

# Data in Rail Baltica Global Project implementation

Construction Digitalisation Conference 2021

Raitis Bušmanis  
Head of Virtual Design and Construction



Co-financed by the Connecting Europe  
Facility of the European Union

# About me



Raitis Bušmanis

Head of Virtual Design and Construction

- In RB Rail since January 2018
- Before that Trimble Solutions Oy
- In 'BIM field' since 2012



Tootsi  
Station

Kilksama  
Regional Stop

Rapla



# Current progress in Latvia

## Main line design

- All sections under design, strong progress on South and North sections

## Local facility design procurements

- For freight multimodal transport hub in Salaspils – ongoing
- For infrastructure maintenance facilities – approaching decision
- For regional stations - launched in Oct

## Local facility construction works

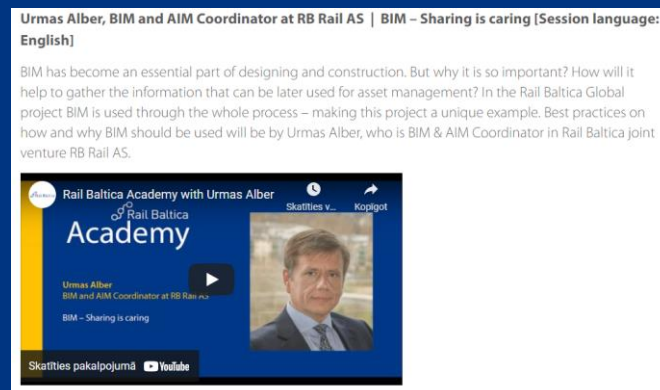
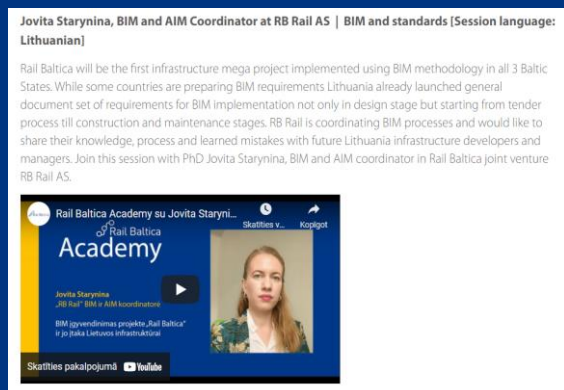
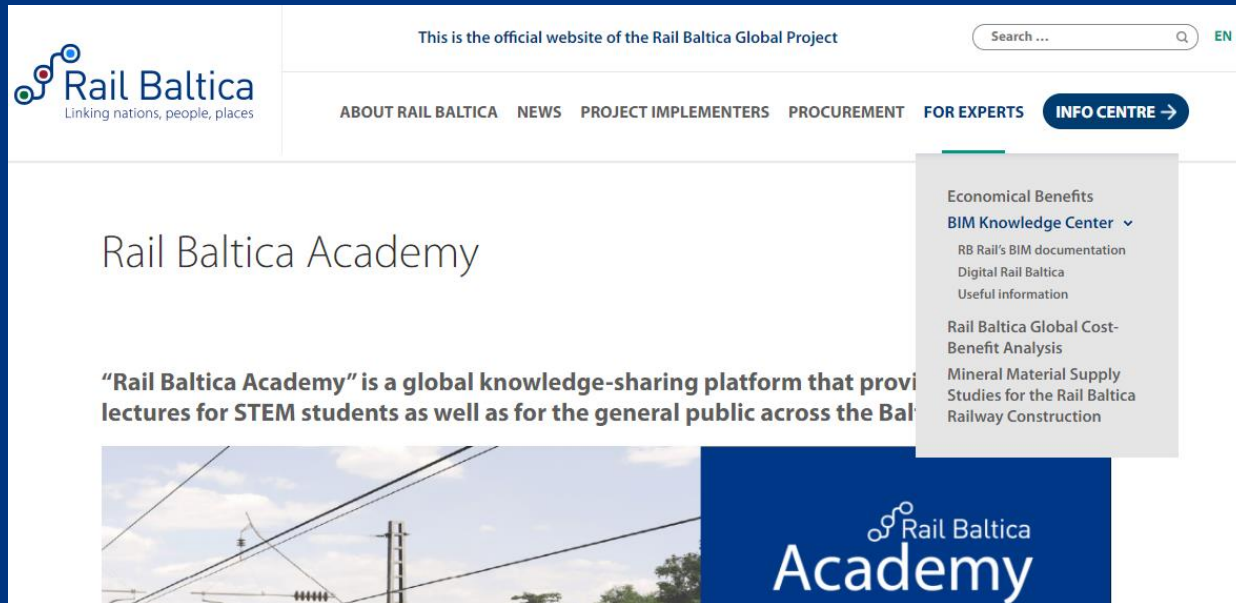
- Riga central station section & Riga Airport station section construction works progressing
- Preparation for main line construction procurement ongoing

## Land acquisition

- On sections ready for construction – completed, on main line – commenced

## Strategic decisions

- Government support gained for a dedicated Rail Baltica law addressing acceleration needs



- Rail Baltica Academy – public knowledge sharing platform for STEM students and general public
- 7 public lectures on environmental sustainability, railway and airport interoperability, BIM and standards, infrastructure objects in Rail Baltica and other topics available online at: [www.railbaltica.org/rail-baltica-academy](http://www.railbaltica.org/rail-baltica-academy)
- Over 20 different lectures as a part of Rail Baltica Academy's Autumn session, starting in November 2021



# Data behind BIM

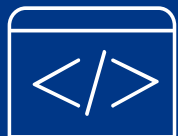
# Some general numbers



BIM models (\*.IFC) – 6 367



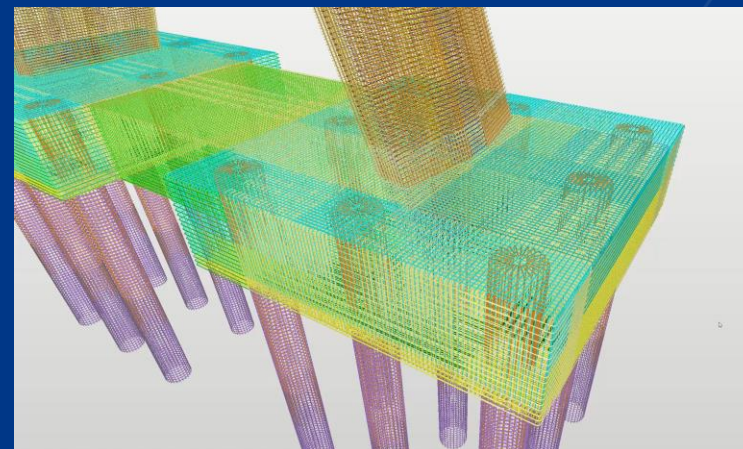
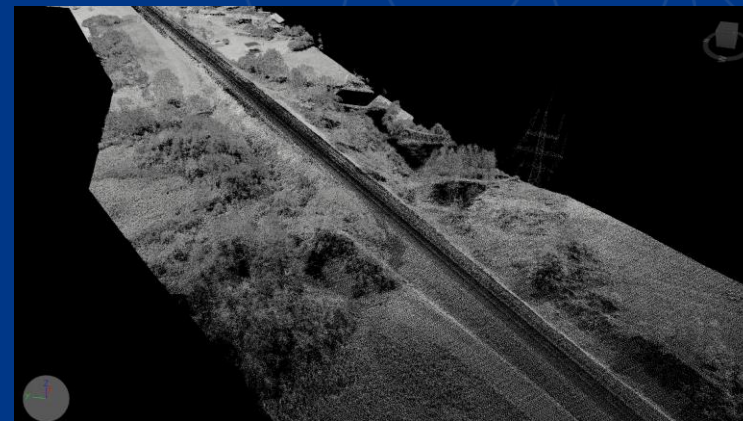
Drawings (\*.dwg/\*.dgn) – 82 999



