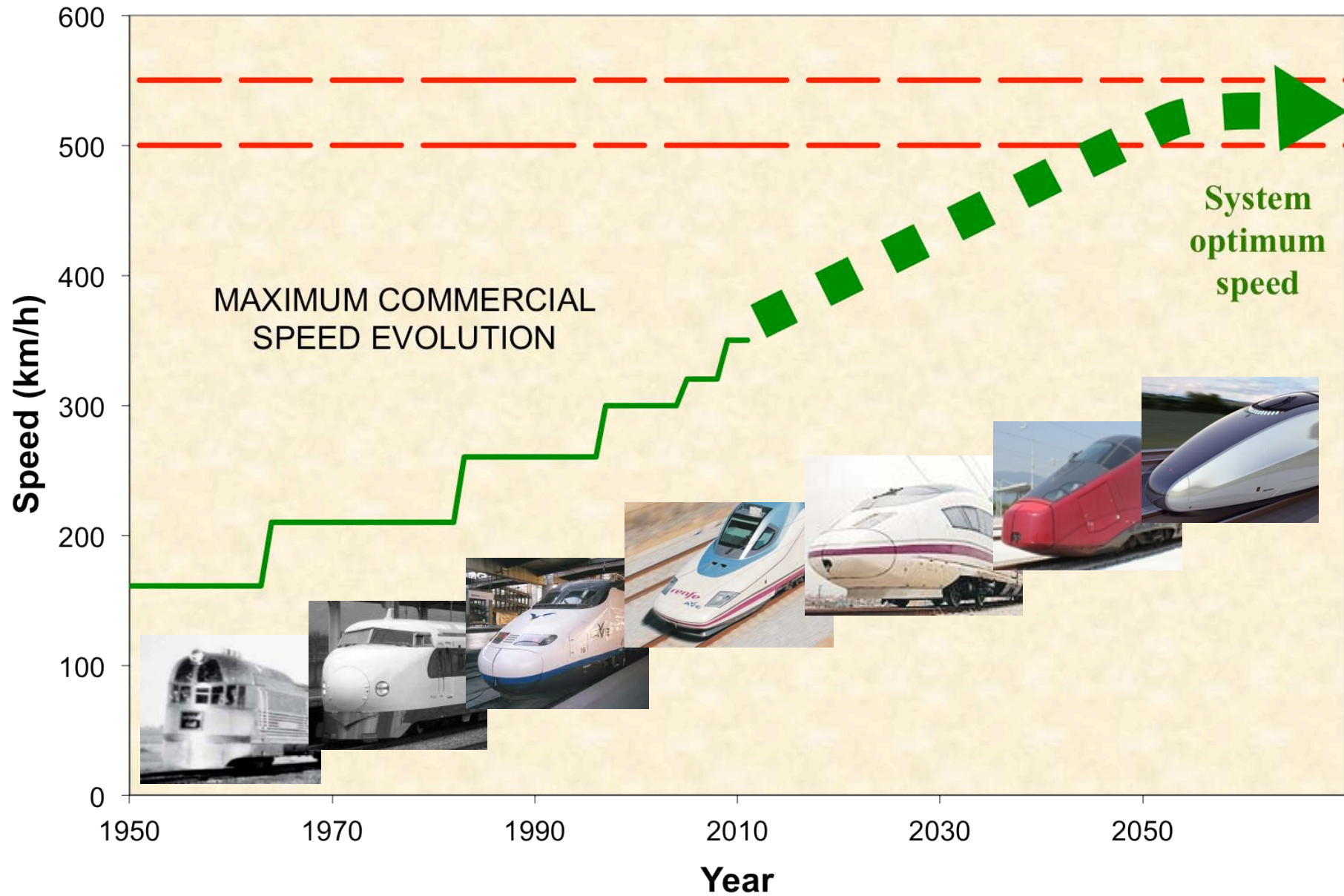
RAILWAY HIGH SPEED HISTORICAL EVOLUTION



SPEED INCREASE TECHNICAL CONSTRAINTS BY SUBSYSTEM

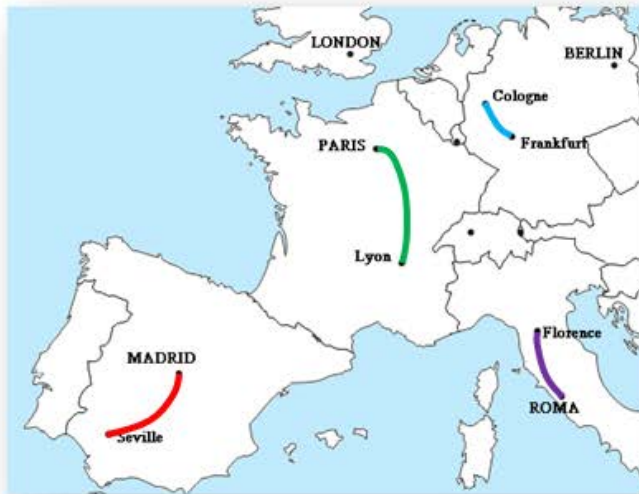


OPTIMUM SPEED. EXPECTED RANGE



VERY HIGH SPEED AND VERY LONG DISTANCE. OPERATIONAL APPROACH. HISTORICAL EVOLUTION

Late XX century HSR lines features



Line	OY	L	IMS	CMS
