www.soilprom.eu

Organisation: Wageningen University and Savonia University of Applied Sciences
Main Authors: Hoxha-Jahja, Ardita; Rezaei, Mahrooz; Kainulainen, Petri; Eskelinen, Tuomo

SOILPROM

Needs of Modelling Platform (MP) and Decision Support Tool (DST) Users

Deliverable 5.1

Date: 28/02/2025
Doc. Version: 1.1

This project has received funding from the European Union's Horizon Europe Research and Innovation program under Grant Agreement No. 101156589. This output reflects only the author's view, and the European Union cannot be held responsible for any use that may be made of the information contained therein.

SOILPROM

Document Control Information

Settings	Value
Deliverable Title	Needs of Modelling Platform (MP) and Decision Support Tool (DST) users
Work Package Title	WP5- Collaboration with end-users and engagement with local stakeholders
Deliverable number	5.1
Description	Mapping of MP and DST users' needs in terms of functionalities for the MP and the DST
Lead Beneficiary	Wageningen University
Lead Authors	Hoxha-Jahja, Ardita; Rezaei, Mahrooz; Kainulainen, Petri; Eskelinen, Tuomo
Contributors	Seremetis, Ioannis; Szymkiewicz, Adam; Ritsema, Coen; Abhishek, Abraham
Submitted by	Wageningen University
Doc. Version (Revision number)	V1.1
Sensitivity (Security):	Public
Date:	28/02/2025

Document Approver(s) and Reviewer(s):

NOTE: All Approvers are required. Records of each approver must be maintained. All Reviewers in the list are considered required unless explicitly listed as Optional.

Name	Role	Action	Date
Wipfler, Louise (WR)	Reviewer	*< Review>*	26-2-2025

Document history:

The Document Author is authorized to make the following types of changes to the document without requiring that the document be re-approved:

- Editorial, formatting, and spelling
- Clarification

To request a change to this document, contact the Document Author or Owner.
order (latest version first).

Configuration Management: Document Location

The latest version of this controlled document is stored in the project SharePoint Folder 'Submitted Deliverables,' and in the Document Library of the EU Funding and Tenders Portal.

Nature of the deliverable		
R	Report	

Dissemination level		
PU	Public	

ACKNOWLEDGEMENT

This report is part of the deliverables from the project "SOILPROM" which has received funding from the European Union's Horizon Europe Research and Innovation program under grant agreement No 101156589

More information on the project can be found at: http://www.soilprom.eu.

SOILPROM

TABLE OF CONTENTS

I. INTRODUCTION

The overall objective of SOILPROM is to deliver upgraded and integrated models for transport and fate of soil pollutants. The models help assessing the impact of soil pollution on soil functions and related ecosystem services, by considering a selection of pollutants that potentially pose a high risk to the environment and to humans.

The updated and integrated models will be able to better support a wide range of stakeholders in implementing sustainable land management strategies and formulating policies for healthy soils all over Europe. In order to facilitate them to do so, an open access Modelling Platform (MP) and a Decision Support Tool (DST) will be developed in the course of the project.

This report is a documentation of findings and analysis based on responses to a survey among potential users of the MP and DST. The survey was carried out between December 15, 2024, and January 23, 2025. The related questionnaire was designed by SOILPROM partner NIBIO, and carried out by leaders of seven use cases of soil pollution in The Netherlands, Germany, Spain, Norway, Poland, and Belgium. The use case leaders have been familiar with and working on the seven soil pollution use cases over a period of time. Through their engagement, they have developed good contacts with relevant stakeholders of each use case, and have identified who among the stakeholders are potential users of the SOILPROM MP/DST. It was this group that the survey targeted primarily, besides other interested individuals. Thus, respondents included direct stakeholders in the use cases who would potentially use the MP and DST to support their efforts towards soil pollution management, including scientists, farmer organisations, government agencies, as well as other potential users outside of the use cases. Analysis and interpretation of the questionnaire data was carried out jointly by project partners Savonia, GUT, NIBIO, AUA and WU.

2. OUTLINE OF SURVEY RESPONSES

A total of 77 responses were collected from seven countries: the Netherlands, Germany, Spain, Norway, Poland, and Belgium, and the UK. The highest number of respondents were from Spain (27.3%), followed by the Netherlands (19.5%) and Poland (18.2%). The lowest response rates came from the UK (13%) and Belgium (9.1%).

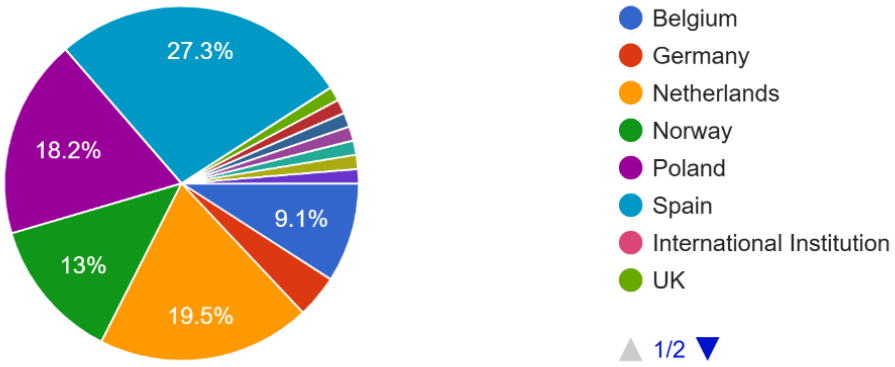

Figure 1: Responses to survey question 'In which country are you working?' (77 responses)

In terms of professional affiliation, 51.3% of respondents work in universities or research institutes, followed by representatives from consulting companies, local and EU-level government institutions, environmental agencies, water supply companies, and state geological institutes.

Regarding gender distribution, 67.5% of respondents are male, while 32.5% are female.

Sector representation is led by environmental monitoring or modelling (57.7%), followed by food and agricultural production services (11.5%). Other sectors, each comprising less than 10% of respondents, include water supply management, industrial or mining operations, environmental policy development, and nature management.

The highest frequency (40) of recorded institution is from Academia, researchers. The lowest (4) comes from End-Users/Citizens.

Table 1: Institution Frequency in the survey data

	Frequency	Percent	Valid Percent	Cumulative Percent
End-users/Citizens	4	5,2	5,2	5,2
Public sector/Government	20	26	26	31,2
Private sector	13	16,9	16,9	48,1
Academia, researchers, trainers	40	51,9	51,9	100
Total	77	100	100	

3. KEY FINDINGS

3.1. USER PROFILE

To better understand users' needs, it is essential to first analyse the sectors they work in. The majority of respondents (57.7%) are engaged in the environmental monitoring and modelling sector. The remaining users work in sectors such as food and agricultural production, water supply management, and environmental policy development.