Documents – 315031

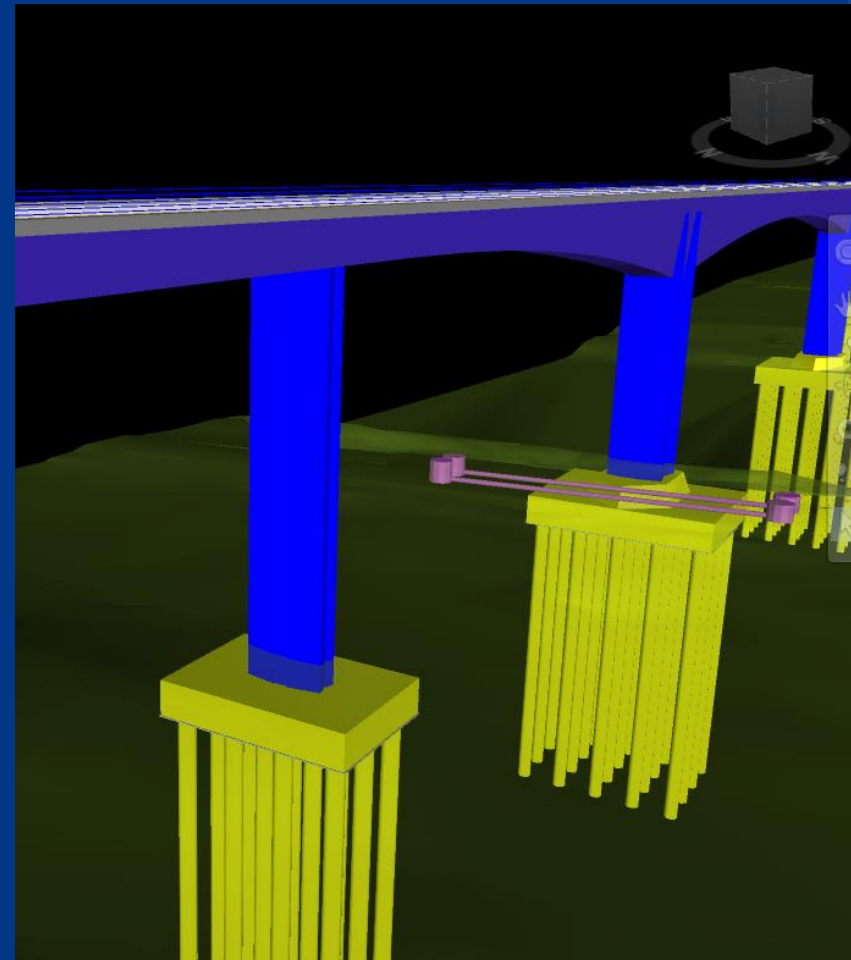
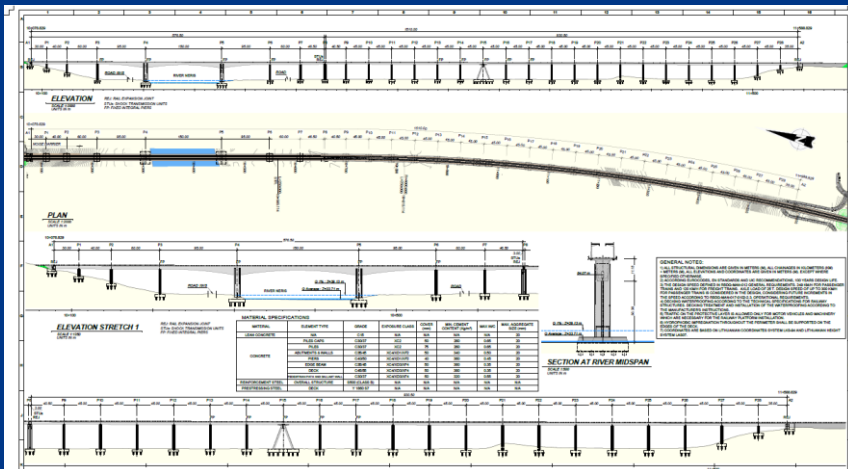


Data – 7644 GB



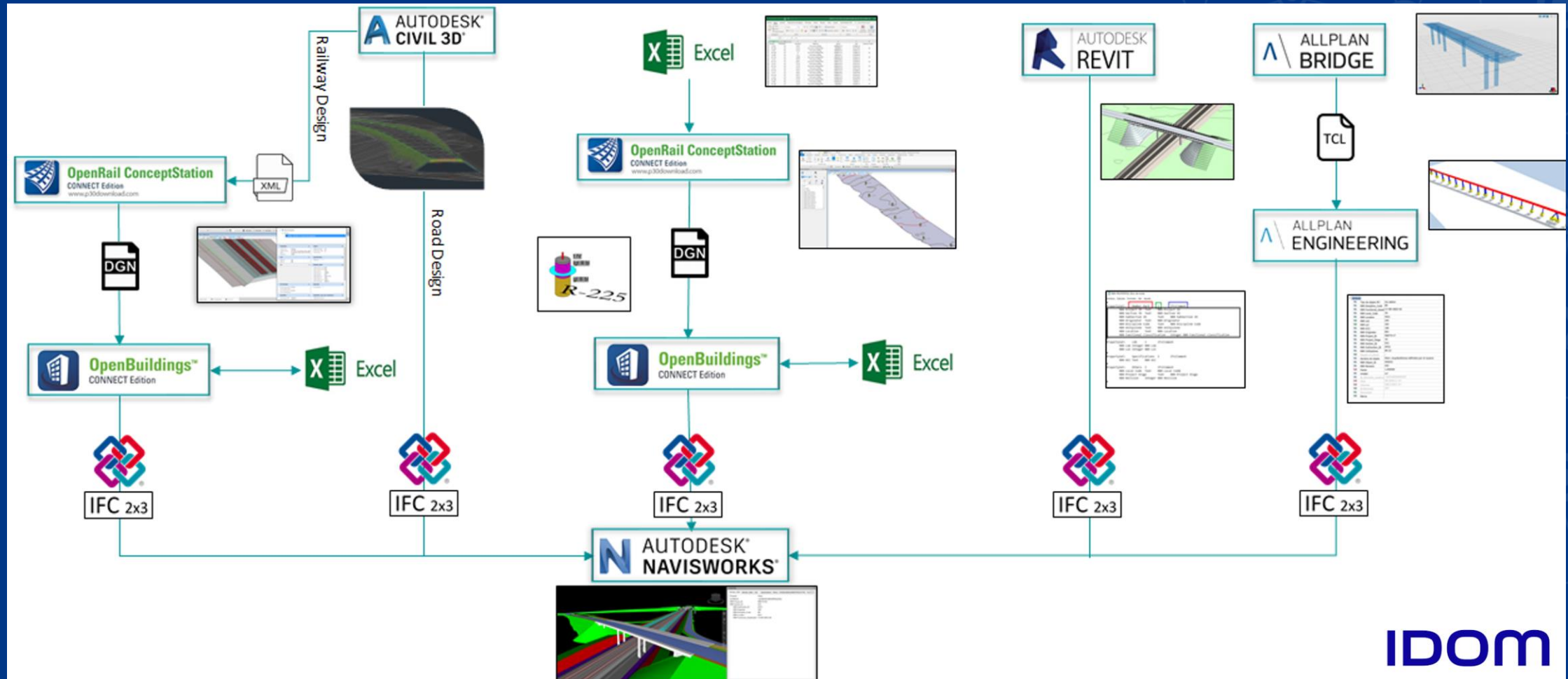
And counting...

