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# The Impact of Soil Database Selection on Soil Passability Results for Decision Support

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**Abstract**

Soil passability modelling depends on the quality and integration of soil data. This study evaluates the influence of soil database selection on passability assessment using soil datasets commonly used in the Czech Republic. Soil types and soil texture were harmonised, validated against field observations, and analysed with respect to spatial agreement. Results show that DSM50 provides the most consistent soil type information, while soil texture assessment relies on the dataset with the widest cover age, as no clear best dataset emerged. An attribute-specific hierarchical integration framework is proposed to ensure robust and operationally applicable soil passability modelling.

**KEY WORDS:** *soil; passability; soil database; soil characteristics; vehicle movement; harmonisation*

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## 1. Introduction

Reliable assessment of soil passability is a key prerequisite for military mobility planning, route selection, logistics support, and operational decision-making in dynamically changing environments [1–5]. Soil conditions directly affect terrain passability and thus fundamentally determine the feasibility and safety of military vehicle movement, particularly under variable meteorological and hydrological conditions [6–10].

In Central Europe, and especially in the Czech Republic, this issue is further intensified by pronounced spatial heterogeneity of soils combined with strong seasonal variability in soil moisture [11]. These factors significantly increase the demands on the quality and accuracy of soil information used within decision support systems. Consequently, terrain passability assessment has long been addressed not only at the national level but also within international initiatives and alliance frameworks, where emphasis is placed on data standardisation, model interoperability, and the integration of digital soil databases with meteorological and hydrological inputs [12–15].

In practical applications, soil-related terrain passability assessment relies primarily on digital soil databases. However, these datasets differ substantially in spatial resolution, thematic accuracy, attribute structure, and applied classification schemes. [16–17] The parallel existence of multiple soil datasets thus complicates their integration into operational models and may lead to inconsistent, difficult-to-interpret, or mutually incomparable outputs [18–19].

Within the Czech Republic, several soil data sources are available for analytical and operational use, including the Bonited Soil Ecological Units (BSEU) [20-21], the Digital Soil Map 1:50,000 (DSM50) [22], the Special Purpose Soil Database (SPSD) [23], and selected layer from the Detailed Maps of Soil Properties (DMSP) [24]. These datasets were developed in different periods, for different purposes, and based on varying input data. As a result, each exhibits specific advantages and limitations with respect to spatial coverage, thematic content, and reliability. None of the available databases can therefore be considered universally optimal for all modelling purposes, which highlights the need for their systematic comparison and evaluation.

The significance of soil databases becomes particularly evident when they are applied within the soil passability model MPP2018 CZ [18–19], which represents the national framework for assessing the impact of soil conditions on military vehicle mobility. In this model, soil types are aggregated into six groups, while soil textures (particle-size classes) are classified into two groups that enter the calculation of terrain passability. Despite the conceptual robustness of the model structure, its outputs are influenced to a considerable extent by the choice of input soil data. [19]

Previous studies have shown that uncertainties related to soil type classification, and particularly the representation of soil texture, constitute a significant source of variability in model results [18–19]. These uncertainties are most pronounced in transition zones between soil units, in hydrologically influenced areas, and in regions where detailed pedological mapping is unavailable [20–24].

This paper examines the influence of soil database selection on the results of soil passability assessment within the MPP2018 CZ framework [18]. The study aims to evaluate the suitability of selected soil databases in terms of soil type and soil texture representation, their mutual consistency, and their agreement with field observations. Based on the obtained results, a transparent, attribute-specific hierarchical decision logic for soil data integration is proposed. The study is based on the doctoral dissertation of Marková [19] and contributes to improving the robustness, interpretability, and traceability of soil passability modelling, while also providing practical recommendations for decision-support applications in military operational planning.