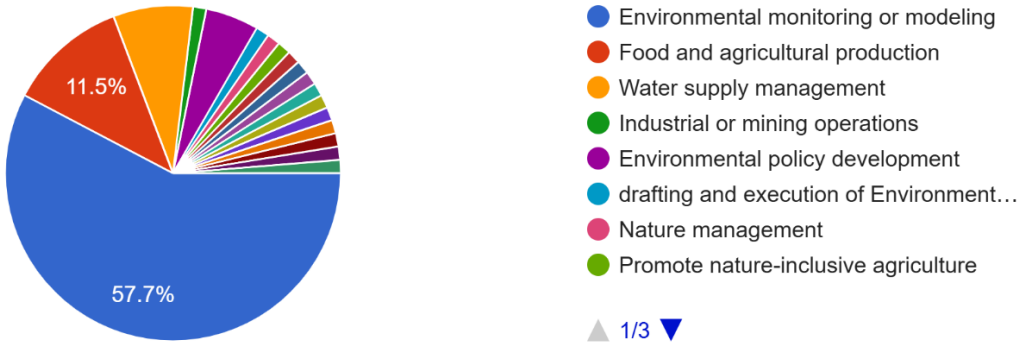

Figure 2: Sectors that describe work focus of respondents (70 responses)

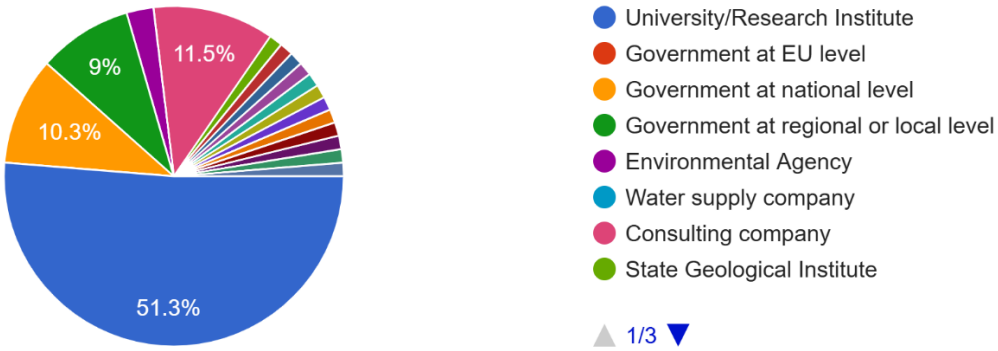

Figure 3: Type of institutions respondents represent (70 responses)

3.2. Key Pollutants

A majority of respondents (54.5%) identified nutrients as key pollutants, followed by pesticides (44.2%) and metals (39%). These results confirm that the project's chosen pollutants align well with user priorities. Other significant pollutants include PFAS (23.4%) and microplastics (15.6%). A smaller percentage of respondents (1.3%) highlighted additional pollutants relevant to their specific use cases, such as organic solvents, phenols, pharmaceuticals and organic substances.

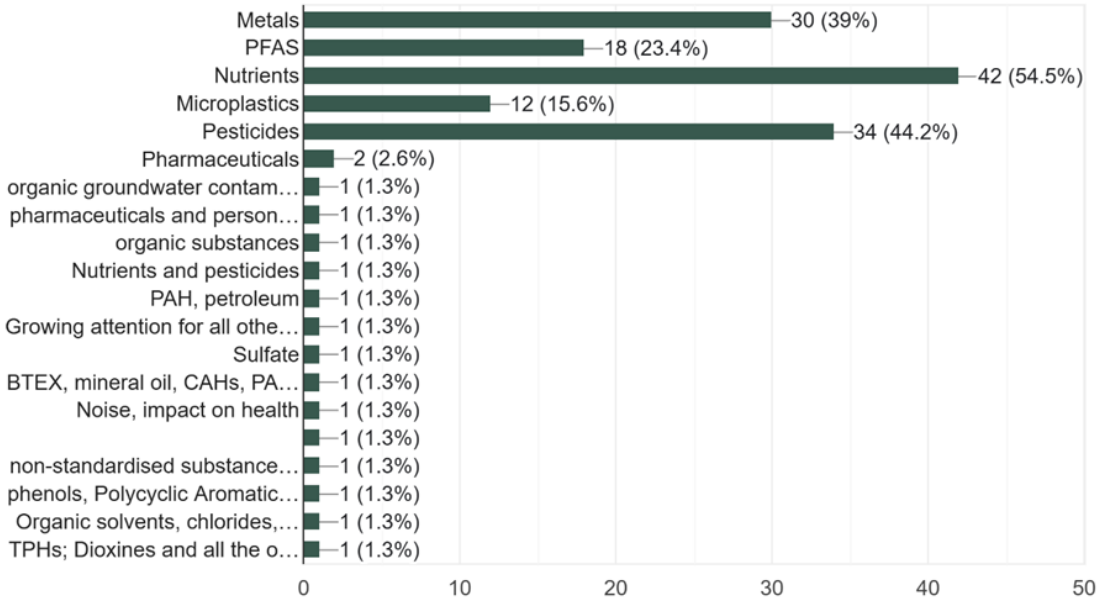

Figure 4: Contaminants considered by respondents to be important to their work (77 responses)

3.3 Current extent of usage of the models

A majority of respondents (60%) do not run models themselves but either utilize model outputs (31.4%) or express interest in incorporating model results into their work (28.6%).

Among the remaining 40%, a significant proportion are actively involved in model development (22.9%), while others use models or various decision support tools (11.4%). The rest engage with modelling frameworks or decision-making tools in varying capacities, contributing to different aspects of data analysis and application.

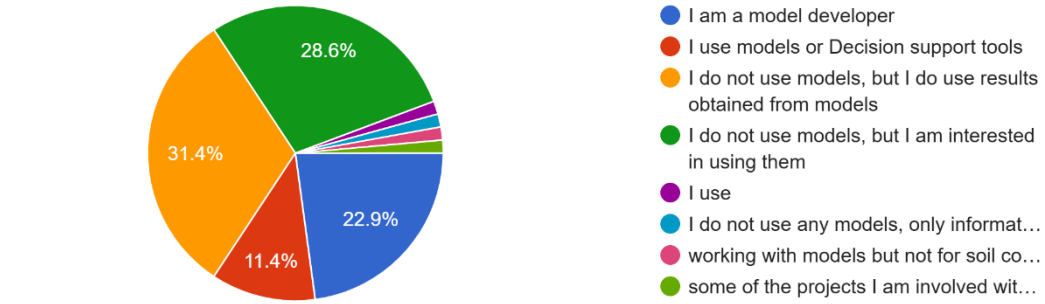

Figure 5: Extent/ ways to which respondents utilize computer models of soil contamination in their work (70 responses)

Among respondents who engage with models or decision-making tools (60%), a diverse range of established modeling frameworks is employed. The most commonly used tools include MODFLOW/MT3D (45.7%), SWAT (23.9%), HYDRUS-HYDRUS HPx (17.4%), SWAP-PEARL (10.9%), and OpenLISEM (4.3%). Additionally, a smaller proportion of users (~2.2%) utilize other existing models such as ICE CREAM, GEEN, and AEM.

