

Sustainable design solutions in Rail Baltica Riga Central Station project considering the various challenges and requirements



Summary

- Project overview and challenges
- Sustainability – concept
- Project elements
 - Bridge
 - Station building
 - Landscape design

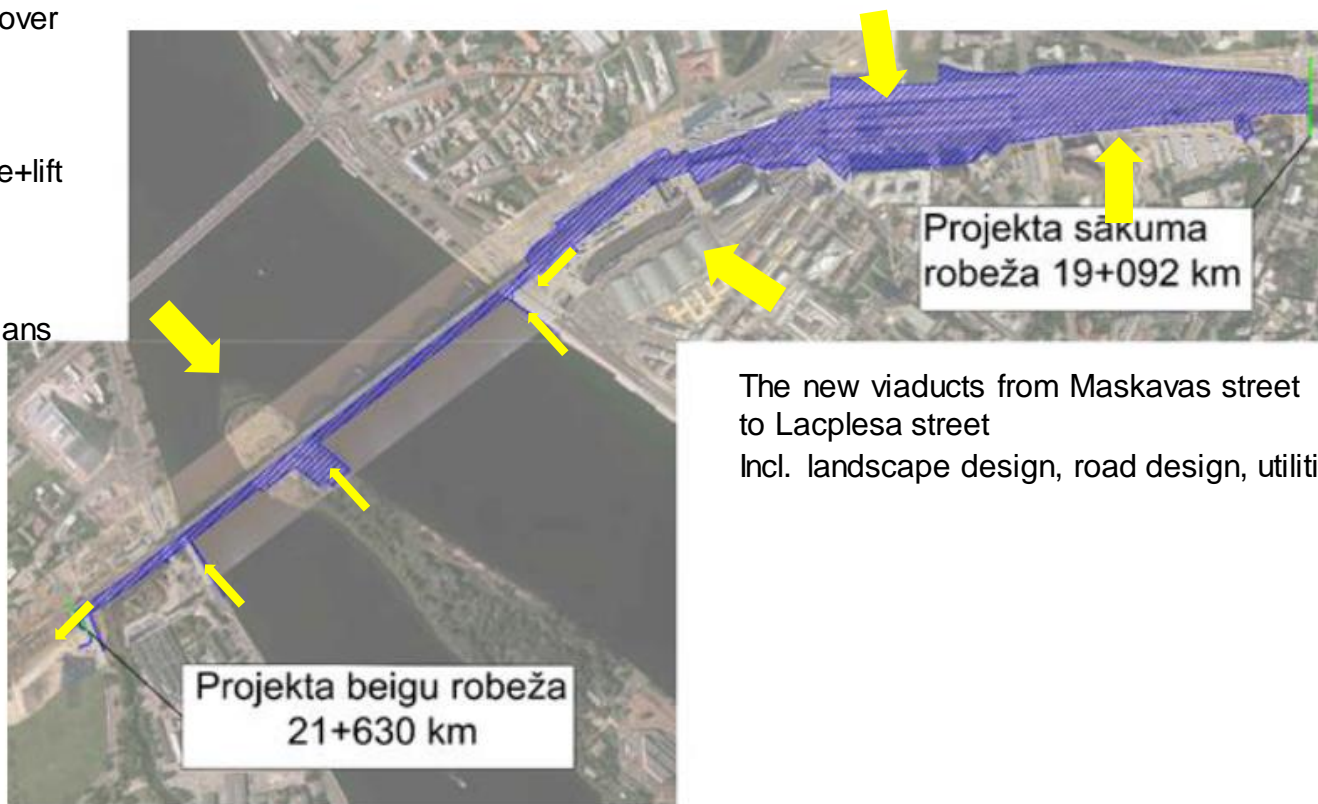
Project overview and challenges

Project overview

The new bridge over
Daugava river

with 5 access
ramps / staircase+lift
and lane for
emergency
evacuation and
cyclists+pedestrians

The new station building (connected to existing station building)
Concourse level – main arched volume
Platform level – platforms and tracks
Ground level – retail area/circulation/regional bus station



The new viaducts from Maskavas street
to Lacplesa street
Incl. landscape design, road design, utilities design, ...