# BIM process – models and drawings



Properties				
Item	AllplanAttributes	RBR-DATA	Material	TimeLiner
Property				Value
GLOBALID				1xQhCN\$FDEDP5FZSd2_nY3
RBR-OCC				300
RBR-Object_ID				STR-DCK-001
RBR-Material_Designation				C45/55
RBR-Material_Description				Post-tensioned Concrete
RBR-Product_Name				Varies
RBR-Product_Description				Varies
RBR-Pr_Code				Varies
RBR-Type_number				Varies
RBR-Units				Varies
RBR-Exposure				XC4/XD3/XF4
RBR-Concrete_Volume				9474.36 m³
RBR-Steel_Mass				2694373.80 kg
RBR-Steel_Mass-Prestressing				604871.80 kg
RBR-Reinforcement_Ratio				285.0 kg/m³
RBR-Reinforcement_Ratio-Prestressing				65.00 kg/m³
RBR-Project_ID				RBDT-LT
RBR-Section_ID				DS1
RBR-SubSection_ID				DPS2
RBR-Originator				IDO
RBR-VolSysZone				BR6180ZZ
RBR-Location				0011
RBR-Discipline_Code				BR
RBR-Local_Code				SK
RBR-Project_Stage				MD
RBR-Revision				001
RBR-LoG				300
RBR-Lol				300
RBR-Design Life				100
RBR-Start_Kilometre				10+078.829
RBR-End_Kilometre				11+588.829
RBR-Functional_classification				CV-BR-ABGE-00
RBR-Position				North
RBR-Type				Post-tensioned Slab
RBR-Depth				Variable 4.15 - 11.15 m

# Native BIM model with attribute data -> IFC -> Asset Register



# Native BIM model with attribute data -> IFC -> Asset Register

## BIM attributes

Properties: Building Element Proxy (1 of 172) - filtered	
rbr	Value Type
RBR-Exposure	XC2
RBR-Functional_classification	CV-8R-OPSS-RD
RBR-IsTemplate	<no value>
RBR-Length	<no value>
RBR-Local_Code	TS
RBR-Location	0009
RBR-LoG	300
RBR-Lol	300
RBR-Material_Description	Reinforced Concrete
RBR-Material_Designation	C30/37
RBR-Native_Unique_ID	<no value>
RBR-Number	<no value>
RBR-Object_ID	STR-FND-006
RBR-OCC	307
RBR-Originator	IDO
RBR-Position	A-2
RBR-Pr_Code	N/A
RBR-Product_Description	N/A
RBR-Product_Name	N/A

Item	AlignAttributes	RBR-DATA	Material	TimeLine	IFC
Property		Value			
GLOBALID		1xQhCN8FDEDP5FZ5d2_nY3			
RBR-OCC		300			
RBR-Object_ID		STR-DCK-001			
RBR-Material_Designation		C45/55			
RBR-Material_Description		Posttensioned Concrete			
RBR-Product_Name		Varies			
RBR-Product_Description		Varies			
RBR-Pr_Code		Varies			
RBR-Type_number		Varies			
RBR-Units		Varies			
RBR-Exposure		XC4/ND3/XF4			
RBR-Concrete_Volume		9474.36 m³			
RBR-Steel_Mass		2694373.80 kg			
RBR-Steel_Mass-Prestressing		604371.80 kg			
RBR-Reinforcement_Ratio		285.0 kg/m³			
RBR-Reinforcement_Ratio-Prestressing		65.00 kg/m³			
RBR-Project_ID					
RBR-Section_ID					
RBR-SubSection_ID					
RBR-Originator					
RBR-VolSysZone					
RBR-Location		0011			
RBR-Discipline_Code		BR			
RBR-Local_Code		SK			
RBR-Project_Stage		MD			
RBR-Revision		001			
RBR-LoG		300			
RBR-Lol		300			
RBR-Design_Life		100			
RBR-Start_Kilometre					
RBR-End_Kilometre					
RBR-Functional_classification					
RBR-Position		North			
RBR-Type		Post-tensioned Slab			
RBR-Depth		Variable 4.15 - 11.15 m			



## Asset Register database

TABLE PROPERTIES		SQL
General		
Name:	site	
Comment:	physical larger objects (VolSys) - overpasses, utility objects, roads, culverts.	
Columns		
Name	Type	N PK
objectid	int	o
id	nvarchar(16)	o
Comment: RBR-VolSysZone = MD code = BR1230		
Default value:		
Check expression:		
Collate:		
FILESTREAM: Yes No		
SPARSE: Yes No		
IDENTITY: Yes No		

dps	
objectid	int PK
no	smallint PK
dps_code	nvarchar(11)
ds	nvarchar(3) N
ds_name	nvarchar(32)
ds_name_local	nvarchar(32)
dps_name	nvarchar(4)
dps_name_local	nvarchar(32)
city	nvarchar(2)
stage	nvarchar(32)
tpm	nvarchar(4)
shape	geometry
dps_code_original	nvarchar(20)
tpm	nvarchar(50)
city_ds	nvarchar(10)

site_gx	
objectid	int PK
site_objectid	int PK
shape	geometry
stage	smallint
version	int
is_public	int
status	int
source	nvarchar(4) N
created	datetime
updated	datetime
site_id	nvarchar(16)
site_func_class	nvarchar(32)
site_name	nvarchar(4)
site_name_local	nvarchar(4)
site_type	nvarchar(32)

site	
objectid	int PK
site_objectid	nvarchar(16) PK
name	nvarchar(54) N
name_local	nvarchar(54) N
func_class	nvarchar(32) N
type	nvarchar(32)
tp	nvarchar(4)
cd	nvarchar(4)
slnear	smallint

site_dates	
site_objectid	int PK FK
stage	smallint PK
planned	date
actual	date
approval	date

site_bridge	
objectid	int PK
site_objectid	int N FK
whatever_is_needed_for_bridge	ntext N

asset	
objectid	int PK
id	nvarchar(32) N

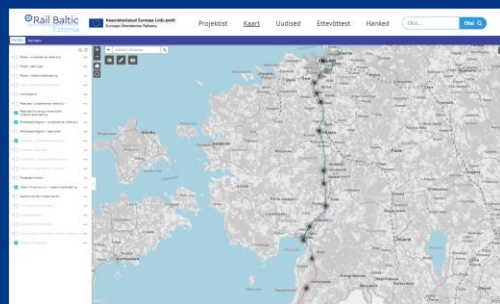
asset_g	
objectid	int PK
name	nvarchar(32) N
site_id	nvarchar(32) N

# Global Project Partners Engagement

RB Rail AS & Rail Baltic Estonia OÜ

Sharing common environment and data creates new cooperation opportunities between project coordinators and implementing bodies

## Public Map



<https://rbestonia.ee/>

## Land Acquisition



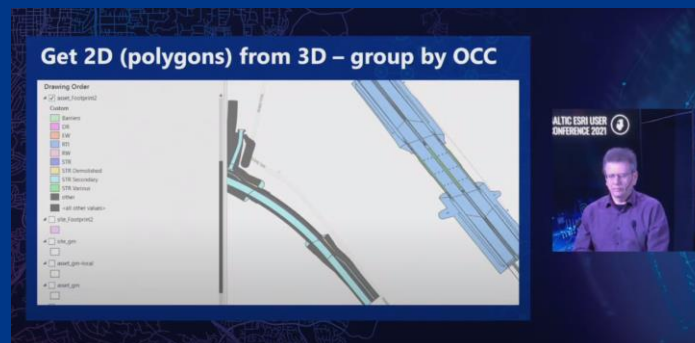
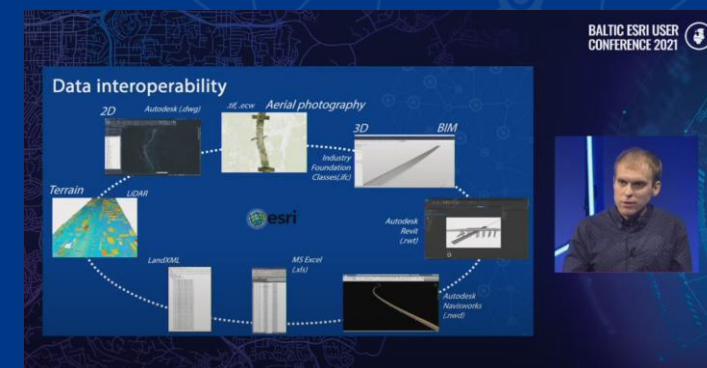
3D  
BIM + GIS data