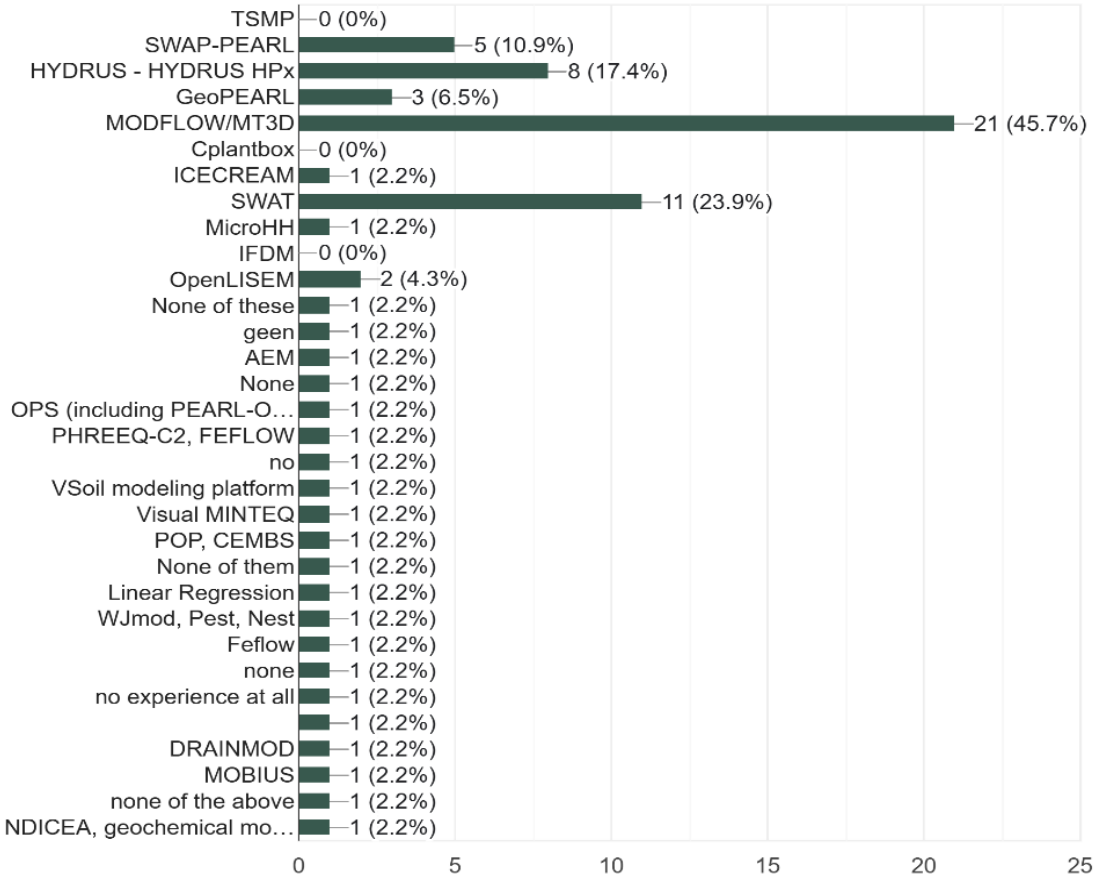

Figure 6: Models used by respondents (46 responses)

Interest in the SOILROM Modelling Platform and Decision Support Tool

The SOILROM MP and DST has garnered significant interest, with 85.7% of respondents expressing a willingness to use it. This strong demand highlights the importance of integrating user feedback and addressing specific needs to ensure the tool's effective development and applicability.

Challenges and barriers to adoption of the SOILROM Modelling Platform and Decision Support Tool

A minority of respondents (14.3%) expressed no interest in using or testing the SOILROM MP and DST, citing various reasons. The most commonly reported barriers include time constraints (30%) and lack of relevance to their current work (30%). Additionally, 10% of respondents each indicated challenges such as insufficient time, lack of necessary technical skills, or uncertainty about the potential benefits of the platform. These findings highlight the need for targeted outreach, training, and clear communication of the tool's value to enhance user engagement and adoption.

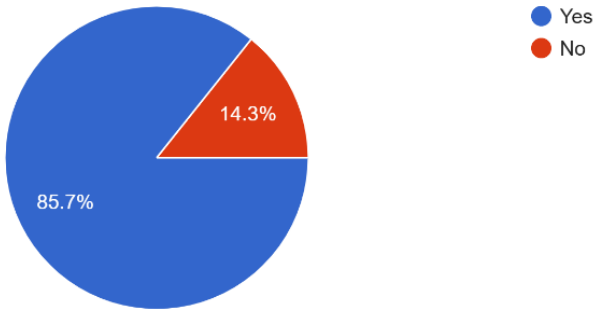

Figure 7: Interest in testing/using MP and DST (70 responses)

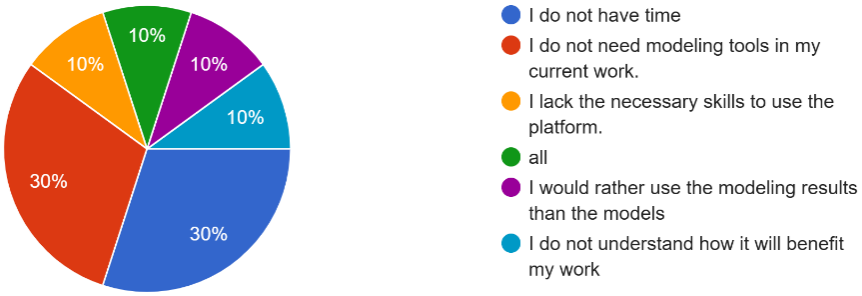

Figure 8: Reasons, if not interested in using MP and DST (10 responses)

3.4 Desired applications of MP and DST

Key Information Requirements for SOILROM Model Simulations

Understanding the specific information needs of stakeholder (end-users) is critical for the effective design and development of the SOILROM MP and DST. The survey results indicate that the primary focus of respondents is on contaminant transport from soil to the groundwater (75.7%), emphasizing the necessity of incorporating robust groundwater contamination modelling. Additionally, 64.3% of the users prioritize information on contaminant travel times, concentrations (e.g., in soil, groundwater, surface water, vegetation, and organisms), and fate, followed closely by contaminant transport from soil to surface water (62.9%).

Other relevant processes include contaminant uptake by vegetation (44.3%) and contaminant exchange between soil and the atmosphere (24.3%). These findings strongly indicate that, according to the respondents, the primary objective of the model simulations should be to assess contaminant pathways and transport dynamics, particularly concerning groundwater and surface water contamination.

Key Contamination Scenarios for Model Development

Survey results indicate that the primary focus of contamination scenarios within the SOILPROM Project should, according to the respondents, be on assessing the impact of agricultural practices (57.1%), particularly regarding the continuous release of contaminants such as fertilizers and pesticides (54.3%). Additionally, significant attention is given to the fate of historical contaminants that persist in the soil despite no longer being actively released (52.9%).

Other relevant contamination scenarios include land use changes (47.1%) and the impact of climate change (44.3%), and how these effect fate and transport of contaminants across regions and impact ecosystem services. In contrast, single accidental contaminant releases (22.9%) were identified as less frequently prioritized by respondents.

