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Flood Risk Management – Flood Prevention by Land Consolidation in the Rhine Catchment Area

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Institute of Urban Planning and Land Management
University of Bonn, Germany

Flood Disasters in Europe

Rhine River, 1995

Concept of Land Consolidation in Germany

Basis: Land Consolidation Act (LCA)
Changes in Land Tenure Arrangements

Map of old parcels Map of new lots

Development of Land Consolidation

- **Traditionally:**
  Promoting efficient agriculture and forestry by assembling economically viable units of land in rural areas

- **Nowadays:**
  Land conservation and nature protection, village-renewal projects and flood protection

Types of Land Consolidation in Germany

- **Comprehensive LC Procedure**
  (Sections 1-37, LCA)

- **Simplified LC Procedure**
  (Section 86, LCA)

- **LC Procedure in Case of Permissible Compulsory Acquisition**
  (Section 87, LCA)

- **Accelerated LC Procedure**
  (Section 91, LCA)

- **Voluntary Land Exchange**
  (Section 103a LCA)

LC as a Tool of Flood Risk Prevention

- Relocation of dikes
- Increase of water storage capacity
- Redevelopment of flood plains
- Renaturalization of rivers, restoration of small streams
- Restriction or limitation of sealed surfaces
- Change of land utilisation
- Restoration and creation of additional retention area to cause a diminution of the high water levels

Flood Risk Management

Risk Analysis & Risk Assessment

Preparedness & Alert

Prevention & Mitigation (e.g. by Land Consolidation)

Response & Recovery

Contribution of Surveyors

Applications of geodetic methods, techniques and procedures concerning LC:

1. Geodetic engineering/photogrammetry and remote sensing
2. Data processing/Geographic Information Systems (GIS)
3. Rural planning and land management
(1) Surveying and Photogrammetry

- Establishment of fixed boundary marks
- Photo flight of the land consolidation area
- Determination of new property boundaries
  - Tacheometry
  - GPS Technology
- Drawing up of new cadastral maps
- Establishment of digital stereo photogrammetry
- Updating of the public records

(2) Geographic Information Systems

- Creation and installation of GIS (input, store, retrieve, manipulate, analyze and output geospatial data)
- Digitalization of land register maps
- Editing geodata adapted for the use as geoinformation data for specialized users

(3) Rural Planning and Land Management

- Moderation/mediation
- Reshaping the land consolidation area
- Development of the land consolidation plan
- Determination of the compulsory land compensation

Example:
Land Consolidation „Langeler Bogen“

- Land Consolidation Procedure in Case of Permissible Compulsory Acquisition

  Objectives:
  - Reshaping the area
  - Creation of new path network
  - Sustainable flood protection
  - Landscape conservation

Aerial View of „Langeler Bogen“

Land Consolidation Area: Cadastral Map
**Existing, Insufficient Dike**

- Flood plain
- Embankment

**Existing Road and Path Network**

- Degussa factory
- Farmyard

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**Working Plan: Land Consolidation Procedure**

<table>
<thead>
<tr>
<th>Type of Land Consolidation Procedure</th>
<th>Section 87 LCA</th>
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<tbody>
<tr>
<td>Size of Land Consolidation Area</td>
<td>150 hectares</td>
</tr>
<tr>
<td>Parties Concerned</td>
<td>300</td>
</tr>
<tr>
<td>Land Consolidation Decision</td>
<td>1998</td>
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<tr>
<td>Determination of Boundaries</td>
<td>1999</td>
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<tr>
<td>Valuation of the Parcels</td>
<td>2001</td>
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<tr>
<td>Drawing up of Land Consolidation Plan</td>
<td>2002</td>
</tr>
<tr>
<td>Updating Public Records</td>
<td>approx. 2006</td>
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</tbody>
</table>

**Reshaping of the Land Consolidation Area**

- New road and path network
- New dike

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**Flood Prevention Measures**

**Technical flood protection measures:**
- Dike relocation
- Construction of a new dike
- Creation of extra overflow area with a retention capacity of 4.5 million m³

**Ecologically orientated flood protection:**
- Restriction of sealed surfaces
- Path network to leak water
- Changes in land-use

**Conclusions**

- Land Consolidation can be used as a highly effective instrument in rural areas to improve flood protection.
- Technical flood protection measures
- Ecologically orientated flood prevention strategies
- LC procedure always must recognize the need for diverse local solutions.
- Especially the Surveyor can contribute extremely to the success of a LC procedure!
Thank you very much for your attention!

www.isbk.uni-bonn.de/fig

- Complete information about the Working Group
  8.4 „Disaster Risk Management“
  - In english and german language
  - General Infos/Statistics about natural disasters
  - Research
  - Forthcoming Events
  - Documents
  - Glossary
  - Links

Great natural catastrophes 1950-2004

The River Rhine at Cologne

Views from the Land Consolidation Area

Great natural catastrophes 1950-2004

The River Rhine at Cologne

Views from the Land Consolidation Area
Views from the Land Consolidation Area

© by AKU Siegburg

200-year-Flood: Flood Risk Area

First Flood Protection Strategy

Reshaping of the Land Consolidation Area

Thank you very much for your attention!