

**EHITUSTEADUSKOND**  
**TEEDEINSTITUUT**  
**TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2013**

## **1. Instituudi struktuur**

**Teedeinstituut, Department of Road Engineering**  
**Instituudi direktor Andrus Aavik**

- Geodeesia õppetool, Chair of Geodesy, Artu Ellmann
- Sillaehituse õppetool, Chair of Bridge Engineering, Siim Idnurm
- Teetehnika õppetool, Chair of Road Engineering, Andrus Aavik
- Teede ja liikluse teadus- ja katselaboratoorium, Laboratory of Roads and Traffic, Ott Talvik

## **2. Instituudi teadus- ja arendustegevuse (edaspidi T&A) iseloomustus**

### **2.1 struktuuriüksuse koosseisu kuuluvate uurimisgruppide**

#### **2.1.1 teadustöö kirjeldus:**

##### Structural condition evaluation of pavements and bridges

First aim was to study possibility and effectiveness of use of geosynthetics in pavement structures based on the example of reconstruction of national road 15111 and to give recommendations for construction and reconstruction of road sections crossing swamp areas.

Second aim is to determine the correct test method for the filtration modulus of pavement drainage layers and embankment soils and to prepare the corresponding Estonian standard. Also to test mineral materials available in Estonian quarries which are satisfying filtration requirements to be used in road structural layers.

On the area of bridge research the analyses of condition of bridge joints at all Estonian state road network has been finished. Also most preferable joint structures are determined for Estonian condition.

##### Transport planning and transport impacts

The main research topics in the field of transport planning and transport impacts have been related to analysis of transport growth and its impact. An important traditional research area is traffic safety, where TUT has strong position at research and training areas (road safety auditing and inspection, road network impact analysis, safety analysis, etc).

##### Validation of marine geoid models by ALS technology

The main aim of this continuously ongoing research is to validate accuracy of gravimetric geoid models (GRAV-GEI0ID2011 in particular) over marine areas. In this respect the nadir-range airborne laser scanning data seem to be very promising. However, issues related to ALS data acquisition methodology, elimination of possible systematic errors, data processing, analysis and accuracy estimations need a very throughout investigations.

##### Implementation of the airborne LIDAR and terrestrial laser scanner technology

The Geodesy chair is involved in the research on applicability airborne LIDAR data-series for monitoring coastal processes, detecting of ground surface in areas of complicated relief, etc.

The terrestrial laser scanning (TLS) technology is primarily investigated for enhancing acquisition spatial data of man-made and natural targets. Of particular interest are monitoring of 3D deformations of different construction types. Methods of incorporating the TLS-data into Building information modeling (BIM) are studied as well.

Both the airborne LIDAR and TLS technologies are applied for geoinformatic development of biodiversity, soil and Earth data systems.

#### 2.1.2 aruandeaastal saadud tähtsamad teadustulemused:

##### Structural condition evaluation of pavements and bridges

Main results in 2013 involve the analysis of values of deformation, bearing capacity and roughness dependency from the presence of geosynthetics at pavement structure, started at 2009. Recommendations for use of geosynthetics in swampy area were drafted.

The correct test method for the determination of filtration modulus of pavement drainage layers and embankment soils was defined. Filtration properties of mineral material from 27 quarries were determined.

The condition analyses of bridge joints at all Estonian state road network has been finished. Most preferable joint structures are determined for Estonian condition.

##### Transport planning and transport impacts

As in previous years we have been active on regular analysis of transport development trends focusing on traffic flows and loads change estimation.

##### Estimation of across-water height differences by precise hydrodynamic levelling

In cooperation with the Estonian University of Life Sciences and TUT Marine Systems Institute estimation of across-water height differences by precise hydrodynamic levelling using pressure gauges in West-Estonian Archipelago. The results to be applied for improvement of the Estonian National Levelling Network.

#### 2.2 Uurimisgrupi kuni 5 olulisemat publikatsiooni läinud aastal:

##### 1.1.

- Janulevicius, J.; Cygas, D.; Giniotis, V.; Aavik, A. (2013). Assumptions to road pavement testing by non-destructive means. *The Baltic Journal of Road and Bridge Engineering*, 8(4), 227 - 231.
- Mill, T.; Alt, A.; Liias, R. (2013). Combined 3D building surveying techniques – terrestrial laser scanning (TLS) and total station surveying for BIM data management purposes. *Journal of Civil Engineering and Management*, 19, S23 - S32.
- Liibus, A.; Ellmann, A.; Kõuts, T.; Jürgenson, H. (2013). Precise Hydrodynamic Leveling by Using Pressure Gauges. *Marine Geodesy*, 36(2), 138 - 163.
- Vaníček, P.; Kingdon, R.; Kuhn, M.; Ellmann, A.; Featherstone, W.E; Santos, M.C.; Martinec, Z.; Hirt, C.; Avalos, D. (2013). Testing Stokes-Helmert geoid model computation on a synthetic gravity field: experiences and shortcomings. *Studia Geophysica et Geodaetica*, 57(3), 369 - 400.
- 3.1
- Gruno, A.; Liibus, A.; Ellmann, A.; Oja, T.; Vain, A.; Jürgenson, H. (2013). Determining sea surface heights using small footprint airborne laser scanning. Bostater, C.; Mertikas, S.; Neyt, X. (Toim.). *Remote Sensing of the Ocean, Sea Ice, Coastal Waters, and Large Water Regions 2013 (Conference 8888)*; Dresden, Germany, September 23, 2013 (88880R-1 - 88880R-13).Spie - International Society For Optical Engineering

**2.3** Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustest.

**2.4** Loetelu struktuuriüksuse töötajatest, kes on välisakadeemiate või muude oluliste T&A-ga seotud välisorganisatsioonide liikmed:

Andrus Aavik: World Road Association (PIARC), tehniline komitee Road Pavements, liige; Transportation Research Board of the National Academies (USA) representative for Tallinn University of Technology.

Artu Ellmann: International Association of Geodesy, Eesti korrespondentliige.

**2.5** Aruandeaasta tähtsamad T&A finantseerimise allikad:

- Siseriiklikud lepingud;
- Välisriiklikud lepingud;
- Konsultatsioonilepingud.

**2.6** Soovi korral lisada aruandeaastal saadud T&A-ga seotud tunnustusi (va punktis 2.3 toodud tunnustused), ülevaate teaduskorralduslikust tegevusest, teadlasmobiilsusest ning anda hinnang oma teadustulemustele.

**2.7** Instituudi teadus- ja arendustegevuse teemade ja projektide nimetused (*Eesti Teadusinfosüsteemi, edaspidi ETIS, andmetel*)

**2.8** Struktuuriüksuse töötajate poolt avaldatud eelretsenseeritavad teaduspublikatsioonid (*ETIS klassifikaatori alusel 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1 ja 5.1*).

**2.9** Struktuuriüksuses kaitstud doktoriväitekirjade loetelu (*NB! struktuuriüksus lisab struktuuriüksuse töötaja juhendamisel mujal kaitstud doktoriväitekirjade loetelu*)

**2.10** Struktuuriüksuses järel doktorina T&A-s osalenud isikute loetelu (*ETIS-e kaudu esitatud taotluste alusel*)

**2.11** Struktuuriüksuses loodud tööstusomandi loetelu

**3. Struktuuriüksuse infrastruktuuri uuendamise loetelu** (*summa eurodes*)