Innovations in Education at Faculty ITC and within Land Administration Programme

dr. Dimo Todorovski, Course Coordinator Land Administration Programme

Symposium on Land Administration
Civil Engineering Department, PES University,
31 January 2017, Bangalore, Karnataka, India
UNIVERSITY OF TWENTE.
HIGH TECH HUMAN TOUCH

- An entrepreneurial campus university established in 1961
- More than 10,000 students
- 3,300 staff members / 6 Faculties
  - **BMS** Behavioural, Management and Social Sciences
  - **ET** Engineering Technology
  - **EEMCS** Electrical Engineering, Mathematics and Computer Science
  - **ITC Geo-Information Science and Earth Observation**
  - **TNW** Science and Technology
Location

The Netherlands – in the cultural heartlands of Europe

Enschede:

• A distinctive modern and lively university town
• At the Eastern border of the Netherlands
• Surrounded by remarkable spots of natural beauty and tranquility
• Excellent connections to Amsterdam, Brussels, Paris, London, Zurich and Berlin
• An ideal center of operations
Faculty for Geo-Information Sciences and Earth Observations - ITC

#GWF2017

www.geospatialworldforum.org
ITC ESTABLISHED IN 1950

1950
**International Training Centre for Aerial Survey, ITC**

1968
International Institute for Aerial Survey and Earth Sciences, ITC

1985
International Institute for Aerospace Survey and Earth Sciences, ITC

2002
International Institute for Geo-Information Science and Earth Observation, ITC

2010
Faculty of Geo-Information Science and Earth Observation, ITC

University of Twente
“ITC is recognized worldwide for achievements in teaching, research and capacity development in the field of geo-information sciences and earth observation. We educate our students to be professionals, capable of acquiring knowledge and translating this into practical applications for solving real-world problems.”
Six departments operating as centres of excellence

Covering the different fields of disciplinary interest that encompass ITC's core mission:

- Earth Observation Science
- Earth Systems Analysis
- Geo-information Processing
- Urban and Regional Planning and Geo-information Management
- Natural Resources
- Water Resources
Spatial information for assessing natural hazards and disaster risk

**Themes**
- Natural hazard assessment and monitoring
- Hazard process modeling
- Geo-technical engineering
- Elements at risk mapping
- Vulnerability and risk assessment
- Risk reduction planning
- Disaster preparedness
- Damage assessment and post-disaster rehabilitation
Exploration for minerals and geothermal energy to secure our future supplies

**Themes**

- Exploration, mapping and characterization of mineral resources
- Active geothermal systems as a sustainable energy source.
GEO-INFORMATICS

Technologies supporting the collection, analysis, distribution, and use of spatial data

Themes
• Principles of databases
• Programming
• Design and optimization of geodata processing
• Image processing techniques and spatial data quality
• Geo-information sharing and distribution
• Web technology for GIS
• Mapping, and visualization and distribution of geospatial data.
LAND ADMINISTRATION

A critical success factor in economic growth, food security, nature conservation and poverty reduction

Themes

• Information technology and information management for land administration systems
• Spatial data infrastructures
Sustainable management of the Earth’s natural resources is of concern to us all

**Themes**

- Forestry
- Agriculture
- Environment
Understanding urban processes and contributing to sustainable urban development

Themes
• Urban transport
• Infrastructure and social services
• Quality of urban life
• Urban modelling
• Planning and evaluation approaches
• Disaster risk management
• Urban environmental planning
• Participatory GIS
WATER RESOURCES MANAGEMENT

Improving water management through spatial information on water resources

Themes

• Environmental hydrology
  freshwater, wetland and coastal zone interactions and the environmental impacts of water resources projects

• Surface hydrology
  water quantity aspects (flooding, agricultural water use, climate) from local to regional scale

• Groundwater assessment and modelling
  subsurface processes and the use of spatial models for groundwater assessment and management
COURSE PARTICIPANTS 1950-2015
ORIGIN OF ITC STUDENTS, EXCLUDING EXTRAMURAL AND PHD

<table>
<thead>
<tr>
<th>Region</th>
<th>Students 1950-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>9,880</td>
</tr>
<tr>
<td>Africa</td>
<td>7,017</td>
</tr>
<tr>
<td>Europe</td>
<td>3,555</td>
</tr>
<tr>
<td>America</td>
<td>2,257</td>
</tr>
<tr>
<td>Australia &amp; Oceania</td>
<td>190</td>
</tr>
<tr>
<td>N/A</td>
<td>90</td>
</tr>
<tr>
<td><strong>Total students 1950-2015</strong></td>
<td><strong>22,989</strong></td>
</tr>
<tr>
<td><strong>Total countries 1950-2015</strong></td>
<td><strong>182</strong></td>
</tr>
</tbody>
</table>
GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

• Focus on tools and methods and on application of these in:
  – food security
  – water management
  – urban planning
  – land administration
  – disaster management
  – strengthening civil society
  – earth sciences
  – environmental management and biodiversity
SPECIALIZATIONS IN THE DEGREE AND DIPLOMA PROGRAMMES

