

# **Mega-projects and their potential impacts on innovation and technological progress**

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## Common properties

- ❖ Large scale (construction costs)
- ❖ Long planning/procurement phase
- ❖ Complex (many interacting components)
- ❖ Long life (50 years and more)
- ❖ Uncertain benefits  
(contingent on non-controllable factors)
- ❖ High political influence
- ❖ Heterogeneous stakeholders

planned Messina bridge



## Bent Flyvbjerg's sublimines

- ❖ technological
- ❖ economic
- ❖ aesthetic
- ❖ political

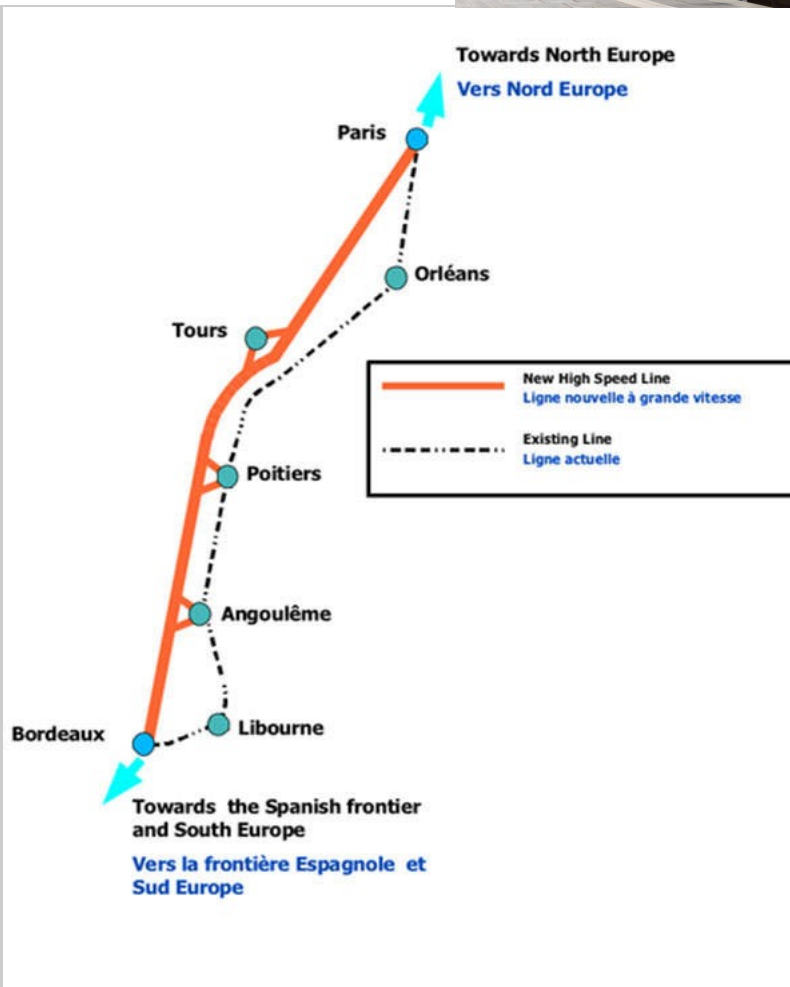


## BF iron law:

- ❖ over budget
- ❖ over time
- ❖ → over and over again

<b>Project</b>	<b>Cost overrun (%)</b>
<b>Suez Canal EGY</b>	<b>1,900</b>
<b>Panama Canal PAN</b>	<b>200</b>
<b>Boston Big Dig US</b>	<b>400</b>
<b>HSR Frankfurt-Cologne GER</b>	<b>200</b>
<b>A6 Motorway UK</b>	<b>100</b>
<b>Great Belt Fixed Link DK</b>	<b>100</b>
<b>Channel Tunnel UK</b>	<b>80</b>
<b>Oeresund Fixed Link DK</b>	<b>40</b>

<b>Project</b>	<b>Cost overrun (%)</b>
<b>Athens airport</b>	<b>-</b>
<b>Oeresund fixed link</b>	<b>32-70</b>
<b>HSR Bordeaux-Tours</b>	<b>-</b>
<b>Vidaduc de Millau</b>	<b>13</b>