These findings highlight the central role of agricultural activities in contamination scenario development, emphasizing the need for models capable of simulating both chronic pollutant inputs and legacy contamination dynamics in soil and water systems.

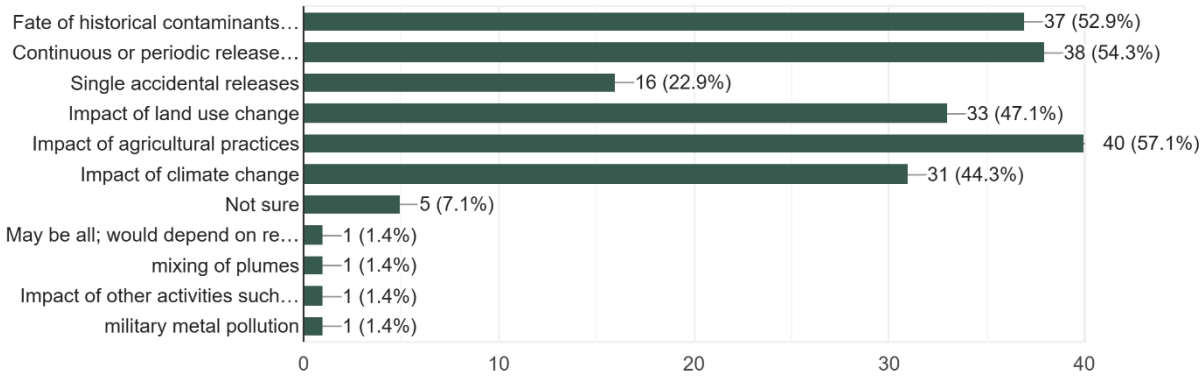

Figure 9: Contaminant scenarios respondents would like to evaluate with MP and DST

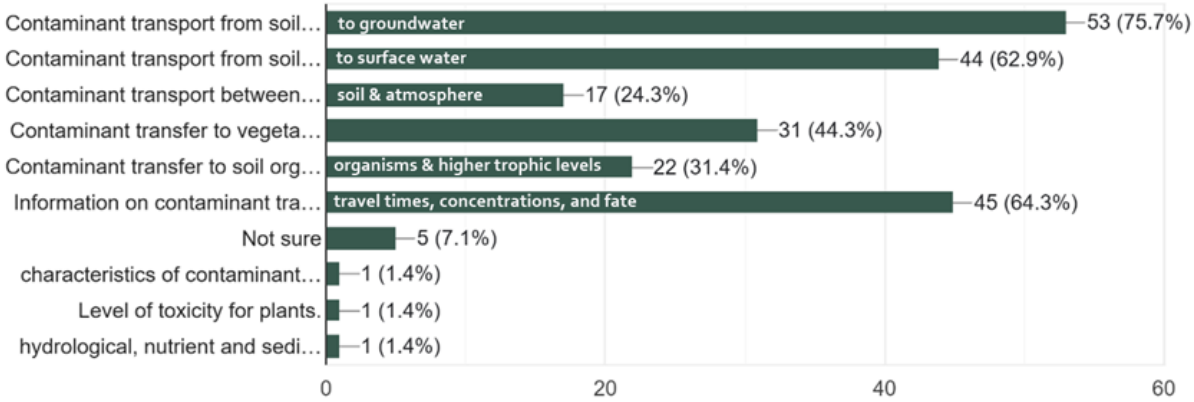

Figure 10: Types of information respondents would like to obtain from model simulations (70 responses)

3.5. Desired Features in MP and DST

User Requirements for the Development of the Modelling Platform and Decision Support Tool

To ensure the effectiveness and usability of the SOILROM MP and DST, it is essential to align its design with user needs. Survey results indicate that the most critical feature is support for easy data import and export in widely used formats such as CSV, Excel, and GIS (71.4%). Additionally, users emphasize the need for an intuitive and user-friendly interface (58.6%), facilitating seamless navigation and accessibility.

Other key requirements include the integration of existing databases for direct data import (48.6%), clear guidance on model parameter selection (44.3%), and customization options for model parameters (42.9%) to enhance flexibility. Furthermore, real-time data visualization capabilities (e.g., charts and maps)

(41.4%) are considered essential for effectively interpreting and analysing model outputs.

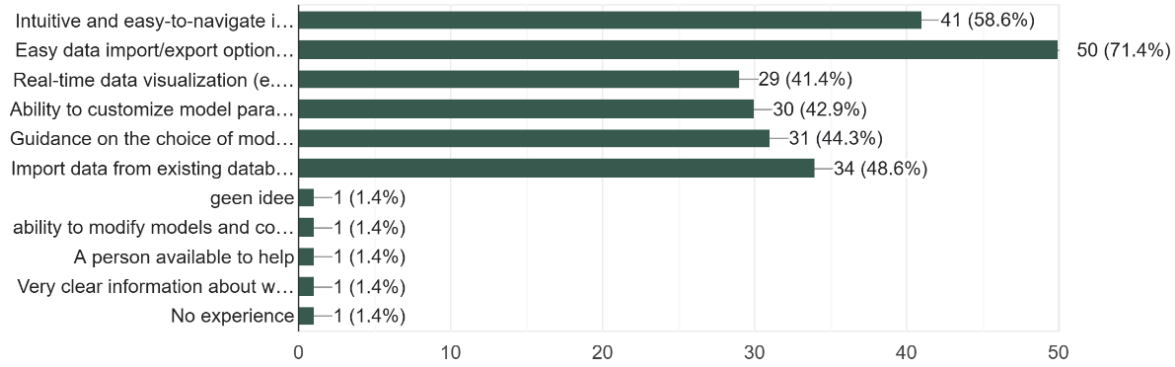

Figure 9: What features would be most helpful in the MP or DST? (70 responses)

These findings underscore the importance of developing a versatile, user-centric platform that prioritizes ease of use, interoperability, and robust visualization tools to maximize its applicability across diverse user groups. 55 respondents out of 77 are looking for easy data import/export options. 45 out of 77 respondents are looking for intuitive and easy to navigate interface.

Table 2: Desirability of easy data import/export options

	Frequency	Percent
Not selected	22	28,6
Selected	55	71,4
Total	77	100

Table 3: Desirability of intuitive and easy to navigate interface.

	Frequency	Percent
Not selected	32	41,6
Selected	45	58,4
Total	77	100

For 57.1% of respondents, real-time data visualization was not considered a critical feature. Similarly, 58.4% of participants did not prioritize the ability to customize model parameters, and 54.5% expressed limited interest in guidance regarding the selection of model parameters. Additionally, the option to import data from existing databases was not selected by 51.9% of users, indicating a relatively lower demand for this functionality.

Customization Preferences for Model Parameters

Survey results indicate that users express varying preferences regarding the flexibility of model parameter adjustments. A significant proportion (45.7%) prefer the ability to modify only selected model parameters, allowing for targeted adjustments while maintaining overall model stability. Conversely, 37.1% of respondents favour high flexibility, advocating for the ability to alter all model parameters as needed to accommodate diverse research and operational requirements.

