



LATVIAN ENVIRONMENT, GEOLOGY
AND METEOROLOGY CENTRE

Transboundary groundwater bodies assessment in Gauja-Koiva and Salaca-Salatsi river basins

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Project closing event

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Interreg
Estonia-Latvia
European Regional Development Fund



EUROPEAN UNION

WaterAct

Joint actions for more efficient management
of common groundwater resources

WP2 Assessment of common groundwater resources in Gauja-Koiva and Salaca-Salatsi river basins



WP2 A.T2.2 Assessment of the status of transboundary GWBs according to harmonized principles

Subtasks included in the activity:

- Transboundary GWB delineation in Gauja-Koiva and Salaca-Salatsi river basins;
- Initial characterization of transboundary GWBs;
- Overall status assessment;
- Recommendations for future.



1. Transboundary GWB delineation in Gauja-Koiva and Salaca-Salatsi river basins



1. Data collection. Information exchange on geological/hydrogeological settings and GWBs: data stored on pCloud & created joint google document;



2. Harmonization. Unified stratigraphy, GWBs grouping (by aquifer systems);



3. Transboundary GWBs identification (developed maps, cross-sections, GW flows, watersheds, discussions).

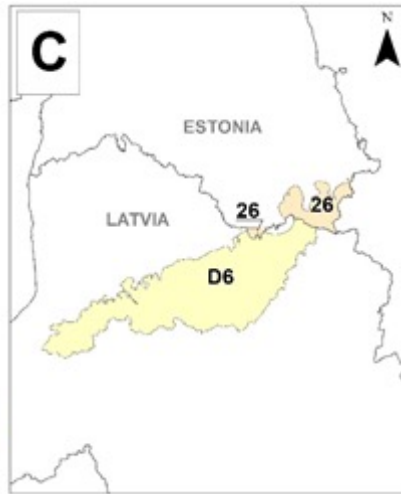
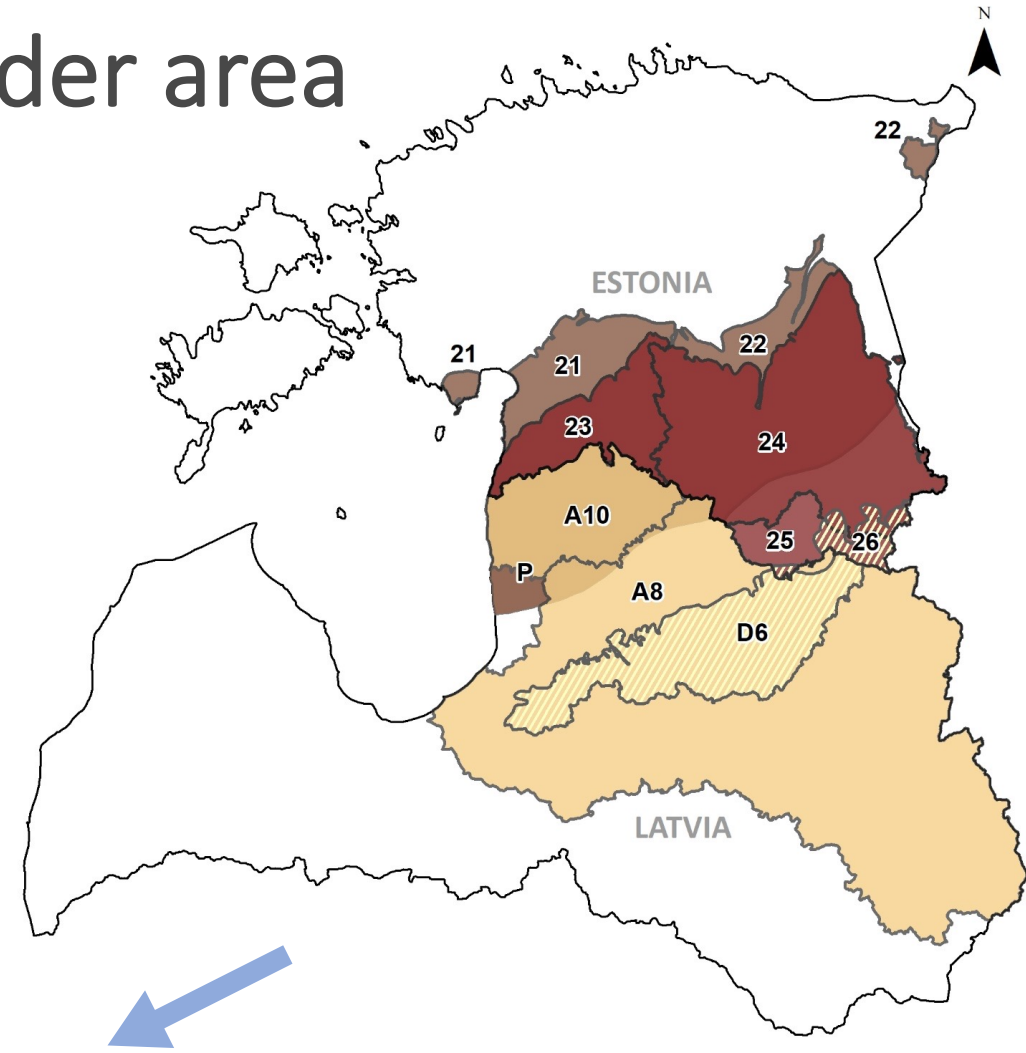
Stratigraphic unit comparison of geological formations in Latvia and Estonia

Aquifers	Geological index (LV)	Geological index (EE)	Dominant sediments	Aquifer system (GWBs)
Quaternary	Q	Q	Sand, loam	Quaternary (attached to each GWB)
Stipinai	D _{3stp}	-	Dolomite, marl	Pļaviņas-Stipinai (LV GWBs D6 and EE GWB 26)
Katlēši-Ogre	D _{3og}	-	Sandstone, marl	
	D _{3kt}	-	Sandstone, marl	
Daugava	D _{3dg}	D _{3dg}	Dolomite, limestone	
Salaspils	D _{3slp}	D _{3db}	Marl, gypsum, limestone	
Pļaviņas	D _{3pl}	D _{3pl}	Dolomite, limestone	
Amata	D _{3am}	D _{2am}	Sandstone, siltstone	Arukūla-Amata (LV GWBs A8 and A10, EE GWBs 23, 24 and 25)
Gauja	D _{3gj}	D _{2gj}	Sandstone, siltstone	
Burtnieki	D _{2br}	D _{2br}	Sandstone, siltstone	
Arukūla	D _{2ar}	D _{2ar}	Sandstone, siltstone	
Narva regional aquitard D _{2nr}			Marl, clay	
Pärnu	D _{2pr}	D _{2pr}	Sandstone, siltstone	Lower-Middle Devonian (LV GWB P, EE GWBs 21 and 22)
Rēzekne	D _{1rz}	D _{1rz}	Marl, sandstone	
Ķemeri	D _{1km}	D _{1km}	Sandstone, siltstone	
Gargždai	D _{1gr}	-	Sandstone, siltstone	
Tilžē	-	D _{1tl}	Sandstone, siltstone	
Ordovician and Silurian regional aquitard O-S			Marl, solid limestone	
Cambrian	C	Ca	Sandstone, siltstone	Vendian-Cambrian
Vendian	V	V	Sandstone, siltstone, gravelite	
Archean and Proterozoic crystalline basement AP-PR			Gneiss, granite	

GWBs in Latvian-Estonian border area

Identification

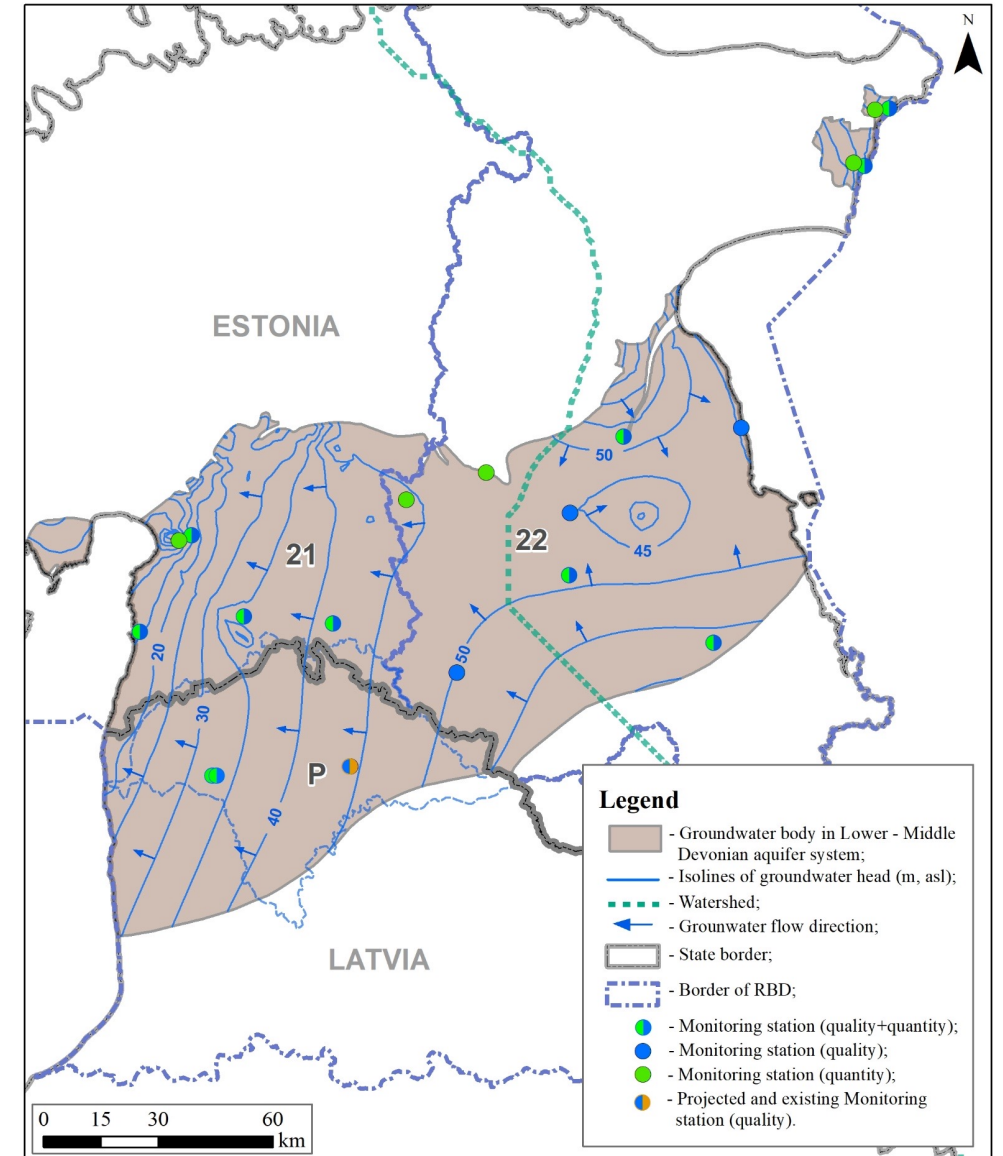
- 10 GWBs in LV-EE border area (6 EE and 4 LV)
- Harmonization – grouped in 3 groups (by hydrogeological settings – aquifer systems)
 1. Lower-Middle Devonian (A);
 2. Middle-Upper Devonian (B);
 3. Upper Devonian (C);