## 2. Data and Methods

This section describes the datasets and methodological approach used to evaluate the influence of soil database selection on soil passability assessment within the MPP2018 CZ framework. The analysis is based on a systematic comparison of soil databases commonly applied in operational and analytical contexts in the Czech Republic. Emphasis is placed on soil type and soil texture attributes, as these represent the key soil-related inputs to the model and a major source of uncertainty in passability predictions. [16–17]

The methodological workflow includes data preprocessing and harmonisation, comparison of soil information across databases, validation against field observations, and assessment of the resulting impact on model outputs. By applying a unified processing framework, the study aims to ensure comparability of results and to provide a transparent basis for subsequent evaluation and decision logic development.

### 2.1. Soil Databases

The study is based on a comparative analysis of four soil databases commonly used for soil passability modelling in the Czech Republic: BSEU, DSM50, SPSD and selected layer from DMSP. These datasets differ substantially in spatial resolution, thematic content, spatial coverage and original purpose, which requires careful harmonisation prior to their use in a unified modelling framework.

All databases originate, directly or indirectly, from the national Comprehensive Soil Survey conducted in the 1960s and 1970s; however, they have subsequently been developed, updated and generalised for different applications, ranging from agricultural land evaluation to military terrain analysis. For the present study, all datasets were processed and evaluated with respect to the soil attributes required by the soil passability model MPP2018 CZ. [20–24]

DSM50 provides information exclusively on soil types according to the national soil classification system. While representing the most detailed nationwide thematic source for soil type delineation, it does not include soil texture information and is not yet digitally available for the entire territory of the Czech Republic. The dataset is primarily intended for thematic soil mapping rather than operational modelling. [22]

SPSD was developed specifically for technical, engineering and military applications. It covers the entire territory of the Czech Republic at an approximate mapping scale of 1:200,000. Despite having a lower spatial resolution than agricultural datasets, SPSD includes both soil type and soil texture information and is structured to enable direct use in military mobility and soil passability models. [23]

BSEU database is a coded soil classification system, originally designed for agricultural land evaluation. It provides detailed information through a multi-digit code, describing soil type, soil texture and additional site characteristics. BSEU data correspond to a detailed spatial scale (approximately 1:5,000) however, they are limited to agriculturally used areas and require systematic decoding and conversion of the classification codes for use in modelling applications. [20–21]

DMSP are raster datasets primarily developed for agricultural applications and provided at a 20-metre spatial resolution. They are based on pedometric approaches and offer information on selected soil properties, including texture-related parameters. Similar to BSEU, their spatial coverage is largely restricted to agricultural land, while forested and non-agricultural areas are represented only to a limited extent. [24]

### 2.2. Harmonisation of Soil Data for MPP2018 CZ

To enable a consistent comparison and application within the modelling framework, all soil datasets were harmonised into the classification system used by the MPP2018 CZ soil passability model. Given the heterogeneity of the input datasets in terms of classification principles, thematic detail, and spatial resolution, harmonisation was essential to transform the original soil information into a mutually comparable form. Soil types and soil texture were processed separately due to their different functional roles within the model and their uneven availability across individual datasets [19].

Soil types were converted into simplified model categories using predefined transformation rules derived from the original national classification systems. The conversion followed the harmonisation procedure developed and validated within the MPP2018 CZ framework, ensuring methodological continuity with previous model implementations. In accordance with the model concept, soil types were aggregated into six soil type categories, reflecting dominant pedogenetic processes and hydrological characteristics influencing terrain passability: C, F, G, K, O, S. [18–19]

Soil texture classes, which differ substantially among the analysed databases in both definition and thematic resolution, were generalised into two model texture categories in accordance with the requirements of the MPP2018 CZ model: fine-grained soils (F-G soils) and coarse-grained soils (C-G soils). [18–19]

In addition to thematic harmonisation, spatial preprocessing was applied to ensure geometric consistency among datasets. Two principal geometric operations were performed:

- spatial clipping of all primary soil databases to the common study extent to ensure identical spatial coverage for comparison,
- exclusion of areas classified as water bodies according to the DSM50 dataset, as these areas are not relevant for soil passability assessment and would otherwise distort comparative analyses. [18–19]

These geometric steps ensured that all datasets entering the modelling framework were spatially consistent and thematically comparable.

