CAREC
Central Asia Regional Economic Cooperation Program

7th Railway Working Group Meeting

22–23 May 2023 • Tbilisi, Georgia

7-е заседание Рабочей группы по железнодорожному транспорту

22–23 мая 2023 года • Тбилиси, Грузия

Railway Asset Management

Strategic Planning and Decision Making

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Asset Management Specialist
Freelancer

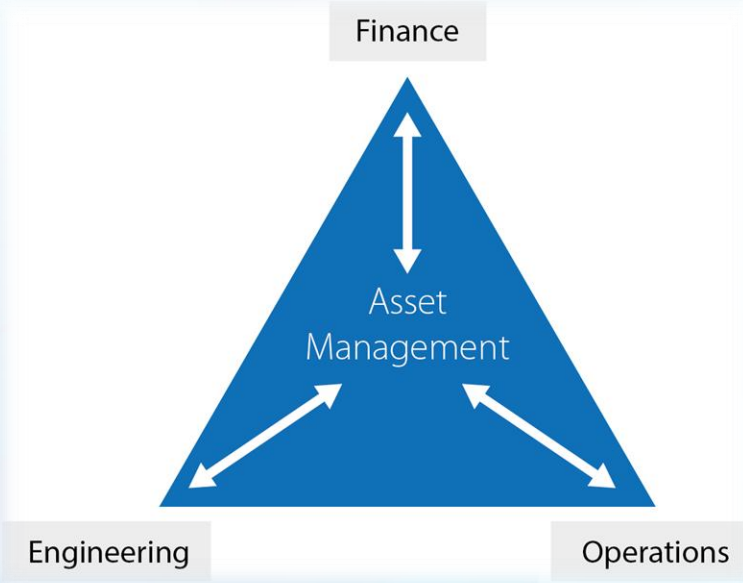
OUTLINE

- What is Asset Management?
- Railway Asset Management Framework
- Strategic Asset Management Planning - ÖBB Infra
- Investment Decision Making – ADIF

ASSET MANAGEMENT

"Coordinated activities of an organization to realise value from assets"

Source: *ISO 55000 series*



Asset Management is an **Integrating Discipline**

ASSET MANAGEMENT

Why do organizations improve their Asset Management?

- To gain significant competitive advantage
- Regulator or government requirement
- Pressure to deliver at significantly lower cost
- Need to improve reliability and availability of assets
- Reputation
- Lack of stakeholder confidence
- Growth in future demand
- Difficulty in accessing capital for new and replacement assets
- Market requirement for greater flexibility and efficiency

ASSET MANAGEMENT

ISO 55000 Clauses:

4- Context of organisation

5- Leadership

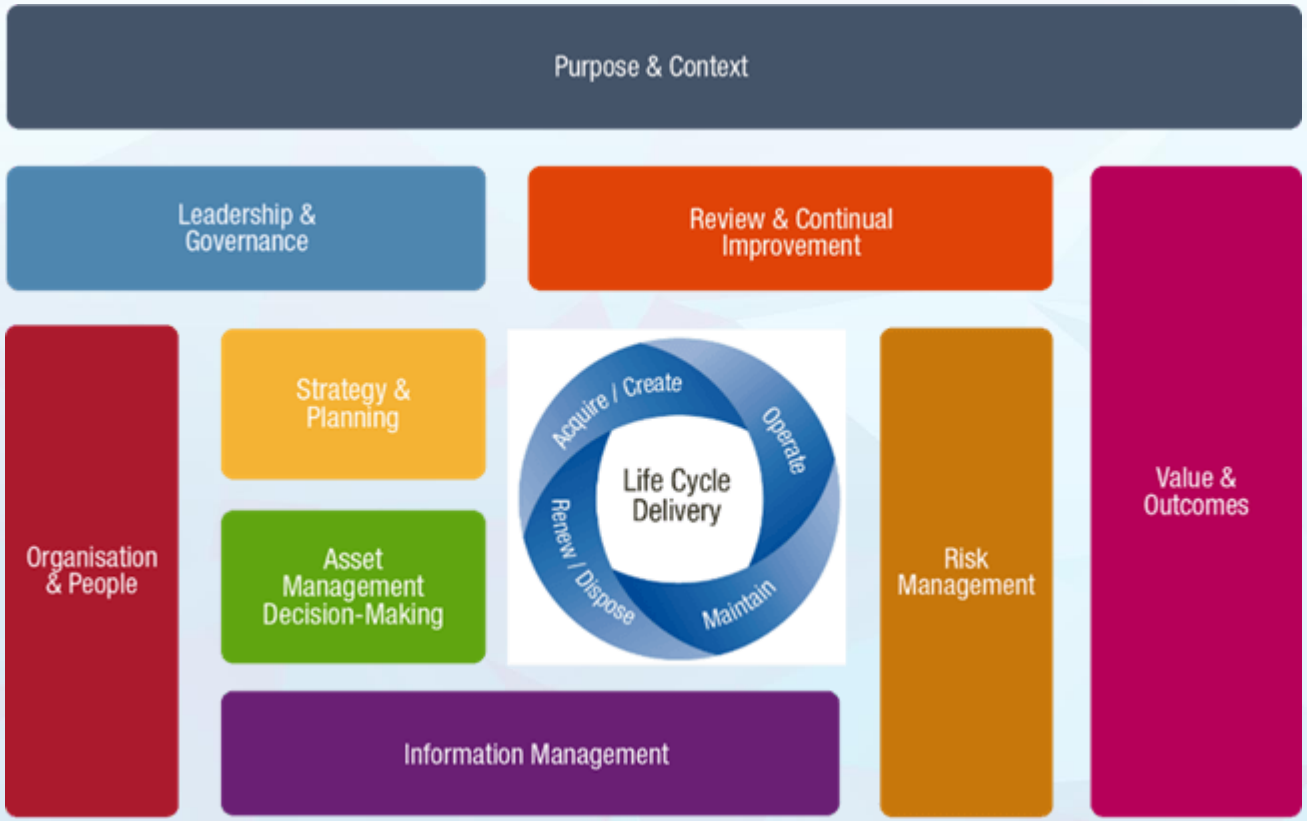
6- Planning

7- Support

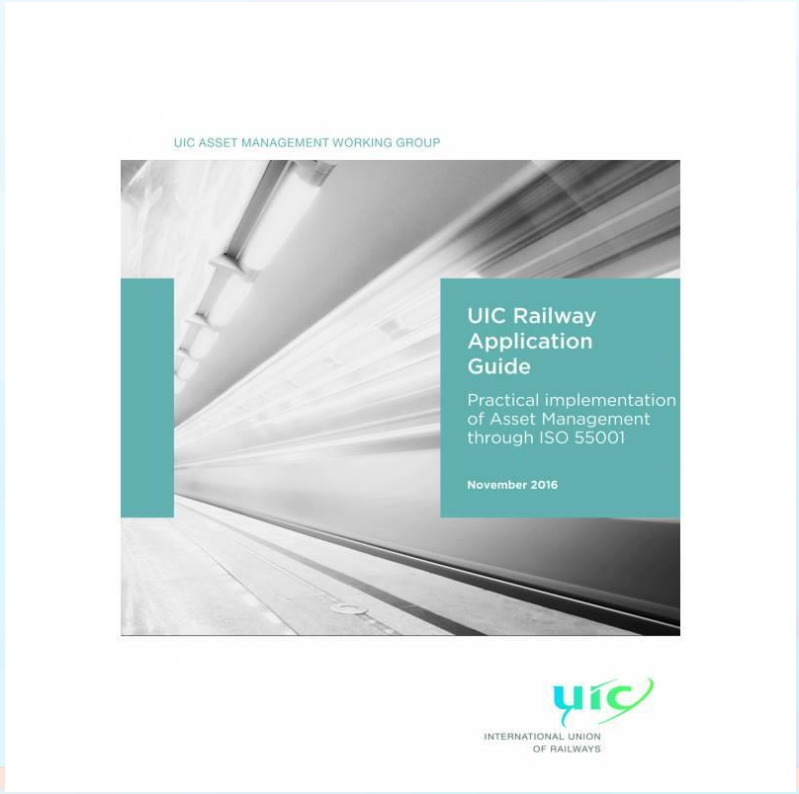
8- Operations

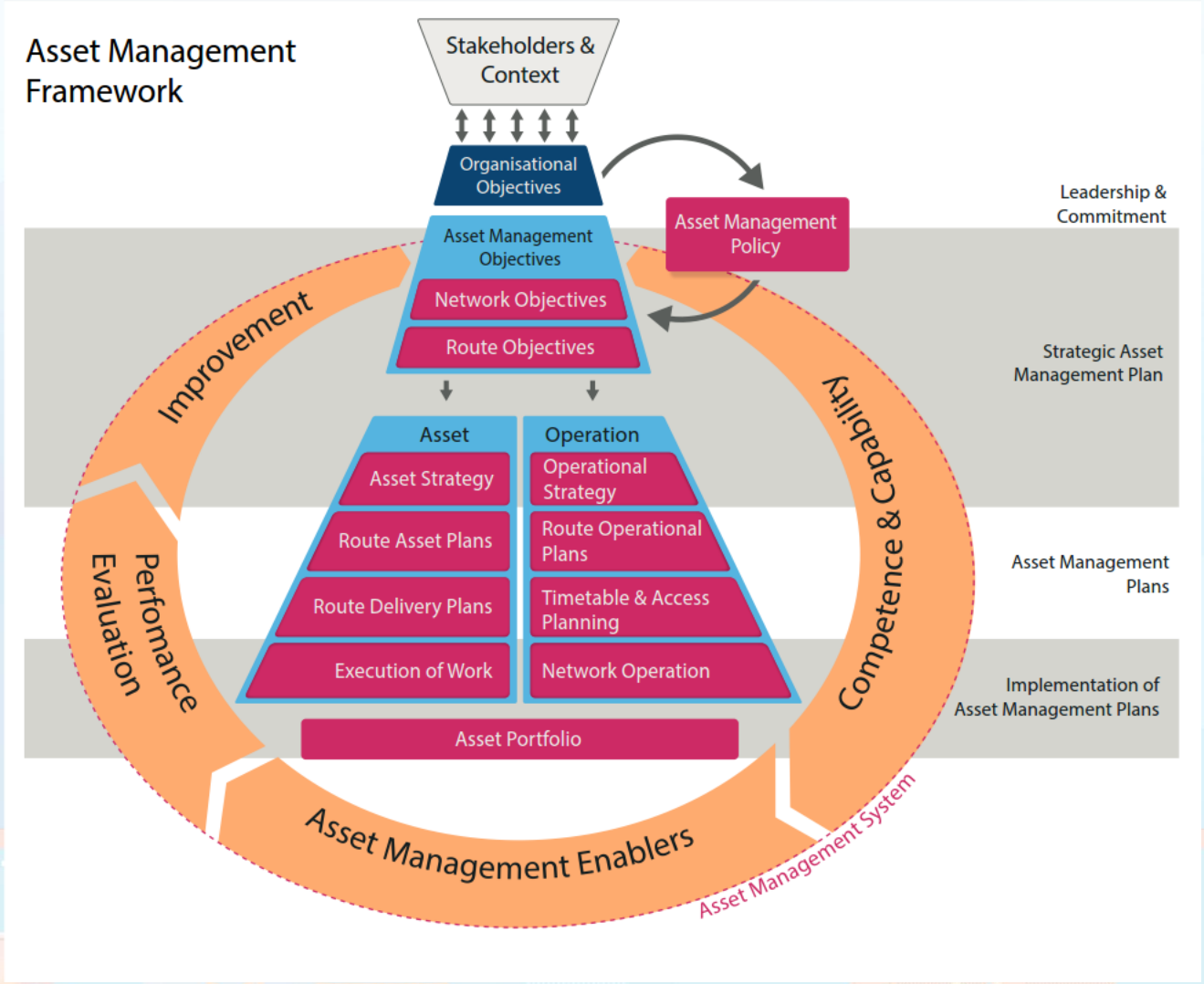
9- Performance evaluation

10- Improvement



RAILWAY ASSET MANAGEMENT