Identification of transboundary GWBs

1. GWBs in Lower-Middle Devonian aquifer system

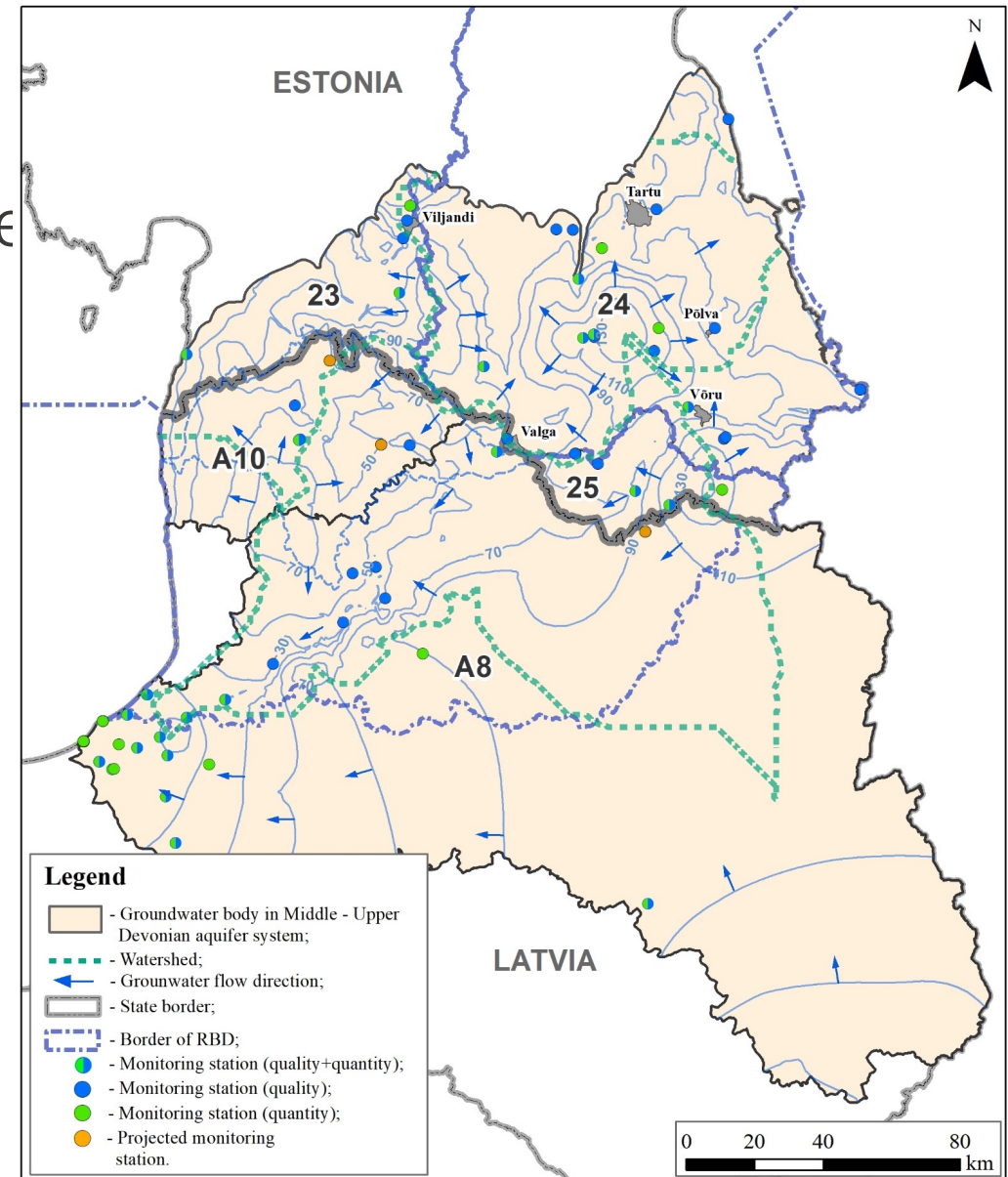
GWBs	21, 22, P
RBDs	3 (East and West-Estonian RBDs, Gauja RBD)
Situation	
<ul style="list-style-type: none">• Deeper GWBs not strictly related to RBDs;• Hydrogeologically connected;• GWB 22 – not in Gauja/Koiva or Salaca/Salatsi river basin;	



Identification of transboundary GWBs

2.GWBs in Middle-Upper Devonian aquifer system

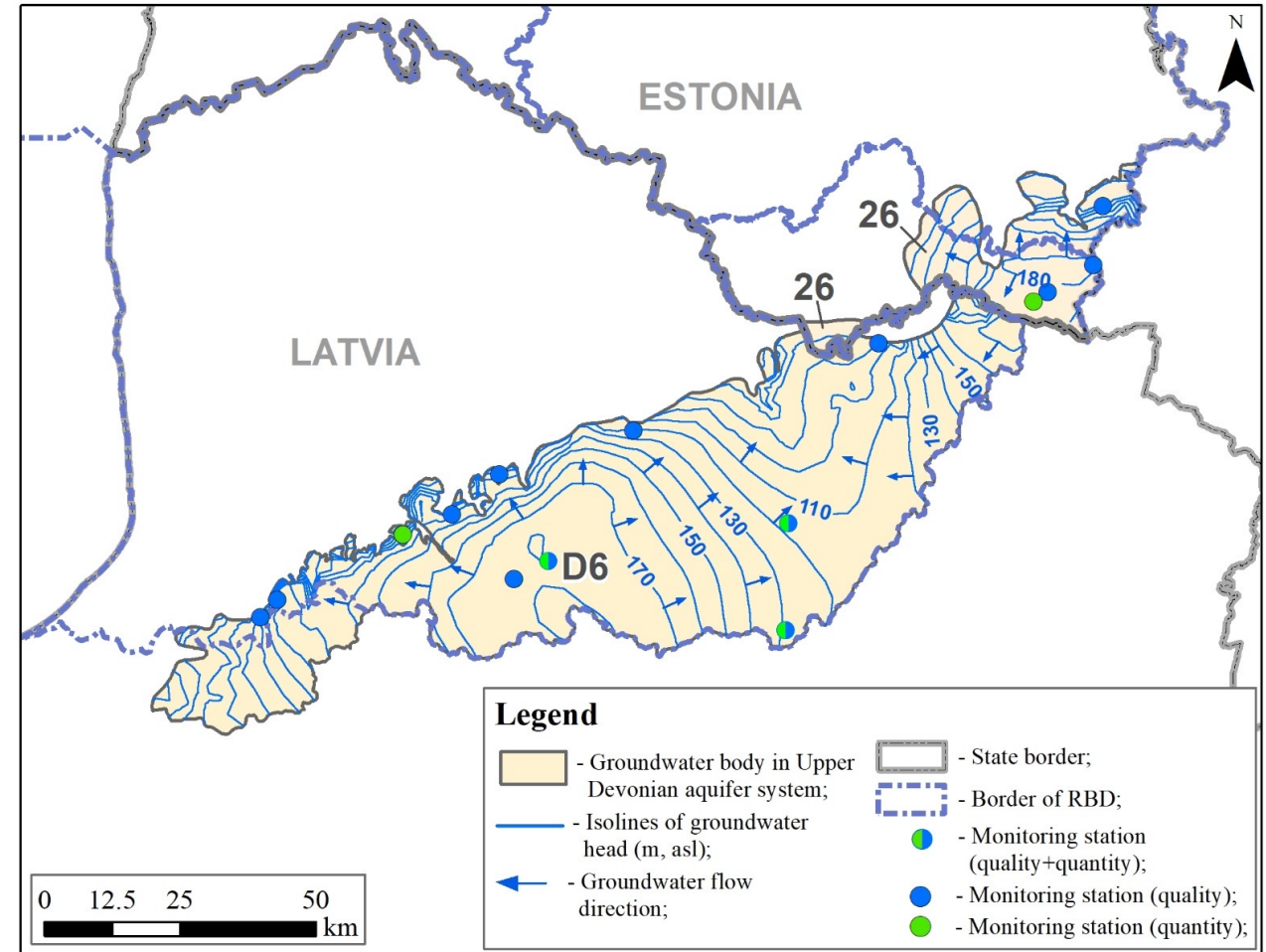
GWBs	23, 24, 25, A10, A8
RBDs	3 (East and West-Estonian RBDs, Gauja-Koiva RBD)
Situation	<ul style="list-style-type: none">• Hydrogeologically connected: 23 with A10; 25 with A8;• GWB 24– not in Gauja/Koiva or Salaca/Salatsi river basin;



Identification of transboundary GWBs

3.GWBs in Upper Devonian aquifer system

GWBs	26, D6
RBDs	Gauja-Koiva RBD
Situation	
	<ul style="list-style-type: none">• More related to RBD;• Hydrogeologically connected;



Result of Latvian-Estonian transboundary groundwater body delineation



List of transboundary GWBs in Gauja/Koiva & Salaca/Salatsi RBs

Latvian GWBs	Estonian GWBs
Upper Devonian aquifer system	
D6	26
Middle - Upper Devonian aquifer system	
A8 A10	25 23
Lower - Middle Devonian aquifer system	
P	21

2. Initial characterization of transboundary GWBs

Transboundary GWB	National GWB	Total Area (km ²)	Area (km ²)	Aquifer characterization		Main use	Overlying strata (m)	Criteria for importance
				Aquifer Type	Confined			
GWB-1 Upper Devonian	D6	5617.1	4891	F, P	Yes	DRW, IND	0-180	GW resources; GW use
	26		726.1					
GWB-2 Upper-Middle devonian	A8	28 671	27349	P	Yes	DRW, IND	0-200	GW resources; GW use
	25		1322					
GWB-3 Upper-Middle devonian	A10	5662	3321	P	Yes	DRW, IND	0-155	GW resources; GW use
	23		2341					
GWB-4 Middle-Lower Devonian	P	8844	4394	P	Yes	DRW, IND	0-280	GW resources; GW use
	21		4450					

Aquifer Type – P- Porous, K - Karstic, F - Fissured

Main use - DRW = Drinking water / AGR = Agriculture / IRR = Irrigation / IND = Industry / GW resources, DRW protection, dependent ecosystems; > 4000 km², GW use, GW resources SPA = Balneology / CAL = Caloric energy / OTH = Other. Multiple selections possible.

Overlying strata Indicates a range of thickness (minimum and maximum in meters)

2. Initial characterization of transboundary GWBs

Conceptual model (characterization)

- A common table for characterization / conceptual understanding was developed (WP1, AT1.1)
- Compiled information used for GWB assessment

Example: Situation for GWB-1 (D6 & 26)

Characteristics		Groundwater bodies in Upper Devonian aquifer system (GWB-1)	
Groundwater body number/code		26	D6
River basin district		East Estonian/Koiva	Gauja
Aquifer system		Quaternary, Upper Devonian	Quaternary, Upper Devonian
Area (km ²)		726,1	4891
Physiographic characteristics		Most of the territory is located in Haanja upland, where the absolute height of the terrain varies from about 100 to 230 m a.s.l. Small part of GWB is also located in Hargla Depression, where absolute height reaches about 60-70 m, but the relative height is about 160 m a.s.l.	Territory has a changing relief - in the western part there is a plain, the central part and the eastern part are formed by highlands, while the rest of the area formed by wavy plains. The absolute height of the terrain varies from about 90 to 265 m a.s.l., but the relative height is about 176.6 m a.s.l.
Hydrogeological characteristics	Lithology	The lithological composition of the aquifer-forming rocks is quite homogenous. The aquifers are hosted by thick-bedded limestone and dolomitized limestone of the Upper Devonian Plavinas Stage and the overlying Quaternary sediments. The lower part of the formation consists of domerite and marl of the Snetnaja Gora Formation, which can be viewed as a local semi-permeable aquitard.	Geological structure that forms the aquifer system are composed of sandstone and dolomite. The local aquitards consist mainly of dolomite marl, siltstone and clay. Dominated by porous rock material. Moraine loam, moraine loam, sand and clay are common in the overlapping Quaternary sediments.
	GWB thickness	The thickness of the bedrock aquifers is in the range of 30-40 m; the thickness of the overlying Quaternary deposits is mostly in the range of 5-10 m, locally up to 20 m.	The thickness of the bedrock reaches up to 105 meters, the average thickness 30 m; the thickness of the overlying Quaternary sediments in the plains is in range of 5-25 m up to 75-135 m in the hills. The average thickness of Quaternary sediments is about 50-60 m.
	Overlying aquitard	The Quaternary sediments overlying the bedrock aquifers consist mainly of loamy till, which has a hydraulic conductivity of 0.1-1.0 m/d.	The Quaternary sediments overlying the bedrock aquifers consist mainly of moraine loam, sand and clay.
	Underlying aquitard	The domerite, marl and clay of the Snetnaja Gora Formation	The clay, dolomite marls and clayey siltstones of Amata formation or lower part of Plavinas formation
	Groundwater level	The aquifers are mostly phreatic. Groundwater level is usually about 20-30 m below ground surface. The absolute height of the groundwater level is in the range of 165-175 m.	Groundwater level is about 10-20 m below ground surface. The absolute height of the groundwater level in the highlands reach about 170-200 m, in the lowlands - 60 - 80 m, while in the western part (closer to the Baltic coast) the level reaches only 10-20 m
Hydrodynamics	Flow direction	The most important groundwater divide in the area is the Haanja Heights, from where the groundwater flows to the south and west towards the edges of the height. Groundwater seeps out in the river valleys and a portion of its volume also infiltrates deeper into the Middle-Devonian aquifers.	The main groundwater flows are from Vidzeme Heights, Alūksne Heights and Haanja Heights (Estonia) in the direction of lower areas - Gauja river valley and adjacent plains
	Filtration coefficient	The transmissivity of the aquifers forming the groundwater body is in the range of 30-300 m ² /d (Perens et al., 2012). The lateral flow velocity of groundwater is in the range of 1-10 m/d and can reach up to 50 m/d in karst aquifers (Ibid.).	The transmissivity of the aquifers forming the groundwater body is in the range of 26-3580 m ² /d (mostly 700 m ² /d)
	Recharge and regime	The groundwater flows radially away from the Haanja Heights and the local hillocks towards topographically lower regions throughout the year. The amount of infiltrating water depends on the composition of local Quaternary cover. In areas with waterlogged soils or in areas underlain by clayey deposits the infiltration rate can be negligible.	Main recharge areas are located in central part of Vidzeme highland and eastern part of Alūksne highland, discharge in topographically lower regions. The amount of infiltrating water is about 1 792 000 m ³ /d
		Groundwater in the groundwater body is mainly of the Ca-HCO ₃ -type, with TDS concentrations ranging from 200 to 600 mg/L. The chloride concentrations are usually <15 mg/L. The concentrations of NO ₃ are also low and do not exceed 5 mg/L in most cases. In terms of	Ca-Mg-HCO ₃ type freshwaters with mineralization up to 1 g/l predominate. Elevated concentrations of sulphate ions above 250 mg/l have been observed in local areas in the Z part of the facility.

