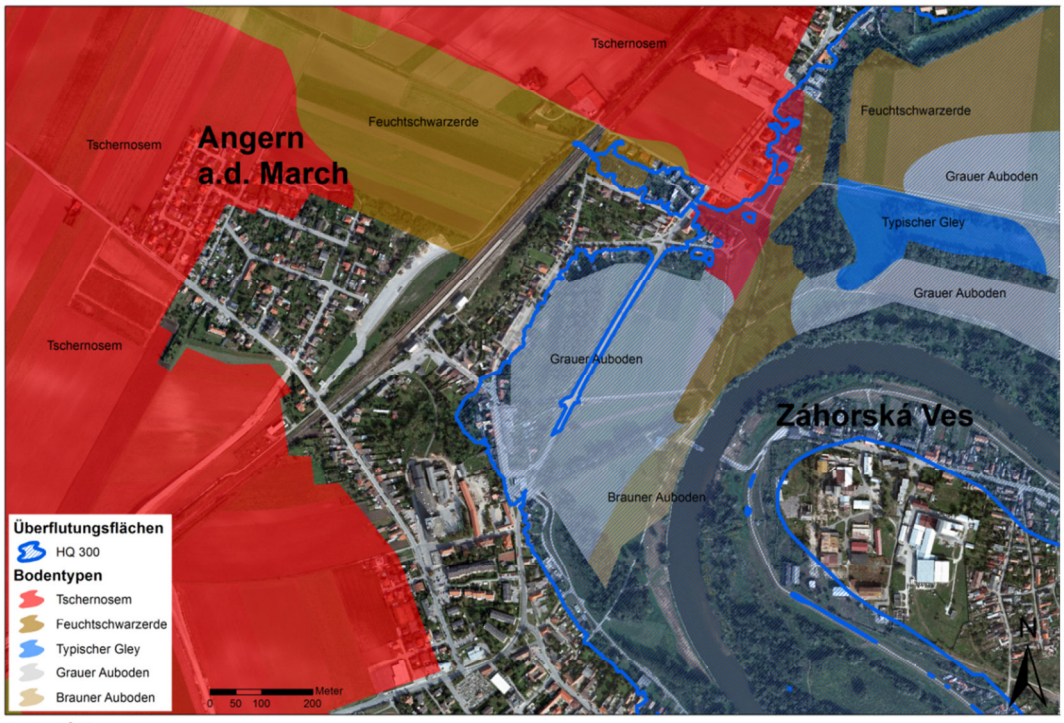
# Ergebnisbericht Projektstudie Boden als Indikator für Hochwasserereignisse


Daten: Land NÖ; IKT
karthographische Bearbeitung: wpa beratende Ingenieure GmbH

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# 1. Einleitung

Hochwässer an Flüssen sind natürliche Erscheinungen, die in Abhängigkeit der Landnutzung in den Überflutungsbereichen Schäden erzeugen können. Die Wahrscheinlichkeit des Auftretens von Hoch-wässern und das damit verbundene Schadenspotenzial kann mit Hilfe einer Risikoanalyse abgeschätzt werden. Risikoabschätzungen von sehr seltenen auftretenden, historischen Hochwässern sind sehr schwierig, da es über diese meist nur wenige Aufzeichnungen gibt. Modellberechnungen dazu können oft nur schwer in der Natur überprüft werden. Hochwässer hinterlassen an den überfluteten Böden meist Spuren durch Auf-oder Abtrag von Sedimenten, aus denen Überflutungsereignisse rekonstruiert werden können. Es stellt sich somit die Frage, ob Böden als Indikator für Hochwasserereignisse herangezogen werden können.

In dem grenzüberschreitenden Projekt SONDAR SK-AT (Soil Strategy Network in the Danube Region) wurde an der March untersucht, ob in den, in den Überflutungsbereichen vorkommenden Bodenformen solche Informationen enthalten sind, mit deren Hilfe Überflutungsbereiche vor allem bei seltenen, historischen Hochwässern besser eingegrenzt werden können.