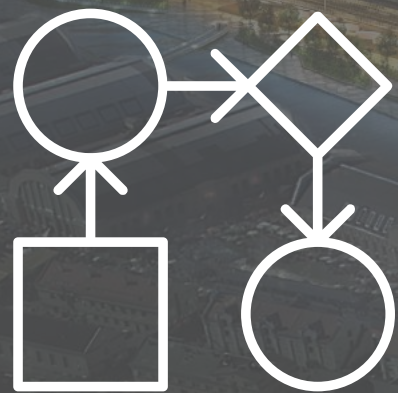


Rail Baltic Estonia OÜ  
Tonis Kundla  
GIS Specialist  
E-mail: [tonis.kundla@rbe.ee](mailto:tonis.kundla@rbe.ee)

# Baltic Esri User Conference

<https://youtu.be/TtR5oAuyo7g>



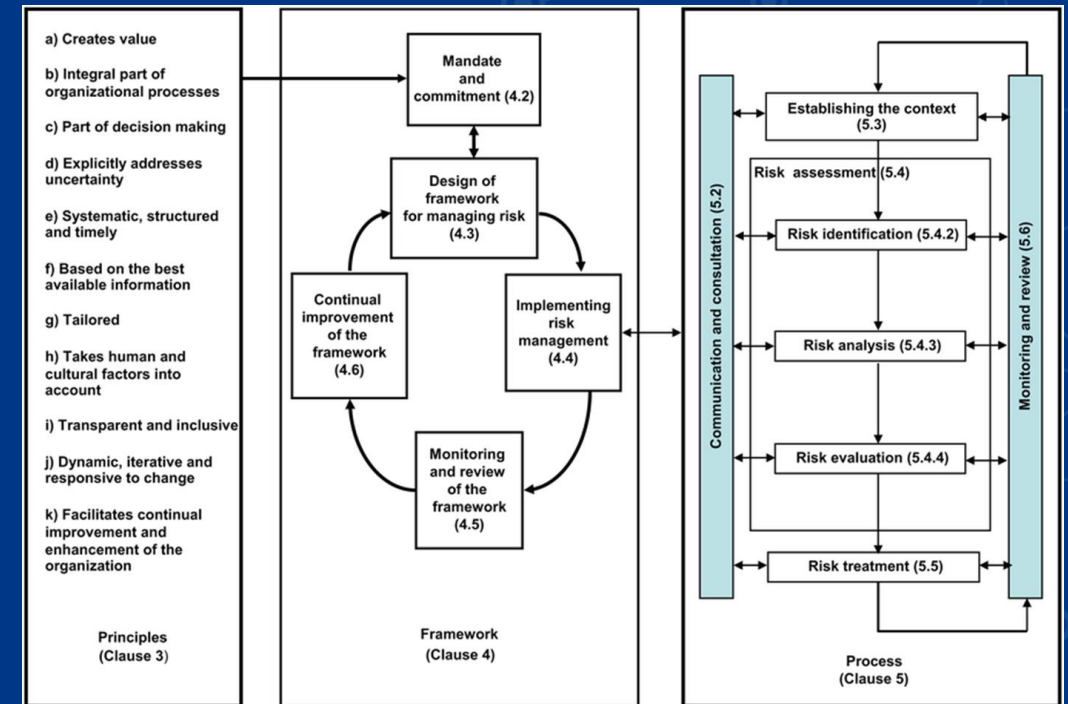


Safety aspects

Rīga Central  
Station

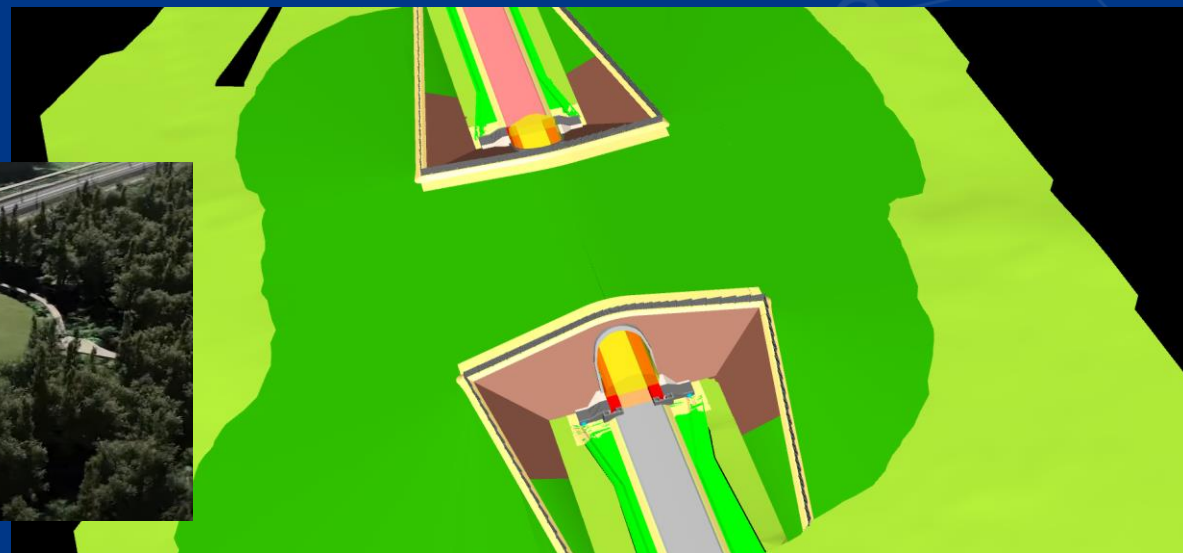
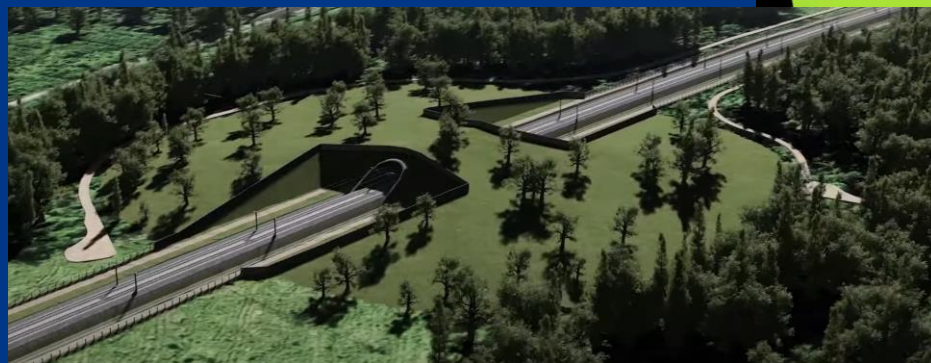
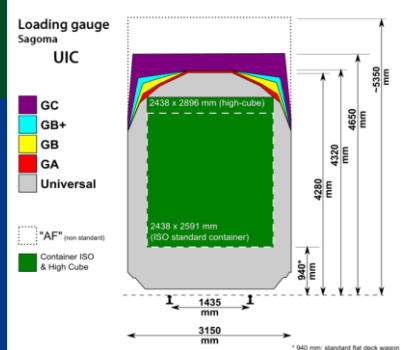
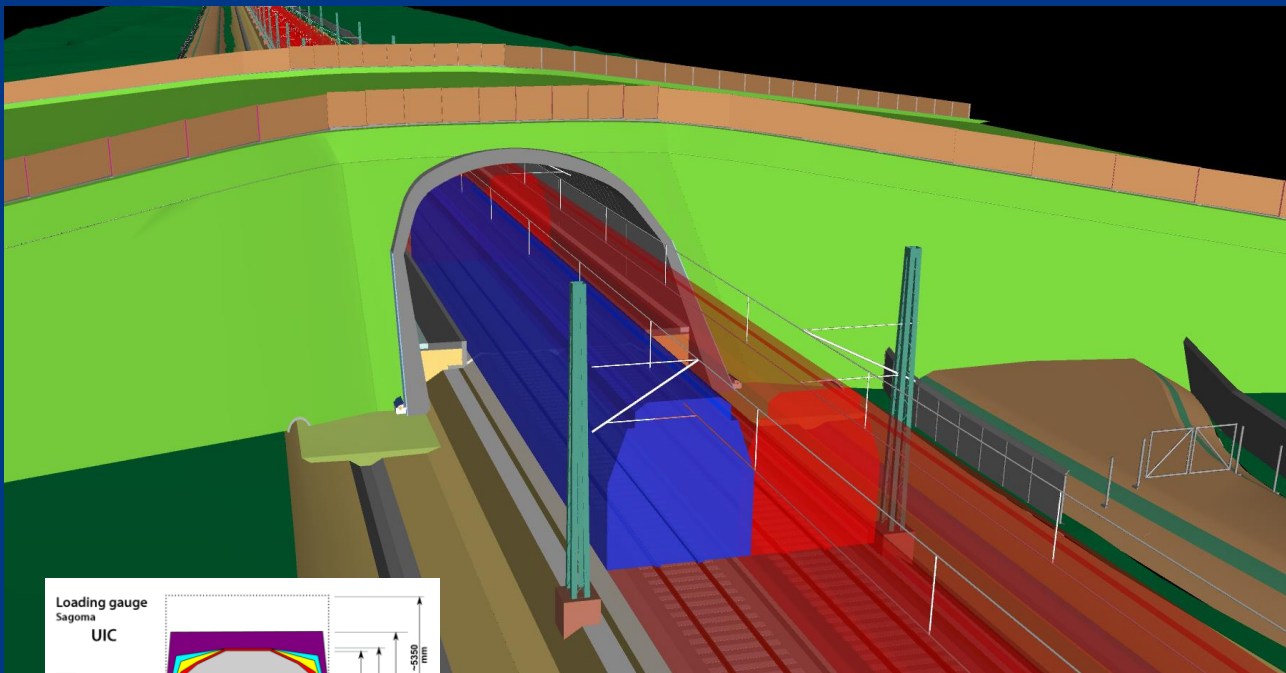
The Rail Baltica railway transport system shall be safe, secure, efficient, cost effective, robust, reliable, durable and comfortable in all aspects, capable of delivering high standards of service quality within the forecasted levels of capacity and employ modern technology with proven performance characteristics;