2. Initial characterization of transboundary GWBs

GWB-1 Upper Devonian aquifer system

- **Total area:** 5617.1 km² (D6 – 4891 km²; 26 – 726.1 km²)
- **Aquifer type** – fractured;
- **Geology** – dolomites, limestones, also sandstones;
- **Water use** – drinking water, industrial (in Estonia locally);

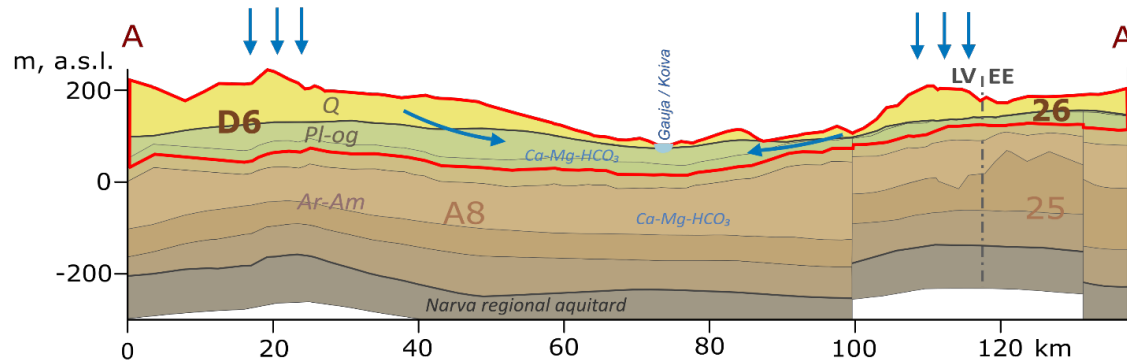


- **Anthropogenic pressure:**

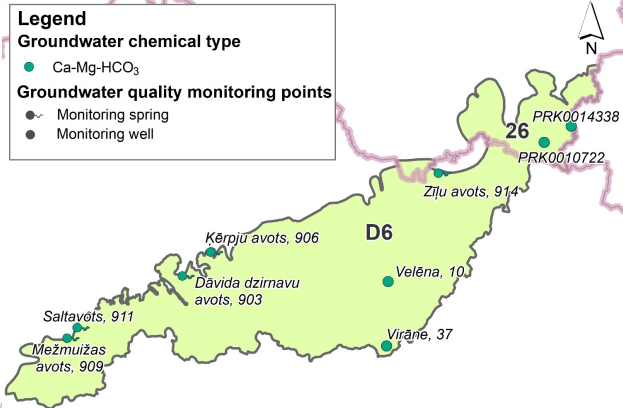
Aquifer system	GWB	Point source pressure	Diffuse source pressure	GW abstraction
1. Upper Devonian	26	Not significant	Not significant	Not significant
	D6	Not significant	Not significant	Not significant

2. Initial characterization of transboundary GWBs

Conceptual model for GWB-1 (D6 & 26)

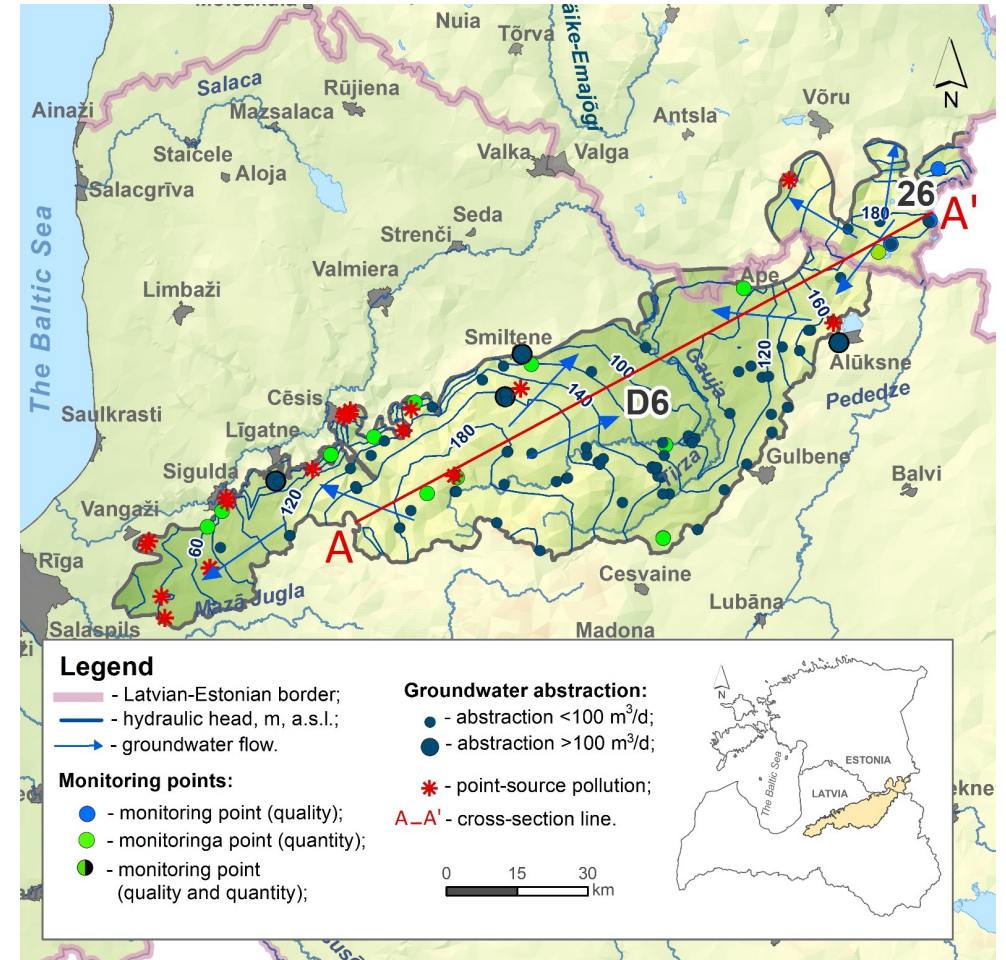
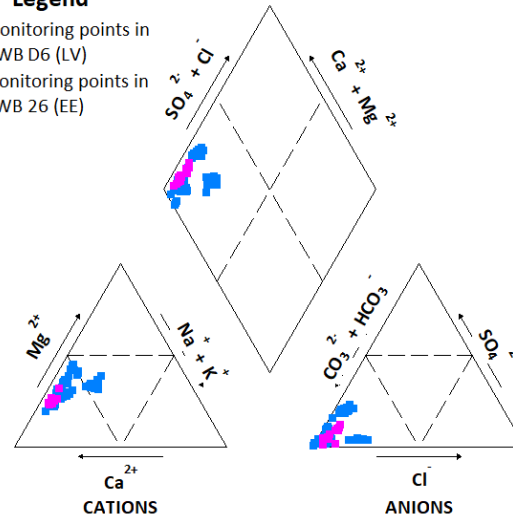


- Legend**
- Groundwater chemical type**
 - Ca-Mg-HCO₃
 - Groundwater quality monitoring points**
 - Monitoring spring
 - Monitoring well



Legend

- Monitoring points in GWB D6 (LV)
- Monitoring points in GWB 26 (EE)



Legend

- Latvian-Estonian border;
- hydraulic head, m, a.s.l.;
- groundwater flow.
- Groundwater abstraction:**
- - abstraction < 100 m³/d;
- - abstraction > 100 m³/d;
- * - point-source pollution;
- Monitoring points:**
- - monitoring point (quality);
- - monitoring point (quantity);
- - monitoring point (quality and quantity);



2. Initial characterization of transboundary GWBs

GWB-2 Upper-Middle Devonian aquifer system

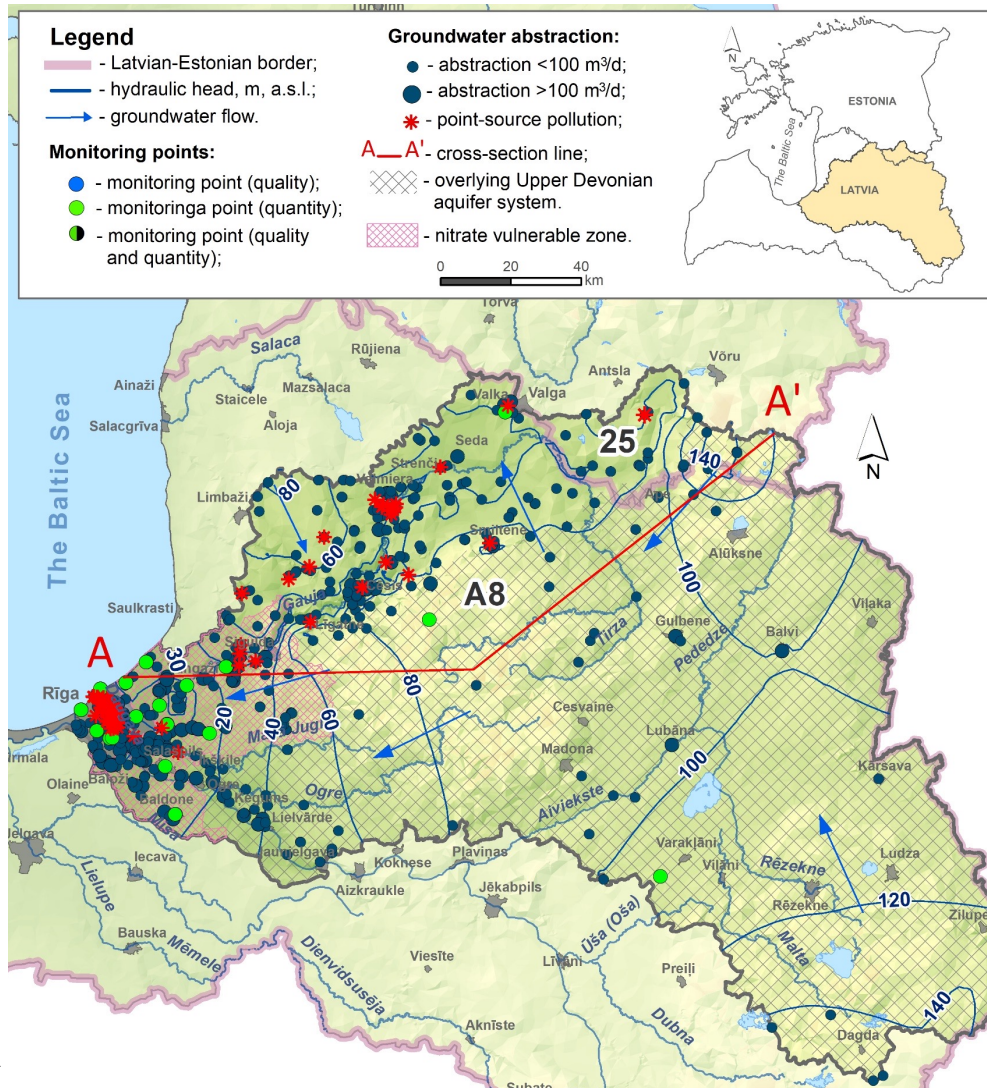
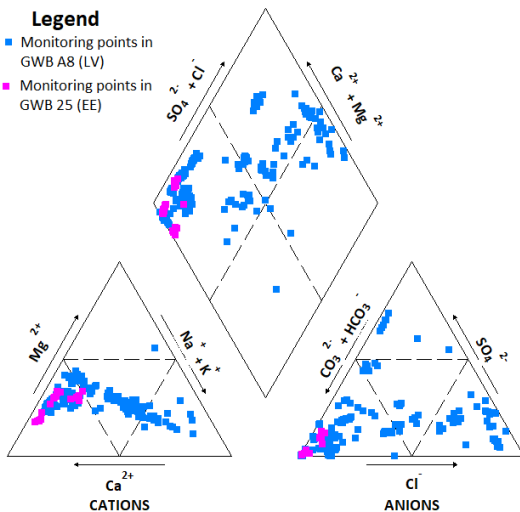
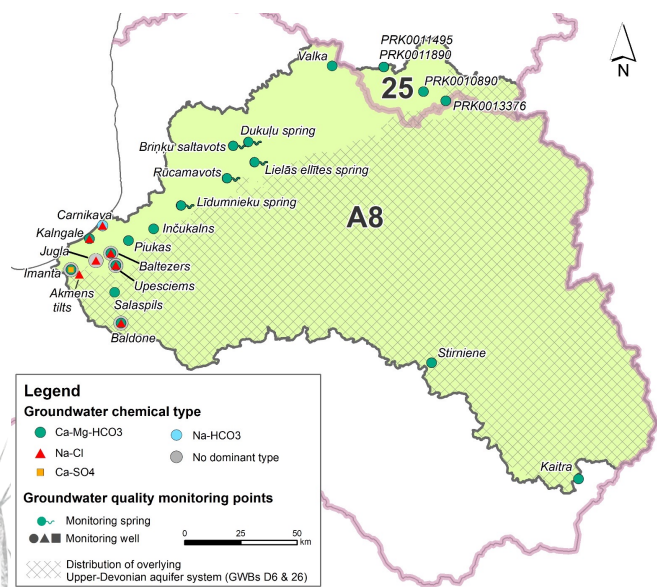
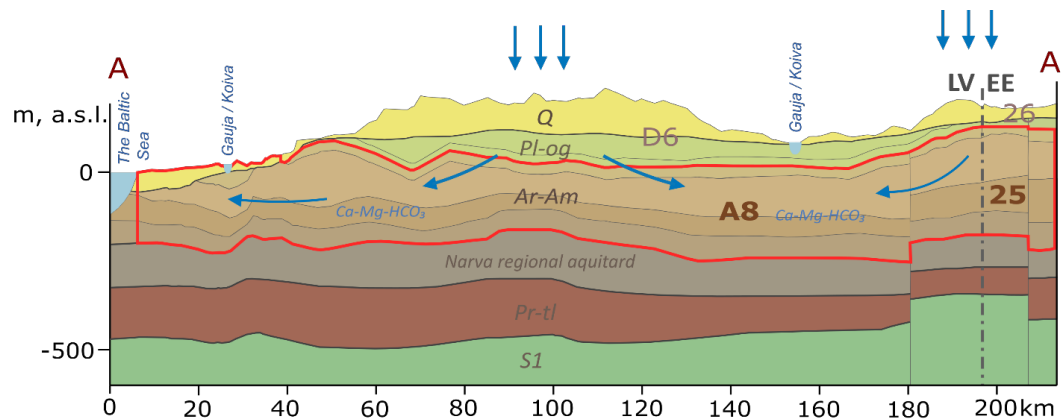
- **Total area:** 28671 km² (A8 – 27349 km²; 25 – 1322 km²);
- **Aquifer type** – porous;
- **Geology** – sandstones;
- **Overlying aquifers** – Upper Devonian GWBs;
- **Water use** – drinking water, industrial;
- **Anthropogenic pressure:**