Es konnte festgestellt werden, dass im Untersuchungsgebiet Angern an der March und Záhorská Ves in der Slowakei bestimmte Bodenformen Hochwasserereignissen zugeordnet werden können. Wenn in Bodenkarten derartige Bodenformen vorkommen, dann weisen diese auf potenzielle Überflutungsräume, hin.

Mit Hilfe der in Österreich digital zur Verfügung stehenden Bodenkarte (eBOD) können die übeflutungsanzeigenden Bodenformen flächendeckend ausgeschieden werden. Blaulichtorganisationen bzw. Katastrophenschutzdienste können diese Informationen nutzen, um eine bessere Eingrenzung von potenziellen Überflutungsräumen durchzuführen.

Mit diesem Projekt war es somit möglich ein besseres Verständnis bei der Einschätzung eines Hochwasserrisikos mit Hilfe von Bodendaten zu erreichen.

## 2. Präsentation Projektbericht SK

### SOIL AS INDICATOR OF FLOOD PROTECTION – A CROSS-BORDER CASE STUDY IN MORAVA FLOOD PLAIN - SLOVAKIA

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### Soil - water interactions

- **The premise:** fluvial sediments may register each flood event in the last 1000 years and in the soil profile in these sediments are well diagnosed.
- In Morava river were registered last major floods in1996, 2002, 2006, 2010.
- Identifying of such areas could be recognized on the basis of soil units mapping and classification (Fluvisols and Gleysols)

### WP3 goals

- Elaboration of risk maps for cross-border regions which can indentify areas threatened by floods
- The actions was focused on training opportunities to control and prevent of flood natural hazards and protection.
- As target groups will address mainly residents of municipalities, local governments and regional associations, voluntary organizations with priority protection areas (fire and rescue organizations, etc.)

### WP3: Soil–water interaction

- Selection of the target area
- Providing documentation materials (data, maps for the cross-border target area)
- Jointed methodology and approaches in terms of soil maps
- Target area definition
- Hydrological model approaches and verification
- Voluntary organizations (next actions)
- Transmissions of results (on other regions)

### Selection of the target area

- Záhorská Ves – Angern an der March

### Providing documentation materials in Slovakia

- Soil types and subtypes maps (1:5,000)
- Soil-ecological units maps (1:5,000)
- Remote sensing maps (orthophoto maps) and satellite images for flooding events identification
- Land use map (1:5,000)
- Digital terrain map (DTM) (1:5,000)
- Flooding zones according to modelled hydrophysical data
- Soil water retention capacity map