- 302 km
- 38 km connecting lines
- Started 2012 compl. 2017
- Time reduction Bordeaux-Paris: 1 hr
- Cost: 7.8 bn EUR
- PPP project
- 50 years concession contract
- LISEA (private): 3.8 bn
- Public (State, EU): 3.0 bn
- RFF (Infra. Manager): 1.0 bn

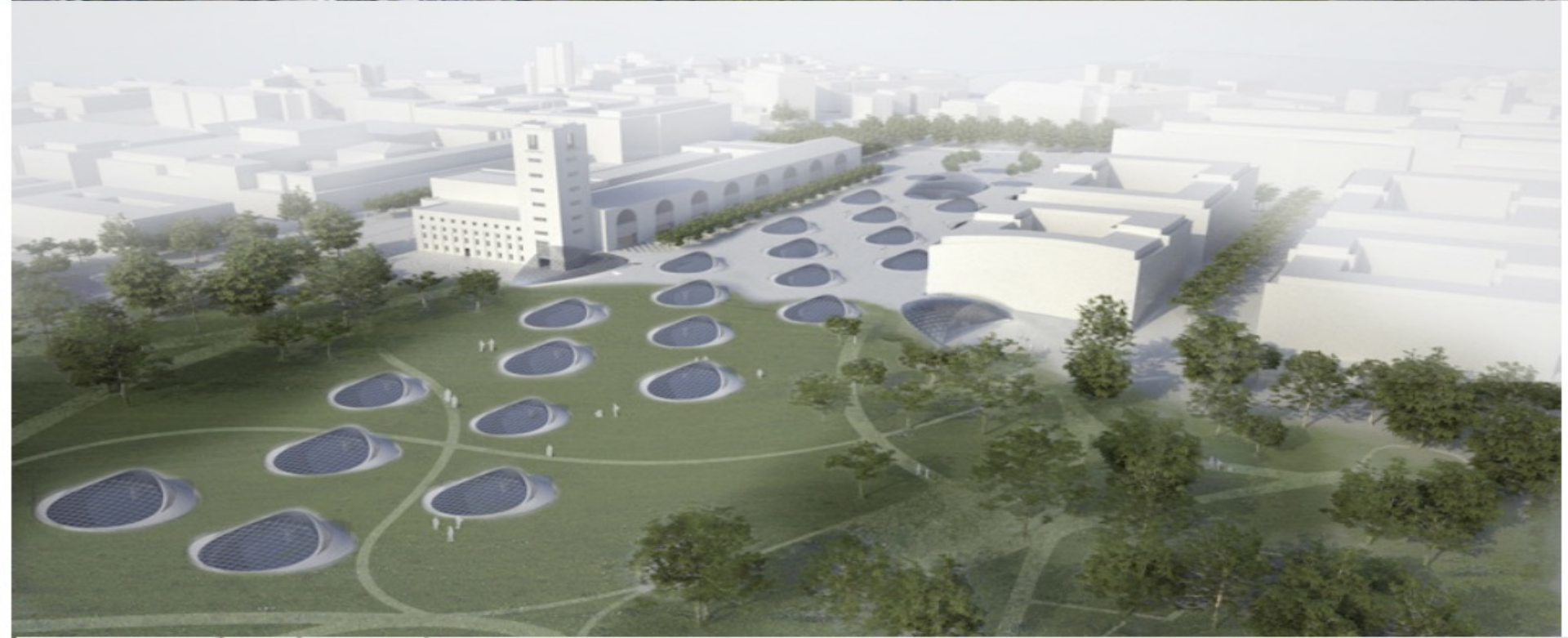


# Stuttgart 21: Complex combination of federal, regional and urban investments





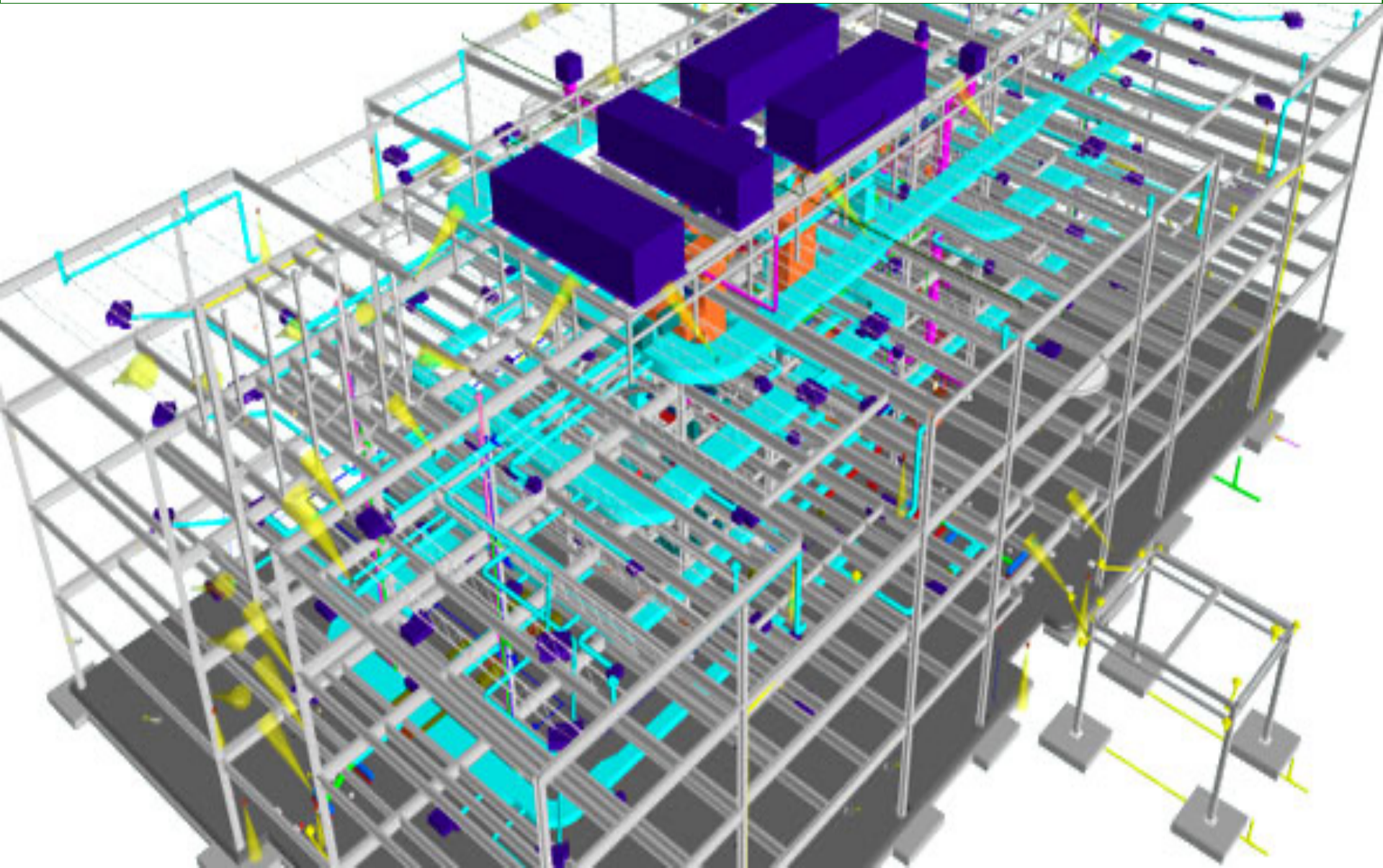
# Stuttgart new underground station





- ❖ **Rough planning based on appraisal biases in the early phase**
- ❖ **Decision taken on this base and on political favours for main stakeholder groups**
- ❖ **No efficient structure of management and control bodies**
- ❖ **No change management**
- ❖ **No risk management**
- ❖ **No structured public relations management and mediation processes**

- **Management by public enterprise owned by the client**
- **Not taking into account international expertise**
- **Control body positions allocated to political leaders**
- **Requirements for changes after construction start**
- **Too late checks and warnings, reluctance of the client to take unpopular decisions**