Aquifer system	GWB	Point source pressure	Diffuse source pressure	GW abstraction
2. Upper-Middle Devonian	25	Not significant	Not significant	Not significant
	A8	Significant	Not significant	Not significant



2. Initial characterization of transboundary GWBs

Conceptual model for GWB-2 (A8 & 25)



2. Initial characterization of transboundary GWBs

GWB-3 Upper-Middle Devonian aquifer system

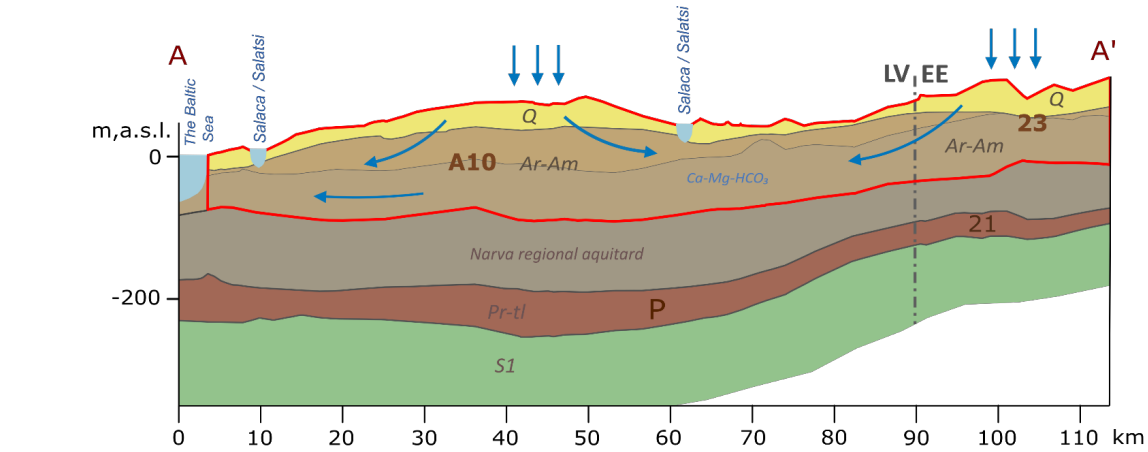
- **Total area:** 5662 km² (A10 – 3321 km²; 25 – 2341 km²)
- **Aquifer type** – porous;
- **Geology** – sandstones;
- **Water use** – drinking water, industrial;
- **Anthropogenic pressure:**

Aquifer system	GWB	Point source pressure	Diffuse source pressure	GW abstraction
3. Upper-Middle Devonian	23	Not significant	Not significant	Not significant
	A10	Not significant	Not significant	Not significant

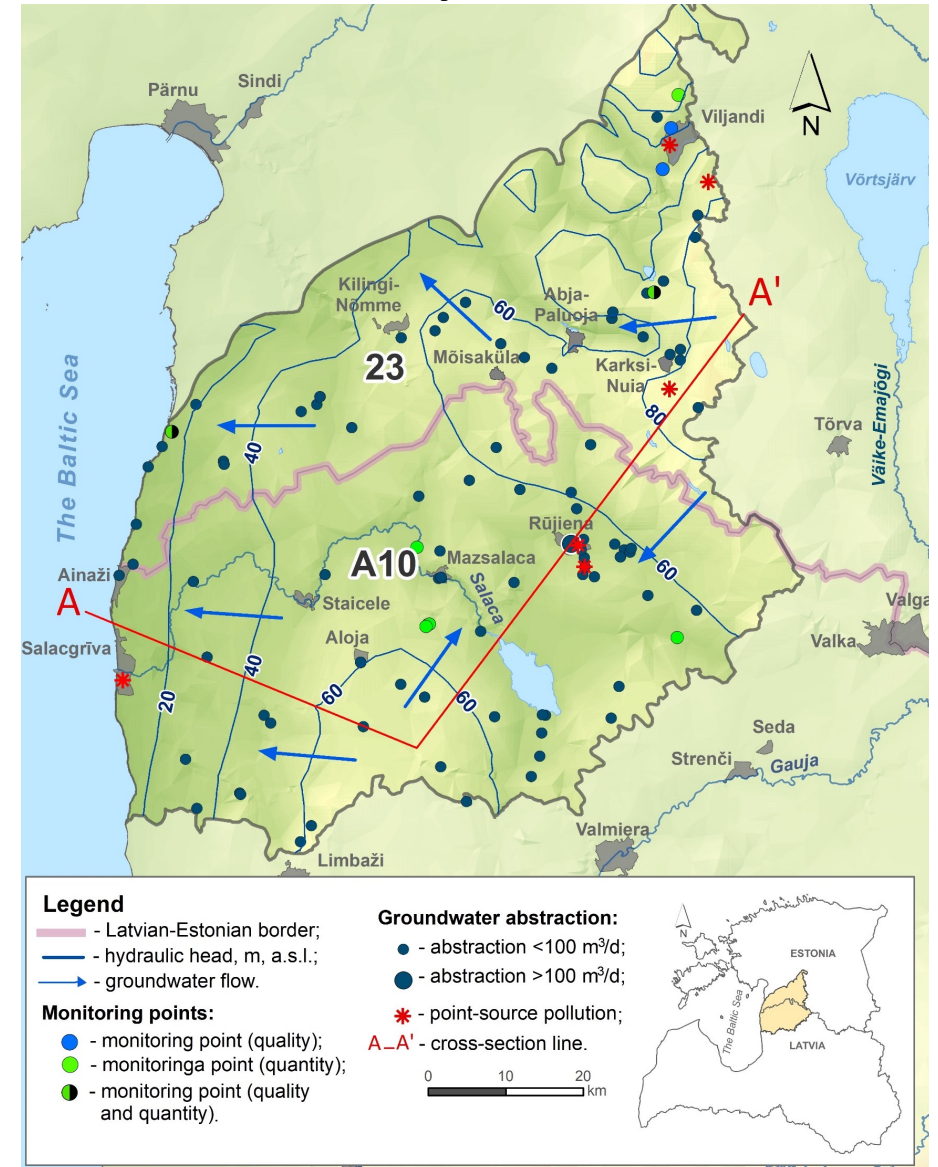
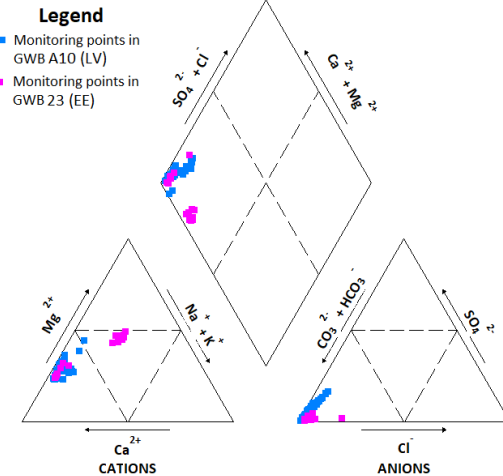
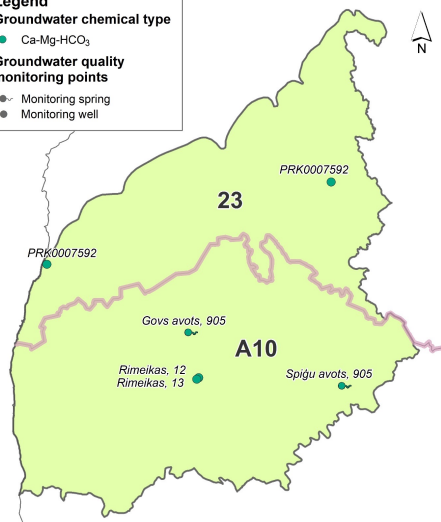


2. Initial characterization of transboundary GWBs

Conceptual model for GWB-1 (A10 & 25)



Legend
Groundwater chemical type
 ● Ca-Mg-HCO₃
Groundwater quality monitoring points
 ● Monitoring spring
 ● Monitoring well



Legend
 - Latvian-Estonian border;
 - hydraulic head, m, a.s.l.;
 - groundwater flow.

Groundwater abstraction:
 ● - abstraction <100 m³/d;
 ● - abstraction >100 m³/d;
 * - point-source pollution;
 A-A' - cross-section line.

Monitoring points:
 ● - monitoring point (quality);
 ● - monitoring point (quantity);
 ● - monitoring point (quality and quantity).

2. Initial characterization of transboundary GWBs

GWB-4 Lower-Middle Devonian aquifer system

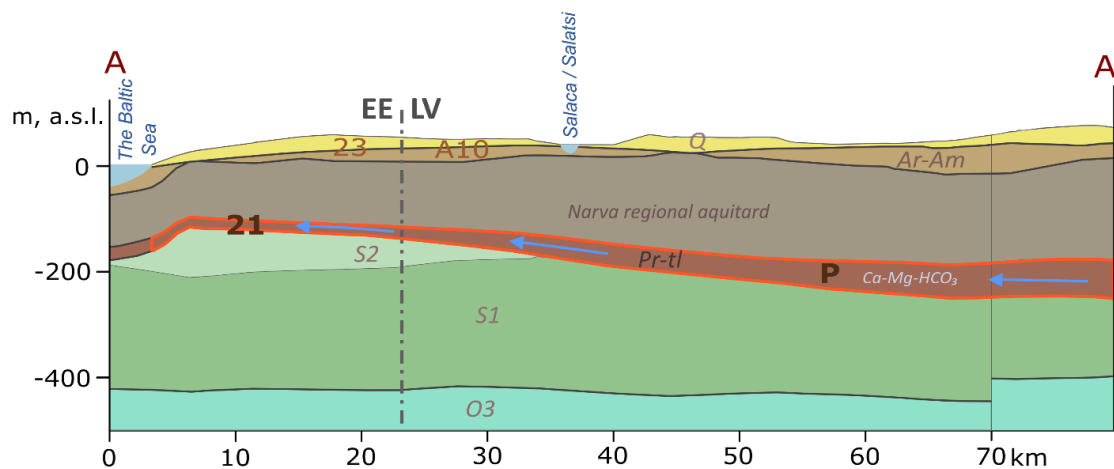
- **Total area:** 8844 km² (P – 4394 km²; 25 – 4450 km²)
- **Aquifer type** – porous;
- **Geology** – sandstones;
- **Overlying stata** – Narva regional aquitard, Upper-Middle Devonian GWBs;
- **Water use** – drinking water, industrial;
- **Pressure assessment:**