Due to differences in the spatial availability of soil attributes across the analysed databases, two nested areas of interest (Fig. 1) were defined for subsequent evaluation. For the comparative assessment of soil type classification, a larger area (area of interest 1) was designated, where soil type information was available for all datasets. Area of interest 2, a smaller and spatially more restricted region, was used to evaluate soil texture harmonisation. This area includes locations where reliable soil texture information was available across all datasets. All quantitative comparisons and model-based assessments were subsequently carried out within these designated areas to ensure methodological consistency and to avoid bias caused by uneven data coverage.

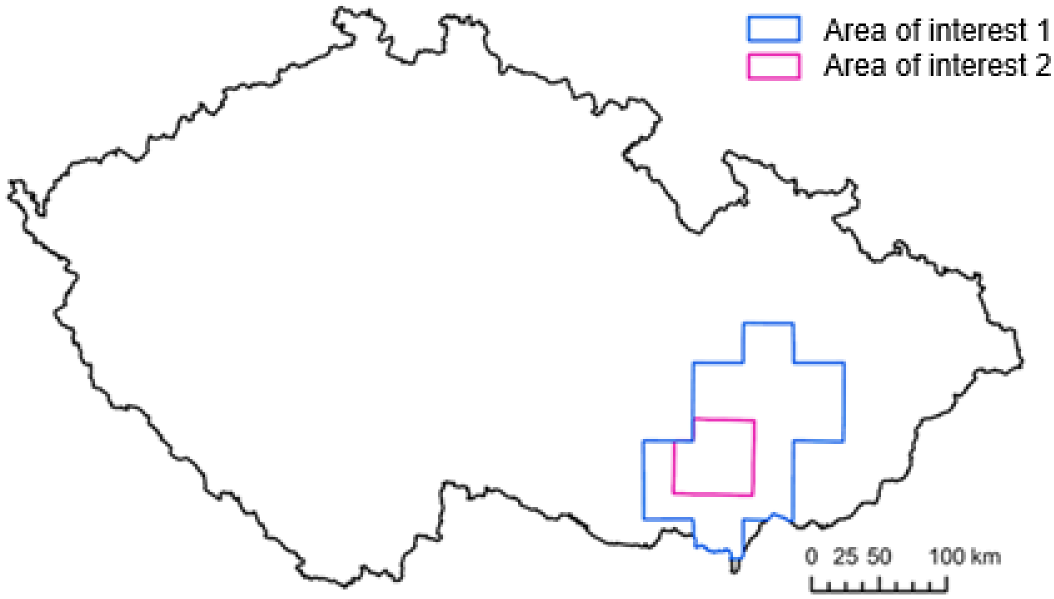


Fig. 1: Locations of the designated areas of interest [19]

## 1.1 Field Validation

Field validation was performed using soil probes collected at selected locations (Fig. 2). These locations represent different soil conditions and landscape contexts. The field observations provided an independent reference for assessing the thematic accuracy of soil type and soil texture classification in the evaluated databases. The validation was not intended to determine the absolute accuracy of individual datasets but to compare their mutual agreement and to identify systematic differences.

The evaluation was conducted in two ways: first, for soil probes classified within their respective databases; and second, for a subset of probes with classifications available across all analysed databases. Field validation results were subsequently incorporated into the evaluation of database suitability for operational passability modelling.