- **Inevitable if planning and construction phases are very long: Changed forecasts for demand development, changed environmental legislation, changed prices and cost calculations**
- **Fast reactions to changed requirements of client or stakeholders**
- **Clear allocation of costs arising to responsible parties**
- **Example of Olympic Games in London 2012**

## Over the life cycle of a mega-project

Phase of the Life Cycle	Resource input risk	Market risk	Financial risk	Construction risk	Environmental Risk	Social Risk	Political Risk
Planning							
Procurement							
Construction							
Operation							

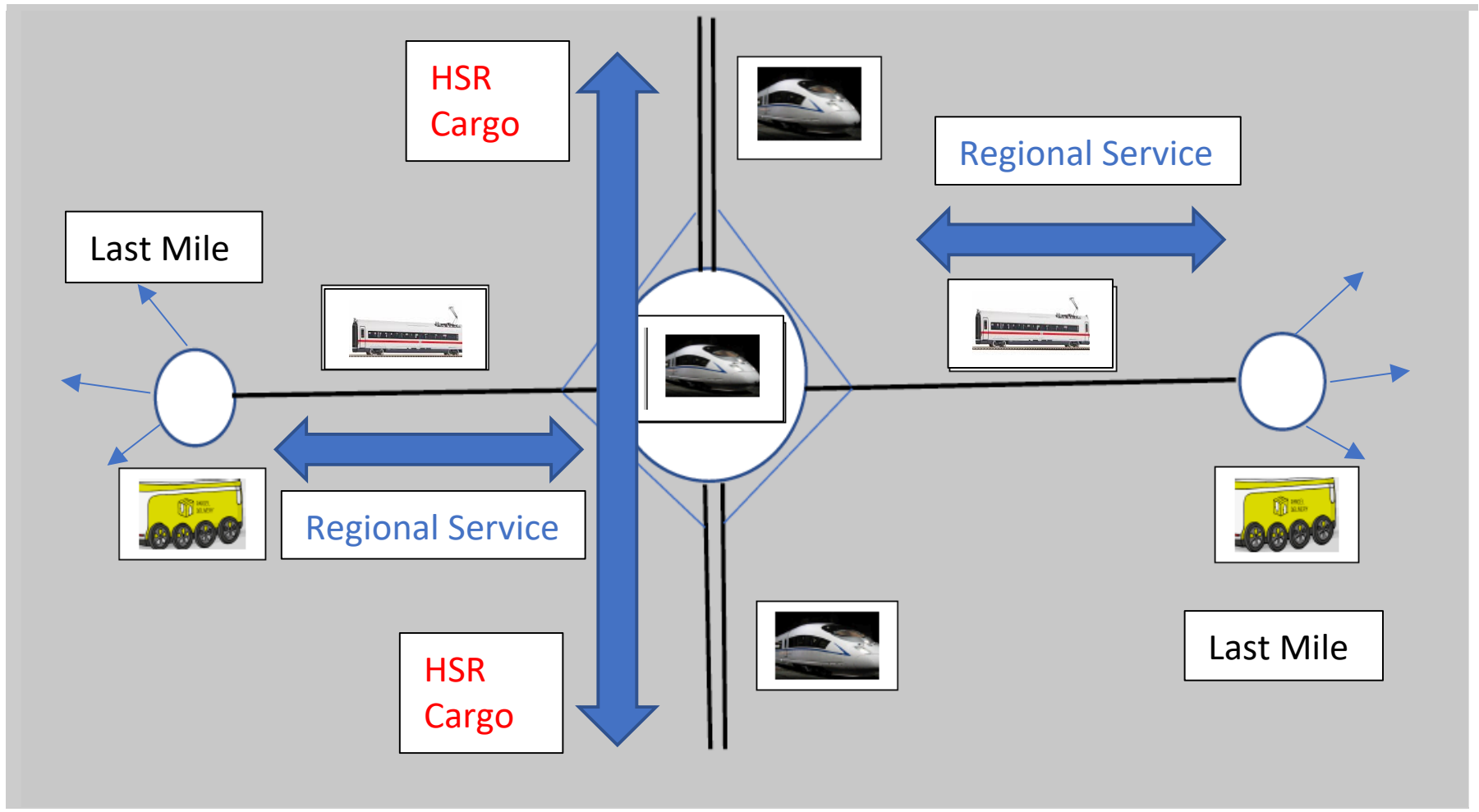
## Micro-economic approaches

### Business-case studies

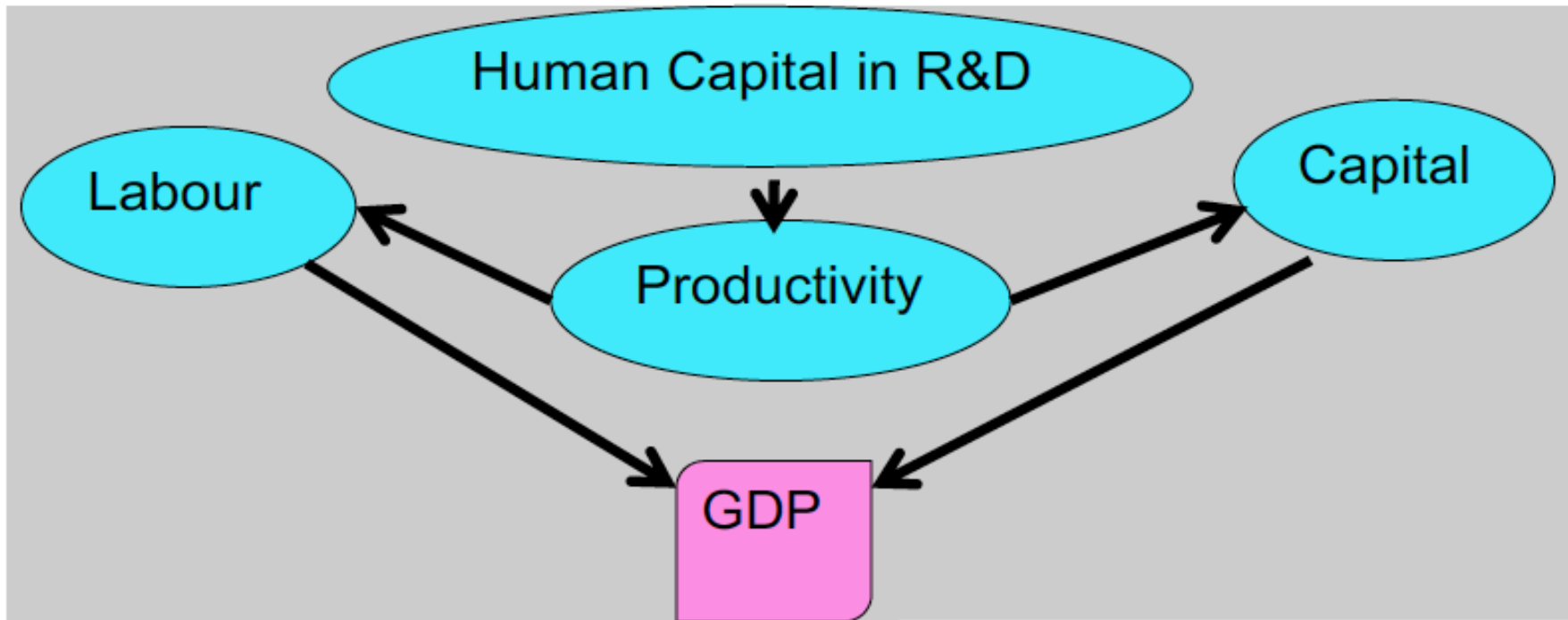
- **Example: Hyperloop**
- **Example: HSR for freight**
- **Automation in logistics**
- **Alternative fuel production**