Aquifer system	GWB	Point source pressure	Diffuse source pressure	GW abstraction
4. Lower-Middle Devonian	21	Not significant	Not significant	Not significant
	P	Not significant	Not significant	Not significant

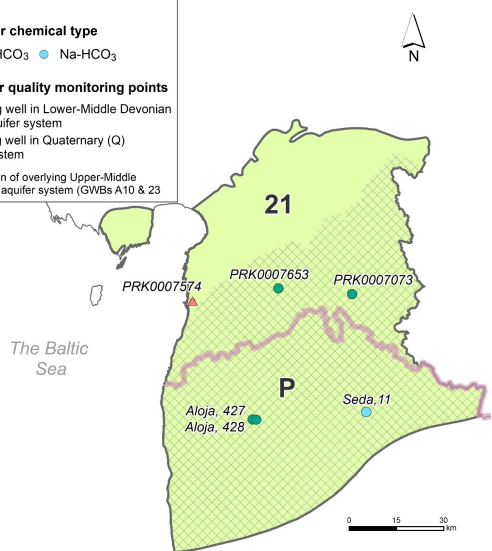


2. Initial characterization of transboundary GWBs

Conceptual model for GWB-4 (P & 21)

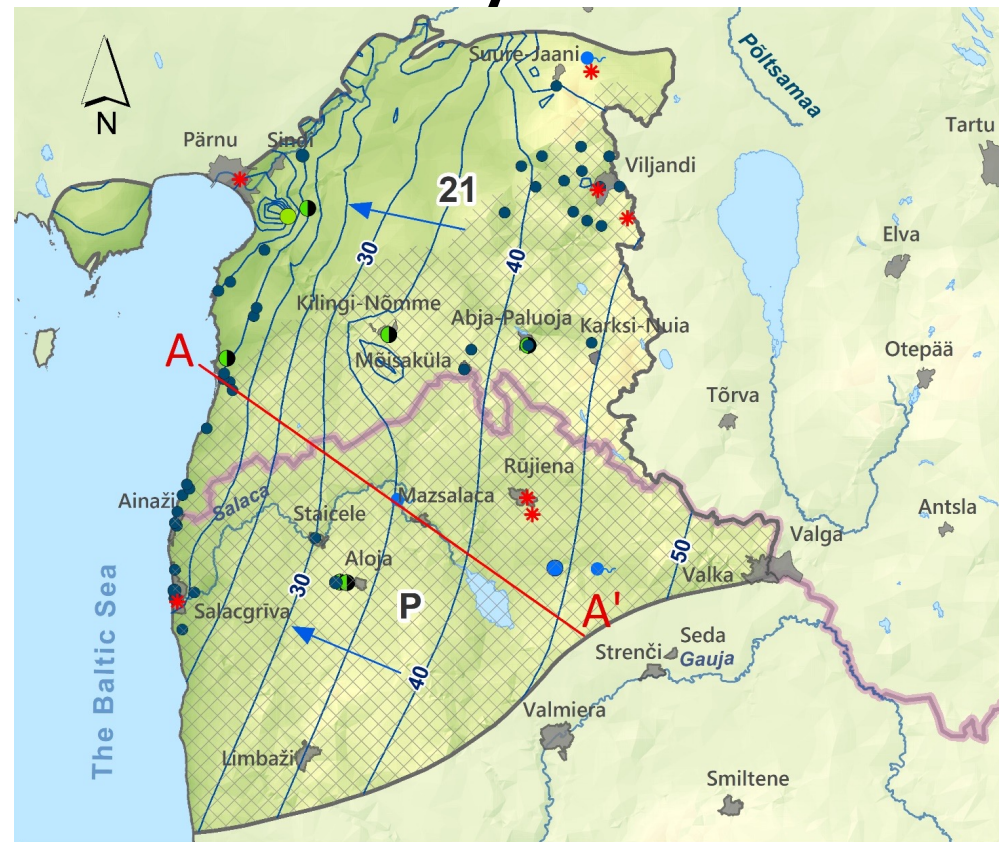
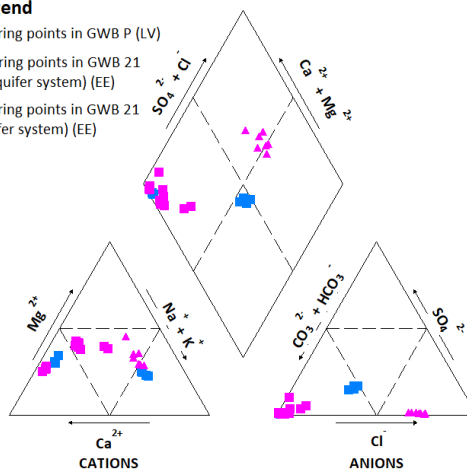


- Legend**
- Groundwater chemical type**
 - Ca-Mg-HCO₃
 - Na-HCO₃
 - Ca-Cl
 - Groundwater quality monitoring points**
 - Monitoring well in Lower-Middle Devonian (D₁₋₂) aquifer system
 - ▲ Monitoring well in Quaternary (Q) aquifer system
 - ▨ Distribution of overlying Upper-Middle Devonian aquifer system (GWBs A10 & 23)



Legend

- Monitoring points in GWB P (LV)
- Monitoring points in GWB 21 (D₁₋₂ aquifer system) (EE)
- ▲ Monitoring points in GWB 21 (Q aquifer system) (EE)



Legend

- Latvian-Estonian border;
- hydraulic head, m, a.s.l.;
- groundwater flow.

Monitoring points:

- - monitoring point (quality);
- - monitoring point (quantity);
- - monitoring point (quality and quantity).

Groundwater abstraction:

- - abstraction < 100 m³/d;
- - abstraction > 100 m³/d;
- * - point-source pollution;

A—A' - cross-section line;

- ▨ - overlying Upper-Middle Devonian aquifer system.



3. Status assessment of transboundary GWBs

Assessment carried out based on harmonized principles (WP1)

1. Chemical status assessment tests:

1. General quality assessment;
2. Saline or other intrusions;
3. Groundwater associated aquatic ecosystems;
4. Groundwater dependent terrestrial ecosystems;
5. Drinking water protected areas.

2. Quantitative status assessment tests:

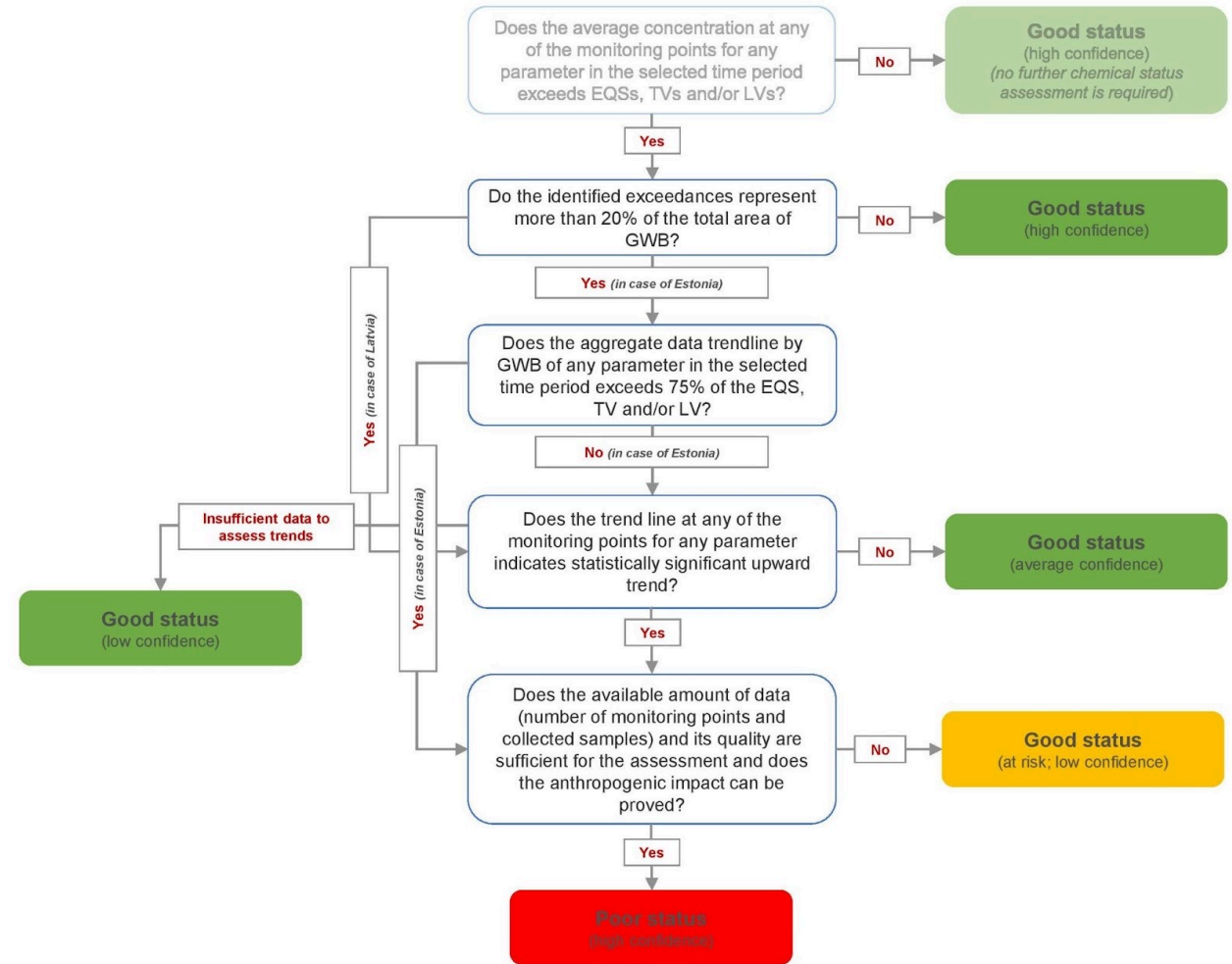
1. Water balance assessment test;
2. Saline or other intrusions;
3. Groundwater associated aquatic ecosystems;
4. Groundwater dependent terrestrial ecosystems.



Chemical status assessment

Test 1. General quality assessment

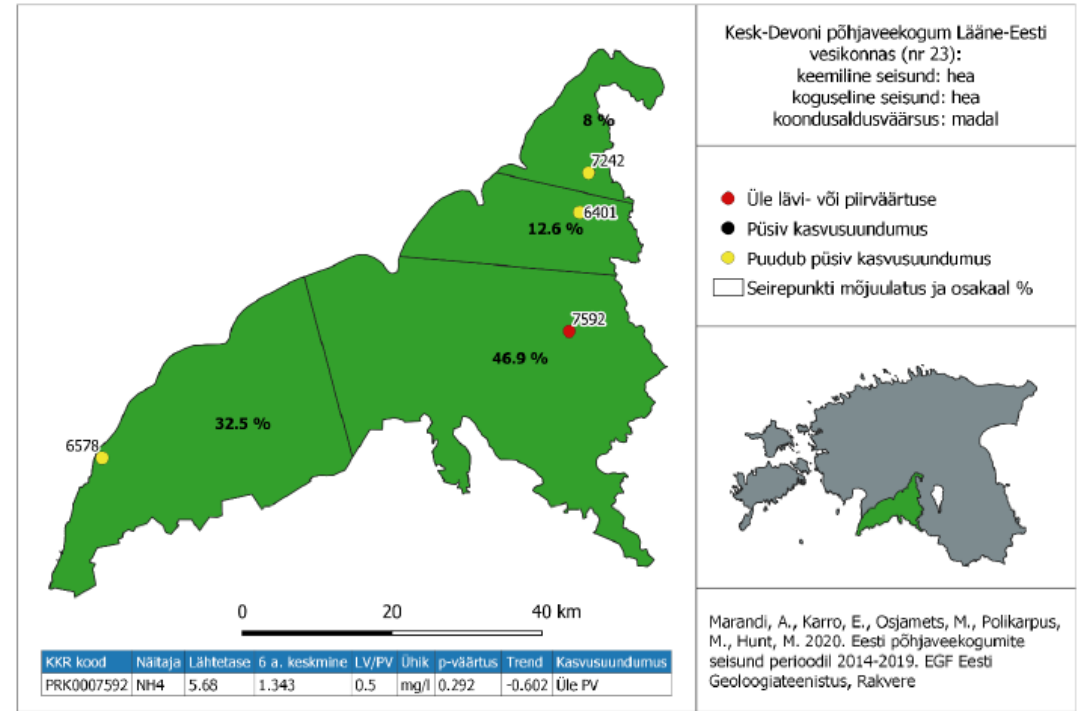
- **In Latvia** – exceedences of TVs in GWB D6 & A8 – do not exceed the 20% criterion - **good status with high confidence**;
- **In Estonia** – exceedences of TVs/LVs detected in GWB 23 & 21;
 - in GWB 21: mean COD values > TV, do not exceed 20% criterion – GWB in a **good status (high confidence)**;
 - in GWB 23: mean NH₄ values > TV; represents > 20% criterion; no significant upward trend detected - **good status with low confidence**;
- In GWBs A10, P, 25 and 26 no exceedences detected – **good status (high confidence)**, no further chemical status assessment required!