Additionally, users highlight the importance of predefined parameter presets, enabling the selection of pre-configured parameter sets tailored to different scenarios. This feature would enhance usability by providing standardized settings while still allowing customization where necessary.

These findings suggest that the development of the MP should incorporate both structured parameter control and flexible customization options, ensuring adaptability for a broad range of user needs.

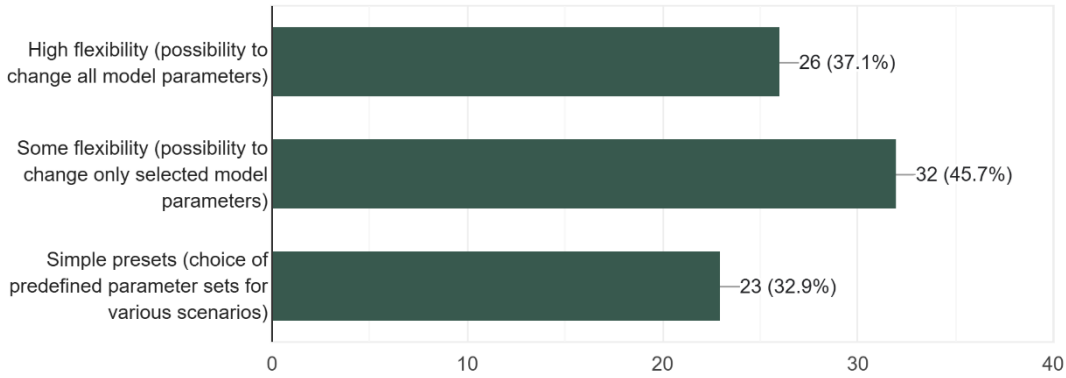

Figure 10: Level of customization expected when configuring model parameters (70 responses)

User Preferences for Output Visualization Formats

Survey results indicate diverse preferences among users regarding the visualization and export of model outputs. The most commonly preferred format is GIS raster files (e.g., GeoTIFF, ESRI Grid) (64.3%), highlighting the need for spatially explicit data representation.

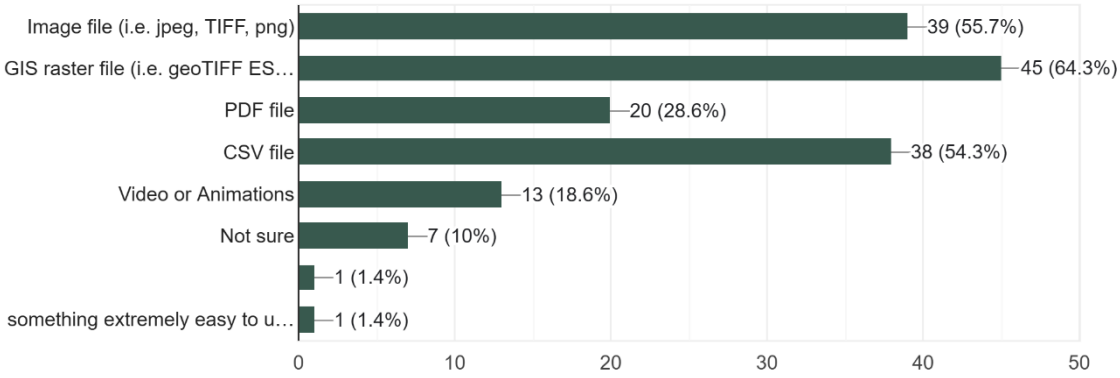

Figure 11: Desired visualization of outputs

User Preferences for Exporting Numerical Outputs

Survey results indicate that users predominantly prefer structured tabular formats for exporting numerical outputs. Excel and CSV formats (61.4%) are the most widely favoured, reflecting the need for seamless data integration, analysis, and visualization in spreadsheet-based applications. Additionally, 22.9% of respondents suggest TXT format, which offers a lightweight and flexible alternative for handling numerical data.

These findings highlight the importance of supporting multiple export formats to ensure compatibility with various analytical tools and user workflows.

e

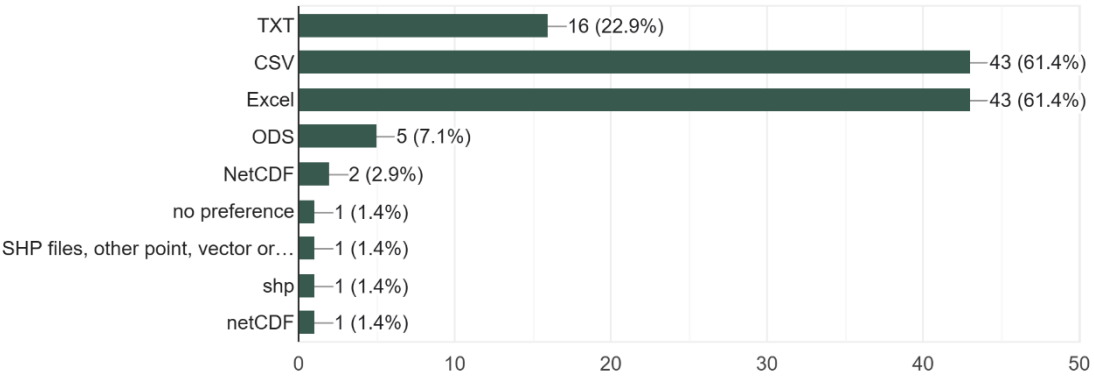

Figure 12: Preferred formats for exporting numerical outputs (70 responses)

Figure 13: Format for exporting numerical outputs

User Preferences for Exporting Textual Outputs

Survey results indicate varying preferences for textual output formats, with the majority of users favouring TXT format (52.9%), likely due to its simplicity and

broad compatibility. Additionally, CSV (38.6%) and Excel (35.7%) are also widely preferred, reflecting the need for structured and easily manageable data formats. A smaller proportion of respondents favour ODS (12.9%), while Word format (2.9%) is the least preferred option.

These findings suggest that textual output export functionality should prioritize plain text and structured formats (TXT, CSV, and Excel) to maximize usability across different applications and user requirements.

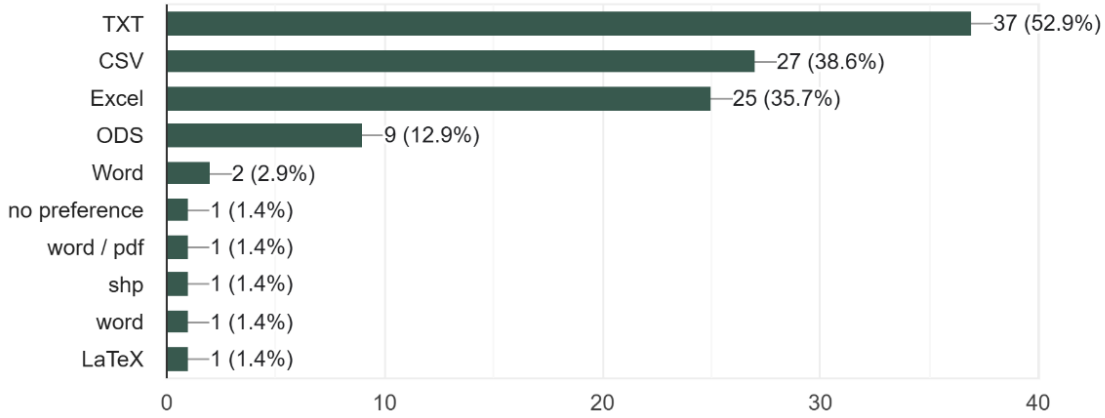

Figure 13: Preferred formats for exporting textual outputs (70 responses)

Institutional Influence on Preferences for Model Parameter Guidance

Survey results indicate a tendency for institutional affiliation to influence user preferences regarding guidance on model parameter selection. Specifically, respondents from academia, research institutions, and training organizations place a higher level of importance on this aspect (P = 0.067), suggesting a greater need for structured methodological support within these sectors. For further details, refer to Table 4 below.