Project process

DESIGN & BUILD

PROJECT
DEVELOPMENT



CONCEPT
DESIGN

PLH

MASTER DESIGN
DETAILED TECHNICAL DESIGN
BUILDING PERMIT APPLICATIONS



+ many other sub consultants

CONSTRUCTION



+ sub contractors

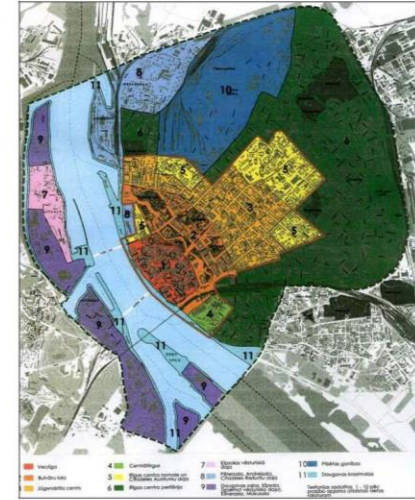


Challenges

- Project location – historical center of Riga (UNESCO Heritage)
- Project size – 2.6 km in length
- Construction conditions – operational station / operational traffic lanes
- Budget restrictions – Financing in stages by INEA (European Union)
- Contractual requirements

+ Stakeholder requirements

- Latvian Railways
- Riga Municipal Construction Board
- Riga Municipal Traffic Department
- Latvian State Roads
- State Cultural Heritage Office
- State Environment Office
- Riga Bus Terminal
- Riga Udens
- Riga Gaisma
- Riga Siltums
- ...



The map of Riga – the scheme shows how according to the demands of cultural heritage preservation, the territory of the Historic Centre of Riga and its buffer zone is differentiated

Sustainability – concept

Sustainability focuses on meeting the needs of the present without compromising the ability of future generations to meet their needs.

The concept of sustainability is composed of three pillars: social, economic and environmental



Rail Baltica project/PLH concept design/EDZL, BERERIX and Designers involvement – joint effort in concept development

Generator for future development

Creating meeting spaces

Connecting places and people

Accessibility for all

Connecting the city

Safety for all

Creating visual identity

Riga - business center & touristic destination

Connecting Regional with Local

Creating employment opportunities

Know-how and technology transfer

Design and build

Constructing in phases

Energy saving, optimising operational processes etc.



Promoting green public transport use

Enhance connectivity for passengers and freight

Multimodal hub: train + bus + cycling + walking

Connecting east-west cycling/pedestrians

Adding 'green value' to the City

Integration of environmental friendly measures

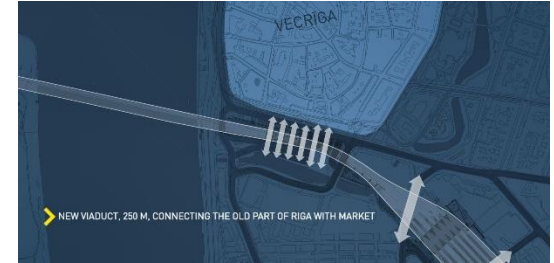
Total concept – People and place

Generator for future development of the urban center – *uplifting of station neighbourhood*

Connecting places and people – *easy access to transport, connection of city areas from North–South and East–West; connecting of inhabitants to other parts of the country / other countries*

Connecting the city North–South – *opening up the existing railway embankments to create physical and visual connections of the historical center with the Central Market area; connecting Elisabethes street with Timoteja street for traffic*

Creating visual identity in the Cityscape – *architectural concept development for the entire length of the project; with similar materials, finishes and details*



Total concept – People and place

Creating meeting spaces and places of reflexion inside the station building and outside – *large waiting areas inside and recreational areas in the landscaping*

Focus on accessibility for all – *according to international standard TSI PRM; outside landscaped areas also foreseen with tactile pavements, warning signalisation, mild inclinations of ramps etc*

Ensuring and creating safe spaces for all – *studies and integration of mitigation in terms of human safety (blast resistance structural impacts, fire safety strategy, emergency evacuation scenarios, ...)*