- An Assessment Body (AsBo) is an independent party appointed to assess the application of the hazard management safety risk process applied during a project.
- The Notified Body (NoBo) performs conformity assessment according to Technical Specifications for Interoperability (TSIs) through documentary assessments, audits (manufacturing, installation, conception) and test witnessing.

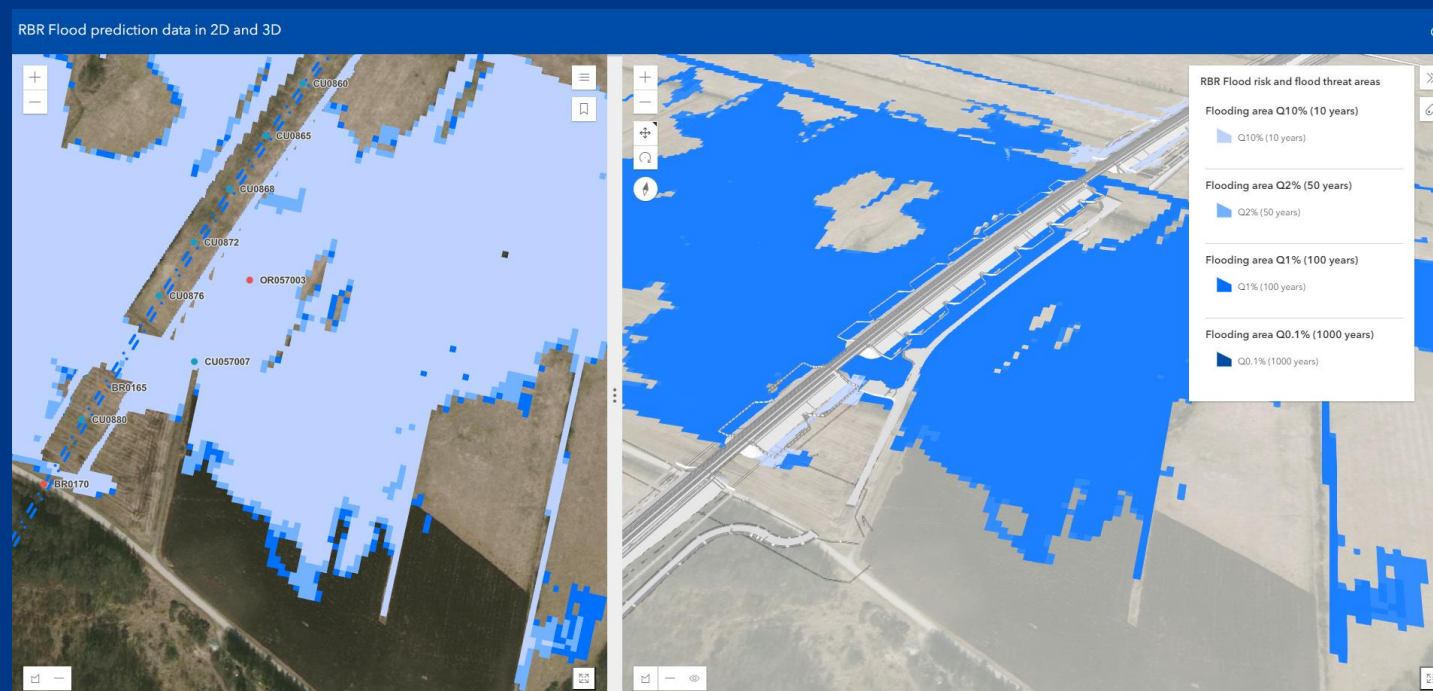
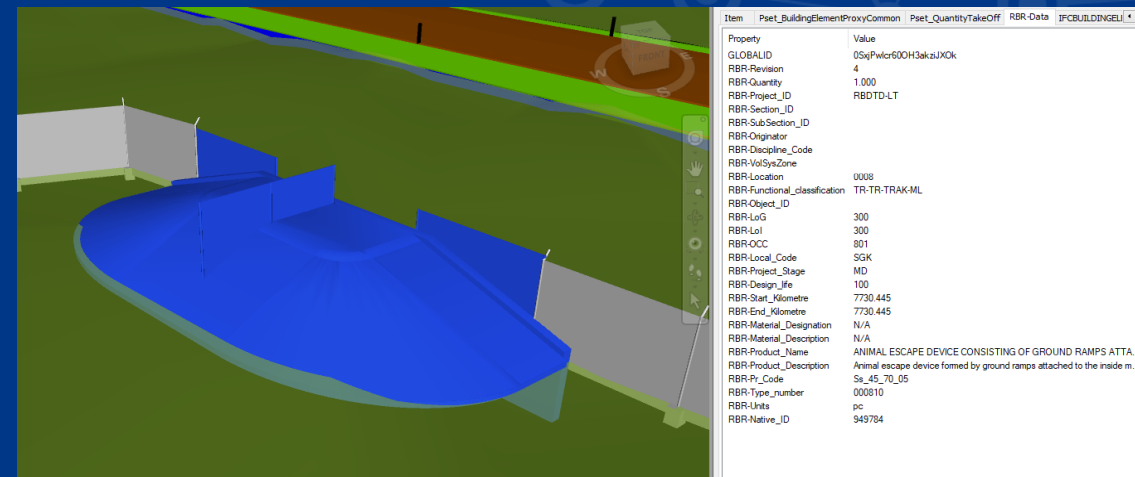
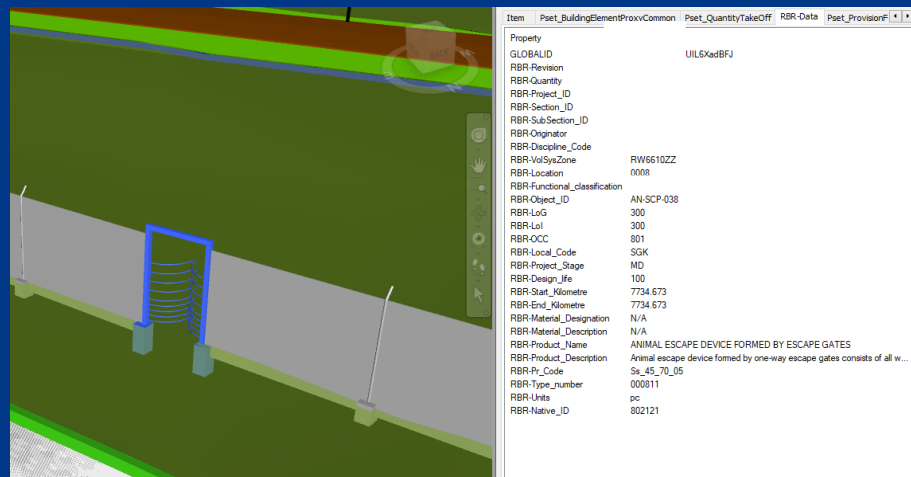