## Logistics system including HSR



# Assessment of mega-projects with special focus on technical progress



$$\dot{A} = \frac{dA}{dt} = \delta * H_A * A$$

A: tech. knowledge

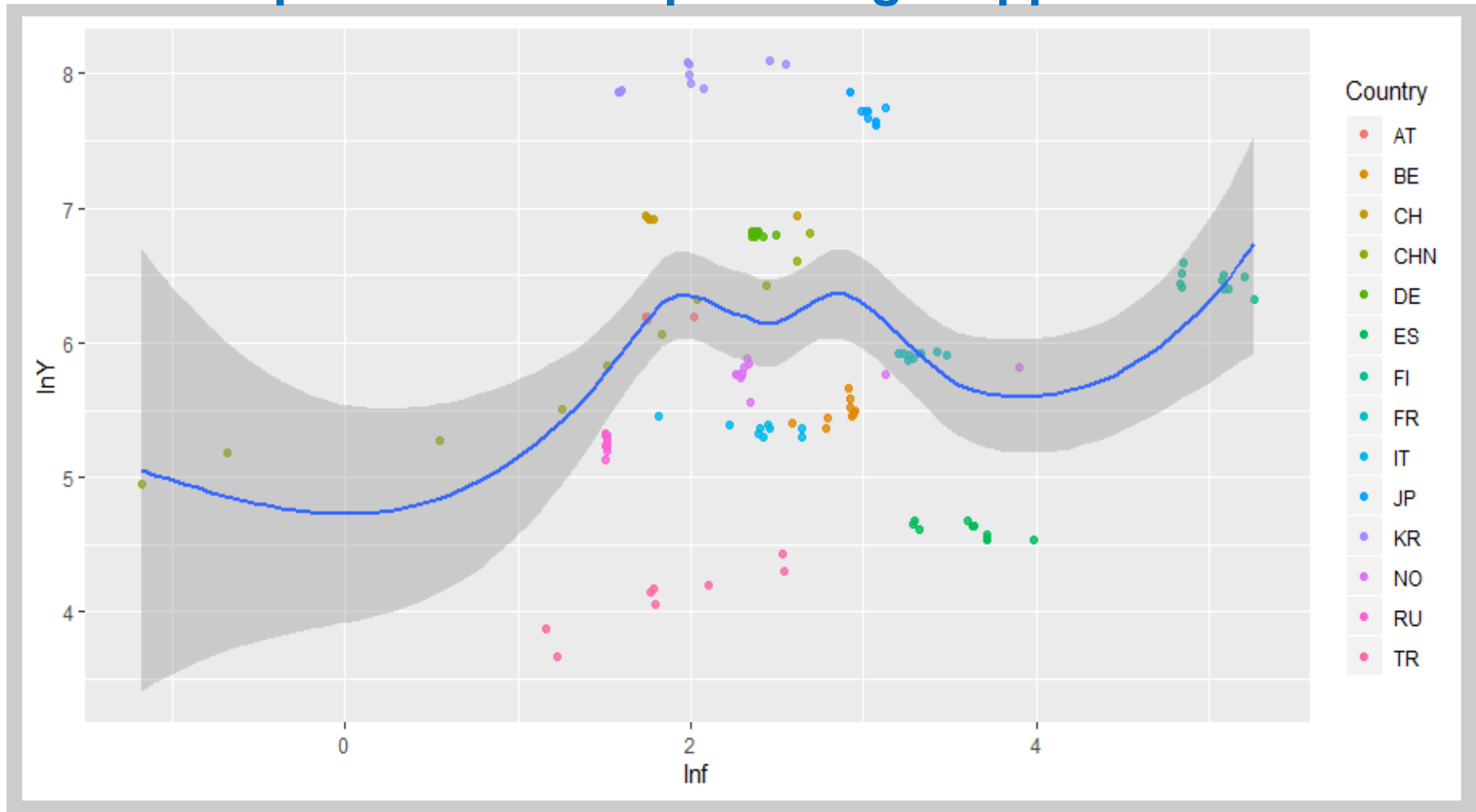
$H_A$ : human capital

$\delta$ : productivity of  $H_A$  in R&D

## Macro-economic approaches

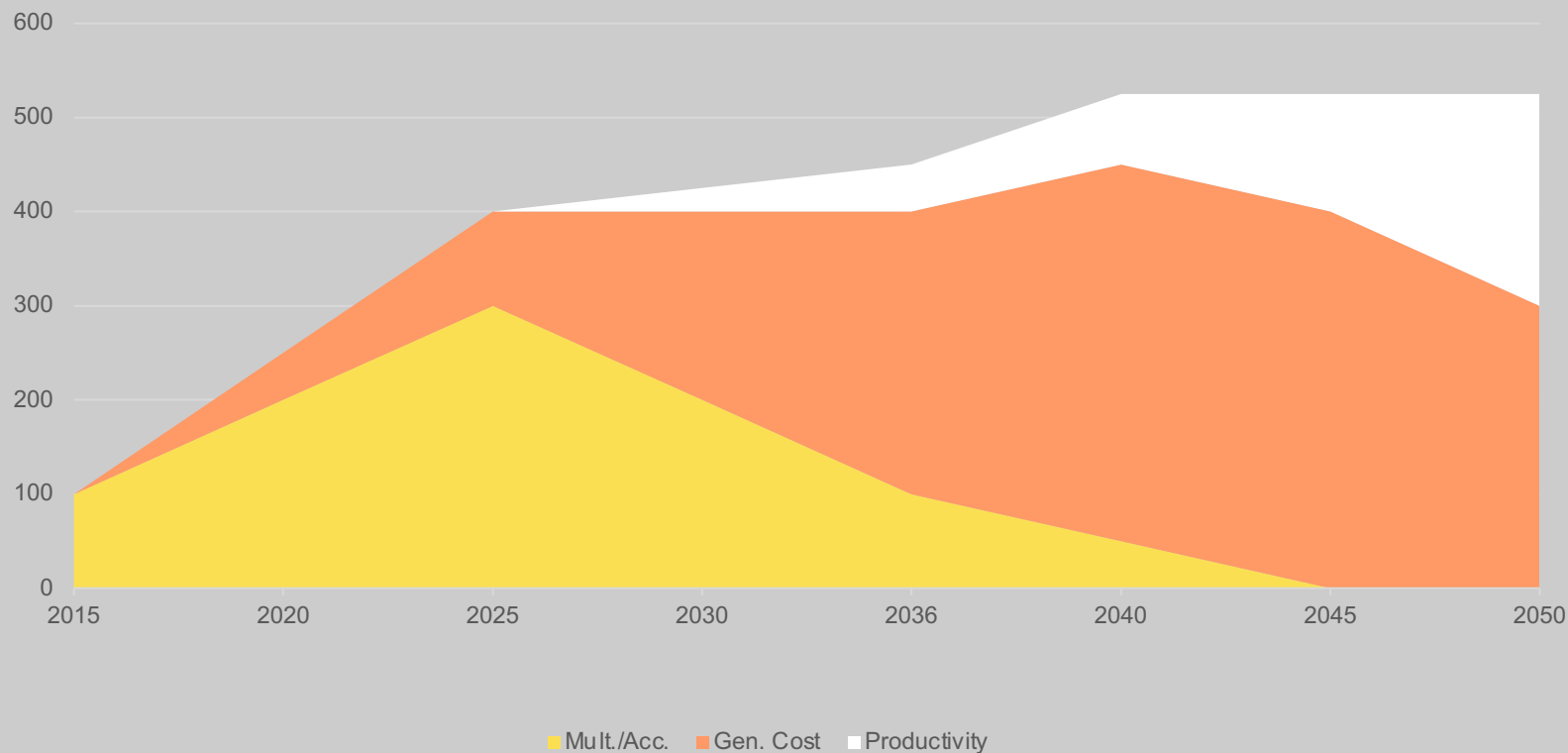
- Systems dynamics
- Including endogenous growth

## Impact of HSR on patent right application



## Wider economic impacts

Benefit Profile of WEI



## ❖ Missing participation of stakeholders

- Affected population
- Environmental groups
- Critical experts

## ➔ Mediation, communication, arbitration

- Start in early phase
- Open process, alternative solutions
- Open communication