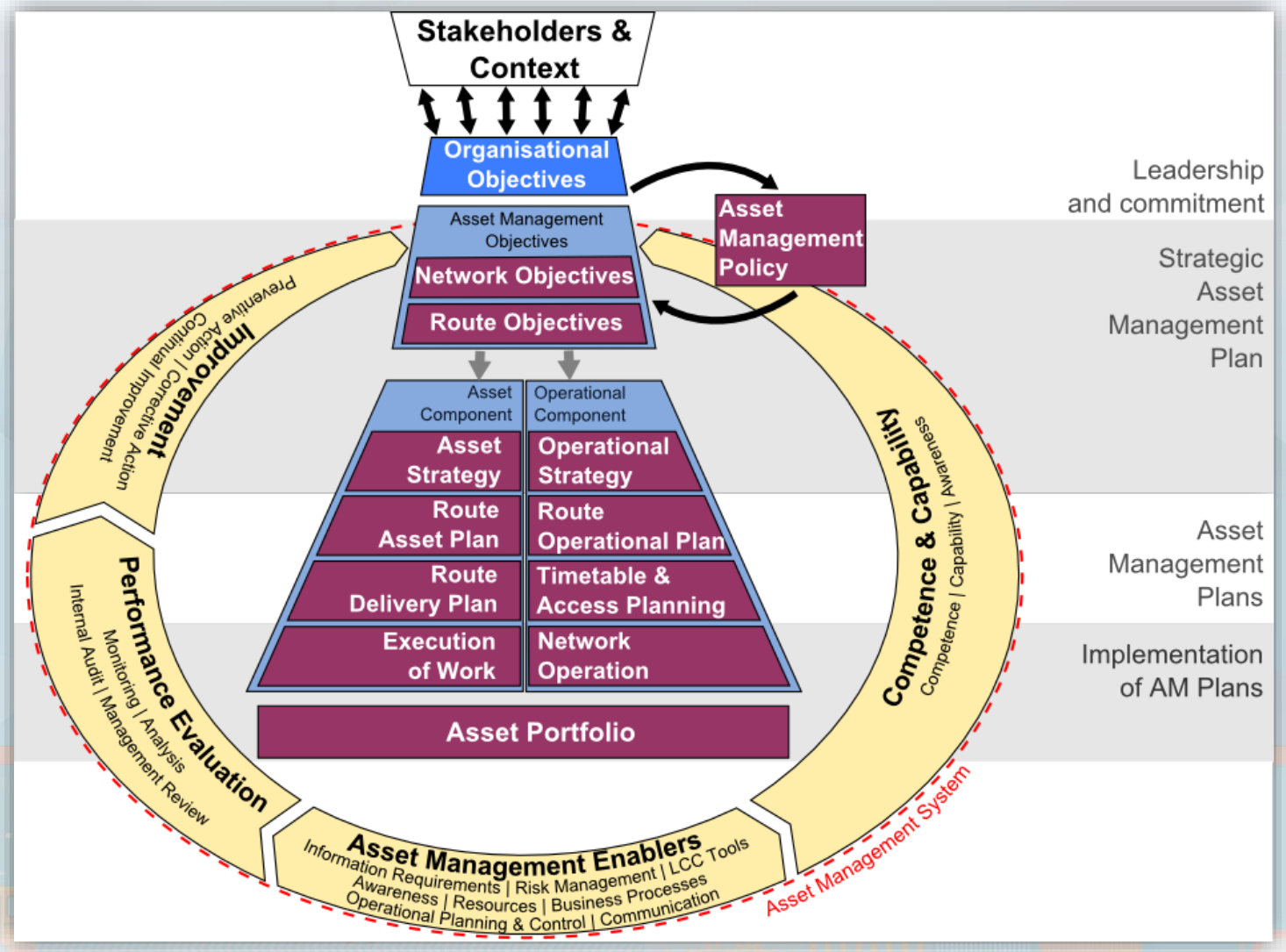


STRATEGIC ASSET MANAGEMENT PLANNING

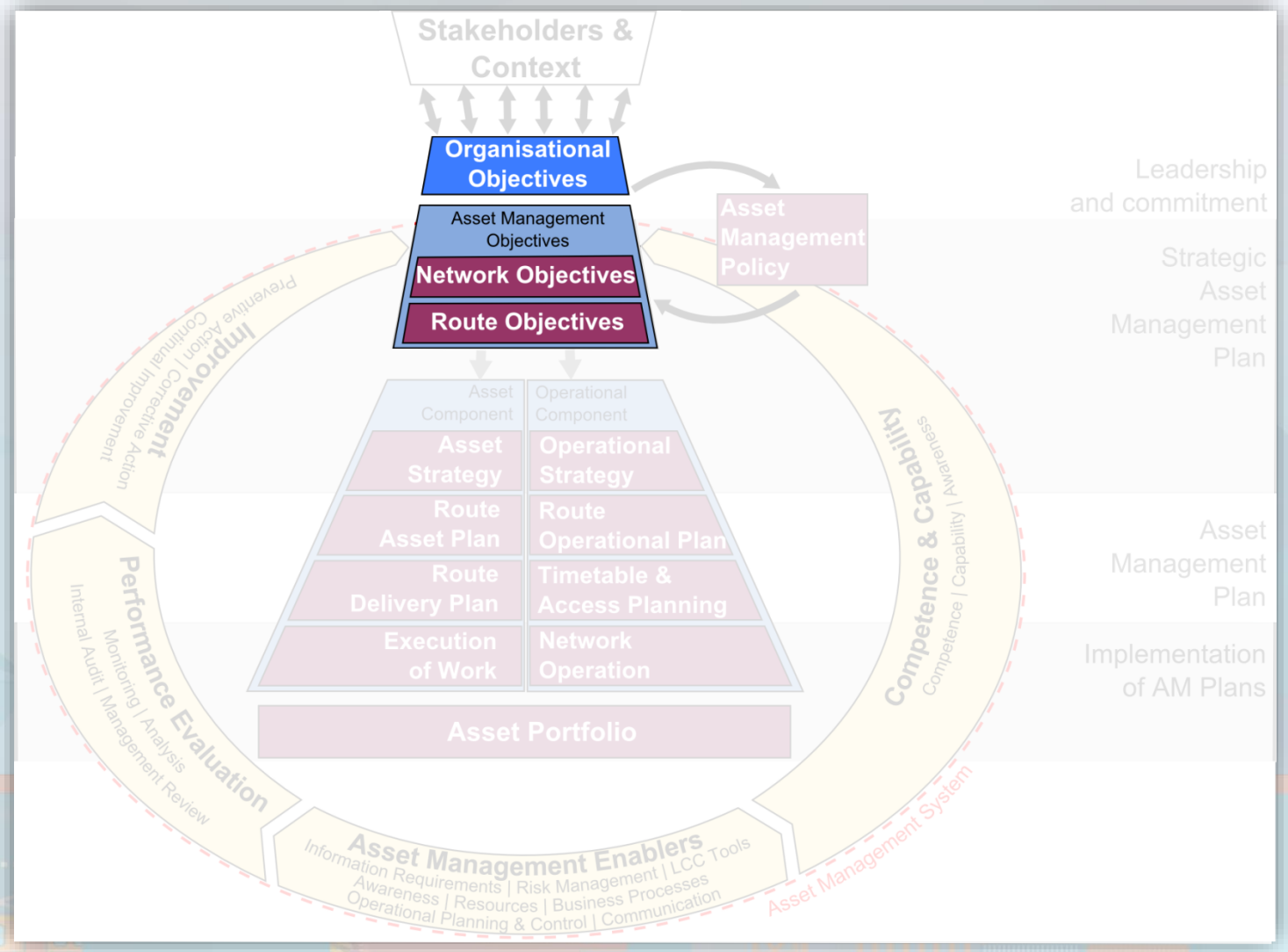
> The **ÖBB Infrastruktur AG** is supposed to be the **Leader** in the field of **Asset Management** in **Europe**

Andreas Matthä
(CEO ÖBB Holding AG)