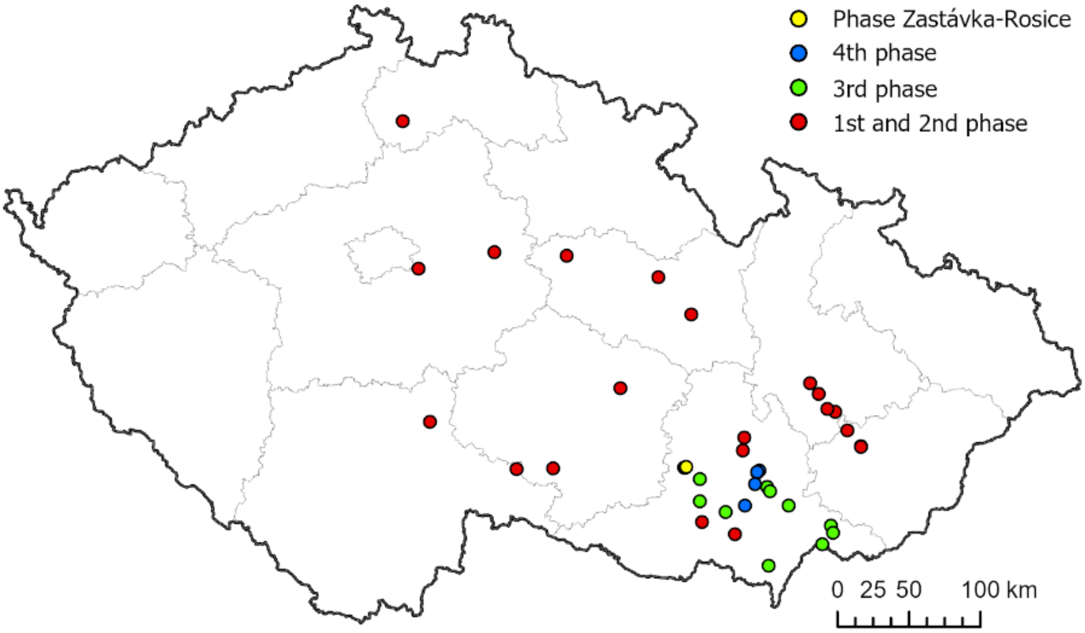


Fig. 2: Locations of soil probes for validation in particular phases. [19]

### 1.2 Mutual Comparison of Soil Databases

A mutual comparison of soil databases was conducted to assess their thematic and spatial consistency and to identify systematic differences among individual data sources. Unlike field validation, this comparison was based exclusively on direct inter-dataset comparison, without the use of an external reference.

The analysis was carried out for soil types and soil texture (particle-size classes) and was restricted to areas where the respective information was available in all compared databases. DSM50 was used for the comparison of soil types, while the SPSD database was used for the comparison of soil texture. The mutual comparison enabled the description of differences in spatial delineation of categories and their consistency across databases.

### 1.3 Evaluation Approach

The suitability of soil databases for use within the MPP2018 CZ model was evaluated based on three criteria: thematic consistency, spatial coverage, and operational usability. The evaluation was conducted separately for soil types and soil texture. [19]

Based on the field validation results and mutual database comparison, an attribute-specific hierarchical decision logic was developed for soil data integration into the MPP2018 CZ model. This approach enables transparent selection of the most appropriate data source depending on attribute availability while preserving traceability of inputs for operational decision support.

## 3. Results

This section presents the results of the comparative analysis of soil databases within the MPP2018 CZ framework. The results are structured in accordance with the evaluation workflow described in the Data and Methods section. At first, the outcomes of database comparison are presented with respect to their agreement with field soil probe observations. Subsequently, results of the mutual spatial agreement among soil databases are reported. All results are presented separately for soil types and soil texture after harmonisation into the classification scheme used by the MPP2018 CZ model [19].

### 1.4 Agreement with Field Soil Probes

Field probes serve as an independent reference for evaluating the thematic consistency of soil type and soil texture classification across datasets. Results are reported separately for soil types and soil texture and are evaluated in two variants:

- for soil probes with classification available in the respective database,
- for a subset of soil probes with classification available across all analysed databases. [19]

The results quantify relative agreement and highlight systematic differences among soil databases.

The results of the comparative analysis are presented separately for soil type and soil texture, reflecting their different availability, representation, and roles within the MPP2018 CZ soil passability model. In addition, dataset coverage and implications for operational use are evaluated to support the subsequent development of a hierarchical data selection framework.