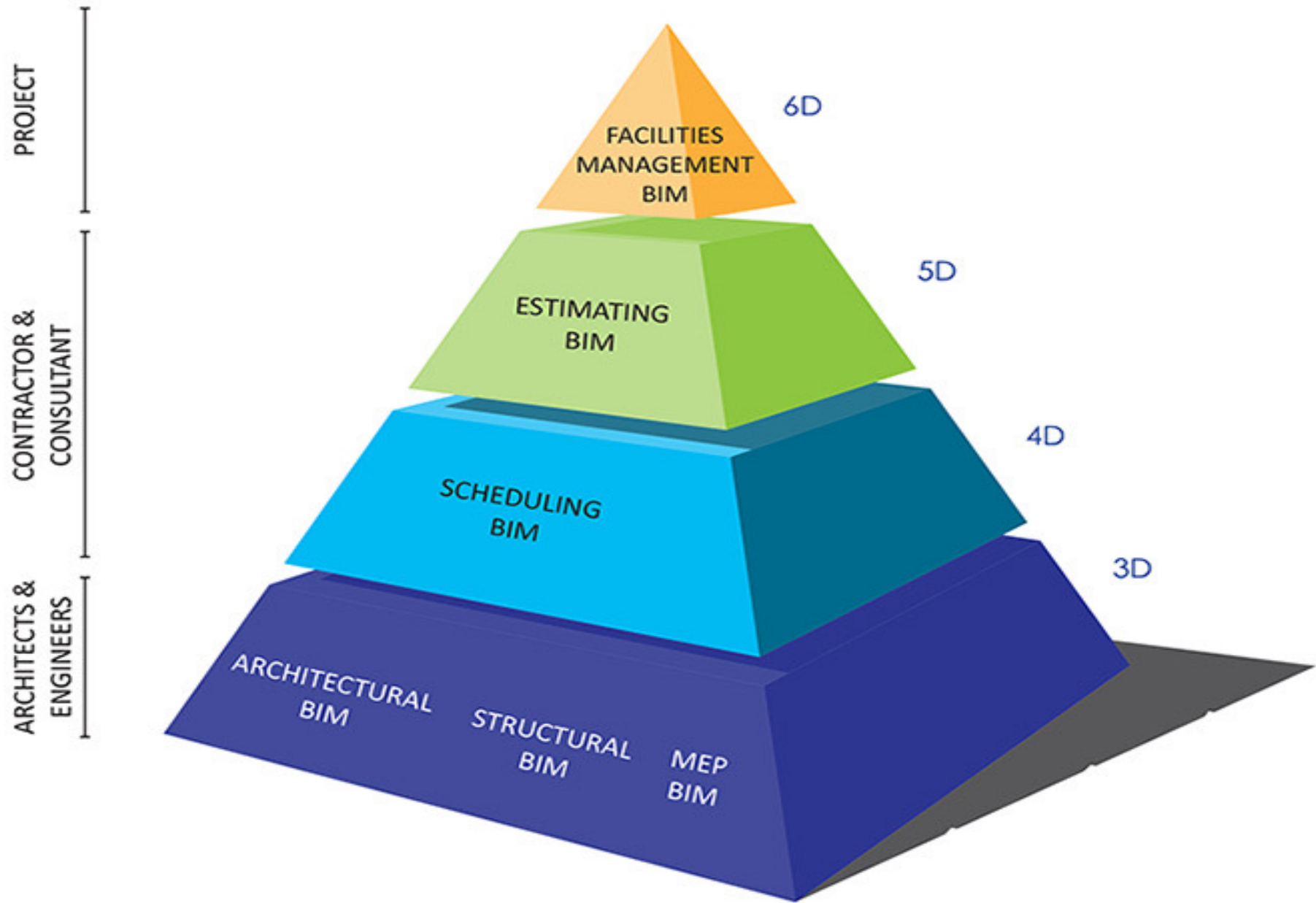


**Thank you!**

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# Life Cycle Planning

# Planning Stages



Forecast  
Assessm.  
Alternat.  
Comparis.  
Data

Pre-  
Design  
Forecast  
Demand/S  
upply  
Model  
Land Use  
Assess  
Risk  
Finance  
Impact  
Space  
Environ.  
SEA, EIA

Pre-  
Design  
Alignment  
Land Use  
Building  
Geology  
Cost,Risk  
Finance  
Databanks

Design  
Fin.  
Alignment  
Fin  
Building  
Spec. Cost,  
Risk Det.  
Data  
Banks

Building  
Modelling  
Control  
Change  
Managem.  
Cost, Risk.  
Perm.  
Informat.  
Platform  
Detailed  
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Dokument  
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Mainten.  
Managem.  
Life Cycle  
Control

# Decision Support Methods