ISO 55000 Guideline of the UIC AMWG



Objectives within the UIC AM Framework…



ÖBB Infrastructure - strategy pyramid

Strategy pyramid

Values

- reliable, competent, transparent

Vision

- attract people to railway and raise enthusiasm

Mission

- to create attractive mobility

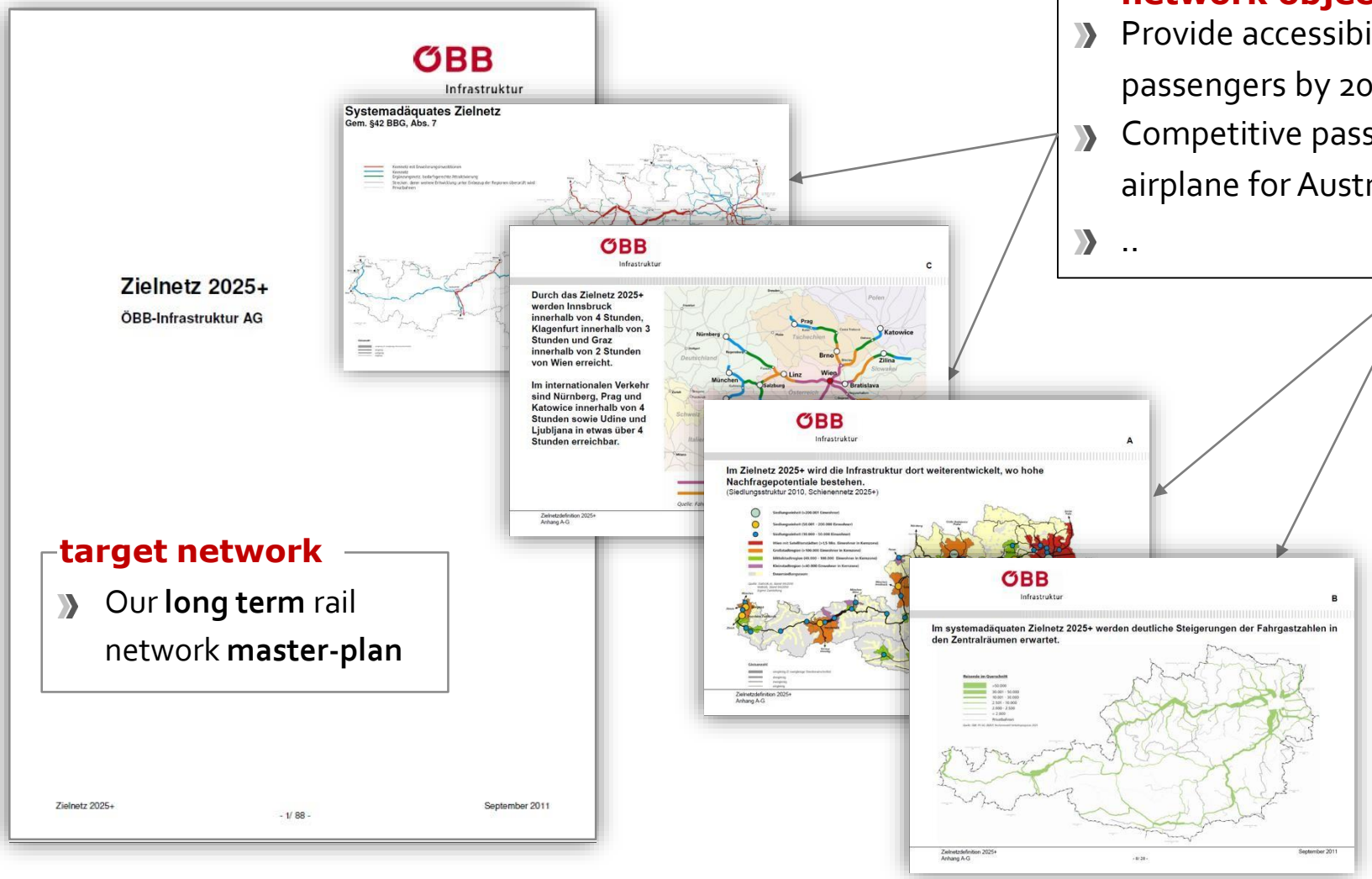
Objectives

- ÖBB-Infrastruktur will provide a railway infrastructure by 2025 that is attractive, accepted and in line with the market.
- …

Strategies

- Create traffic forecast in order to know the market in future
- …

Network objectives



target network

- Our **long term** rail network **master-plan**

network objectives

- Provide accessibility for 90% of our passengers by 2025
- Competitive passenger travel time train vs. airplane for Austria's main cities by 2025
- ..

Breaking down Network objectives to Route objectives

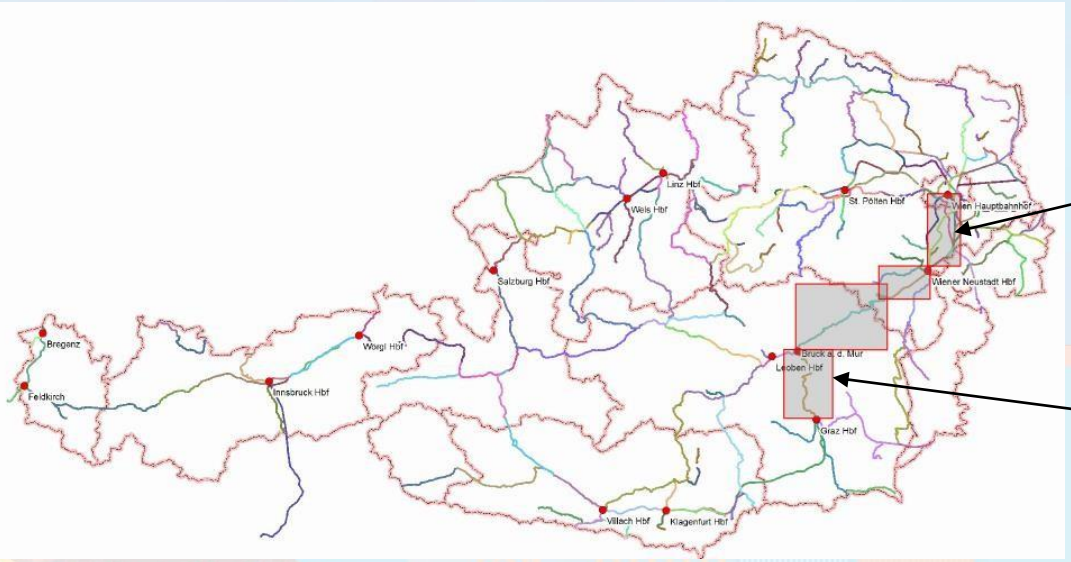
network objectives

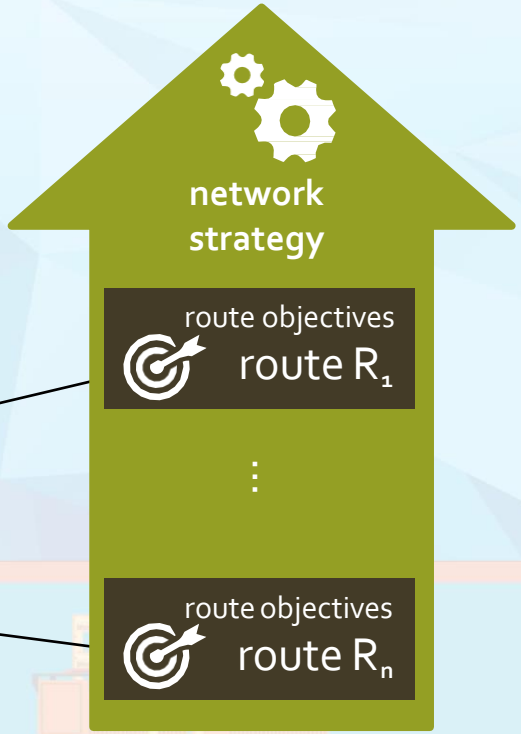
network-strategy

- A **breaking down** of the complex target network into smaller **geographical pieces** that are **easier to control**
- We **derive the route objectives from the network objectives** such that a **gradual achievement of the route objectives** corresponds to a **progressively movement towards our target network**

Example: reduction of travel time

- This **objective** needs to **be broken** down **into the sections of route**, as the **measures need to be implemented** on the **entire route**.