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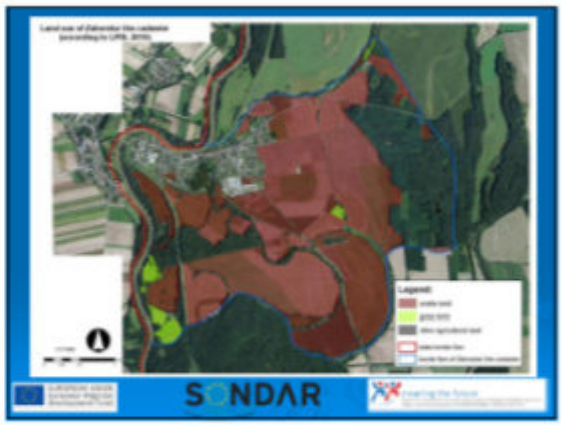
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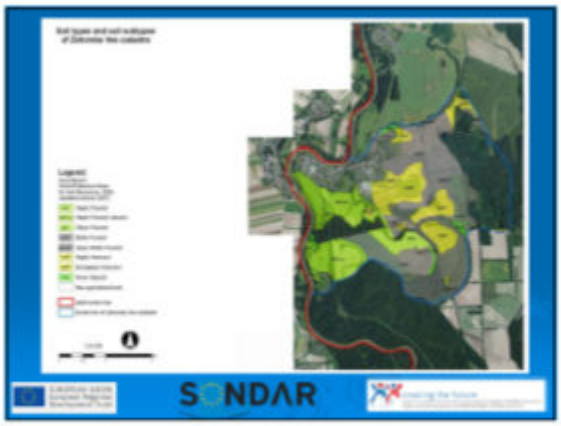
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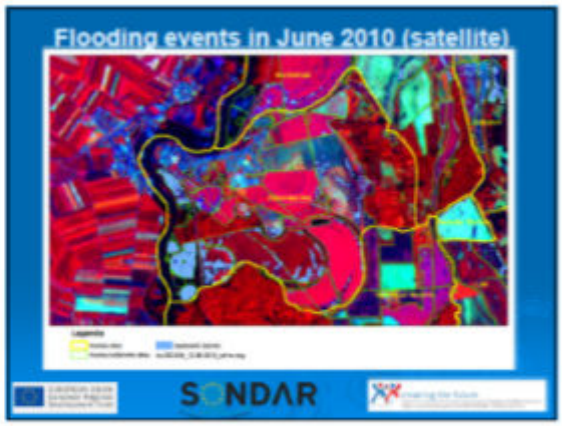
Flooding events in June 2010 (satellite)
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Flooding events in June 2010
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Jointed methodology and approaches in soil mapping
World Reference Base for Soil Resources (2006, 2007) was used for the correlation soil types and soil texture in both countries, mainly hydromorphical soil types like Fluvisols and Gleysols.
Features of flood identification could be: thin sedimentation layer on surface, stratification of layers, buried horizons presence, gleyic colour pattern and some redox mottling.
The methodology was discussed like how to distinguish areas under regular flooding without ground water affecting, and proper flood identification within soil profile.
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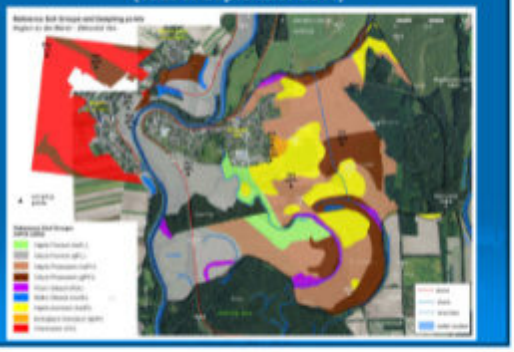
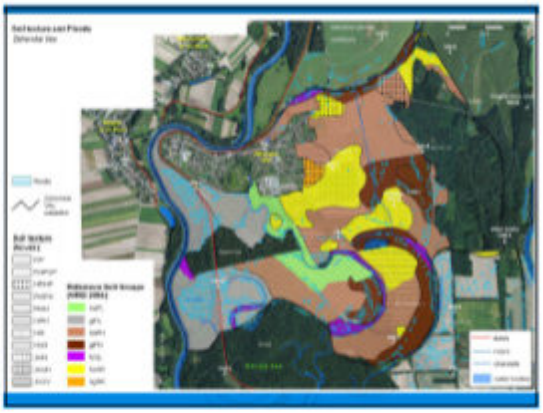
## Common soil survey in the target area (19th of September 2011)



## Soil sampling in the cross-border area

## Soil survey in the Slovak part with 4 soil types identification

## Conclusion 1

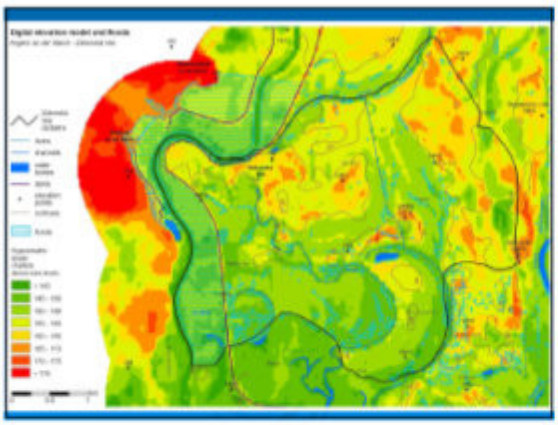
Selected areas around Angern and Záhorská Ves represent from the natural point of view two **different types of lowland country**:

- while on the Austrian side the relief from the river to the country gradually rising towards the lower or middle (?) river terraces (hence the occurrence of Chernozems),
- the Slovak side is typical country of floodplain which relief is divided horizontally, into the system depressions, dead branches, flat alluvial plains and elevation of the Pleistocene consisting of blowing sands.