Chemical status assessment

Test 1. General quality assessment

- **In Latvia** – exceedences of TVs in GWB D6 & A8 – do not exceed the 20% criterion - **good status with high confidence**;
- **In Estonia** – exceedences of TVs/LVs detected in GWB 23 & 21;
 - in GWB 21: mean COD values > TV, do not exceed 20% criterion – GWB in a **good status (high confidence)**;
 - in GWB 23: mean NH₄ values > TV; represents > 20% criterion; no significant upward trend detected - **good status with low confidence**;
- In GWBs A10, P, 25 and 26 no exceedences detected – **good status (high confidence), no further chemical status assessment required!**

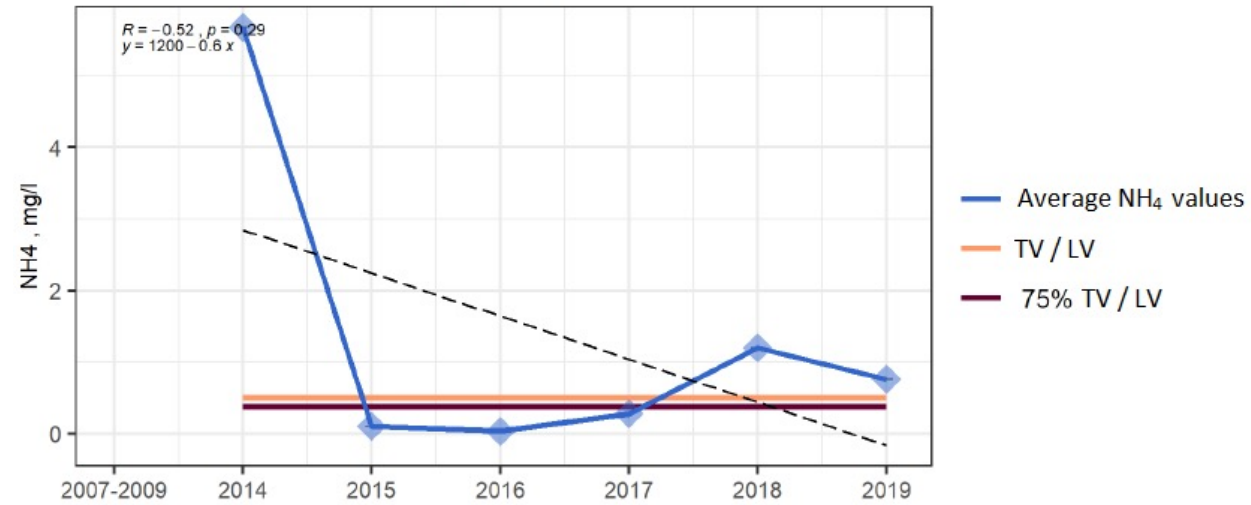


status
(confidence)
(chemical status
is required)

status
(confidence)

status
(confidence)

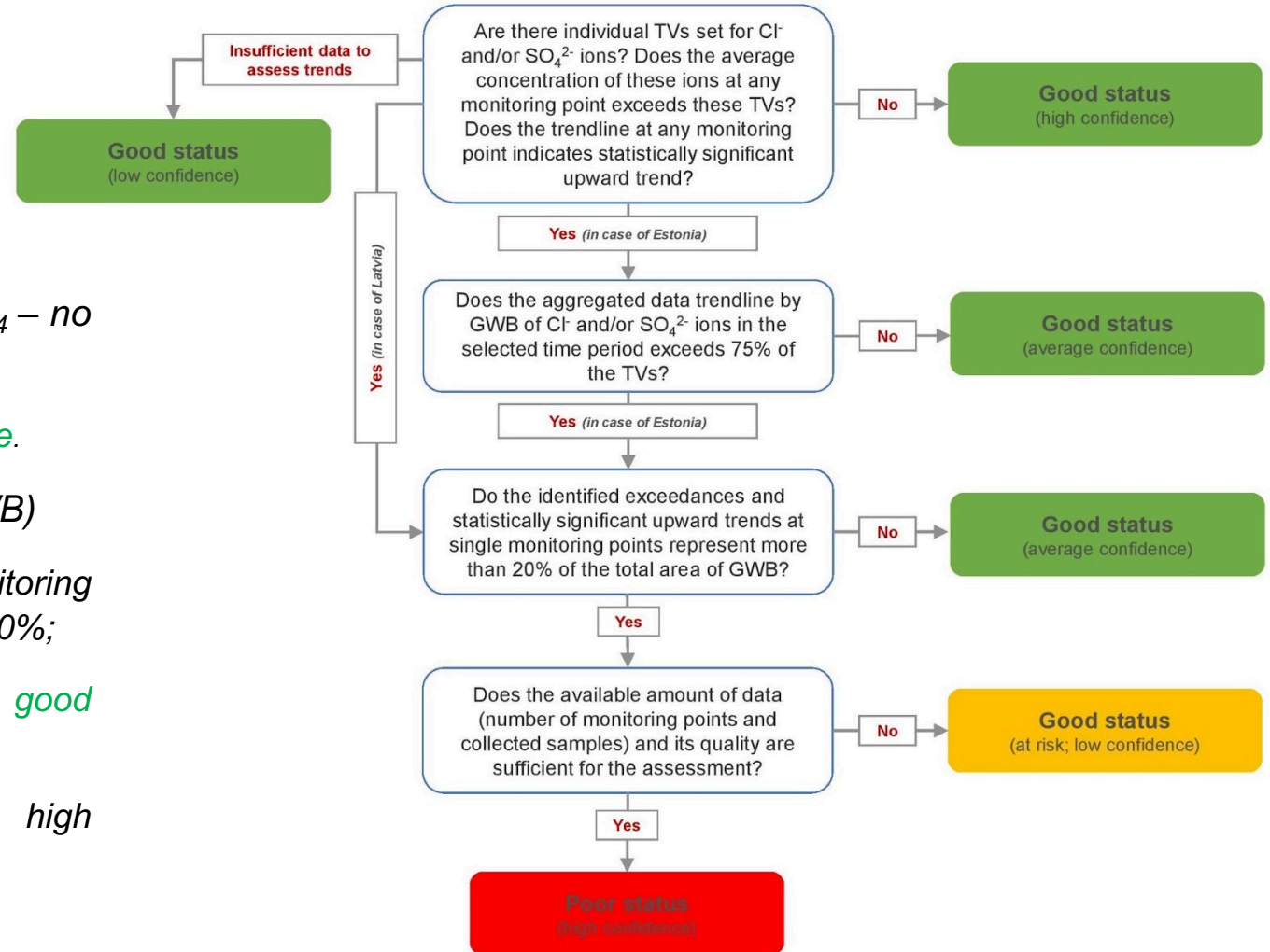
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Chemical status assessment

Test 2. Saline or other intrusion

- **In Estonia** – in GWBs no TVs set for Cl⁻ & SO₄²⁻ – no risk of intrusion – no further steps required);
 - all GWBs – **good status with high confidence**.
- **In Latvia** – TVs set for Cl⁻ & SO₄²⁻ (for each GWB)
 - Exceedences – GWB A8 in some monitoring points (not in border area); affected area <20%;
 - insufficient data set to perform trends – **good status with low confidence**;
 - all other GWBs – **good status with high confidence**.



Chemical status assessment

Test 3. Groundwater associated aquatic ecosystems (surface waters)

In Latvia – results from UL project (2021)*

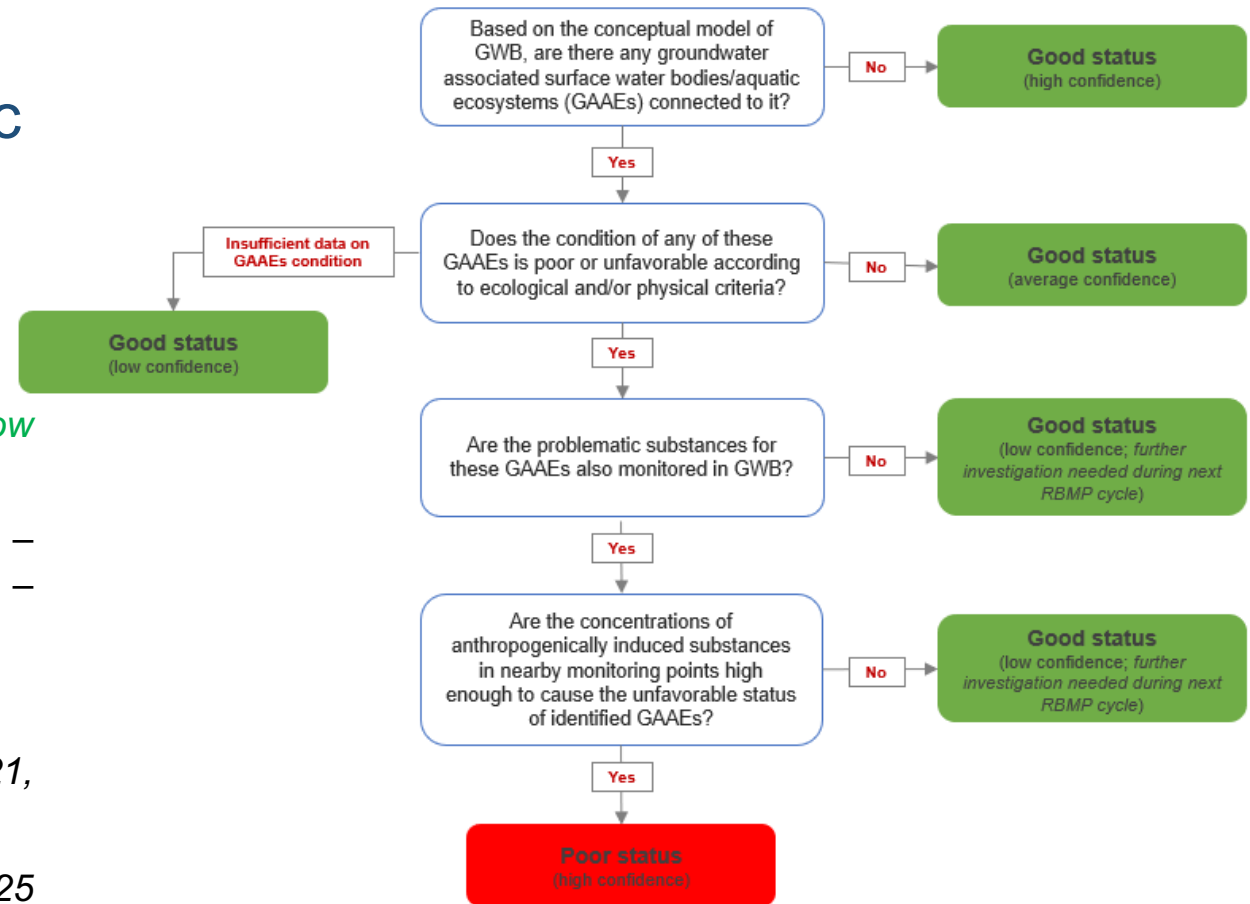
GAAEs identified in GWB A8 & D6.

- GWB D6: no poor quality GAAEs – *good status (low confidence)*;
- GWB A8 – 4 poor quality GAAEs were identified – poor ecological quality not related to groundwater – GWB A8 is in *good status (low confidence)*.