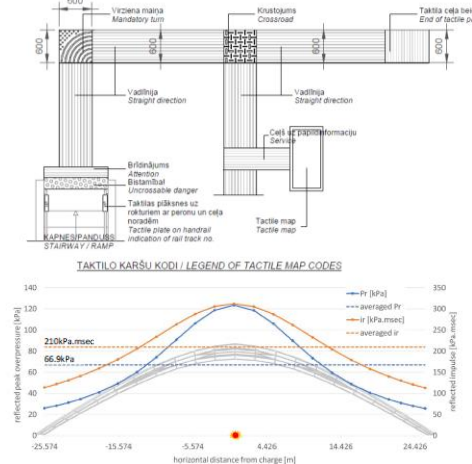


Figure 112 Reflected peak overpressure and reflected impulse along the arch (distribution and average values) for 11kg TNT.

Total concept – Environment

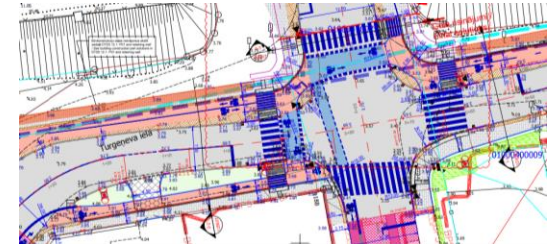
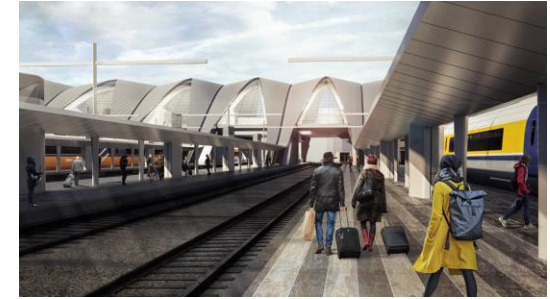


Promoting green public transport use – *collective transport reduces CO₂ production; stimulating renewal of local moving stock*

Enhance connectivity for passengers and freight – *easy and fast access to public transport/pedestrian and cycling lanes; more opportunities for freight/goods transport by rail*

Multimodal hub: stimulating train + bus + cycling + walking – *by developing co-function of public traffic and attention to soft road users*

Adding 'green value' to the City – *creating new public green urban spaces; (re)planting with indigenous trees and plants*

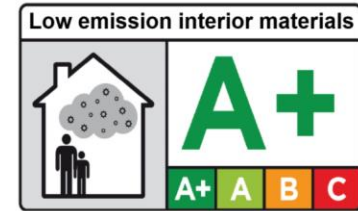


Total concept – Environment

Integration of environmental friendly measures in design and construction

For example:

- *use of low-emitting materials*
- *acoustical studies all along the project to locate and to mitigate noise pollution*
- *during construction and stimulated during use: waste separation and recycling*
- *re-using of materials and construction tools (where possible)*



Total concept – Economy



Promoting Riga as a business center – *international attention was gained with including Riga/Latvia as one of the connection points in the Rail Baltica project making Riga more attractive for investments*

Promoting Riga as a touristic destination – *international travel is possible by rail to the rest of Europe*

Connecting Regional with Local – *also within Latvia new regional stations will be build/upgraded*

Creating employment opportunities – *+36 000 new jobs created in the Baltic region*

Know-how and technology transfer – *bringing local and international experts together*



Total concept – Economy

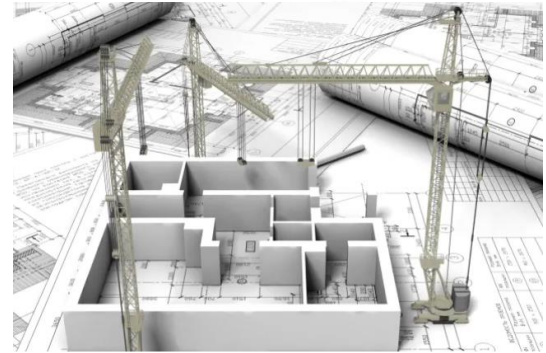


Design and built set-up of the project – *combining the efforts design wise already with construction, also including provisions for adjacent and future projects, is reducing the construction works and timing and therefor also the overall environmental impact of the construction.*