Tokaido Shinkansen	1964	515	210	270
Paris-Lyon	1981/83	425	250	300
Rome-Florence	1977/92	254	250	300
Madrid-Seville	1992	471	250	300
Cologne-Frankfurt	2002	180	300	-
Taipei-Kaohsiung	2007	345	300	300

OY: Opening Year
L: Length (km)

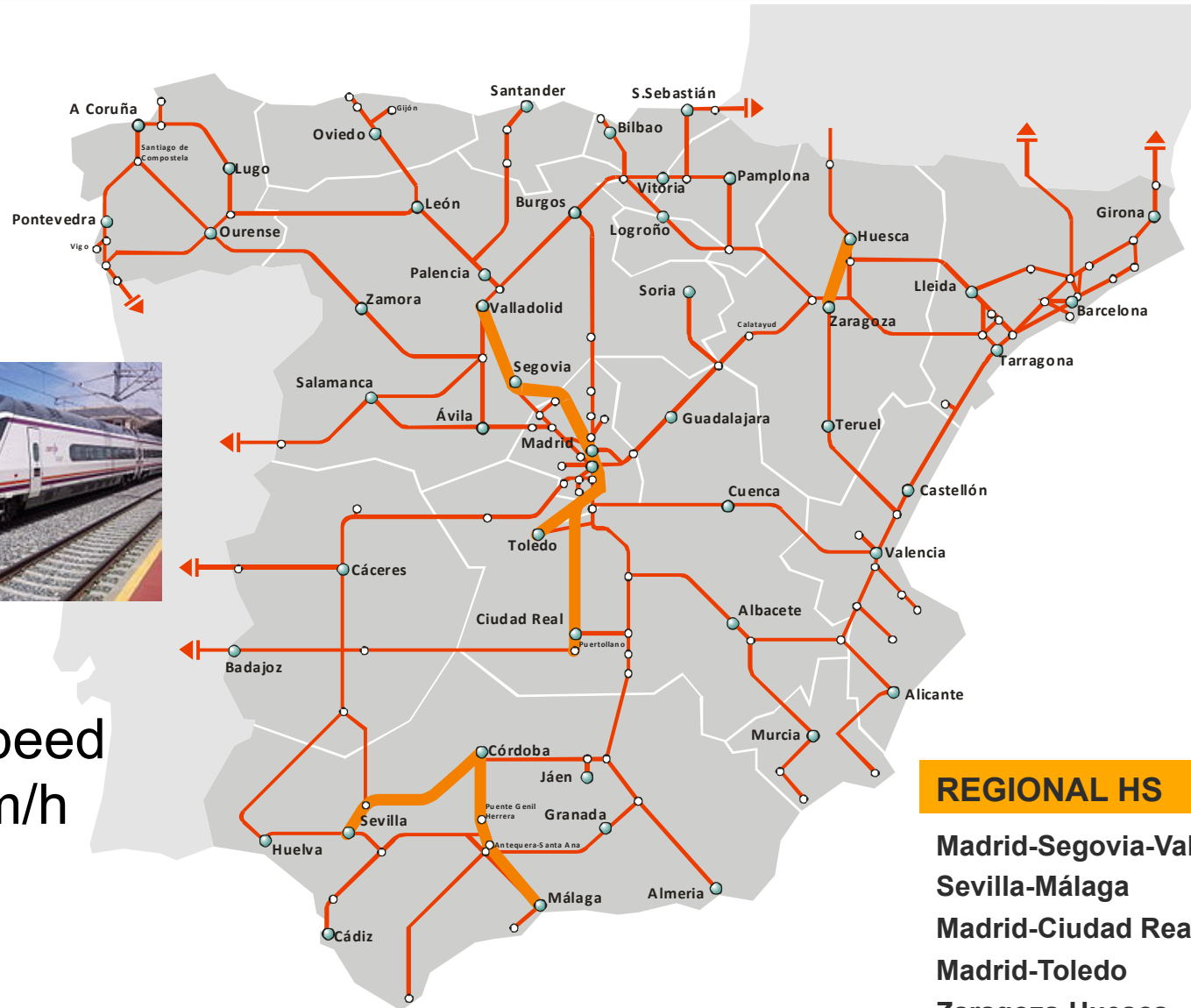
IMS: Initial Maximum Speed (km/h)
CMS: Current Maximum Speed (km/h)