## Conclusion 2

In Záhorská Ves we have applied other approach to flooding origin

- Flooding is caused not only by river water but also due to ground water level, which is in hydraulic connection with surface water levels.
- At the flooding, the ground water level increases, moreover in the case of rain, the rain water cannot be well drained in concave depression forms.
- Also the retention capacity of the soil is low. Urban area of the village itself is situated in a little higher position.



## Soil types (texture) identification

- **On depression landforms** (mostly flooded by river Morava) are: Gleysols, Gleyic Phaeozems, Gleyic Fluvisols.
- The flat relief of the **alluvial plains** (mostly flooded by rains and ground water level) are linked with Gleysols, and Phaeozems.
- On the **sandy dunes** elevations can be found Regosols, and Arenosols (without significant hydrological influence)
- The most flooded areas are consisting of soils with lower retention capacity and soil texture – loamy as well as clayey-loamy, and clays.

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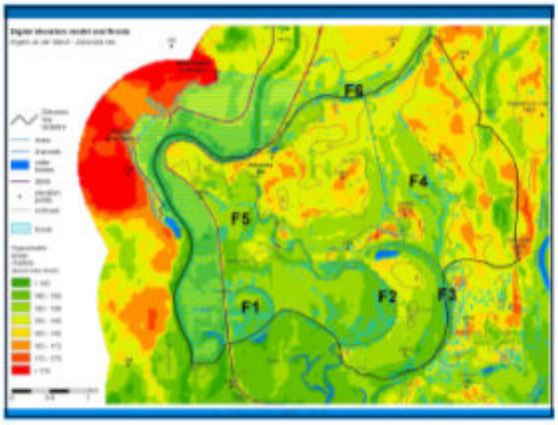


## Flooding areas

- **F1** – depression of the dead branch with Gleysols and Fluvisols with shallow ground water level,
- **F2** – depression of the dead branch, or the watercourse Oblaz with Gleysols and Gleyic Phaeozems with shallow ground water level,
- **F3** – depression of the dead branch of the watercourse Záhorský potok with Gleysols and Gleyic Phaeozems with shallow ground water level
- **F4** – depression, concave relief form with shallow ground water level, with Gleyic Phaeozems,
- **F5** – depression, concave relief form with shallow ground water level with Gleyic Fluvisols,
- **F6** – the area along the watercourse Hlinec with Gleysols, Gleyic Phaeozems, the part of the water is derived by canal interconnecting the creek Hlinec with Záhorský potok.

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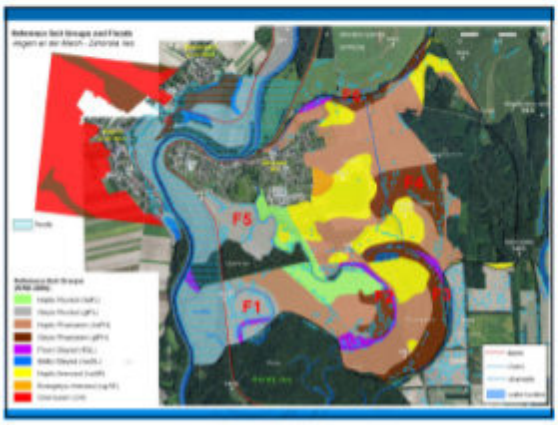