Constructing in phases so that the station/tracks can kept being operational at all times – *no interruption of business*

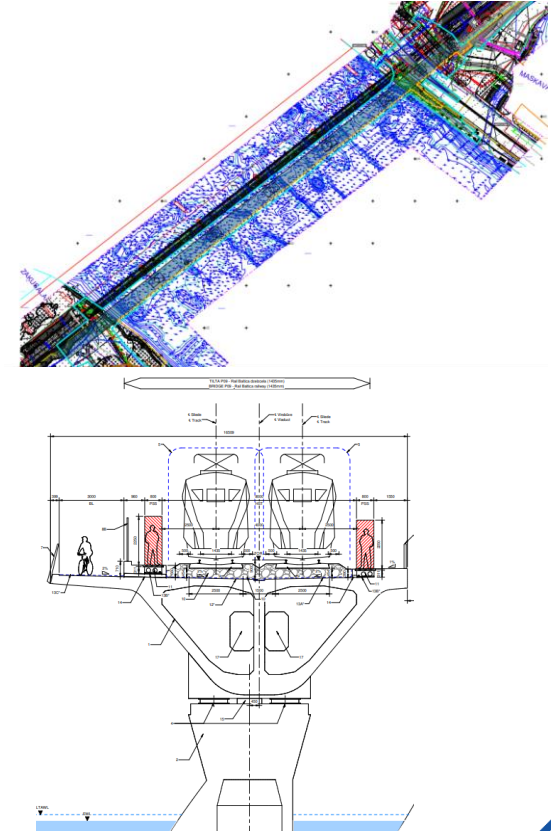
Finding practical approaches to energy saving, optimising operational processes:

- *Energy consumption monitoring*
- *Introduction of energy saving fixtures (LED)*
- *Coordination and integration of future City developments*
- *BIM modelling: preparing the design in detail in a virtual reality environment helps to mitigate issues and clashes before construction, adding to the reduction of construction time*



Project elements

Bridge design – sustainable aspects



Bridge design – sustainable aspects

Challenges:

Respecting the UNESCO Heritage and surroundings

Respecting existing bridge and historical value

Integration in landscape

Mobility and functionality

Implementing all requirements and constraints
(navigation clearance, structural design and capacity, ...)



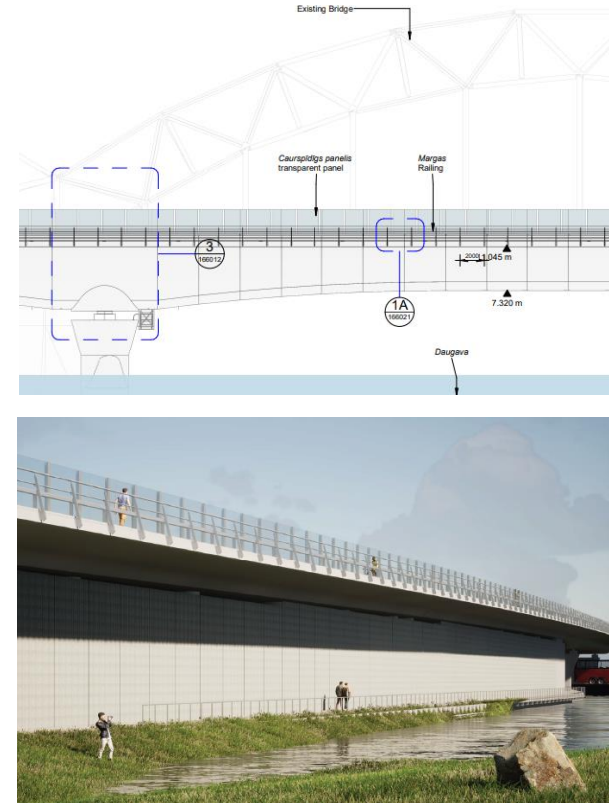
Bridge design – sustainable aspects

Alignment of supports – minimalisation of bridge heights as far as structurally possible – floating / light impression