THE CORRIDOR'S FEATURES INFLUENCE II



Max. Speed
250 km/h



REGIONAL HS

Madrid-Segovia-Valladolid

Sevilla-Málaga

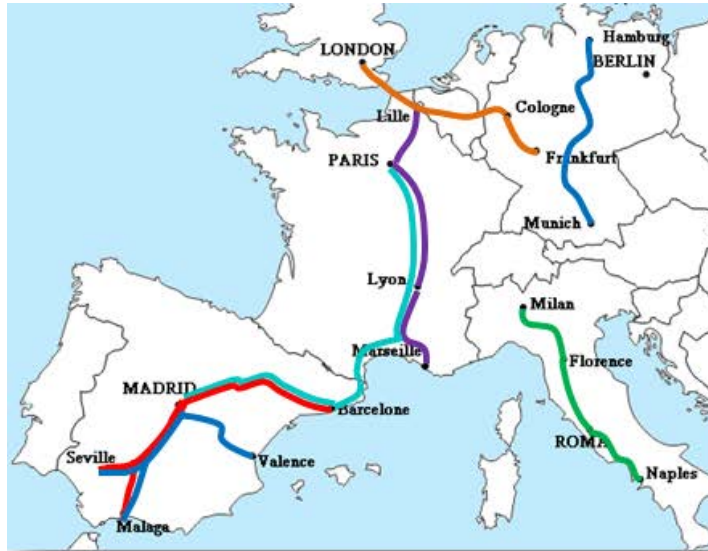
Madrid-Ciudad Real-Puertollano

Madrid-Toledo

Zaragoza-Huesca

VERY HIGH SPEED AND VERY LONG DISTANCE. OPERATIONAL APPROACH. CURRENT AND EVENTUAL FUTURE SERVICES

Early XXI Century HSR current / future very long services



Line	L	BTT	DSDS
Beijing-Shanghai	1318	4h 59 min	34 (+4)
Barcelone-Seville-Malaga	1109	4h 59 min	3
Tokio-Fukuoka	1100	5h 04 min	30
Lille-Marseille	990	4h 44 min	7
Valence-Seville-Malaga	801	3h 50 min	1
Hamburg-Munich	776	5h 37 min	12
Naples-Milan	772	4h 15 min	20
Frankfurt-London	700	Planning stage	
Paris-Madrid	1500	Planning stage	

