CEDR

Conférence Européenne
des Directeurs des Routes

Conference of European
Directors of Roads

Guidelines for soil management in road projects -

- best practice for protecting soils and mitigating impacts during road planning, construction and road operation

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Our approach

- Reports -> Guidelines
- Sources: Scientific literature, experience-based knowledge, workshops
- Reports and Guidelines available on CEDR site. Scientific publications in progress.
  https://www.cedr.eu/peb-call-2019-soils

14:00	**Welcome and introduction**
14:15	**ROADSOIL** – *presentation of key project results with Q&A session* Marguerite Trocmé: *Introduction to CEDR soil call and the Roadsoil project* Hans Martin Hanslin: *Guidelines for soil management in road projects* Monica Jayesingha: *Road impacts on soil functions* Silvia Tobias: *Practice of soil protection in road project in European countries* Attila Nemes: *Data driven support for improved decision systems to help protect soils at road construction sites* Trond Knapp Haraldsen: Examples of soil handling in infrastructure projects
15:45	Discussions on results and implementation
16:00	**End of hybrid event**
16:30	**Summary of discussions and closing remarks**
17:00	**End of Conference**

Scope and context

The guidelines address soil management in

- areas directly affected by land take
- areas temporarily used for transport or storage of soils
- areas used for agricultural or ecological compensation or restoration based on soil resources from road projects.

Scope and context

- Road project phases
  - Planning – construction - management and maintenance
- Audience
  - From planners to contractors and machine operators
- Existing guidelines
  - Various national and regional
  - Supplement, focus on critical parts

Precautions

These guidelines present key approaches to soil management in road projects. The reader should be aware that detailed protocols are not possible and would be risky, due to the huge differences in soil and climate between regions, and the large variation in soil characteristics even within a single road construction project. To properly address the local conditions, soil expertise should be included early in the project.

Local knowledge and adjustments required

The soil management plan

The **soil management plan** as outlined in an Environmental Impact Assessment (EIA) and refined in the detailed planning, is the core of best practice in soil management.

- **Measures** implemented to avoid, mitigate or compensate for the soil impacts during the road construction process.
- **Quality checks** during and after the construction work assures that the soil protection measures have been implemented according to the recommended regulations.
- SMP adjusted to the **local** soil properties, climate and terrain, and accounting for predicted **climate change**.

Capacity building and training

- **Early involvement of soil experts** is critical to achieve successful soil management - **local adjustments** and **continuity** in follow-up.

- Systems for **training and certification of soil experts** is recommended combined with in-house training and capacity building in the road administrations and with the contractors to better benefit from the experts.

- Including **training of machine operators on-site**, where project-specific training has achieved very good results.
- Soil data management

- **These are major measure to eliminate critical bottlenecks for sustainable soil management.**

Strategies to reduce soil compaction

The risk of soil compaction of both subsoil and topsoil has to be addressed during machine operation, soil handling and storage on a day-to-day basis

- Avoid operation of heavy machinery on A- or B-horizons unless the soil is frozen or very dry.
- Strip soil for temporary storage and use construction roads or matting systems for short term use as transport corridors.
- Apply a **decision support system** based on soil texture and on-site measurement of soil moisture to guide operation of machinery.
- Information on construction machinery has been added to the **Terranimo®** toolbox to predict risk of soil compaction

This approach depends on active use of soil data to inform machine operation and will build awareness and best-practice with contractors.

Strategies for soil stripping and storage

For reuse in landscaping or in compensation measures, topsoil (A-horizon) and subsoil (B-horizon) are best stripped and stored separately.

- Mixing B- (with structure) with C-horizon (without structure) is not recommended.
- Stockpiles are shaped and spaced to ease weed and invasive alien plant management and seeded with a competitive grass cover to maintain soil qualities. Geotextiles are usually less efficient.
- Keep land in cultivation for as long as possible before stripping to avoid propagation of unwanted plant species.
- Measures to control runoff and manage stormwater are required.

Strategies for soil reuse and reconstruction.

An **initial survey** of topsoil and subsoil qualities will provide the required information to **prioritise soil allocation** to different uses, landscaping, agriculture, forestry or urban greening.

For landscaping and compensation measures, **soil profiles are rebuilt horizon by horizon** in narrow strips where machine operation on relocated soil is avoided. All driving is done on the C-horizon during reconstruction.

- Use temporary construction roads as far as possible.
- If there are shortages of topsoil, **constructed soil** can be made on-site from crushed rock blended with organic material and natural mineral soil.
- Coarser material can be used as drainage layers and contribute to mass balance of the project.

Quantify and monitor impacts

Road projects affect soils both during construction and during operation.

Use **indicators of soil properties** to document road impacts on soils and evaluate compensation measures

We recommend a list of indicators that will capture the state of measurable soil properties.

Indicator
Soil organic carbon
pH
Total Nitrogen
Plant available phosphorus
Salinity
Soil texture classification
Clay, silt and sand content
Bulk density

Can be used to evaluate the soil function parameters listed in the EIA Directive (compaction, sealing, erosion and organic content).

IAS and pathogen management.

- It is critical to assess the occurrence of invasive alien species and soil-borne pathogens in the **planning phase** of road projects - **proactive**

- Measures to control are well described elsewhere. **Start early** and clarify responsibilities throughout the project.

- Prevent establishment/propagation and redistribution on temporal construction sites and along new road stretches
  - Logistic/quality system to keep track of soil qualities

Key message

- Include soil experts early in projects
- Establish and use strategies to prevent soil compaction
- Strip, store and rebuild soil - horizon for horizon
- Train and educate machine operators

Challenges

- Harmonizing legislation - especially conflicts with waste legislations