## Cross-border area Záhorská Ves – Angern an der March

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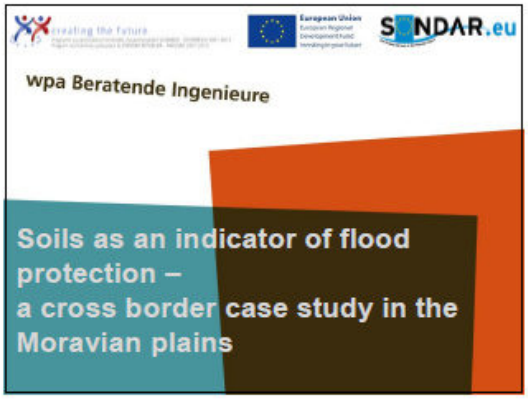
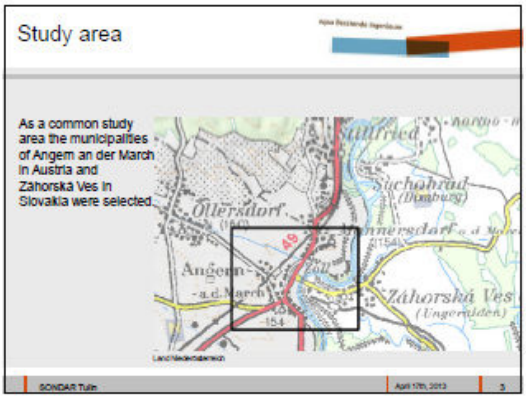
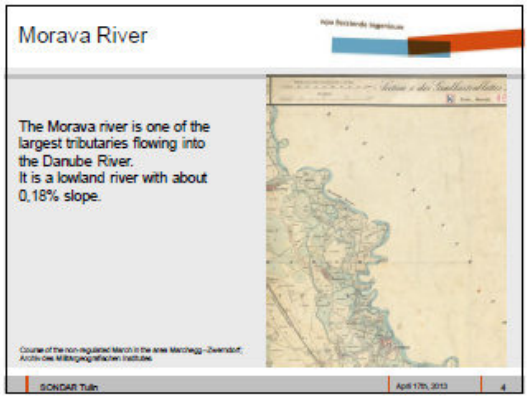
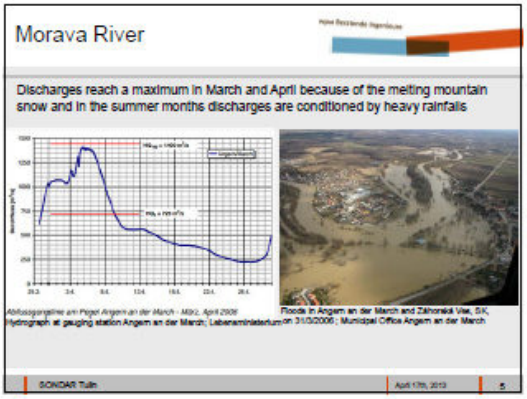
# 3. Präsentation Projektbericht AT








## Soil as an indicator

**Auboden** (Fluvisol)

Soil features caused by flooding by rivers

- Repeated flooding leads to a sequence of typical layers in the soil profile

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## Soil as an indicator

**Gley** (Gley soil)

Soil features caused by flooding by groundwater

- In this Gley soil groundwater is usually up to 80 cm below the ground surface and therefore causing the typical colours

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## Soil as an indicator

**Feuchtschwarzerde** (Gleyic Phaeozem)

Soil features caused by flooding by groundwater

- Due to the temporary high water saturation this soil shows a 70 cm thick humic layer.

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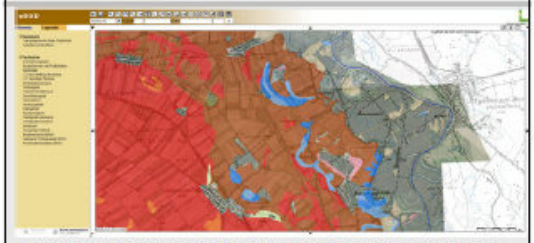
## Austrian soil map eBOD 1:25.000



Screenshot from the Austrian soil map eBOD (http://gis.lebensministerium.at/ebod) showing the area of Oberweiden