Breaking down Network objectives to Asset objectives

network objectives

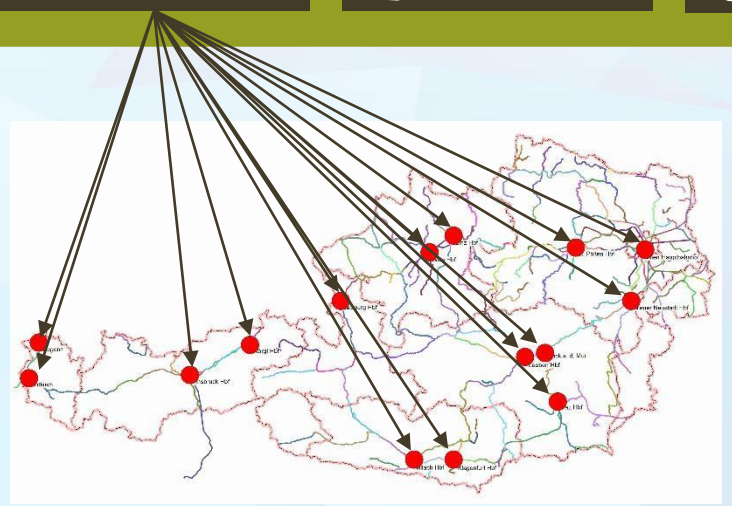
asset objectives stations

asset objectives switches

asset objectives bridges

asset objectives tunnels

asset portfolio strategy



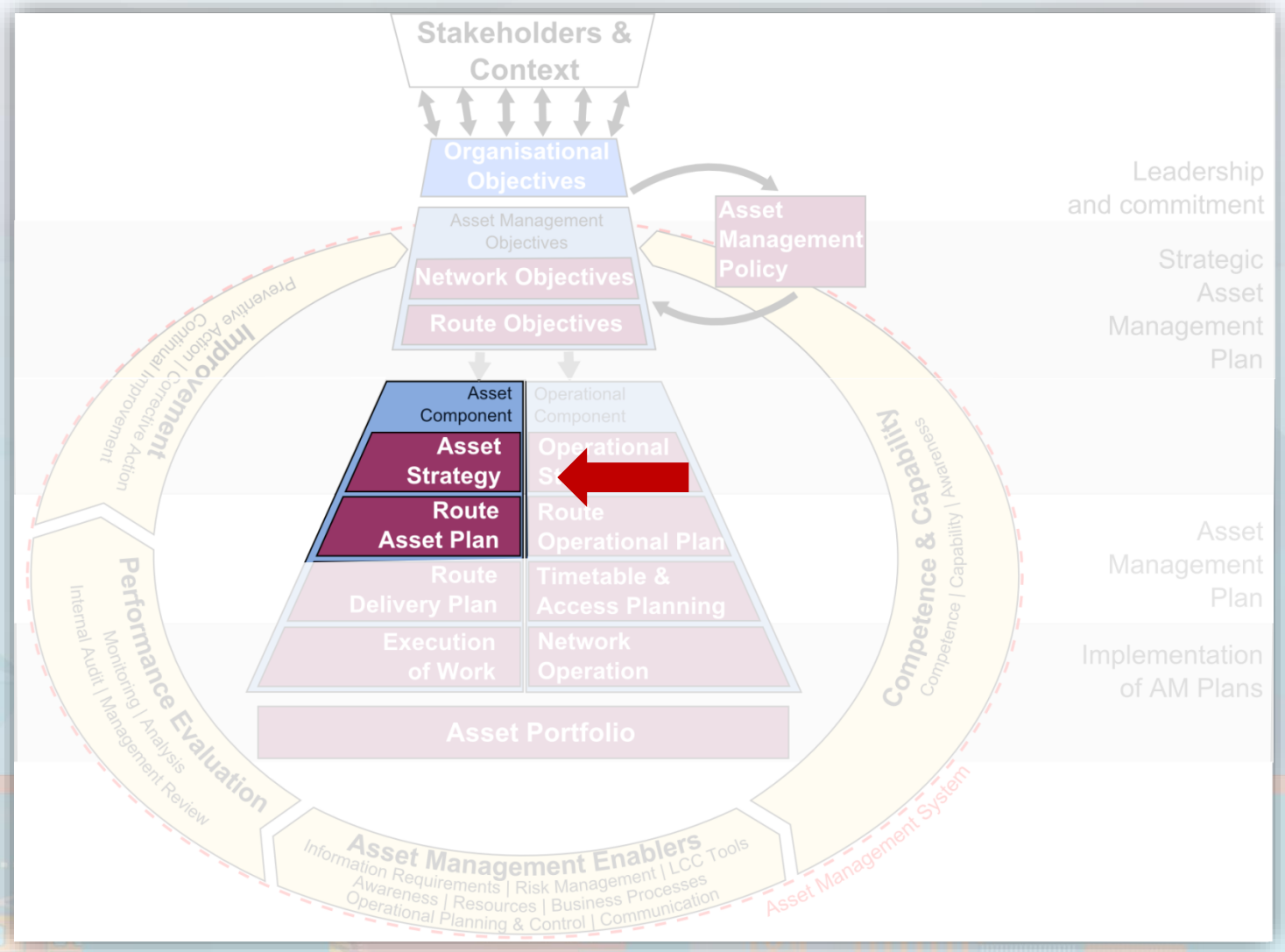
Example: accessibility

- By **2025** we want to **provide accessibility for 90 % of our passengers**.
- As an infrastructure manager we need to ask ourselves **„What are the stations where we will serve 90 % of our passengers in 2025?"**

Asset portfolio strategy

- A **breaking down** of the **complex target network** into **smaller functional pieces** that are **easier to control**.
- We **derive asset objectives from** the **network objectives** such that a progressively **movement towards our asset objectives** corresponds to a **gradual achievement of the target network**

Strategies within the UIC AM Framework…



Mapping the objectives

network objectives

asset objectives stations

asset objectives switches

asset objectives bridges

asset objectives tunnels

asset portfolio strategy

network strategy

route objectives route R_1

⋮

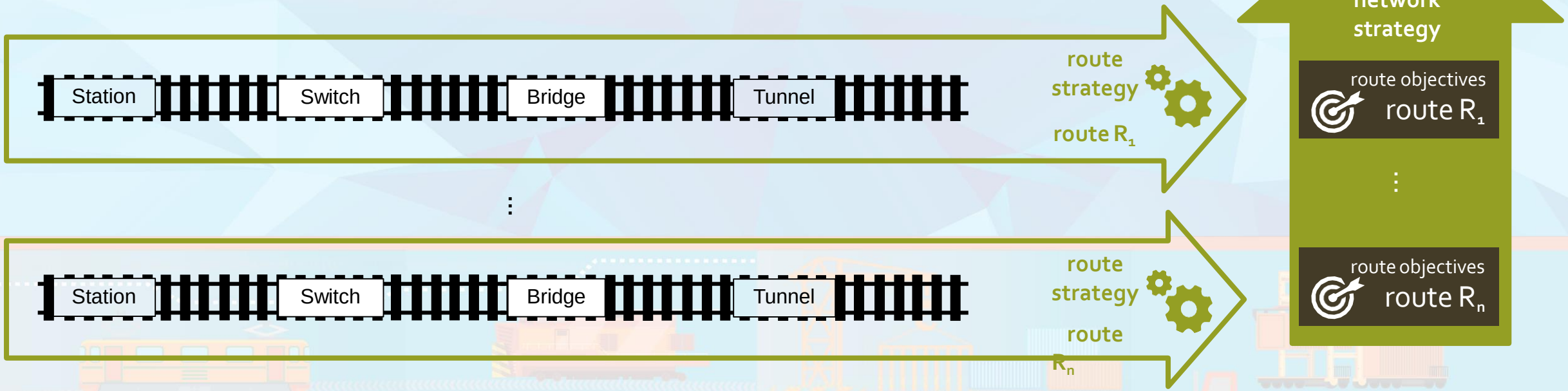
route objectives route R_n

…derive **measures** from **route-objectives.**

network objectives

route strategy

- We derive **measures** from the **route objectives** such that a **stepwise implementation of those measures** corresponds to a **gradual achievement of the route objectives**