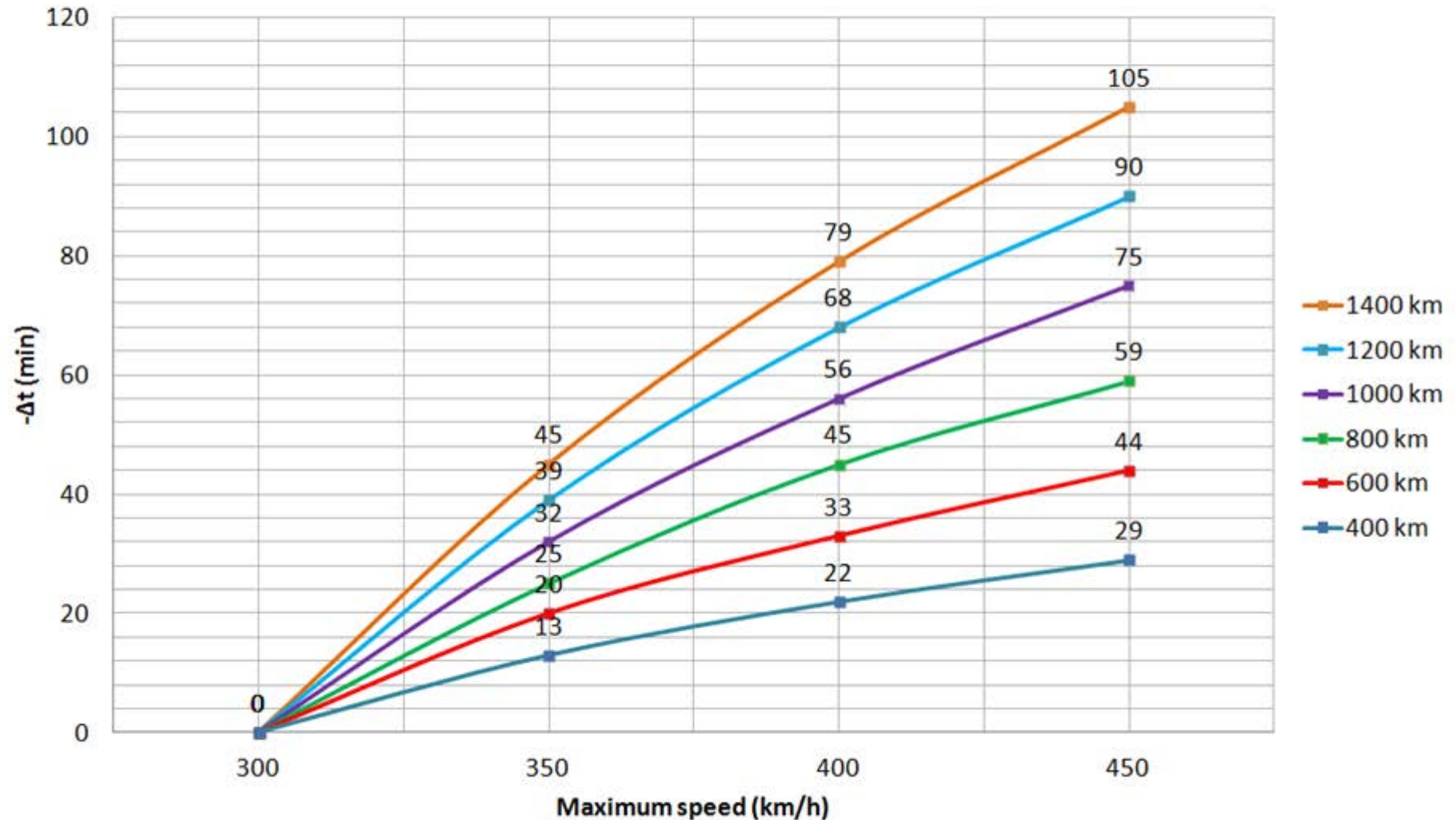
L: Length [km]
 BTT: Best Travel Time
 DSDS: Direct Service Daily Pairs



VERY HIGH SPEED AND VERY LONG DISTANCE. OPERATIONAL APPROACH. CURRENT AND EVENTUAL FUTURE SERVICES

Travel time reduction compared to maximum speed

Higher speeds are suitable for longer services





THANK YOU FOR YOUR ATTENTION