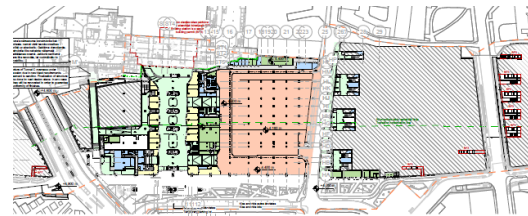
Developed with 50-100 year life time with durable solutions

Carefull studies of concrete mix: ongoing studies of concrete mix (complies with all technical and architectural requirements, using local components, reducing the cement content, or by using environmentally friendly cement)

Bridge used not only for train, but also as connection for pedestrians and cyclists



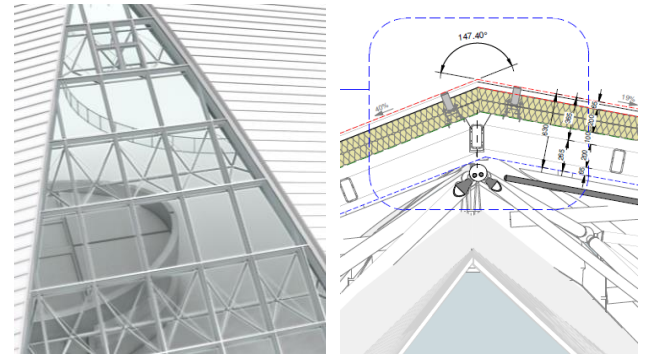
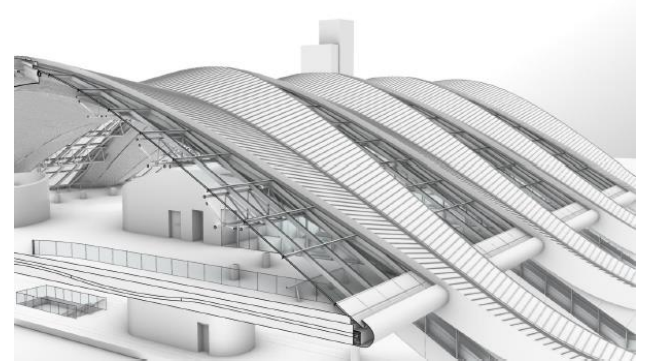
Station design – sustainable aspects



Station design – sustainable aspects

Detailed study of thermal boundary – design of the envelope/façade is developed with great care:

- effective isolation
- large window surfaces (with high thermal qualities: triple glazing, low solar factor and frit) to introduce large quantity of natural daylight
- energy efficiency assessment study calculation of end consumption
 $\text{LBN002-19 } 55.6\text{kWh/m}^2 < 110 \text{ kWh/m}^2$
- roof structure/finishes are made of recyclable and easily disassembled/demountable materials
- airlocks are used for every entrance/exit to reduce heating/cooling losses



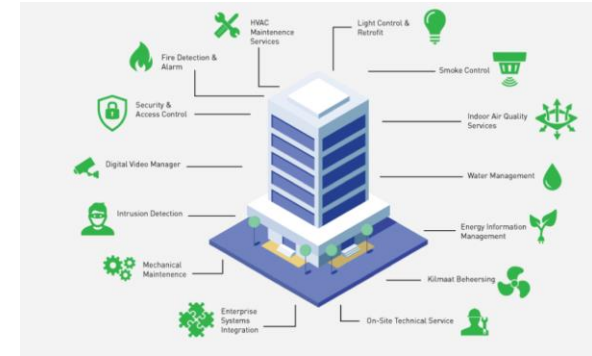
Station design – sustainable aspects

Energy consumption:

- constant monitoring (BMS system) to automatically adjust the consumptions/settings
- platform lights equipped with daylight sensors
- introduction of energy saving fixtures, like LED lights, also for street lights
- air handling units equipped with heat recovery
- connected to City heating (hot water supply) for radiators etc

Material choices:

- low emitting / local / non-hazardous materials are preferred
- existing hazardous materials (like asbestos) will be removed and handled by specialists as per prescriptions during construction