…derive **measures** from **asset-objectives.**

network objectives

asset objectives stations

asset objectives switches

asset objectives bridges

asset objectives tunnels

asset portfolio strategy

asset strategy station

asset strategy switch

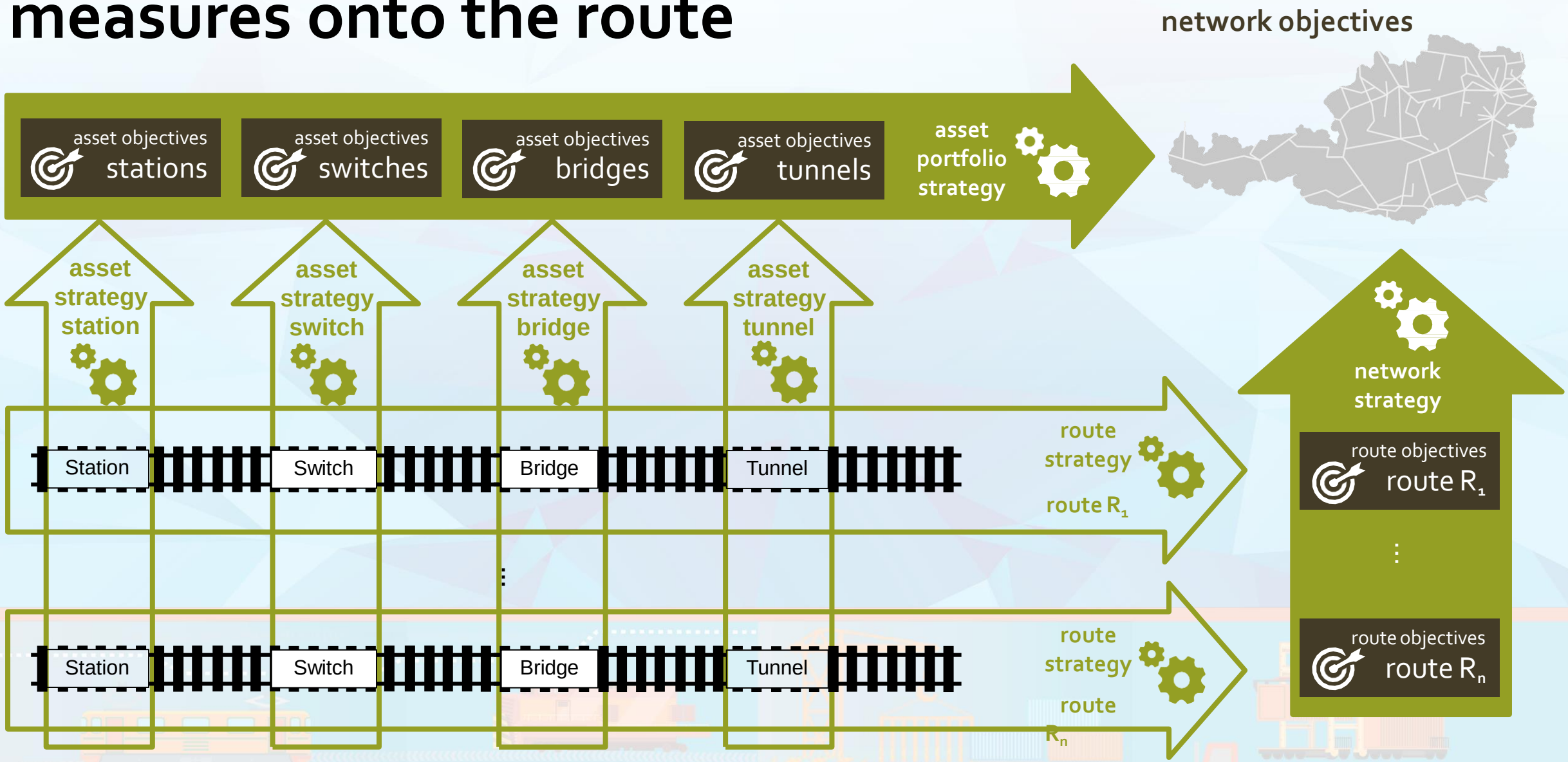
asset strategy bridge

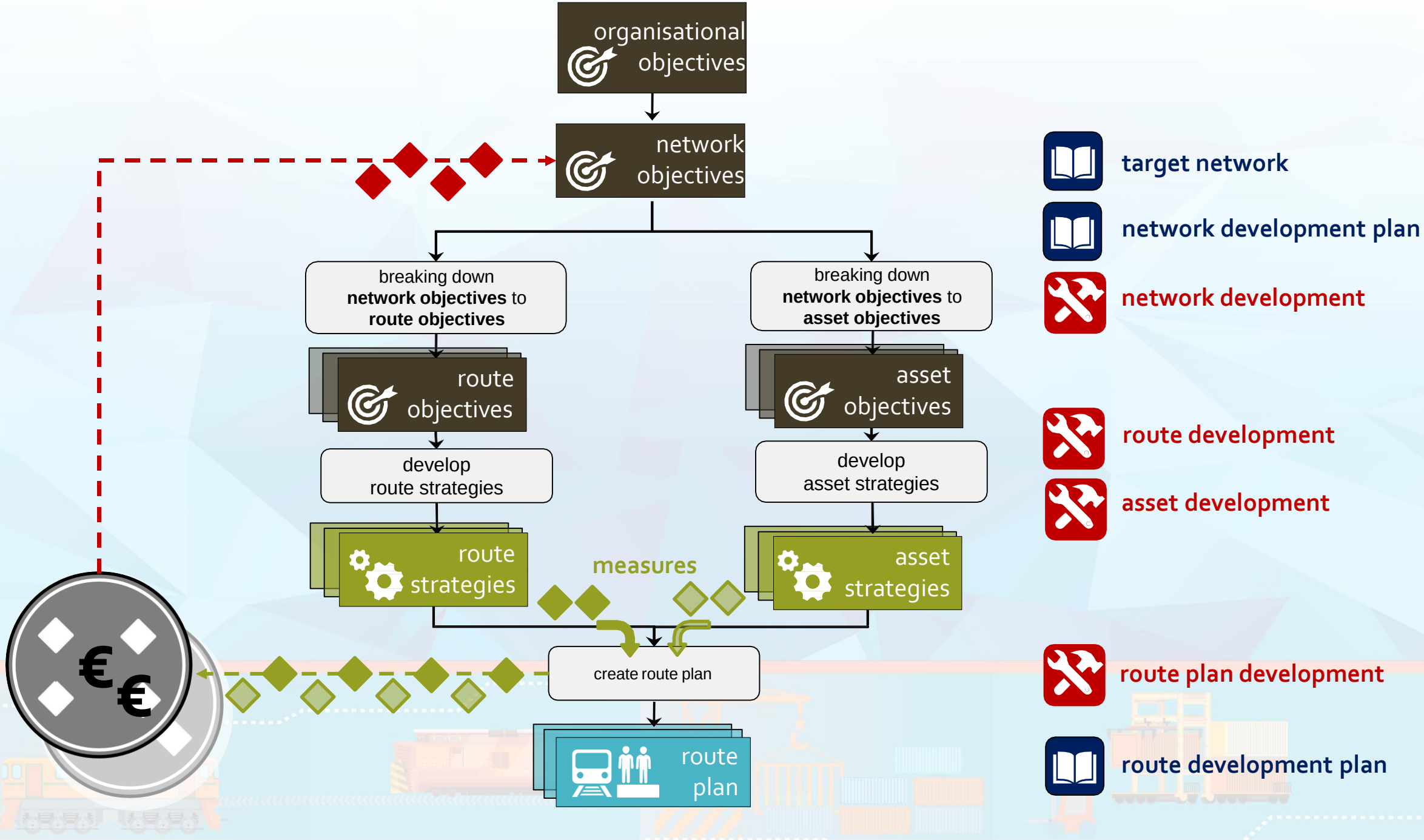
asset strategy tunnel

asset strategy

- We derive **measures** from the **asset objectives** such that a **stepwise implementation of those measures** corresponds to a **gradual achievement of the asset objectives**

Map **asset measures** and **route measures onto the route**




organisational objectives
network objectives
breaking down **network objectives** to **route objectives**
breaking down **network objectives** to **asset objectives**
route objectives
asset objectives
develop route strategies
develop asset strategies
route strategies
asset strategies
measures
create route plan
route plan
target network
network development plan
network development
route development
asset development
route plan development
route development plan

INVESTMENT DECISION MAKING

Decision Making
Life Cycle Cost Tool in ADIF

Track Maintenance or Track Renewal/Replacement?

