





Estonian-Latvian cooperation: project "GeoRefAct"

K. Kollo¹, I. Liepiņš², A. Rüdja¹, J. Sakne², J. Metsar¹, M. Znotiņa², K. Kosenko², A. Keiselis², V. Zuševics²

EUROPEAN UNION

¹ Estonian Land Board

² Latvian Geospatial Information Agency

NKG General Assembly, 5-8 September, Copenhagen, Denmark

Estonian-Latvian cooperation

- Interreg V-A Estonian-Latvian programme
- Project "Harmonization of Estonian and Latvian geodetic systems in border areas" (GeoRefAct)
- Project period 2021-2022
 - Financed by the European Regional Development Fund: 425 000 EUR
 - Co-financed by the partners: 75 000 EUR
- Project partners: Estonian Land Board and Latvian Geospatial Information Agency
- Project activities:

Measurements and computations of national GNSS and levelling networks in border area, local network of twin-city Valga/Valka and gravity survey in Northern Latvia

Results: coordinate and height transformation models including web-based services



Project "GeoRefAct"

- The most up-to-date geodetic strategy will be used in the implementation of the project
 - The methodology to be developed includes the principles of geodetic data assessment, data processing and modelling of geodata transition surfaces
- Common measurements in the border region will be performed (measurements using high-precision global positioning, relative gravity, high-precision levelling, as well as traversing and levelling in the Valka/Valga region)
 - Results of the measurements serve as the basis for detection of differences between Latvian and Estonian geodetic systems
 - Transition surfaces between Latvian and Estonian geodetic systems are modelled based on differences detected by high-precision geodata
- Project outcomes will be made available for a wider audience free of charge
 - Web-services will be available through ELB and LGIA web-pages



GeoRefAct





• 2021

- Methodologies for common measurements and computations – February-May 2022
 - GNSS, high-precision levelling, Valga/Valka local geodetic network (traversing and high-precision levelling), gravity
- Field measurements May-September 2021
 - GNSS, high-precision levelling, geodetic measurements in Valga/Valka
- Preliminary computations September-December 2022

• 2022

- Gravity measurements April-August 2022
- Calculations January-October 2022
 - (GNSS, high-precision levelling, Valga/Valka local geodetic network (traversing and high-precision levelling), gravity)
- Compilation of transition models (for coordinates and heights) – July-November 2022
- Seminars– December 2022/January 2023

GNSS: May – June 2021





High-precision levelling: September 2021





Valga/Valka GNSS + traverse + levelling: August 2021





Relative gravity measurements: April – August 2022 Calibration of gravimeters: April 2022 in Estonia Relative gravity measurements by LGIA





Data Processing, Levelling







Point no 2128, BM ID 4402

B 57 46 35.16126, *L* 26 01 23.37819

H[m] zero	Source	Diff to LAS-2000,5 [mm]	Diff to EH2000 [mm]
51.07090	H _{LAS-2000,5} ; EVRF	0	-7.4
51.07834	$H_{ m EH2000}$	7.4	0

Data Processing, Levelling



(EE Init H Zero, OBS Zero) EH and LAS – New



Estimated variance component	1.0		
Largest residual	1.15 mm		
Average precision, <i>H</i>	1.45 mm		
Homogeneity of precision, <i>H</i> :	RMS	0.98 mm	
	MAX	6.93 mm	
	MIN	0.05 mm	

- Weighting by lines/line groups: 5
- NKG2005LU
- Epoch 2000.0

Data Processing, GNSS



• Two steps:

- CORS
- Static points
- Bernese GNSS Software version 5.2





Data Processing, GNSS

Differences between EE and LV solutions





- Step 1
 - RMS < 0.1 mm
 - AVE repeatability, mm
 - N 0.55, E 0.67, Up 2.29
- Step 2
 - RMS < 1 mm
 - AVE repeatability, mm

N 3.87, E 3.57, Up 5.00

• Modeling is in progress

Data Processing, twin city Valga-Valka





	L-EST97	LKS92	LKS20
Estimated variance component, S	0.6	0.7	0.7
Estimated variance component, Hz	0.7	0.6	0.7
Largest residual, S [mm]	3.4	5.1	3.3
Largest residual, Hz [mgon]	5.4	6.5	5.4
Average precision, <i>x</i> [<i>mm</i>]	2.2	2.4	2.2
Homogeneity of precision, x: RMS [mm]	1.1	1.1	1.1
MAX [mm]	5.5	5.6	5.6
MIN [mm]	0.5	0.6	0.5
Average precision, y [mm]	2.0	2.2	2.0
Homogeneity of precision, y: RMS [mm]	0.8	0.9	0.8
MAX [mm]	4.3	4.5	4.2
MIN [mm]	0.7	0.8	0.7

• Modeling is in progress

Karin Kollo

lvars Liepiņš

Karin.Kollo@maaamet.ee

Ivars.Liepins@lgia.gov.lv



Estonia–Latvia programme 2014–2020 We support ideas that help Estonia and Latvia to grow through neighbourly cooperation

PROJECT

GeoRefAct

Harmonization of Estonian and Latvian geodetic systems in border areas

Financed by the European Regional Development Fund: Co-financed by the partners:

425 000 €

75 000 €

www.estlat.eu





EUROPEAN UNION