Table 4: Institutional influence on preferences for model parameter guidance

			Institution				Total
			End-users/Citizens	Public sector/Government	Private sector	Academia, researchers, trainers	
Guidance on the choice of model parameters	Not selected	Count	3	14	9	16	42
		% within Recoded institution	75,00 %	70,00 %	69,20 %	40,00 %	54,50 %
	Selected	Count	1	6	4	24	35

		% within Recoded institution	25,00 %	30,00 %	30,80 %	60,00 %	45,50 %
Total		Count	4	20	13	40	77
		% within Recoded institution	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %

Institutional Influence on the Importance of Importing Data from Existing Databases

Statistical analysis reveals a significant impact of institutional affiliation on the perceived importance of importing data from existing databases (P = 0.032). The results indicate that this functionality is particularly valued within the academic and private sectors, whereas it holds relatively lower importance for public sector institutions, including government agencies.

These findings suggest that the development of the MP should prioritize seamless database integration to meet the needs of academic researchers and private sector users, while considering the specific requirements of public institutions.

Table 5: Institutional Influence on the Importance of Importing Data from Existing Databases

			End-users/Citizens	Public sector/Government	Private sector	Academia, researchers, trainers	
Import data from existing databases	Not selected	Count	4	14	6	16	40
		% within Recoded institution	100,00 %	70,00 %	46,20 %	40,00 %	51,90 %
	Selected	Count	0	6	7	24	37
		% within Recoded institution	0,00 %	30,00 %	53,80 %	60,00 %	48,10 %
Total		Count	4	20	13	40	77
		% within Recoded institution	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %

Statistical analysis indicates a significant impact of institutional affiliation on the selection of data import formats (P = 0.008). Specifically, CSV files emerge as the most preferred format for data extraction among respondents from the academic and private sectors, highlighting the need for structured and widely compatible data exchange mechanisms within these domains.

These findings underscore the importance of ensuring CSV compatibility in the MP to accommodate the preferences of academic researchers and private sector users, while also considering alternative formats to support diverse institutional needs.

Table 6: Institutional Influence on Preferred Data Import Formats

			End-users/Citizens	Public sector/Government	Private sector	Academia, researchers, trainers	Total
CSV file	Not selected	Count	3	11	9	10	33
		% within Recoded institution	75,00 %	55,00 %	69,20 %	25,00 %	42,90 %
	Selected	Count	1	9	4	30	44
		% within Recoded institution	25,00 %	45,00 %	30,80 %	75,00 %	57,10 %
Total		Count	4	20	13	40	77
		% within Recoded institution	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %

4. Derived User Needs

This section outlines the user needs identified through the user needs analysis. These identified needs reflect the expectations of stakeholders involved in the survey and should be considered when defining the platform's functional requirements and conceptualizing its functionalities. However, it should be clear that within the SOILPROM context, not all identified needs can be addressed accordingly due to, for instance, project related financial and time restrictions or technical reasons. Therefore, a project-wide discussion will be needed first to prioritize which user needs can receive the respective follow-up in developing the MP and DST and which ones not, by using a pre-defined set of selection criteria for this purpose.

During the survey design phase, the questions were structured not only to extract relevant insights and identify user needs to be addressed but also to document all potential user needs for future reference. This ensures the ability to propose features and functionalities for the MP and DST beyond the SOILPROM project's duration, as part of Task 4.3, 'Sustainability Assessment.'

The derived user needs serve as both inspiration and a representation of end-user challenges and expectations. However, some needs may not be addressed due to various constraints, such as technical limitations or falling outside the scope of the MP and DST objectives.

User needs form the cornerstone of any platform's design and are fundamental to the analysis performed. They refer to the desires, goals, preferences, and expectations that users have when interacting with a product or service. These needs can cover a broad spectrum of factors, including functionality, usability, aesthetics, accessibility, and emotional satisfaction (Heijs, 2022). Table 7 highlights user needs extracted from the analysis, resulting in the function requirements. User needs are meant to be read in the format of "As a user, I want to […] in order to […]", which has been abbreviated for brevity. Each user need described is assigned a unique identifier (UN#) to facilitate precise referencing for future use.

Table 7: User needs derived from survey responses

User Need ID	User Need Description
UNO1	Import and export data in desired format, to easily consume the outputs of the models.
UNO2	Export data in structured formats when applicable (CSV, Excel, TXT), for enhanced interoperability between different applications
UNO3	Access functionalities of MP and DST through an intuitive interface, to navigate easily, retrieve relevant information, and perform key actions efficiently.
UNO4	Be provided with real-time visualizations of the model outputs (charts, heatmaps, etc.) to quickly interpret data.
UNO5	Import data from existing databases, to run the models seamlessly.
UNO6	Import my own high-quality data, to run the models for my own case.
UNO7	Have guidance on the model parameters definition, to easier select the most suitable set of parameters for my case.
UNO8	Ability to adjust model parameters, to better align with my specific case and modelling needs
UNO9	Be provided with presets of parameters, to enable the selection of pre-configured parameter sets tailored to different scenarios

UN10	Evaluate a wide range of contamination scenarios, to support more informed decision-making.

5. Discussion

The survey, conducted from December 15, 2024, to February 5, 2025, involved 77 respondents from the Netherlands, Germany, Spain, Norway, Poland, and Belgium, as well as the UK. Respondents were professionals in academia, government, consulting, and environmental sectors. The majority of participants were male (67.5%), with the largest representation from academia (51.9%).

A significant portion of respondents (55.7%) work in environmental monitoring and modelling, followed by sectors such as food and agriculture, water supply, and environmental policy. This indicates a strong interest in the environmental implications of soil pollution.

The majority of respondents identified nutrients (52.9%), metals (41.4%), and pesticides (40%) as the most important pollutants. Additionally, PFAS (24.3%) and microplastics (15.7%) were identified as pollutants relevant to users. This aligns well with the SOILPROM project's focus. Other groups of contaminants (like pharmaceuticals or hydrocarbons) were mentioned by much smaller numbers of respondents, which means that SOILPROM covers the contaminants most significant to the potential end-users. 60% of respondents do not actively run models but rely on existing outputs or express interest in model integration. Among the remaining 40%, 22.9% are involved in model development. Commonly used models include MODFLOW/MT3D, SWAT, and HYDRUS, among others.