Background: ISO55001 Principles

Asset Management is about achieving an appropriate balance of asset cost, risk and performance to meet organisational objectives and deliver value from the assets to an organisation and to its stakeholders.

Risk management should provide an effective mechanism for identifying threats to Asset Management objectives, for assessing their impact and for identifying appropriate mitigation measures

Decision Making Criteria is a recurring theme in ISO 55001. It should consider the business context, stakeholder requirements and the organizational and Asset Management objectives to assure decisions on Asset Management plans and asset interventions.

Spanish Railway Network

- High Speed Network (In blue, 1435 mm gauge)
  - ≈3200 km (in double track)
- Conventional Network (in red, 1668 mm gauge)
  - ≈15000 km (track, not line)
- Narrow Gauge Network (in green, 1000 mm gauge)
  - ≈1300 km (track, not line)

Where to invest while focusing on Asset Renewal Policy?

Developing Basic Life Cycle Cost Tool

Economic Efficiency in Assets Management during the whole Life Cycle Cost

- ADIF has characterized the whole network with KPIs measuring the proper time to stop maintenance activities and therefore to start renewal activities

Relationship between Service Level and Economic Efficiency

- The investment priority results are from a combination of Service Level (SL) willing to render an economic efficiency during the whole Life Cycle Cost

Global View of Network Status

- ADIF has all the KPIs aggregated so that they can predict future scenarios of Net state based on different hypothesis of investments during these years

Developing Basic Life Cycle Cost Tool

Homogenization Criteria for selecting Renewal activities

- ADIF has homogenous criteria applied to any part of the network, wherever area related to the decision. Until nowadays, this issue was not possible

Renewal and Maintenance Policy & Common Strategy Setting

- It allows Direction to fix them up and to maintain them as fixed information in the definition of Renewal Plans, so that ADIF can make sure that every Renewal fulfills the fixed requirements for the Direction Team

Which ones are Network critical assets? **Track**

Developing the new Asset Management Tool for the Conventional Line (1,668 mm):

- Higher needs of renewal than High Speed Lines
- High Speed Net, young enough to have renewal needs
- Greater complexity due to Network heterogeneity
  - Physical: due to different Network elements
  - Asset degradation status

Route Section of 200 meters

Track km. in Conventional Network

How to prioritize the Maintenance in Track?

Prioritization in maintenance activities face how to eliminate detected failures previously found in Track Condition Analysis:

- ADIF uses a key Indicator denominated **Risk Level (RL)**, to quantify:
  - The Risk of reducing Service Level (implementing Temporary Speed Restrictions) when detected failures have been not eliminated.
  - The greater or lesser impact of reducing such a service level by section

The KPI Risk Level (RL) is calculated , for every basic section of 200 m. as follows:

RL (Risk Level) **= PR** (Potential Risk) **x Uf** (Use Factor)

The greater the Risk Level value is the higher priority in maintenance activities (defined on every basic section)

How to prioritize the Investment in Track?

- The **Residual Useful Life (RUL)** measures:
  - The level of Track maintainability (Related to the efficiency in maintenance operations)
  - The likelihood to implement a Temporary Speed Restriction (TSR) if we do not work in a given section

- The Replacement Policy is determined by the setting of thresholds in the following KPI: RL & RUL (values can be modified by the user)

- The set-up of a Replacement Policy is equal to the setting of the following target, every basic section of 200 meters should have:
  - A Risk Level (RL) **LOWER** than the RL threshold
  - A Remaining Useful Life (RUL) **BIGGER** than the RUL threshold

Track Maintenance or Replacement?

		Risk Level (RU)	
		HIGH > 5	**LOW < 5**
Residual Useful Life (RUL)	**HIGH > 3**	Short-term Maintenance activities: Level 1-2-3	Short-term Maintenance activities: Level 1 Medium-term Maintenance activities: Level 2-3
	LOW < 3	Short-term Renewal	Short-term Maintenance activities: Level 1 Medium-term Maintenance activities: Level 2-3 Long-term Renewal

Decision Making Matrix

Decision making for maintenance activities & renewal policy is determined by Risk Level (RL), and Residual Useful Life (RUL), that is calculated for every basic section

Short- term: <1 year

Medium-term:>1 year <3 year

Long-term: >3 year

KPIs Computer Applications Display

PLAN de ACTUACIONES de REPOSICIÓN			
Tipo de Actuación	Coste (€)	Kms. Tratados	% Tray. Analizados
REN. INTEGRAL	503.600.000,00	503,6	3,31
REN. Parcial	986.400.000,00	874,8	5,75
Rehabilitación	1.749.600.000,00	1166,4	7,66

MANT. MIN. ANUAL HASTA REPOSICIÓN (1ª AÑO) - COSTE TOTAL (€)			
Tipo de Actuación	Coste (€)	Kms. Tratados	% Tray. Analizados
TRAT. INTEGRAL			
TRAT. Parcial			
Trat. Puntual	332.760.729,23	2306,8	0,15

PLAN de ACTUACIONES de MANTENIMIENTO			
Tipo de Actuación	Coste (€)	Kms. Tratados	% Tray. Analizados
TRAT. INTEGRAL	8.546.328,03	79,4	0,52
TRAT. Parcial	41.745.150,29	854,6	5,61
Trat. Puntual	42.701.184,04	667,0	4,38

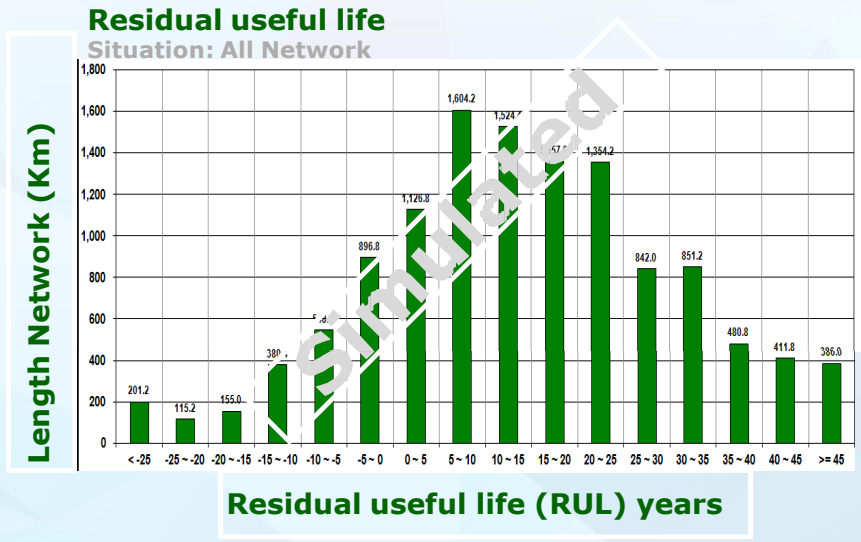
REPOSICIÓN	MANT. MIN.	MANTENIMIENTO	TOTAL
POLÍTICA y ESTRATEGIA ESTABLECIDAS			
3.239.600.000,00	332.760.729,23	92.992.662,36	3.665.353.391,59
DIFERENCIA ENTRE POLITICA y ESTRATEGIAS y EL PLAN de ACTUACIONES			
0,00	0,00	0,00	0,00