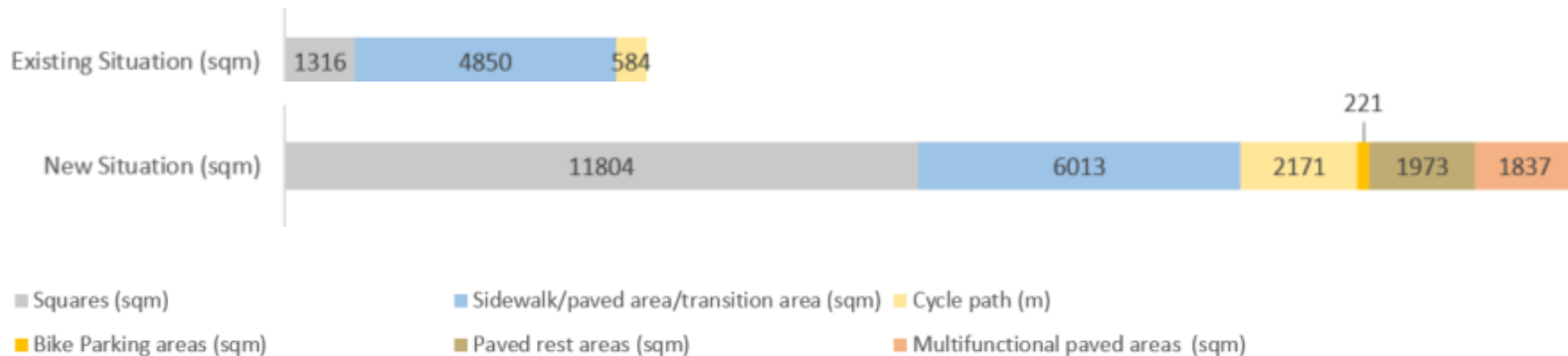
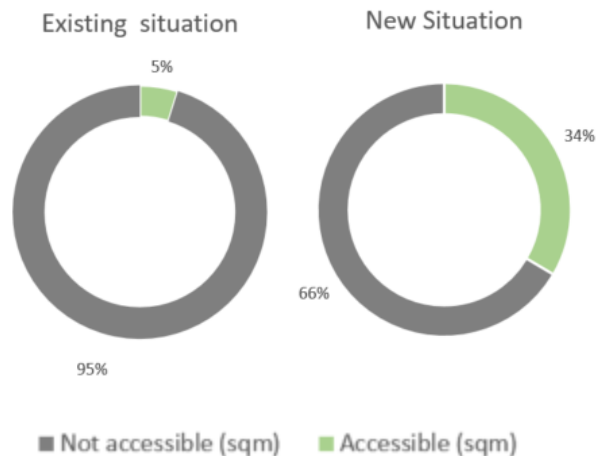
Landscape design – sustainable aspects



Landscape design – sustainable aspects

Greening the city:

- creating a better micro climate / thermal comfort
- improving the air quality
- increasing biodiversity



Landscape design – sustainable aspects

Areas of green is increased – 3 major recreation areas for the city are introduced in the design



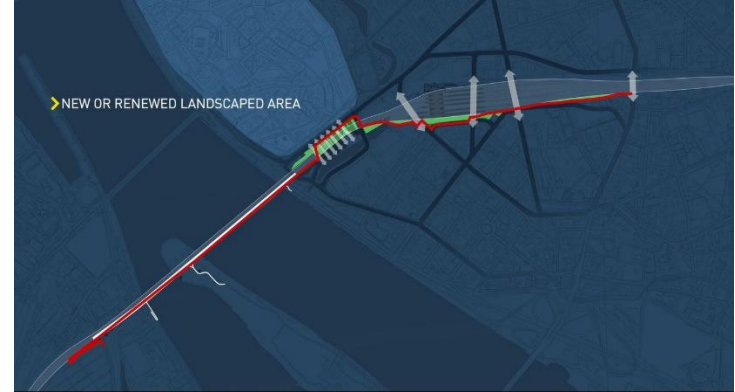
Landscape design – sustainable aspects

Bicycle and pedestrian lanes all along the project
+ bicycle racks and parkings

Recreating and resting areas will be foreseen

Waste will be recycled; separating waste bins will be placed to encourage the population to separate the waste, to ease the recycling process

Special attention to storm water management



Thank you for your attention