In Estonia – GAAEs identified in all transboundary GWBs (21, 23, 25, 26);

- According to GQA test – no need to assess GWB 25 & 26
- in GWB 21: 1 poor GAAE, lack of data - *good chemical status with low confidence*;
- In GWB 23: 3 poor GAAEs, but not because of GW - *good chemical status with average confidence*;

*No pazemes ūdeņiem atkarīgo ekosistēmu identificēšana un novērtēšana Latvijas pazemes ūdensobjektu līmenī (Identification and assessment of groundwater dependent ecosystems at the level of Latvian groundwater bodies). Project No. 1-08/205/2020. University of Latvia, 2021



Chemical status assessment

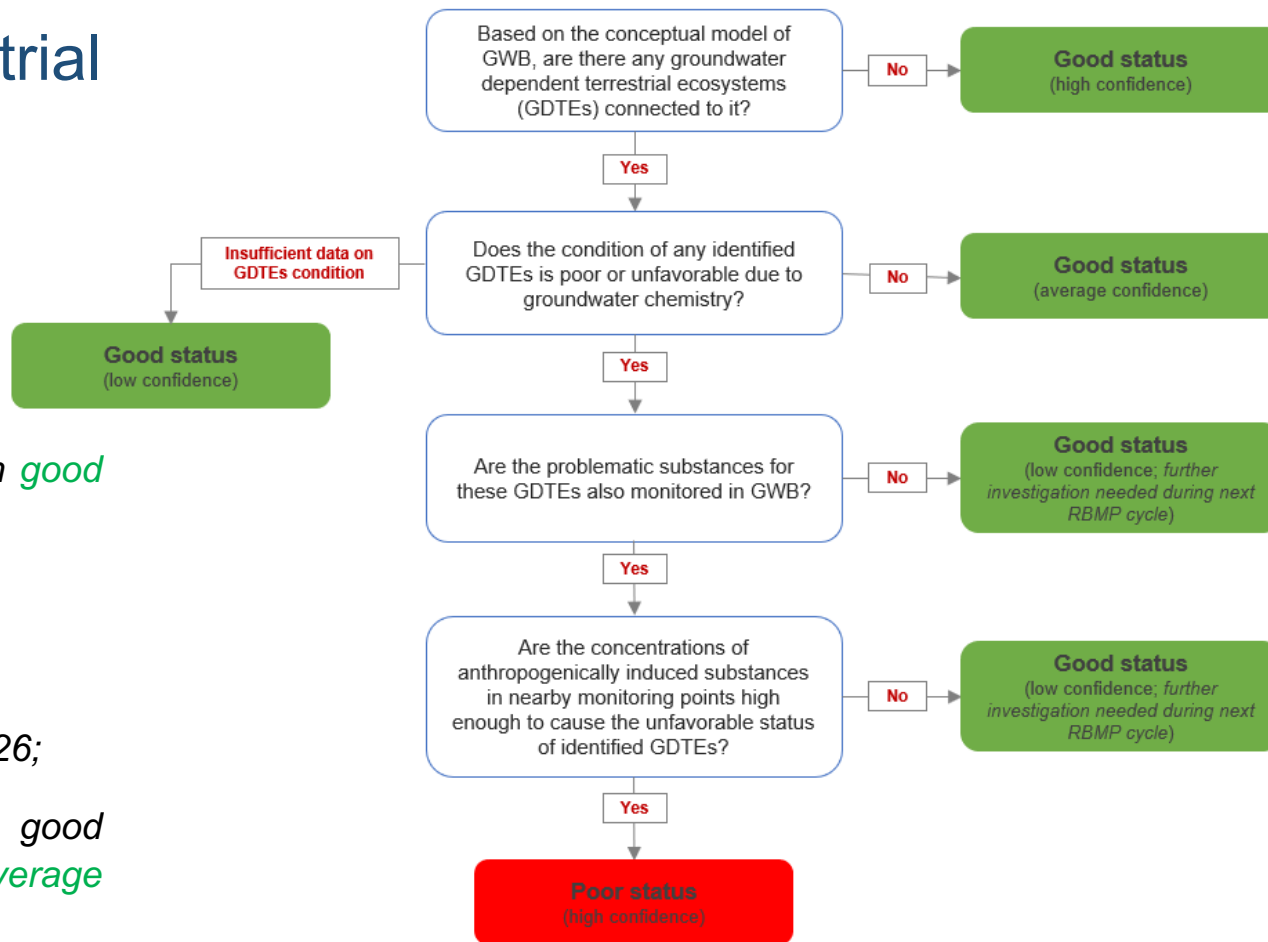
Test 4. Groundwater dependent terrestrial ecosystems (GDTEs)

In Latvia – GDTEs identified in GWBs D6, A8 & A10.

- According to GQA test – no need to assess GWB A10;
- GDTEs in poor or unfavorable status – D6, A8;
- Poor status of GDTEs not because of GW – GWBs in *good status (low confidence)*;

In Estonia – GDTEs identified in GWBs 23, 25, 26;

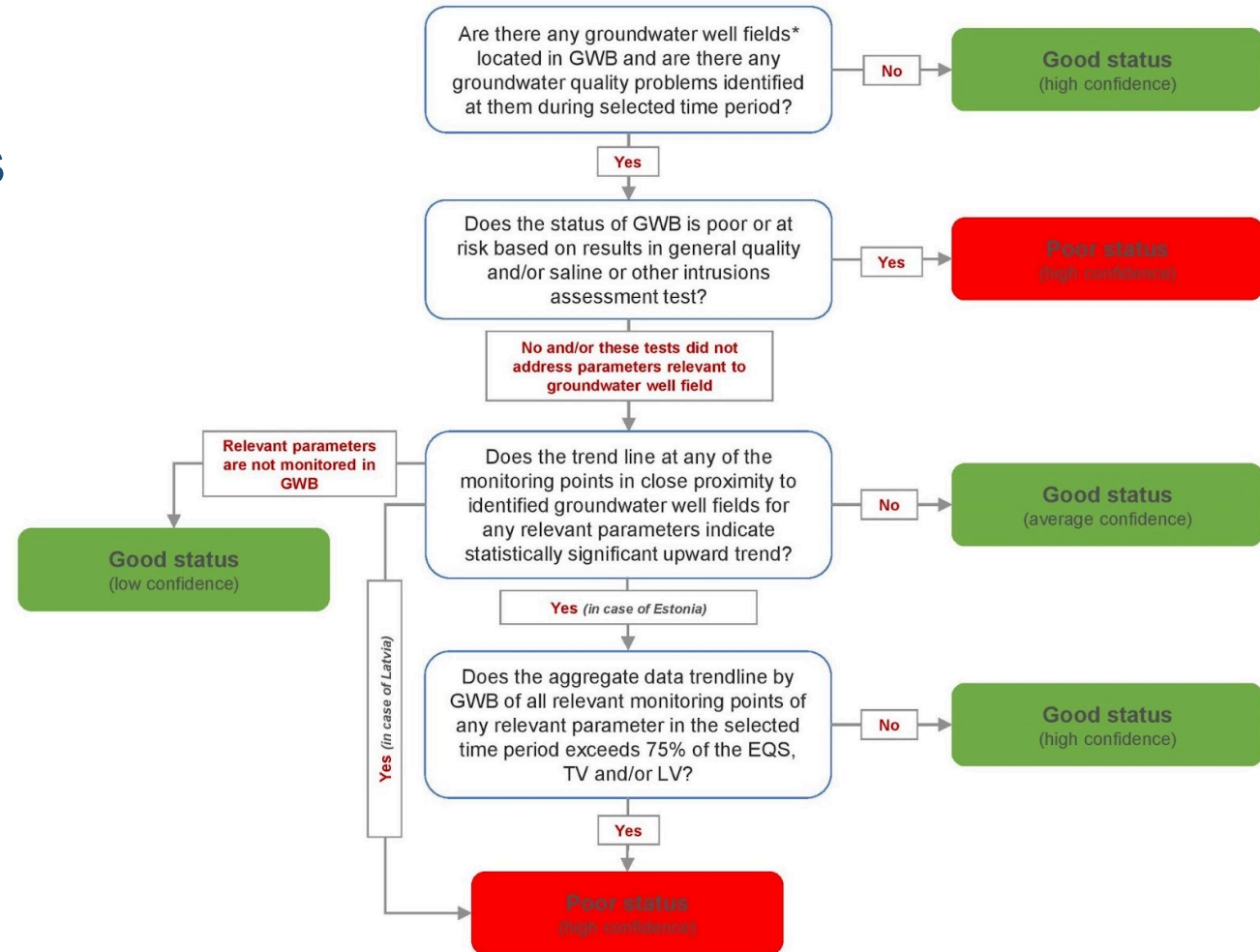
- According to GQA test – no need to assess GWBs 25, 26;
- In GWB 23 – no GDTEs with status lower than good identified – GWB in *good chemical status with average confidence*



Chemical status assessment

Test 5. Drinking water protected areas

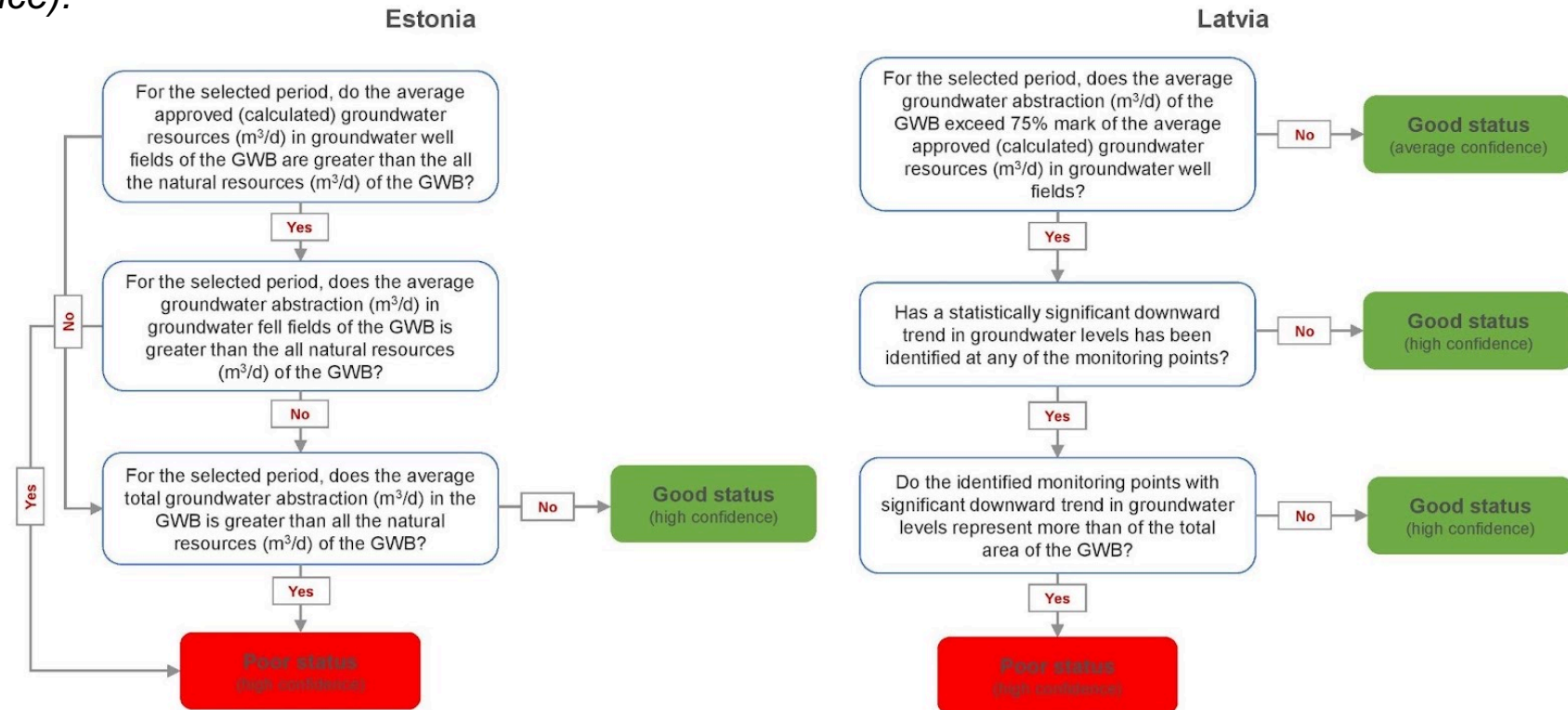
- **In Latvia** (well-field: $>100 \text{ m}^3/\text{d}$)
 - well-fields in all GWBs;
 - no quality problems for assessment period – GWBs in **good chemical status (high confidence)**;
- **In Estonia** (well-field: $>500 \text{ m}^3/\text{d}$)
 - well-fields located in GWB 21 & 23;
 - no quality problems identified for assessment period – GWBs on **good chemical status (high confidence)**;