Risk Management Process (EU Regulation 402 CSM)

# Example: Kinematic gauge and animal crossings



# Example: Animal escape gates and flood modeling



RBR-Type

Steel Barrier H2-W3

# Example: Overhead catenary system protection

OCSP

Item	IPC	AlplanAttributes	RBR-Data	TimeLine	Material
Property					Value
GLOBALID			0220000500y5v5N3kq		
RBR-Occ			340		
RBR-Project_ID			RBDT0-EE		
RBR-Section_ID			D52		
RBR-SubSection_ID			DP51		
RBR-Originator			IDO		
RBR-Discipline_Code			BR		
RBR-VolSysZone			BR0200ZZ		
RBR-Location			0012		
RBR-Functional_classification			CV-BR-OPSS-RD		
RBR-Object_ID			STR-BAR-004		
RBR-Start_Kilometre			11483.726		
RBR-End_Kilometre			11483.726		
RBR-LoG			300		
RBR-Lol			300		
RBR-Design_Life			100		
RBR-Material_Description			Varies		
RBR-Product_Name			Driveway parapet (barrier)		
RBR-Product_Description			Driveway parapet (barrier)		
RBR-PI_Code			P-20_85_07		
RBR-Type_number			61001		
RBR-Units			m		
RBR-Local_Code			TS		
RBR-Project_Stage			MD		
RBR-Elevation			5		
RBR-Type			Steel Barrier H2-W3		
RBR-Position			Right		
RBR-Length			67.30 m		

Crash barriers

Kinematic gauge

Item	IPC	AlplanAttributes	RBR-Data	TimeLine	Material
Property					Value
GLOBALID			01V_1VhTAF9Z3_4z3dM4		
RBR-Occ			342		
RBR-Project_ID					
RBR-Section_ID					
RBR-SubSection_ID					
RBR-Originator					
RBR-Discipline_Code					
RBR-VolSysZone			0012		
RBR-Location			CV-BR-OPSS-RD		
RBR-Functional_classification					
RBR-Object_ID					
RBR-Start_Kilometre			11483.726		
RBR-End_Kilometre			11483.726		
RBR-LoG			300		
RBR-Lol			300		
RBR-Design_Life			100		
RBR-Material_Description			Varies		
RBR-Product_Name			Overhead catenary system protection (OCSP): transparent methacrylate fence		
RBR-Product_Description			Overhead catenary system protection (OCSP): transparent methacrylate fence		
RBR-PI_Code			Sa_25_16_73_05		
RBR-Type_number			610034		
RBR-Units			m		
RBR-Local_Code			TS		
RBR-Project_Stage			MD		
RBR-Revision			5		
RBR-Type			Standard Antivandal Fence		
RBR-Position			Left		
RBR-Length			23.40 m		