Geo-information science and earth observation for
• Applied Earth Sciences
• Geoinformatics
• Land Administration
• Natural Resources Management
• Urban Planning and Management
• Water Resources and Environmental Management
• NEW: Spatial Engineering
Land Administration Programme
## General Course Structure

<table>
<thead>
<tr>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core modules (module 1-3)</td>
<td>Scientific domain (module 4-10)</td>
<td>Research profile (module 11-15)</td>
<td>Individual MSc research (module 16-23)</td>
</tr>
</tbody>
</table>

### Course Duration
- **18 month MSc**
- **9-month PGD (mod. 1-10 +)**

### Modules
- **Geo-information Mgt. For good Land Governance** (12 wks – mod. 7-10)

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# GWF2017

www.geospatialworldforum.org
Land is at the basis of all societies

Land administration: a critical success factor for economic growth, food security, nature conservation and poverty reduction

‘the process of determining, recording and dissemination information about tenure, value and use of land when implementing land management policies’ (UN/ECE, 1996)

A well-functioning land administration information system, is one of the main instruments for governments to implement their land policies
Land Administration in the World

• Only one quarter of the countries in the world maintain a complete land administration system – in regard of Land Tenure/Ownership, Land Use for Urban/Rural Planning and Land Value.

• Conventional land titling programs incapable of bridging the gap; they fail to support the provision of a minimum form of land tenure security for
  – For all the citizens
  – Including vulnerable ones
Reality

Represent/Map/Document: People -> Land Relationship

Slides/pictures credit Dr. Mila Koeva
Reality is getting multi-dimensional

Slides/pictures credit Dr. Mila Koeva
Reality is getting multi-dimensional

The 2D approach is not so efficient in complex, modern structures and also it’s hardly understandable.

Slides/pictures credit Dr. Mila Koeva

www.esri.com
Cadastral survey and demarcation

Slides/pictures credit Dr. Mila Koeva
GNSS for LA

The Basics (GPS Segments, Signals, Clocks)

Accuracy aspects for LA

What application is most suitable? DGPS Receivers, quality and methods

Slides/pictures credit Dr. Mila Koeva

www.geospatialworldforum.org
# Cadastral survey and demarcation

<table>
<thead>
<tr>
<th>Method</th>
<th>Speed</th>
<th>Cost</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain and compass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plane table</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total station</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handheld GPS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Precision GPS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imagery</td>
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</tbody>
</table>

**Note 1:** many projects now combine ground and airborne tools

Slides/pictures credit Dr. Mila Koeva
The multi-disciplinary approach is not time-consuming compared with the past and is capable to provide data of very high accuracy and spatial resolution. This approach requires knowledge from different disciplines. For example geodesy, GNSS, GIS and photogrammetry are some of them.
DETAILED SENSOR COMPARISON FOR LA

- **Classification of sensors**
  - Depending of the platform (ground, airborne, spaceborne)
  - Depending of the type of energy (active, passive)
  - Depending of the way of measuring (analogue, digital)

- **Satellite characteristics**
  GSD, swath, sensor type, bands, type stereo, accuracy, price

- **Image characteristics**
  GSD, spatial, spectral, radiometric, temporal resolution

Slides/pictures credit Dr. Mila Koeva
1. technical concepts and tools
2. possibilities, but also the limitations
3. how to combine tools to create fit-for-purpose approaches
3D data challenges

- Scanning, digitizing, georeferencing
- Processing, storing, transferring, visualising, updating
- Quality
- Availability
- Metadata
- Automatization

“BIG DATA”
Land Administration Info.

- Deeds Register & Electronic Records
- Cadastral Relational Database
- e-Cadastral Content Repository
- 5G Databases

Customer Service Centre, Mullingar, Ireland
**Land Admin. Course Structure**

**CORE modules**

| Module 1-3 | Geo-information Science and Earth Observation |

**COURSE modules**

<table>
<thead>
<tr>
<th>Module 4</th>
<th>Database and geo-information modelling for LA</th>
</tr>
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<tbody>
<tr>
<td>Module 5</td>
<td>Land information systems</td>
</tr>
<tr>
<td>Module 6</td>
<td>Cadastral data acquisition and 3D cadastre</td>
</tr>
<tr>
<td>Module 7</td>
<td>Securing land tenure</td>
</tr>
<tr>
<td>Module 8</td>
<td>Land policy and land management</td>
</tr>
<tr>
<td>Module 9</td>
<td>Organizing land administration</td>
</tr>
<tr>
<td>Module 10</td>
<td>Innovative approaches for land administration</td>
</tr>
</tbody>
</table>
Advances in Responsible Land Administration
Jaap Zevenbergen, Walter de Vries, Rohan Mark Bennett

August 14, 2015 by CRC Press
Reference - 305 Pages - 24 B/W Illustrations
ISBN 9781498719599 - CAT# K25501

For Librarians
Available on CRCnetBASE >>
Recap

University of Twente/ITC
Land
Land Administration
Represent/Map/Document

People -> Land Relationship

3D Challenges

International student life – Learn from each other…
Fellowships

https://www.itc.nl/fellowships
Thank you for your attention!

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