For soil types, databases based on detailed pedological mapping show higher thematic agreement with field soil probes than datasets primarily developed for operational purposes. In the case of the BSEU database, the evaluation is influenced using the BSEU-M1 variant with a different methodological arrangement compared to the standard BSEU classification [19]. Differences among databases are most pronounced when soil types are compared directly using the original classification systems. After conversion of soil types into the simplified categories used by the MPP2018 CZ model, the level of agreement increases markedly across all databases, thereby reducing the influence of differences among individual classification approaches. A summary of the agreement between soil type classifications and field soil probes, assessed both in the original classification and after aggregation according to the MPP2018 CZ scheme, is presented in Table 1.

Table 1.

Overall agreement in soil database classification and soil probes of soil type [19]

| Database | Classified locations [%] | | Mutually classified locations [%] | |
|---|---|---|---|---|
| | Soil type | MPP2018 CZ classification | Soil type | MPP2018 CZ classification |
| SPSD | 45 | 69 | 49 | 76 |
| DSM50 | 69 | 83 | 73 | 93 |
| BSEU | 83 | - | 80 | - |
| BSEU-M1 | 59 | 83 | 61 | 85 |

For soil texture, more pronounced discrepancies among databases are observed when texture classes are compared using detailed classification systems. These differences are related to varying methods of data derivation and different levels of thematic detail across the analysed data sources. Databases employing broader texture intervals tend to show higher agreement with field soil probes than those using finer class resolution. After aggregation of soil texture into the two categories applied in the MPP2018 CZ model, differences among databases are substantially reduced and the resulting agreement becomes comparable across datasets. The results of soil texture agreement with field soil probes are summarised in Table 2.

Table 2.

Overall agreement of soil database classification and soil probes of soil texture [19]

| Database | Classified locations [%] | | Mutually classified locations [%] | |
|---|---|---|---|---|
| | Novák classification | MPP2018 CZ classification | Novák classification | MPP2018 CZ classification |
| SPSD | 60 | 92 | 60 | 91 |
| BSEU | 80 | 89 | 81 | 88 |
| DMSP | 63 | 89 | 63 | 91 |

Overall, the field validation results indicate that the level of thematic agreement between soil databases and field soil probes depends strongly on the level of classification detail. At the same time, they confirm that harmonisation of soil attributes into the categories used by the MPP2018 CZ model significantly improves the comparability of soil databases and limits the influence of differences in their origin and structure.

### 1.5 Spatial Agreement of Soil Databases

This subsection presents the results of the mutual spatial comparison of soil databases, conducted without the use of field reference data. The analysis focuses on assessing the spatial consistency of soil type and soil texture classification across the analysed databases within the defined areas of interest.

The spatial comparison of soil types was performed between the BSEU, SPSD and DSM50 databases, with DSM50 used as the thematic reference framework. Soil types were compared after conversion into the six soil groups applied in the MPP2018 CZ model (C, F, G, K, O, S).

The results indicate that the highest level of spatial agreement is observed for dominant soil groups with extensive and relatively homogeneous spatial distribution. Conversely, soil groups associated with specific hydrological conditions or transitional pedogenetic characteristics exhibit a higher degree of spatial discrepancy among databases. These differences are most apparent in areas characterised by fine-scale soil heterogeneity and along the boundaries of soil units.

Spatial agreement between the BSEU and DSM50 databases is summarised in Table 3, which documents the spatial overlap of individual soil groups and their mutual correspondence. Similarly, spatial agreement between SPSD and DSM50 is presented in Table 4, where colour coding in the tables means: **green** indicates agreement, **yellow** indicates disagreement exceeding **10 %** of the soil-group area, and **orange** marks cases where disagreement exceeds the agreed area. These tables enable identification of both the dominant matching soil group combinations and systematic differences in soil group delineation between databases. [19]

