The Process of Changing from Local Systems into SWEREF 99

– A Challenge for Lantmäteriet and a Great Step for the Municipalities

Tina Kempe, Anders Alfredsson, Bengt Andersson, Lars E. Engberg, Fredrik Dahlström & Géza Lohász
Outline

• Introduction of SWEREF 99 for Swedish geodata
• The background with local control networks in Sweden
• Lantmäteriet has developed tools to...
  • perform so-called *direct projection*
  • analyse distortions of local control networks
  • create a correction model to handle the distortions
• Concluding remarks
Initial Work on National and Local Level

• Implementation of SWEREF 99 as national reference frame for GNSS was done in 2001 and is used for production of maps and data bases since 2007
• Lantmäteriet recommends local authorities to use the national reference frame
• Project ‘RIX 95’
  • Calculate transformation parameters: local systems ↔ SWEREF 99
  • Establish new, easily accessible control points
Swedish National Geodata Strategy

One of eight Strategic Goals:
• “All bodies that produce, manage, provide and use geodata should utilise the national geodetic reference systems, SWEREF 99 and RH 2000.”

In line with the INSPIRE directive, where it is prescribed that data exchange should be done using ETRS89 and EVRS.
Introduction of SWEREF 99 in Other Governmental Agencies

Year

<table>
<thead>
<tr>
<th>Year</th>
<th>On-going work</th>
<th>SWEREF 99 partly in use</th>
<th>SWEREF 99 in use</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>25</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>15</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2009</td>
<td>15</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
Introduction of SWEREF 99 in the Municipalities

- No activities
- On-going work
- SWEREF 99 in use

Year

Number

2006  2007  2008  2009  2010 (May)

2006  2007  2008  2009  2010 (May)

No activities
On-going work
SWEREF 99 in use

LANTMÄTERIET
Background – Local Reference Frames

- Old local reference frames
  - Not strongly linked to national reference frame
  - Frames are often distorted, due to the way the networks are established
  - More or less every local authority has had its own reference frame
- Each municipality is responsible for its own control networks
  - Lantmäteriet can only give advise
Transformation Method for Local Systems

- Transformation parameters from RIX 95 project are mainly based on direct projection; in some cases combined with similarity transformation in two or three dimensions

- Different rectification methods have been tested → the most suitable method – interpolation of residuals in Delaunay triangles – was chosen
Transformation of Local Systems

Local system

Distortion model

Correction model

SWEREF 99

‘local projection’

RIX 95 transformation

SWEREF 99 lat/long

SWEREF 99 TM

SWEREF 99 dd mm

LANTMÅTERIET
Variations of Distortions

Deviant points

Break of trend
Concluding remarks

- SWEREF 99 seems to be accepted more quickly by the municipalities (local authorities) than by the governmental agencies.
- The correction method chosen – simple interpolation in Delaunay triangles – has, so far, produced correction models good enough for their purposes.
- Introduction of the new height system RH 2000 is ongoing, but at a slower pace.
Thanks for your attention!

More information can be obtained from

- Our poster *The Process of Changing from Local Systems into SWEREF 99*
  - Describes into detail the direct projection concept and interpolation of residuals
- www.lantmateriet.se/refsys
- www.lantmateriet.se/geodesi