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## Soil sampling

The soil types specified in the Austrian soil map eBOD were verified by sampling

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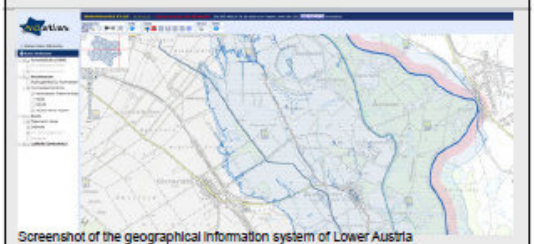
## River Morava hydrology



Screenshot of the geographical information system of Lower Austria (NÖ ATLAS - http://atlas.noe.gv.at).
Hatched blue is the runoff area with an return period of 300 years.
The representation is obtained by zooming in and selecting the following map (layer): "floods → flood areas → HQ300"

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## River Morava hydrology and soil types

Flooded areas in a 300-year flood (HQ 300) in Angern a.d. March and soil types according to the Austrian soil map -eBOD 1:25.000



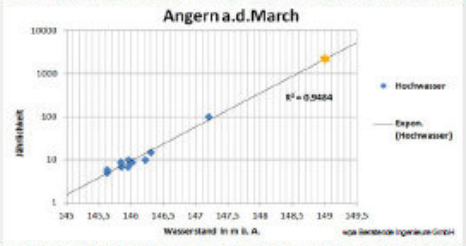

## River Morava hydrology and soil types

Aerial view of the 2006 flooding of the Morava in which the soil types were transferred from the Austrian soil map 1:25.000




## River Morava hydrology

Water levels and probability of occurrence (water gauge in Angern an der March)




Extreme flood events with water levels of 149 m a.s.l. have a return period of more than 1000 years.



## Floodplains and soils

Floodplains of floods statistically occurring every 300 years (HQ 300) and of floods with a probability of occurrence beyond 1000 years (149 m a.s.l.) as well as river water or groundwater-influenced soils in Angern an der March.




## Floodplains and soils

Floodplains of floods statistically occurring every 300 years (HQ 300) and of floods with a probability of occurrence beyond 1000 years (149 m a.s.l.) as well as river water or groundwater-influenced soils in Oberwelden.




## Summary

From the Austrian soil map we can learn that:

- Auböden (Fluvisoil), Gleye (Gleyesoil) and Feuchtschwarzerden (Gleyic Phaeozem) are soils flooded during high river water levels.
- These soil types can help therefore to identify areas flooded during very seldom flood events.



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Programm zur grenzüberschreitenden Zusammenarbeit SLOWAKEI - ÖSTERREICH 2007-2013
Program cezhraničnej spolupráce SLOVENSKÁ REPUBLIKA - RAKÚSKO 2007-2013

# 4. Impressum

Im Rahmen der grenzüberschreitenden Zusammenarbeit zwischen der Slowakei und Österreich wurde seitens der Europäischen Union das Projekt SONDAR SK–AT (Soil Strategy Network in the Danube Region) gefördert. Leadpartner des Projektes ist BIENE Boden und Bioenergie –Netzwerk NÖ/EU. Projektpartner sind in Österreich die Universität für Bodenkultur (BOKU) und in der Slowakei VVB Vodohospodárska výstavba (Wasserbauinstitut) in Bratislava und VUPOP Výskumný ústav pôdoznalectva a ochrany pôdy (Staatl. Bodenschutzinstitut) in Bratislava. Für die Bearbeitung der Aufgaben in den Arbeitspaketen 3 und 4: „Boden-Wasser-Interaktion: Bodenkarten als Prognose- und Sensibilisierungsinstrument“ / “Ausbildungsprogramme“ wurde die wpa Beratende Ingenieure GmbH mit der Ausarbeitung dieses Handbuches zur Ausscheidung von potenziellen Überflutungszonen bei seltenen Hochwässern beauftragt.

## 5. Weitere Infos

Nähere Details zum Projekt finden Sie auf www.sondar.eu/sk

Weitere Details entnehmen Sie bitte den Handbüchern für Gemeinden und Freiwilligenorganisationen.

Download der AT Version des Handbuchs:
http://www.sondar.eu/sk/files/20130909_handbuch_web.pdf

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