Table 3.
Spatial agreement of BSEU (vertically) and DSM50 (horizontally) soil database groups for area of interest 1 [19]

| | C | | F | | G | | K | | O | | S | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | km² | (%) | km² | (%) | km² | (%) | km² | (%) | km² | (%) | km² | (%) |
| C | 2887,3 | 84 | 93,1 | 15 | 9,1 | 17 | 149,1 | 26 | 1,1 | 24 | 0,8 | 3 |
| F | 109,6 | 3 | 488,4 | 79 | 16,5 | 31 | 27,5 | 5 | 0,3 | 8 | 0,5 | 2 |
| G | 12,7 | 0 | 9,9 | 2 | 17,8 | 34 | 7,7 | 1 | 0,2 | 5 | 3,2 | 11 |
| K | 352,0 | 10 | 24,8 | 4 | 5,9 | 11 | 354,2 | 62 | 0,1 | 1 | 9,5 | 32 |
| O | 1,3 | 0 | 0,4 | 0 | 0,8 | 2 | 0,1 | 0 | 2,7 | 62 | 0,0 | 0 |
| S | 62,5 | 2 | 4,1 | 1 | 3,1 | 6 | 28,3 | 5 | 0,0 | 0 | 15,5 | 52 |

Table 4.
Spatial agreement of SPSD (vertically) and DSM50 (horizontally) soil database groups for area of interest 1 [19]

| | C | | F | | G | | K | | O | | S | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | km² | (%) | km² | (%) | km² | (%) | km² | (%) | km² | (%) | km² | (%) |
| C | 2953,8 | 86 | 110,3 | 18 | 12,1 | 23 | 170,0 | 30 | 0,9 | 20 | 0,4 | 1 |
| F | 208,7 | 6 | 439,8 | 71 | 11,8 | 22 | 41,3 | 7 | 0,1 | 1 | 0,3 | 1 |
| G | 10,5 | 0 | 8,4 | 1 | 18,2 | 34 | 12,0 | 2 | 0,5 | 12 | 2,1 | 7 |
| K | 180,7 | 5 | 16,5 | 3 | 8,6 | 16 | 310,0 | 55 | 0,1 | 2 | 21,0 | 71 |
| O | 3,0 | 0 | 0,7 | 0 | 0,5 | 1 | 0,2 | 0 | 2,8 | 63 | 0,1 | 0 |
| S | 3,1 | 0 | 0,1 | 0 | 0,9 | 2 | 8,2 | 1 | 0,0 | 0 | 5,2 | 18 |

The spatial comparison of soil texture was conducted between the BSEU/SPSD and DMSP/SPSD databases following their harmonisation into the two texture categories used in the MPP2018 CZ model (F-G soils and C-G soils). The comparison was limited to the smaller area of interest where soil texture information was available consistently across all evaluated databases.

The results show a generally higher level of spatial agreement for soil texture compared to soil types, particularly after aggregation into the simplified texture categories. Spatial discrepancies occur mainly along the margins of texture class areas and in transitional zones between F-G and C-G soils. These differences reflect variations in the methods used to derive texture information and differences in the thematic resolution of the respective databases.

The overall results of spatial agreement for soil texture across the evaluated databases are summarised in the corresponding tables (Table 5 and Table 6), which document the extent of spatial concordance and discordance between texture classes.

Table 5.
Spatial agreement of BSEU (vertically) and SPSD (horizontally) soil texture groups for area of interest 2 [19]

| BSEU | SPSD | | | |
|---|---|---|---|---|
| | F-G soils | | C-G soils | |
| | km$^2$ | % | km$^2$ | % |
| F-G soils | 747,6 | 95 | 71,3 | 59 |
| C-G soils | 41,0 | 5 | 50,1 | 41 |

Table 6.
Spatial agreement of DMSP (vertically) and SPSD (horizontally) soil texture groups for area of interest 2 [19]

| DMSP | SPSD | | | |
|---|---|---|---|---|
| | F-G soils | | C-G soils | |
| | km$^2$ | % | km$^2$ | % |
| F-G soils | 787,3 | 100 | 100,1 | 82 |
| C-G soils | 1,3 | 0 | 21,3 | 18 |

The spatial comparison of soil databases demonstrates that the degree of agreement varies both among individual databases and between the evaluated soil attributes. While soil type classification is more strongly influenced by differences in classification concepts and mapping scales, soil texture classification shows higher spatial consistency after harmonisation into simplified categories. The results of the spatial agreement analysis provide an essential basis for interpreting differences among soil databases and for their subsequent evaluation with respect to applicability within the MPP2018 CZ soil passability modelling framework.