85.7% of respondents expressed interest in using the SOILPROM MP and DST, emphasizing the potential demand for the tools. Barriers to adoption included time constraints and perceived irrelevance, particularly for 14.3% of respondents. Key features desired for the MP and DST include easy data import/export (71.4%), intuitive interfaces (58.6%), and integration with existing databases (48.6%). Users also prioritized contaminant transport modelling, especially from soil to groundwater (75.7%) and surface water (62.9%). Agricultural practices (57.1%) and the persistence of historical contaminants (52.9%) were the most common contamination scenarios. The interest in agricultural practices aligns well with the significance of nutrients and pesticides to the respondents.

Survey responses indicated a preference for flexible customization of model parameters (45.7%), with a particular interest in predefined parameter presets. For output formats, GIS raster files (64.3%), image files (55.7%), and CSV (54.3%) were the most preferred. Excel and CSV were the most favoured formats for numerical outputs (61.4%).

Statistical analysis revealed that respondents from academia and the private sector placed more importance on features like model parameter guidance and data import from existing databases. CSV file compatibility was notably preferred in these sectors.

Depending on the subsequent used need prioritization process by the project partners, these insights potentially will be further considered during w the development of the respective MP/DST tools.

Insights from the survey provide a foundation for designing the SOILPROM MP and DST in line with user needs as listed below:

1. There is a significant interest in all contaminants considered in SOILPROM. However, in developing DST a good way forward could be to give priority to nutrients, heavy metals and pesticides first, while PFAS and microplastics could be added at a later stage if time and resources permit.
2. The largest group of respondents were interested in the transfer of contaminants from soil to groundwater and evolution of contamination in the soil profile. This supports the use of 1D vertical models of flow and transport through soils in the DST, as planned in the proposal. Contaminant transfer from soil to surface waters is also important to a large group of respondents, and this could potentially be achieved by using simplified 2D models, either numerical or analytical. Furthermore, contaminant transport from soil to atmosphere might be relevant also as shown by recent publications. As such, and based on (amongst other things) the user needs assessment, the project consortium should prioritize and decide what can and what cannot be addressed with this regard.
3. Respondents expressed strong interest in evaluating the effect of agricultural practices on the fate of contaminants, which corresponds to the high relevance given to nutrients and pesticides. Given the feedback from the respondents, it might be a good idea that the DST allows the user to choose from several options in terms of the agricultural practices-- such as the type of crop, the type and amount of fertilizer, and its application time. Similarly, it should preferably be possible to choose from among several types of land use. It must be noted that the DST will not be able to offer full customization of the agricultural practices, due to a large number of crops with their specific parametrizations, as well as a large number of actions (tillage, ploughing, irrigation, etc.). Therefore, prioritization is recommended—i.e. defining a limited set of practices which are feasible and representative for the use cases.
4. The opinion was divided with regard to the level of customization of the MP parameters. Taking into account the concepts of the MP and the DST, it seems appropriate to allow the DST users only limited options to modify parameters in simple models (with up to ca. 10 parameters) and only the most important parameters in more complex models (which might need tens of parameters). This can be justified since the DST is planned as a streamlined interface to selected modelling capabilities of the MP. Furthermore, the MP is envisioned as a repository of computer programs, scripts and input files, which can be browsed and

downloaded by the user. Thus, the MP will allow more advanced users to modify any of the model parameters.

CONCLUSION

The survey results provide valuable insights into the user needs and preferences for the SOILPROM Modelling Platform (MP) and Decision Support Tool (DST). The findings highlight that the majority of potential users are affiliated with academia and research institutions, with a strong representation from environmental monitoring and modelling sectors. The key pollutants of concern-- particularly nutrients, metals, and pesticides-- align well with the project's focus, while additional pollutants such as PFAS and microplastics are also of interest.

Regarding the use of modelling tools, a significant proportion of respondents do not actively run models themselves but utilize model outputs or express interest in integrating modelling results into their work. The most widely used existing modelling frameworks include MODFLOW/MT3D, SWAT, and HYDRUS, which reflects a demand for tools capable of simulating contaminant transport processes. Interest in the SOILPROM MP and DST is high, with 85.7% of respondents indicating a willingness to adopt the platform, underscoring the need for user-centred development, fitting the project needs and available resources.

Key user requirements emphasize ease of data import/export, user-friendly interfaces, and visualization capabilities, with a preference for GIS-based output formats. However, certain features, such as real-time data visualization, full customization of model parameters, and database integration, were not prioritized by a significant portion of respondents. Institutional affiliations also influence preferences, with academic and private sector users demonstrating a stronger interest in specific functionalities such as guidance on model parameter selection and structured data import options.

These insights provide a good starting point and a foundation for designing the SOILPROM MP and DST.

REFERENCES

Heijs, W. (2022). User needs by Systematic Elaboration (USE): A theory-based method for user needs analysis, programming and evaluation. Springer Nature.

ANNEX 1: SURVEY DESIGN

A Survey for Users of Modeling Platform and Decision Support Tool under Development by EU Horizon SOILPROM Project (2024.09-2028.08)

Information about the creation of the survey:

-Translation: we consider translating the survey if a Use Case leader explicitly points out the need for it

-Citizen groups are not potential users of the MP and the DST. They need not be included in the list of stakeholders to be surveyed

-Will be useful to ensure that stakeholders at different levels (local, regional, national) are covered

-Use case leaders are best placed to circulate the survey and follow up

Questions about the creation of the survey:

- Possibility to fill both MP and DST part? Is it a need?

Data management:

- Do you need to add any details on how the data of the survey is processed?
- Is there going to be a separate page of written consent or a text like: By responding to this survey, you accept these conditions.
- Where will the result be reported? Will the information anonymized? and to make it clear that all data will be processed according to ethical and other regulations like GDPR #24 and 26 are similar?

Introduction of SOILPROM and the survey

SOILPROM is an EU Horizon funded project to improve the modelling of soil pollution processes for metals, PFAS, nutrients, microplastics, and pesticides through soil, air, water, and plants compartments, to reach reduced levels of pollution and healthier soils across Europe. The project will use both existing European databases and local newly collected datasets to upgrade, integrate and validate existing soil pollution models under field conditions in 7 diversified use-cases in Europe. The upgraded and integrated models will be usable in an open-access **Modelling Platform** for scientists coupled with a **Decision Support Tool** for practitioners. It will allow to gain knowledge and to increase the capacities in describing key pollution processes and their long-term impacts with respect to the different soil processes, functions, and related ecosystem services. Particularly, emphasis will be placed on quantifying ecosystem services in the 7 SOILPROM use-cases and the related impact of local policies and practices, leading to the development of scenarios and recommendations, through collaborations with stakeholders.

This survey has been created to gather and categorize the needs of the potential users of the modelling platform and the decision support tool. The responses will be summarized and used internally by the SOILPROM consortium in our selection of models and the development of the **Modelling Platform** and the **Decision Support Tool**.