RBR-Product\_Name

Overhead catenary system protection (OCSP): transparent methacrylate fence

Field observation using smartphone or tablet

20:56

Construction site safety observation

Observation items

Risk assessment and safe method statements available on site \*

☒ Yes ☐ No ☐ N/A

All employees are wearing helmets \*

☒ Yes ☐ No ☐ N/A

All employees are wearing safety footwear \*

☐ Yes ☒ No ☐ N/A

Comments \*

2 employees don't have a proper safety boots

All employees are wearing Hi-Viz clothing \*

☐ Yes ☒ No ☐ N/A

Comments \*

Not all employees are wearing Hi-Viz vests

Other required PPEs \*

☒ Yes ☐ No ☐ N/A

Is the work place designated/barricaded safely \*

☒ Yes ☐ No ☐ N/A

Were location of underground utilities detected \*

☐ Yes ☐ No ☒ N/A

20:53

Construction site safety observation

Site

Riga Central station

Location

Stacijas laukums 2

Map

56°57'N 24°7'E

Date

begin\_photos

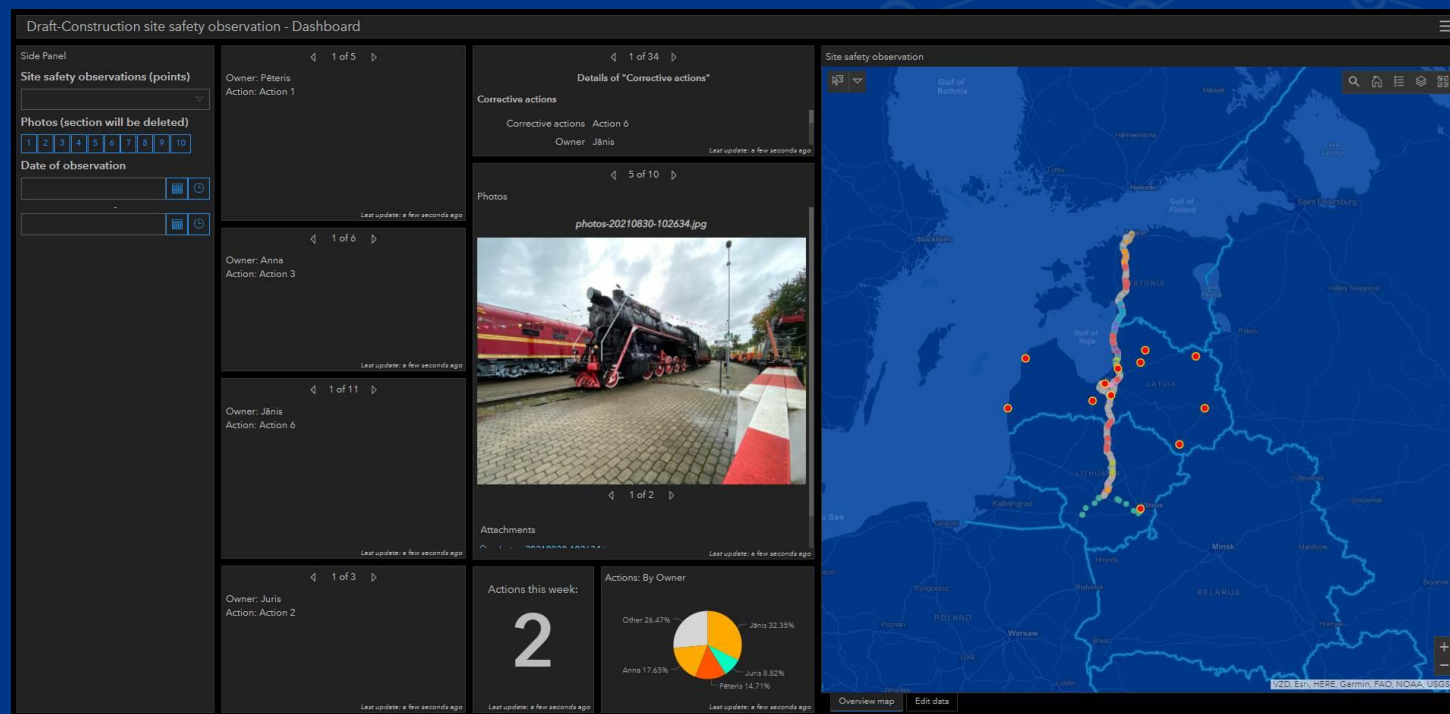
Photos

Only 4 photos

2 of 2

# EXAMPLE: Construction site safety observation pilot project - testing stage

Data collected and displayed in user friendly web-based dashboards

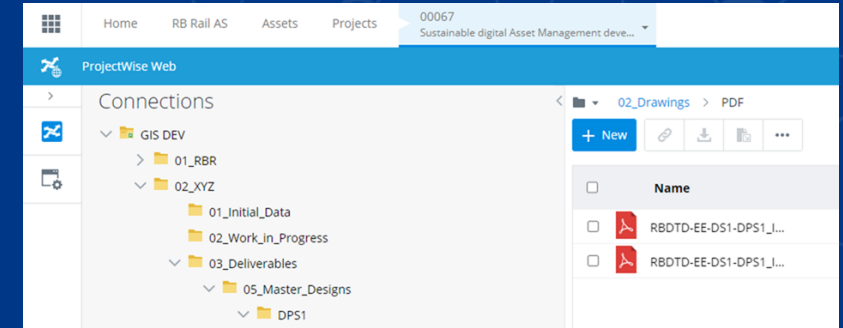
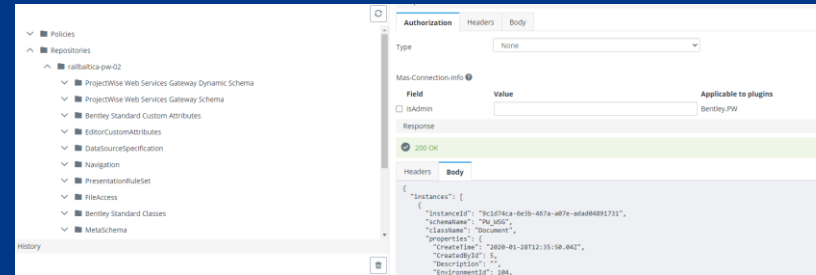
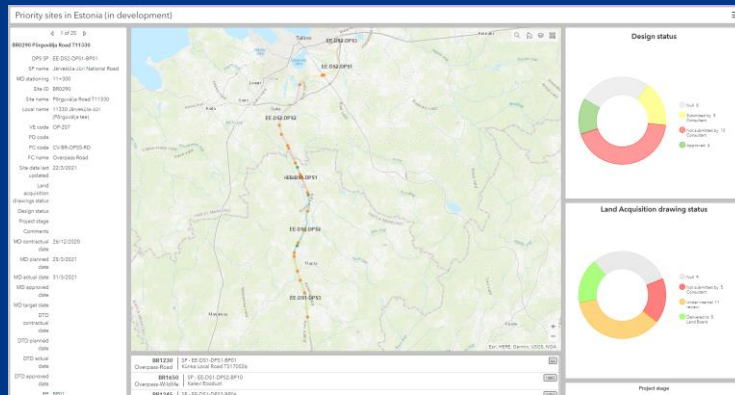


# CDE integration example

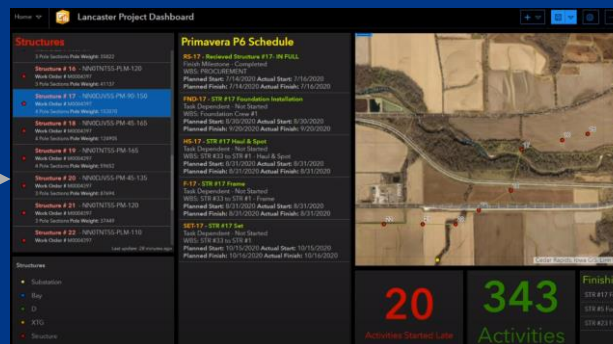
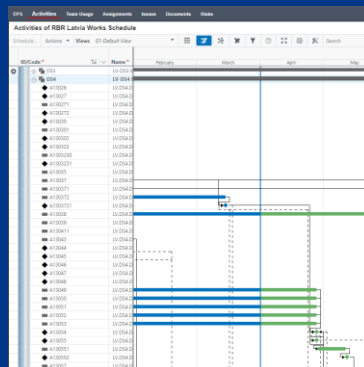
ArcGIS Online

API

Accessing information directly in ProjectWise



## ArcGIS and P6 integration



### The Solution

- Oracle Primavera P6 EPPM (Enterprise)
- ArcGIS Pro Geoprocessing tool
- Uses P6 web services to retrieve data
- Direct integration with P6 from ArcGIS Pro (no manual export of schedules)
- Supports a large portion of the P6 data model (hundreds of different fields)
- Automated join to a specified feature layer
- Integration with 2D & 3D data
- Geoprocessing tool can be schedule to run at a specified frequency

<https://www.youtube.com/watch?v=3AgxBVEnbCw&t=1035s> - Integrate Project Schedules with ArcGIS; David Reeves

# CDE integration example: ArcGIS Online - PW

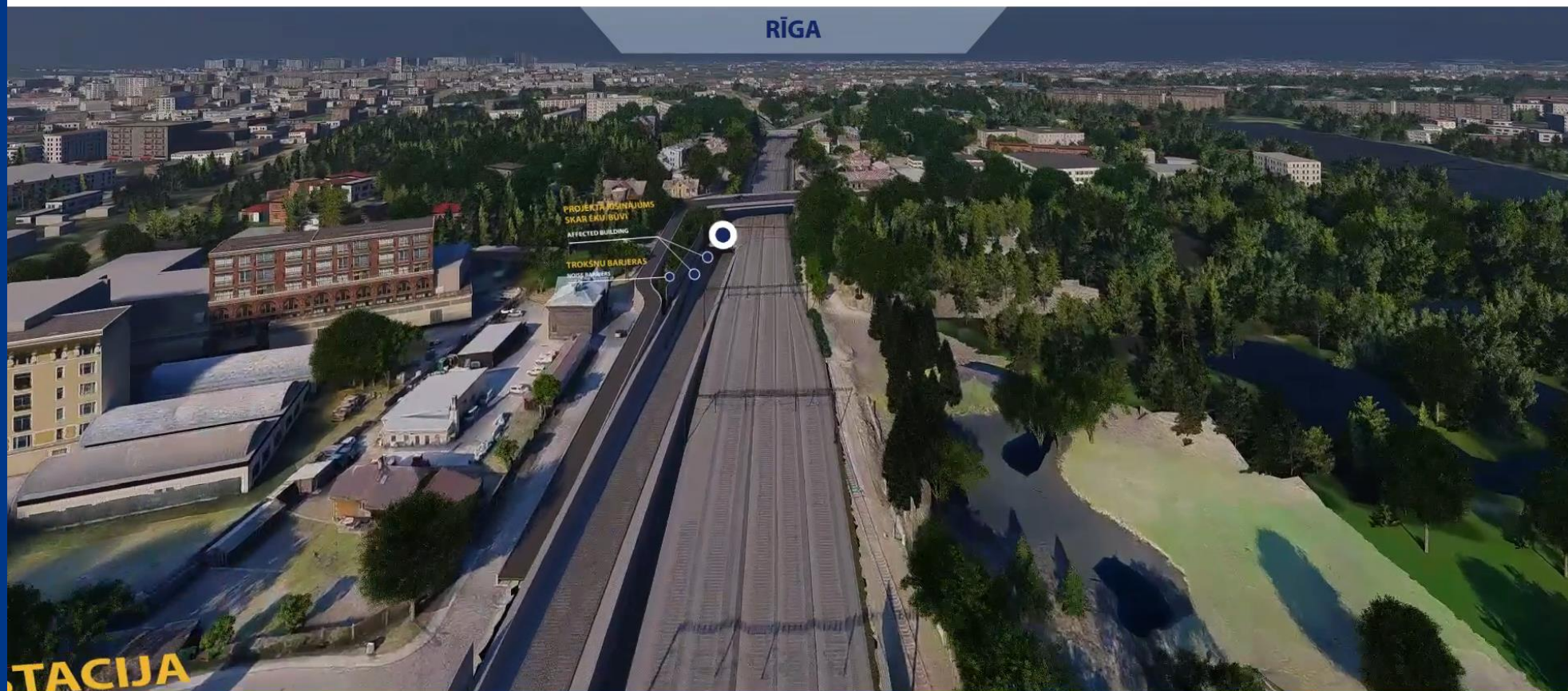
Browser window showing the PW\_Search V2 widget app (testing)\_RV\_version. The interface includes a map of the project area with a red line representing the railway alignment. A search bar at the top left contains the text "BR1610". A pop-up window displays details for a selected feature, including Functional classification (Culvert-Railway), Type (Culvert), Linear object, Building permit, and Construction object.