### 1.6 Hierarchical Integration of Soil Databases in MPP2018 CZ

Based on the results of field validation and mutual spatial comparison, an attribute-specific hierarchical approach was developed for integrating soil data into the MPP2018 CZ soil passability model. The proposed hierarchy is designed to address heterogeneous data availability and varying thematic quality of individual soil databases while ensuring consistent model behaviour and full traceability of input data sources.

The integration logic differentiates explicitly between soil types and soil texture, reflecting their distinct roles within the model and the different levels of uncertainty associated with their representation. For soil type representation, the hierarchy prioritises datasets with the highest thematic consistency and agreement with field observations. DSM50 is used as the primary reference source wherever available and therefore represents the preferred input for soil type classification in the model [19]. In areas where DSM50 coverage is incomplete or absent, BSEU is utilised within agriculturally used land, where it provides relatively detailed and thematically consistent soil type information. In remaining areas without DSM50 or BSEU coverage, soil type information is supplemented from SPSD, which ensures nationwide spatial coverage despite lower thematic detail. Where no other source is available, SPSD serves as a fallback dataset [19]. This stepwise decision logic ensures that the most suitable soil type information is used wherever possible while maintaining complete spatial coverage of the model domain. The hierarchical soil type selection is illustrated in Fig. 3, and all decision steps are explicitly defined to allow retrospective verification of the data sources used in each modelling scenario [19].

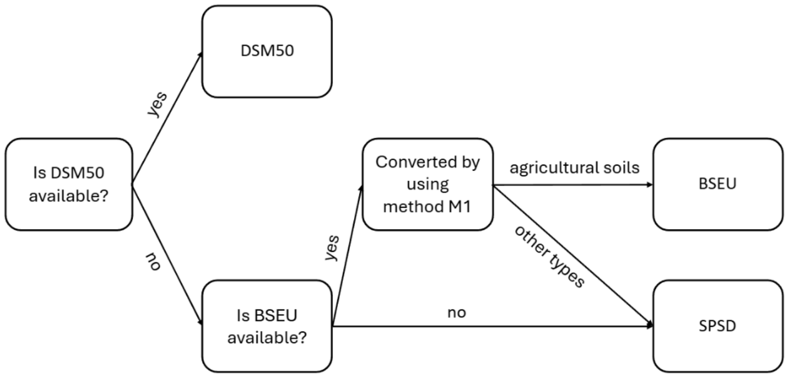


Fig. 3: Hierarchical decision logic for selecting soil type data in MPP2018 CZ. [19]

In contrast to soil types, the results for soil texture do not support a clear preference for a single soil texture data source based solely on thematic accuracy. Field validation and spatial comparison show that, after aggregation into the two texture classes required by the MPP2018 CZ model (F-G and C-G soils), differences among SPSD, BSEU, and DMSP-derived texture information are of comparable magnitude.

In this context, SPSD is retained as the default soil texture source primarily due to its nationwide spatial availability and its established role within existing operational workflows. This choice ensures spatial consistency of soil texture input across the entire model domain, while acknowledging that soil texture remains an inherent source of uncertainty in passability modelling [18]. The proposed hierarchical integration framework enables the MPP2018 CZ model to operate robustly under conditions of heterogeneous data availability without uncontrolled mixing of soil datasets. By applying source selection rules separately for soil types and soil texture, the approach reflects attribute-specific uncertainties and preserves methodological transparency.

From an operational perspective, the hierarchy supports flexible yet traceable use of soil data in decision support applications. Explicit documentation of dataset selection allows reproducibility of model results and facilitates communication of data quality and limitations to end users. The hierarchy is designed for direct implementation within operational GIS environments, including the Geoportal of the Czech Armed Forces' geographic service [19].