Quantitative status assessment

Test 1. Water balance assessment test

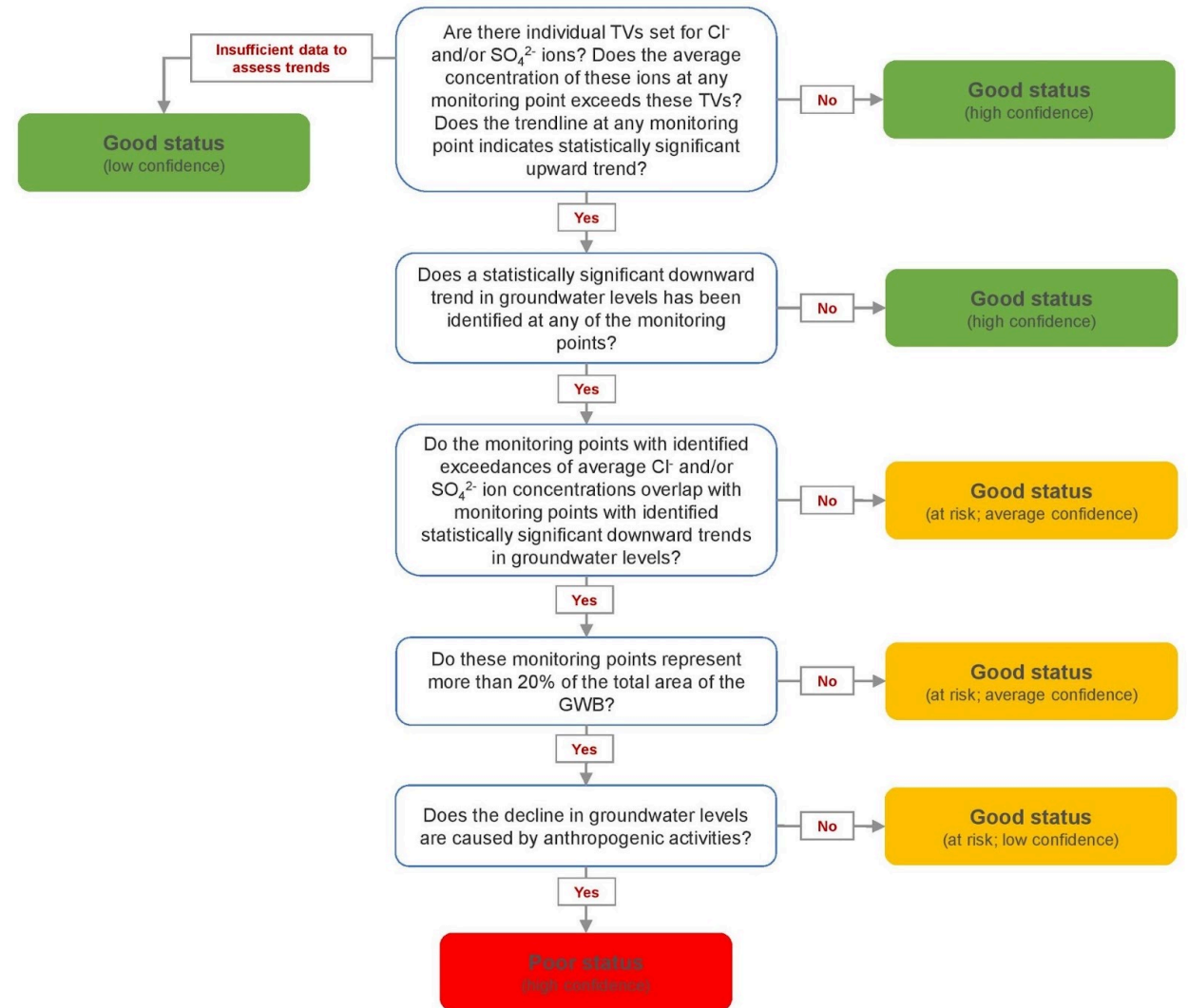
- **Different approaches** – not possible to harmonize;
- *GW abstraction in 2018 compared to natural GW resources (in Estonian case) or approved resources (in Latvian case);*
- **For both sides, GW abstraction do not exceeds the natural/approved resources** – GWBs are in **good quantitative status** (average/high confidence).



Quantitative status assessment

Test 2. Saline or other intrusion

- **In Estonia** – in GWBs no TVs set for Cl⁻ & SO₄²⁻ – no risk of intrusion – no further steps required);
 - all GWBs – **good status** with high confidence.
- **In Latvia** – TVs set for Cl⁻ & SO₄²⁻ (for each GWB)
 - Exceedences – GWB A8 in some monitoring points (not in border area); affected area <20%;
 - insufficient data set to perform trends – **good status** with low confidence;
 - all other GWBs – **good status** with high confidence.



Quantitative status assessment

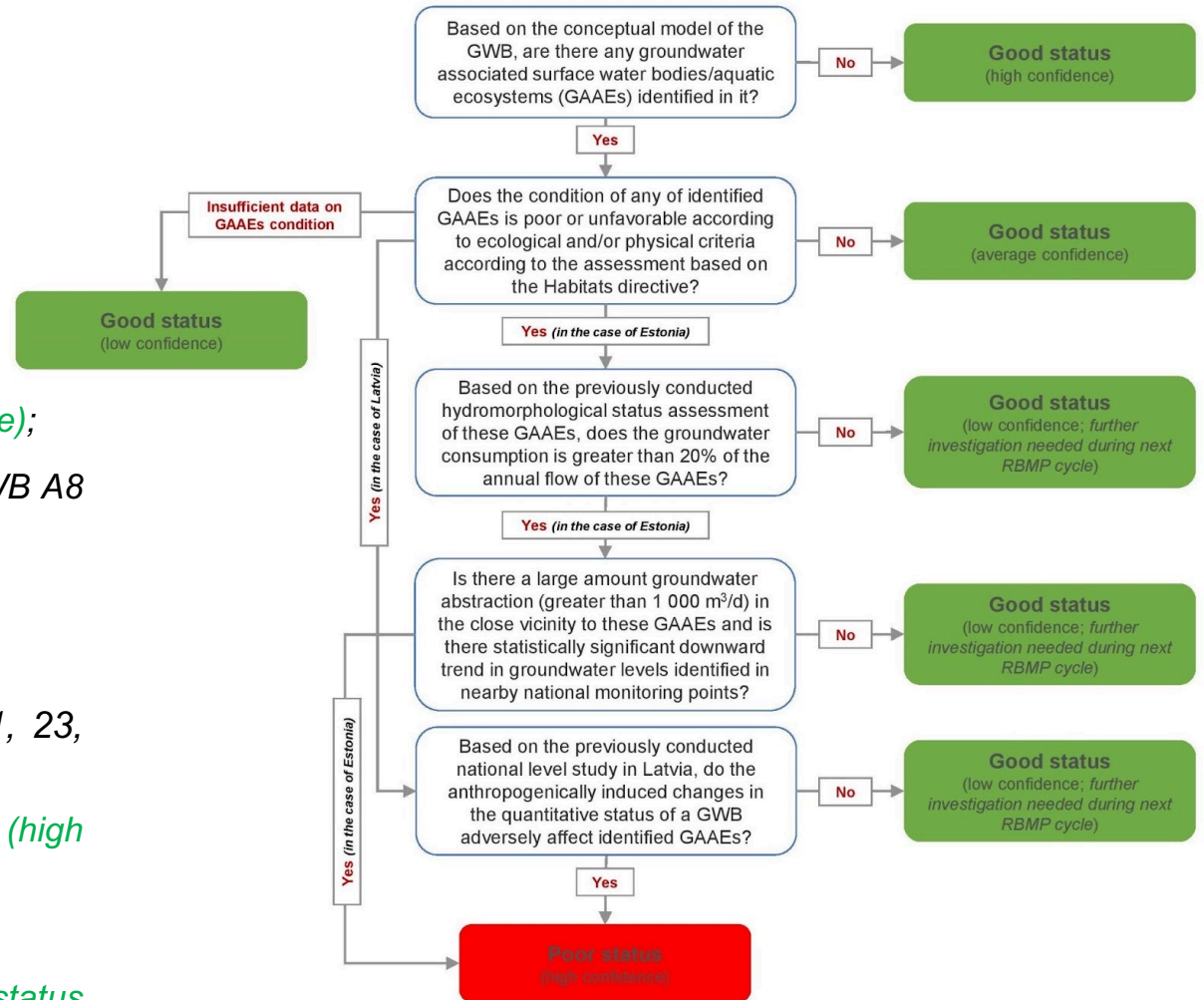
Test 3. Groundwater associated aquatic ecosystems (surface waters)

In Latvia – GAAEs identified in GWB A8 & D6;

- In GWB D6 are no poor GAAEs – **good status (average confidence)**;
- GWB A8 – 4 GAAEs with poor quality – not because of GW– GWB A8 is in **good status (low confidence)**;
- No GAAEs in GWB A10 & P – **good status with high confidence**.

In Estonia – GAAEs identified in all transboundary GWBs (21, 23, 25, 26).

- GWB 25 all GAAEs in good quality – GWB in a **good status (high confidence)**;
- Poor quality GAAEs in GWBs 21, 23, 26;
- GWB 23 – poor GAAEs not because of GW – GWB in a **good status (average confidence)**;
- GWBs 21 & 26: Water abstraction <20 % of annual flow (rivers) – **GWBs are in good quantitative status with low confidence** and further investigation is required in the next RBMP planning period.



Quantitative status assessment

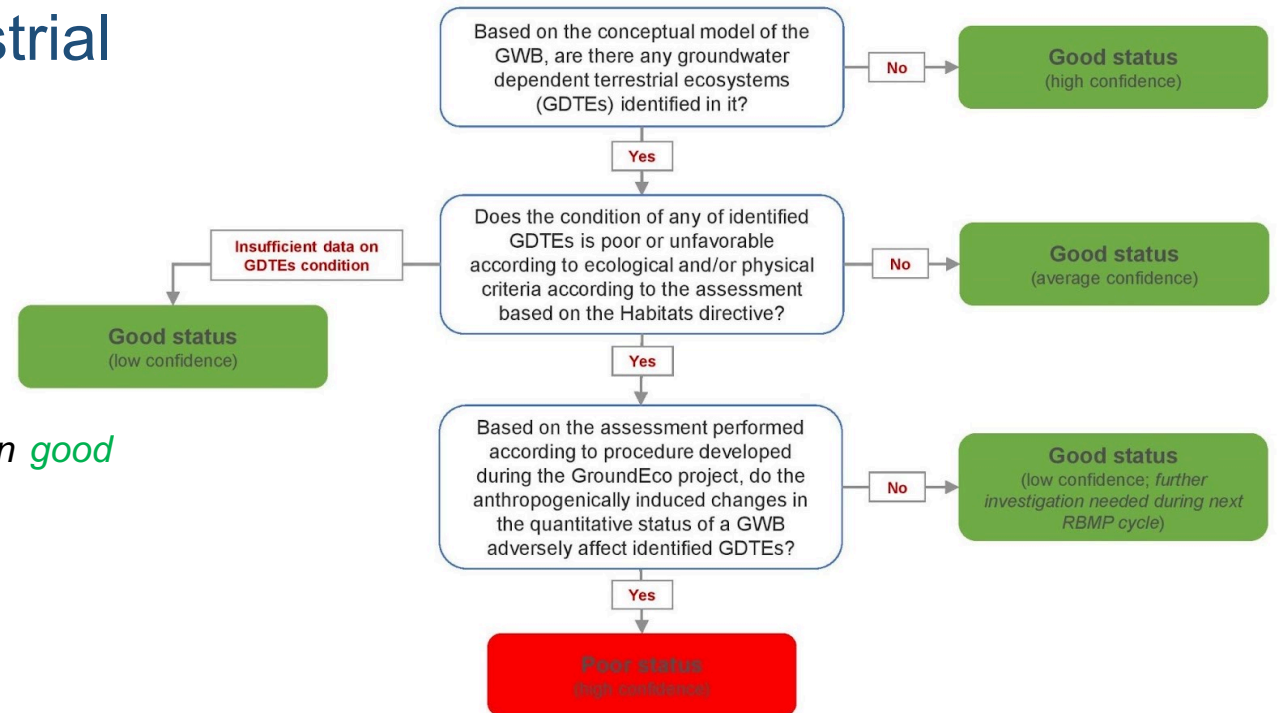
Test 4. Groundwater dependent terrestrial ecosystems (GDTEs)

In Latvia – GDTEs identified in GWBs D6, A8 & A10.

- No GDTEs in GWB P – **good status** (high confidence)
- GDTEs in poor or unfavorable status – D6, A8 & A10;
- Poor status of GDTEs not because of GW – GWBs in **good status** (low confidence);

In Estonia – GDTEs identified in GWBs 23, 25, 26;

- No GDTEs in GWB 21 – **good status** (high confidence)
- In GWBs 23, 25, 26 – no GDTEs with status lower than good identified – GWB in **good chemical status with average confidence**



Summary of transboundary GWBs assessment

1. Chemical status assessment tests:

1. General quality assessment – *good status*;
2. Saline or other intrusions – *good status*;
3. Groundwater associated aquatic ecosystems – *good status*;
4. Groundwater dependent terrestrial ecosystems – *good status*;
5. Drinking water protected areas – *good status*.

2. Quantitative status assessment tests:

1. Water balance assessment test – *good status*;
2. Saline or other intrusions – *good status*;
3. Groundwater associated aquatic ecosystems – *good status*;
4. Groundwater dependent terrestrial ecosystems – *good status*.



Recommendations for further TB groundwater management

1. **Cooperation improvement** (agreements updated, establish a working group, projects);
2. **Periodic meetings, discussions and harmonized activities** - good tool for cross-border cooperation and development of TB water management plans in RBMPs;
3. For LV-EE common GW resources – **in future more focus on Gauja-Koiva RB;**
4. According to developed **TB monitoring program – data exchange.**



Thank you!



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bit.ly/WaterAct-project



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MINISTRY OF THE ENVIRONMENT



Nature
Conservation Agency
Republic of Latvia



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