The right sidebar shows the PW\_Search V2 search results for BR1610, listing document types and their descriptions:

Document type	Document type (description)
<input type="checkbox"/> RP	Report
<input type="checkbox"/> ID	
<input type="checkbox"/> D2	General layout of the building, GA drawings
<input type="checkbox"/> D3	General views, cuts, longitudinal profiles of the building (vert)
<input type="checkbox"/> D4	Other drawings (nodes, details, etc.)
<input type="checkbox"/> BQ	Bill of Quantity (general)
<input type="checkbox"/> BM	BIM model native format
<input checked="" type="checkbox"/> IF	BIM Model IFC format
<input type="checkbox"/> RE	Register
<input type="checkbox"/> DB	Database
<input type="checkbox"/> TQ	Technical Query

The bottom section displays a table of deliverables:

Deliverable (Title)	Design Phase	Version	Document name	Role (Local)	Role (Description)	Vol/Sys	Role (RBR)	Document type	Document file size, MB	Document update time
<input type="checkbox"/> Model (Fillings)	MD	003	RBDTD	AA	General part	BR1610	EW	IF	43.48	2020-11-12 16:56
<input type="checkbox"/> Boreholes Model	VE	001	RBDTD	AA	General part	BR1610	GEO	IF	0.1	2020-11-12 16:56
<input type="checkbox"/> Fence Model	MD	001	RBDTD	TS	Bridges, viaducts, estacade and tunnels	BR1610	BR	BM	17.86	2020-11-12 16:56
<input type="checkbox"/> Model (Excavations)	MD	003	RBDTD	AA	General part	BR1610	EW	IF	6.61	2020-11-12 16:56
<input type="checkbox"/> Boreholes Model	VE	001	RBDTD	AA	General part	BR1610	GEO	BM	1.47	2020-11-12 17:20

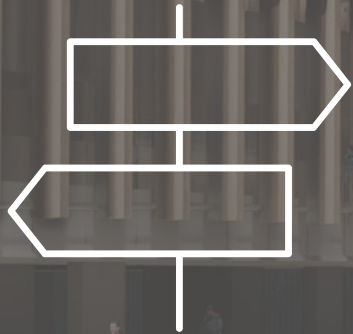


TORŅAKALNS



IMANTA

- The visualization is part of the RailBaltica design and implementation stages;
- This is not the final version and the development of it progresses together with the design process;
- The Visualization does not represent the final design solutions.



# Acknowledgements

RIX Airport  
Station

01



Set clear requirements

## BEP and TIDP

It must correspond to BIM EIR and it shall be agreed during the Inception phase, but must be updated frequently.

VE, MD and DTD stages – must be renewed and followed.

02



Follow the progress

## Client's task

Client must follow the progress. Client must be involved and must have/develop the knowledge. Client must understand what is being delivered. Dedicated team must be assigned (for now).

03



BIM is not alone

## AIM, GIS, etc.

Digitalization should be the priority. Modern asset management, digital tools and IT minded engineers.

04



Everybody must learn

## Client and Consultant

Teams on both sides must learn. Early stages of the project (VE) serves as «test ground» for Master and Detailed Technical Design stages.

Engineers «love» Excel.

05



Big picture

## Client must work with it in mind

Consultants come, do their work and go. Client must think about the goals to be achieved with Digitalization. BIM just to have BIM is not a goal.

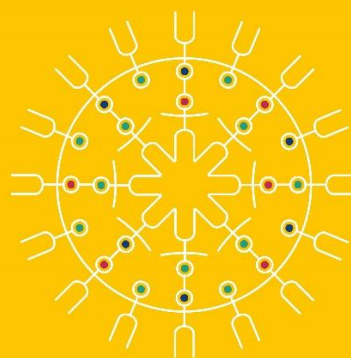


## OUR VISION

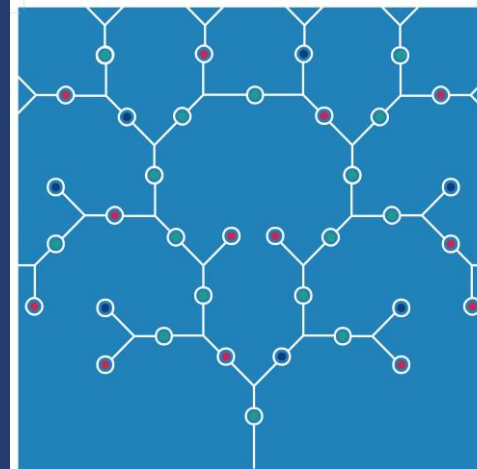
Connected Baltics in a  
connected Europe

## OUR MISSION

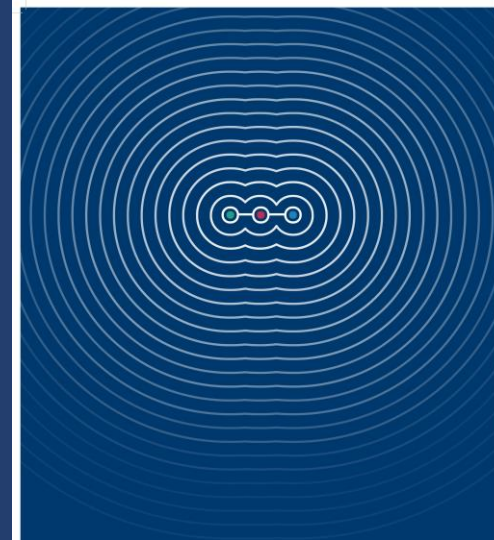
We are delivering a seamless  
mobility for people, goods and  
service to accelerate social and  
economic development in the  
Baltics and beyond



WE VALUE PEOPLE



WE VALUE PROFESSIONALISM



WE VALUE PURPOSE

Thank you!  
[www.railbaltica.org](http://www.railbaltica.org)

**Raitis Bušmanis**

Head of Virtual Design and Construction Department, RB Rail AS

E-mail: [raitis.busmanis@railbaltica.org](mailto:raitis.busmanis@railbaltica.org)