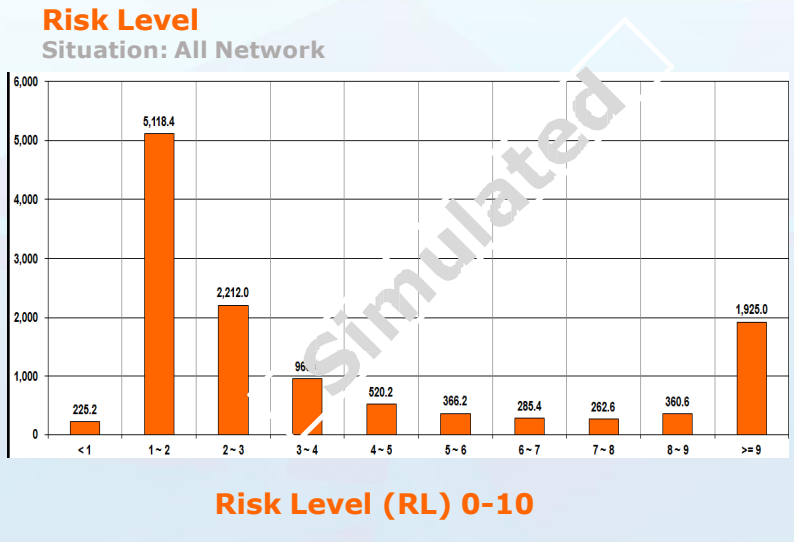
Mostrar Datos Tramificación | Mostrar Códigos de Estación | Mostrar Longitud | Mostrar Clasificación de Líneas | Mostrar Ámbito Territorial Adif | Mostrar Ámbito Territorial Estatal | Mostrar Datos Auscultación

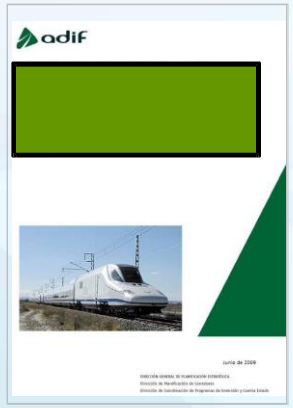
Ubicar por: Línea

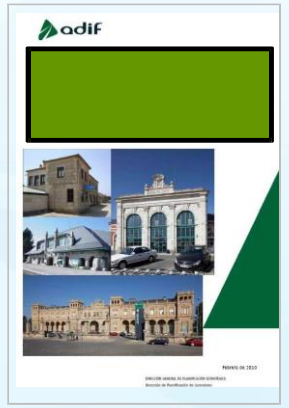
										TRAMOS UNITARIOS A REPONER										TRAMOS UNITARIOS A MANTE			
										PLAN de ACTUACIONES de REPOSICIÓN					MANTENIMIENTO MÍNIMO HASTA LA REPOSICIÓN					PLAN de ACTUACIONES de MANTE			
LÍNEA	VIA	EST INICIAL	EST FINAL	PKI	PKF	ANÁLISIS TR	IND PRIOR.	NR MED	VUR MED	ASIGNACIÓN	ESTRATEGIA	KMS. TRATAI	% DEL TRAYI	COSTE REPO	ESTRATEGIA	KMS. TRATAI	% DEL TRAYI	COSTE MANT	ASIGNACIÓN	ESTRATEGIA	KMS. TRATAI	% DI
MADRID CHAMARTIN - HENDAYA	1	MADRID-CHAMARTIN	PITIS	0,0	6,2		11,20	8,290	8,190	POLÍTICA	Rehabilitación (P)	1,6	25,81	2.400.000,0	Trat. Puntual	1,6	25,81	395.258,0	POLÍTICA	TRAT. Parcial (P)	3,0	
MADRID CHAMARTIN - HENDAYA	1	PITIS	EL TEJAR (APD)	6,2	18,2		3,81	3,690	5,040	POLÍTICA	Rehabilitación (P)	0,6	5,00	900.000,0	Trat. Puntual	0,6	5,00	37.575,9	POLÍTICA	Sin Actuación (P)	0,0	
MADRID CHAMARTIN - HENDAYA	1	EL TEJAR (APD)	BIF. P. PIO	18,2	19,2		21,41	14,160	-7,210	POLÍTICA	REN. Integral (P)	1,0	100,00	1.000.000,0	Trat. Puntual	0,8	80,00	79.536,4	POLÍTICA	Sin Actuación (P)	0,0	
MADRID CHAMARTIN - HENDAYA	1	BIF. P. PIO	PINAR DE LAS ROZAS	19,2	21,1		12,94	9,490	9,430	POLÍTICA	Rehabilitación (P)	1,2	66,67	1.800.000,0	Trat. Puntual	1,2	66,67	388.465,3	POLÍTICA	TRAT. Parcial (P)	0,6	
MADRID CHAMARTIN - HENDAYA	1	PINAR DE LAS ROZAS	LAS MATAS	20,4	24,0		3,67	3,670	21,020	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Sin Actuación	0,0	
MADRID CHAMARTIN - HENDAYA	1	LAS MATAS	TORRELODONES	24,0	30,2		4,05	3,850	15,540	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Trat. Puntual (P)	2,2	
MADRID CHAMARTIN - HENDAYA	1	TORRELODONES	VILLALBA DE GUADARRAMA	30,2	37,9		7,94	6,090	15,340	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Trat. Puntual (P)	3,6	
MADRID CHAMARTIN - HENDAYA	1	VILLALBA DE GUADARRAMA	EL ESCORIAL	37,9	50,3		1,81	2,070	22,560	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Trat. Puntual (P)	0,6	
MADRID CHAMARTIN - HENDAYA	1	EL ESCORIAL	ZARZALEJO	50,3	56,6		1,58	1,800	33,350	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Trat. Puntual (P)	1,2	
MADRID CHAMARTIN - HENDAYA	1	ZARZALEJO	ROBLEDO DE CHAVELA	56,6	64,8		1,43	1,710	35,010	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Trat. Puntual (P)	1,0	
MADRID CHAMARTIN - HENDAYA	1	ROBLEDO DE CHAVELA	SANTA MARIA DE LA ALAMED	64,8	71,8		1,07	1,440	32,800	POLÍTICA	Sin Actuación (P)	0,0	0,00	0,0	Sin Actuación	0,0	0,00	0,0	POLÍTICA	Sin Actuación (P)	0,0	
MADRID CHAMARTIN - HENDAYA	1	SANTA MARIA DE LA ALAMED	LAS NAVAS DEL MARQUES	71,8	83,7		4,77	4,340	11,320	POLÍTICA	Rehabilitación (P)	3,4	28,81	5.100.000,0	Trat. Puntual	3,4	28,81	198.675,7	POLÍTICA	Trat. Puntual (P)	0,8	
MADRID CHAMARTIN - HENDAYA	1	LAS NAVAS DEL MARQUES	NAVALPERAL	83,7	88,5		5,37	4,750	12,310	POLÍTICA	Rehabilitación (P)	1,8	37,50	2.700.000,0	Trat. Puntual	1,8	37,50	125.420,6	POLÍTICA	Sin Actuación (P)	0,0	

Result: Prioritized Renewal Plans









CONVENTIONAL LINE TRACK RENEWAL PLAN

ACTIVITIES CHECKLIST

Conclusion

Adopting an asset management system in the railway means improving the maintenance and replacement decision making of the assets in order to achieve:

- **Transparency**
- **Operational, Economic and Social Efficiency**
- **Homogeneity**

THANK YOU
FOR YOUR ATTENTION!