We would greatly appreciate it if you could respond by DD.MM.YYYY. Thank you very much for your help! Should you have any questions, please contact USE CASE (USE.CASE@XXX.YYY).

This survey will take you less than 10 min.

Read more about the Modelling Platform (MP) and Decision Support Tool (DST)

*The **MP** aims at (1) delivering the models used in the SOILPROM use-cases in a single place and in a structured way, (2) allowing the user to run these models and combinations of models, and (3) linking with the relevant European databases. It targets academicians, but also administration and environmental agencies with modelling skills, allowing them to access breakthrough and unique soil relevant knowledge and data.*

*The **DST** will be integrated to the MP to allow additional users with less modelling skills (i.e., environmental institutions, consulting companies with basic modelling skills) to access part of the functionalities of the MP. The DST will (1) help the user to decide which model(s) are the best for a specific use-case, (2) clarify what input is needed to run the model(s), and which existing databases can be used for that purpose, (3) list what output will be generated by the model(s), (4) show how alternative model scenarios can be defined, explored and analysed, and (5) provide results of the SOILPROM use-cases as examples to the users of the DST.*

PART A: Information about the respondent (Please choose all the relevant options)

1	Country	☐ Netherlands ☐ Belgium ☐ Spain ☐ Norway ☐ Germany ☐ Poland Specific region: [enter text here]
2	Institution	☐ University / Research institute [If you want to, specify] ☐ Private company / consultation [If you want to, specify] ☐ Government at level of [enter EU, national, regional or local; [If you want to, specify]] ☐ Farmer ☐ Others, please specify: [enter text here]
3	Focus of work/duty	☐ Environmental monitoring / modelling ☐ Food / agriculture production ☐ Industry / mining ☐ Policy ☐ Others, please specify: [enter text here]
4	Are you working with:	☐ Metals [If you want to, specify] ☐ PFAS ☐ Nutrients [If you want to, specify] ☐ Microplastics

		☐ Pesticides [If you want to, specify] ☐ Others, please specify: [enter text here]
5	To what extent do you work with models / tools?	☐ I am a model developer ☐ I use models / decision support tools much in my work ☐ I use models / decision support tools sometimes ☐ I do not use models / decision support tools but interested to start using them ☐ I think models / decision support tools will be useful in my work ☐ Others, please specify: [enter text here]
6	Which **model(s)** do you have experience with?	☐ TSMP ☐ SWAP -PEARL ☐ HYDRUS, HYDRUS HPx GeoPEARL ☐ MODFLOW/MT3D ☐ Cplantbox ☐ ICECREAM ☐ SWAT ☐ MicroHH ☐ IFDM ☐ OpenLISEM ☐ MIKE SHE ☐ HGS ☐ Others, please specify: [enter text here] ☐ I am not using model
7	Which **modeling platform(s)** are you currently using?	[Enter text here]
8	Which **decision support tool(?)** do you have experience with?	[Enter text here]
9	The next part of the survey has two choices:	☐ I am more interested in the Modelling Platform and want to answer the questions related to it ☐ I am more interested in the Decision Support Tool and want to answer the questions related to it

PART B: Needs of the Modelling Platform and the Decision Support Tool

[In the online version, the respondent is directed to B1 or B2 part according to his/her answer #9 about MP or DST user]

	(B1) **Modelling Platform**	
10	What is the main challenge when using a **Modelling Platform (MP)**?	☐ ☐ ☐ I have never used a MP ☐ other, please specify: [enter text here]

11	What are some features you like about the platforms you are currently using?	☐ ☐ ☐ ☐ other, please specify: [enter text here]
12	What features or functionalities do you find most helpful when navigating through a modelling platform? (multiple choice)	☐ Intuitive and easy-to-navigate interface ☐ Easy data import/export options (e.g., CSV, Excel, GIS) ☐ Real-time data visualization (e.g., charts, maps) ☐ Ability to customize model parameters
13	Please rank (from 1 to 7) the following challenges in rate of importance (provide some options of challenges)	☐ Complexity of the interface ☐ Difficulty integrating various datasets ☐ Limited options for customizing models or parameters ☐ Slow processing times for large datasets ☐ Lack of real-time data integration ☐ Lack of clear or interpretable visual outputs ☐ Limited output options
14	Will you be interested in using/testing the **Modelling Platform** that SOILPROM is developing?	☐ Yes ☐ No ☐ Not sure
	-If you answered **YES** to the above question #14	
15	What is (are) your main purpose(s) of using/testing the **Modelling Platform**?	☐ ☐ other, please specify: [enter text here] ☐ Not sure
16	What is (are) your expectation(s) of the **Modelling Platform**?	☐ ☐ other, please specify: [enter text here] ☐ Not sure
17	What types of visualizations of outputs would you like to see?	[i.e. tif, geotif, pdf, CSV] ☐ image file ☐ PDF file ☐ CSV file ☐ video ☐ other, please specify: [enter text here] ☐ Not sure
18	What format do you prefer for extracting the outputs?	☐ txt ☐ CSV ☐ other, please specify: [enter text here]
	-If you answered **NO** to the above question #14	
19	What are your reasons / concerns?	☐ I don't need ☐ I don't have time ☐ I'm not interested ☐ other, please specify: [enter text here]
	(B2) **Decision Support Tool**	

20	How comfortable are you with using digital soil modelling tools?	☐ 1 not comfortable at all ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 very comfortable
21	How important is it for you to compare results from different databases?	☐ Very important ☐ A bit important ☐ Not very important ☐ Not important at all ☐ I don't know any database
22	How familiar are you with soil relevant databases?	☐ Very familiar ☐ Familiar ☐ A little bit familiar ☐ Not familiar
23	Will you be interested in using/testing the **Decision Support Tool** that SOILPROM is developing?	☐ Yes ☐ No ☐ Not sure
	-If you answered **YES** to the above question #23	
24	What is (are) your main purpose(s) of using/testing the **Decision Support Tool**?	☐ Optimize my work ☐ Reduce costs ☐ Reduce pollution ☐ Curiosity
25	How familiar are you with SOILPROM's MP available models?	☐ Very familiar ☐ Familiar ☐ A little bit familiar ☐ Not familiar
26	What is (are) your expectation(s) of the **Decision Support Tool**?	☐ Optimize my work ☐ Reduce costs ☐ Reduce pollution ☐ other, please specify: [enter text here]
27	What level of customization do you expect when configuring model parameters?	☐ High flexibility ☐ Simple presets
	-If you answered **NO** to the above question #23	
28	What are your reasons / concerns?	☐ I don't need ☐ I don't have time ☐ I'm not interested ☐ other, please specify: [enter text here]

PART C: Conclusion

29	Do you have any other comments/thoughts?	[enter text here]

30	Would you like to have a copy of the results of the survey?	☐ Yes. If yes, please indicate your Name: [enter text here] Email: [enter text here] ☐ No
31	Are you willing to be contacted by **SOILPROM** for further discussions on the **modelling Platform** and the **Decision Support Tool**?	☐ Yes. If yes, please indicate your Name: [enter text here] Email: [enter text here] ☐ No