## 4. Discussion

The results of this study confirmed that the selection of soil databases is critical factor influencing the reliability of soil passability modelling and, consequently, the quality of decision support based on model outputs. Differences among soil databases are not only limited to spatial resolution or data availability but primarily reflect structural inconsistencies in soil classification systems and the methodological approaches used in their compilation.

The clear superiority of DSM50 in representing soil types is consistent with earlier findings emphasising the importance of cartographic accuracy and consistent classification schemes for modelling applications. Its high level of agreement with field observations reinforces its role as the primary reference source wherever available. At the same time, the incomplete spatial coverage of DSM50 represents a fundamental limitation that prevents its exclusive use in operational environments where nationwide applicability is required. In contrast, the analysis of soil texture shows that uncertainty persists regardless of the selected database. Although SPSD has traditionally been preferred in operational workflows, this study demonstrates that its perceived dominance is largely a consequence of historical availability and nationwide coverage rather than demonstrably superior thematic quality. Once soil texture classes are generalised into the simplified categories required by the MPP2018 CZ model, differences between SPSD, BSEU and DMSP-derived data become comparable and cannot be resolved in favour of a single source. These finding highlights soil texture as an inherent source of uncertainty in passability modelling rather than a problem that can be solved solely by database selection. [19]

The proposed attribute-specific hierarchical integration represents a key conceptual contribution of this paper. Instead of seeking a universally optimal soil dataset, the approach acknowledges the heterogeneous nature of available data and formalises their use through transparent decision rules. Separating the selection logic for soil types and soil texture reflects their different roles within the passability model and allows their respective uncertainties to be addressed more realistically. From an operational perspective, this framework improves both the robustness and traceability of model outputs. Explicit documentation of data-selection steps enables retrospective evaluation of modelling results, which is indispensable in decision support applications where accountability and reproducibility are required. At the same time, the hierarchical approach allows flexible adaptation to different data-availability scenarios without ad-hoc or undocumented mixing of sources. The findings further suggest that future improvements in soil passability modelling should not focus solely on replacing existing soil databases but rather on improving harmonisation procedures, extending field validation, and developing advanced methods for representing soil texture and moisture-related processes. In this respect, the integration of new pedometric products and remote-sensing-based soil information may offer additional benefits, provided that their uncertainties are explicitly incorporated into the modelling framework.

Overall, the study demonstrates that a structured, multi-source approach to soil data integration provides a more realistic and operationally applicable solution than reliance on a single preferred dataset. This perspective is particularly relevant for military decision support systems operating under conditions of incomplete data coverage and variable data quality. The proposed hierarchy enables model deployment in real-world conditions where ideal data availability cannot be assumed and provides a transparent basis for communicating data quality and limitations to end users. The hierarchy is designed for direct implementation within the Geoportal of the Czech Armed Forces' geographic service, supporting both analytical assessments and operational planning tasks.

## 5. Conclusions

This study shows that the selection and integration of soil databases have a decisive impact on soil passability modelling results and on the reliability of outputs produced by the MPP2018 CZ model. Differences among available soil datasets systematically affect the representation of model input parameters and therefore require explicit and controlled handling within the modelling framework.

For soil types, DSM50 provides the most thematically consistent information and represents the preferred reference source wherever it is available. Its incomplete spatial coverage, however, necessitates a hierarchical combination with BSEU and SPSD to ensure full operational applicability of the model. For soil texture, the analysis indicates that after aggregation into the simplified classes used by the model, all evaluated databases exhibit a comparable level of agreement. At this level of generalisation, dataset selection is therefore driven primarily by spatial coverage and operational usability rather than by thematic accuracy alone. [19]

The main contribution of this study is the development of an attribute-specific hierarchical decision logic for soil data integration. Separating the selection of data sources for soil types and soil texture enables consistent model behaviour while preserving transparency and traceability of input data. The proposed framework provides a practical basis for further development and operational deployment of the MPP2018 CZ model, including its implementation within the Geoportal of the Czech Armed Forces' geographic service, where it can support both analytical assessments and operational planning tasks. [19]

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