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Sludge Futures



Report series — 01

Risk perceptions on emerging contaminants in biosolids application to agriculture

Workshop Guides for Facilitators

UKRI Research England

Author

Carolina Montoya Pachongo

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Contents

What's in this document

This document contains detailed activities from two workshops as part of Objective 1 of the Sludge Futures Project—understanding stakeholder perspectives and priorities regarding risks across the sludge-to-agriculture pathway. Participatory workshops were conducted with regulators, farmers, water companies, the food industry and academics.

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Section 01

01

Guide to Step 1

Identifying hazards to public and environmental health from sludge application on farmland.

Total duration: 1 hour - 60 minutes

Step 1 was adapted from the MUISKA approach, developed originally for water security risk analysis. Step 1 was designed to identify the full universe of hazards associated with the application of biosolids to farmland in England and to explore potential connections between causes and cascading consequences across multiple dimensions, while promoting systems thinking.

Section 01

1 Guide to Step 1

Identifying hazards to public and environmental health from sludge application on farmland

1.1 INTRODUCTION

This document is a guide to developing step 1 of the MUISKA approach for sludge management: identifying the predominant hazards to public and environmental health associated with the application of sludge on farmland. This step is designed to be developed separately, with each relevant party group identified in step 0. Relevant parties received a formal invitation from the research team, were informed of the project's ethical considerations, and agreed to participate.

1.2 OBJECTIVES

- Develop a rapid understanding of the hazards to public and environmental health from sludge application based on the local knowledge of citizens and representatives of institutions related to sludge application on farmland in England.
- Create a network of hazards and their consequences and identify how the subsystems related to sludge application on farmland in England (e.g., economy, agriculture, public services, transport, etc.) are interrelated based on the local knowledge of citizens and representatives of institutions related to this practice in sludge management.
- Promote systems thinking.

1.3 KEY DEFINITIONS

To carry out this step of the MUISKA approach, it is necessary to establish the sludge-to-farmland pathway and to define the concepts of the pathway, system, farmland, and hazards. For this reason, these definitions are summarised in Figure 1.

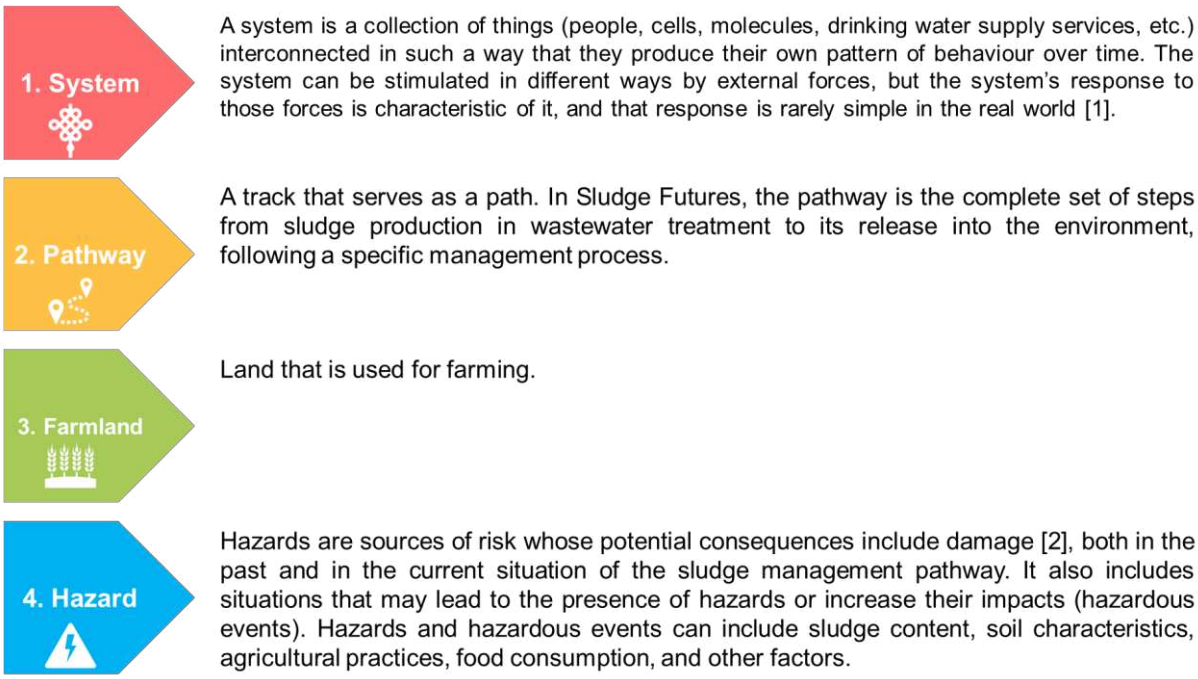


Figure 1. Five basic definitions to develop step 1 of the MUISKA approach

[1]: Meadows (2008)[1]*; [2]: Society for Risk Analysis* (2018)[2]

1.4 DEVELOPMENT OF STEP 1

1.4.1 Supplies

- Six printed copies of this guide
- Printed copies of the PowerPoint presentation
- Square Post-it notes
- Coloured markers
- Masking tape

[1] Meadows, D.H. 2008. Thinking in systems. A primer (D. Wright, ed.). London: Chelsea Green Publishing.

[2] Society for Risk Analysis 2018. Society for Risk Analysis Glossary, p.9.

* Copies of the invitation letter, participant information, and informed consent.
* Copies of the pathway 1.
* Pencils and erasers
* A1/A0 paper sheets
* Three large glue sticks
* Newsprint
* Camera

1.4.2 Preparation - Pathway 1

Time allocated: 15 minutes

a) Depending on the number of participants, divide the whole group into several subgroups.
b) Give each subgroup a printed copy of the sludge management pathways, PowerPoint presentation, post-it notes, and coloured markers (see Figure 2).
c) Ask participants to observe the pathway and understand it.
d) Ask them to add additional steps they think the pathway is missing. Guide them to consider the activities that occur once the sludge leaves the WWTP, depending on the relevant party group they represent.

1.4.3 Identifying hazards to water security

Time allocated: 45 minutes

a) Hand over post-it notes and ask them to write down hazards related to the pathway once the sludge leaves the WWTP and until the last step.
b) Remind them that the definition of hazard is in the printed PowerPoint presentation.
c) As participants write down hazards on the post-it notes, collect them, and group them on the wall.

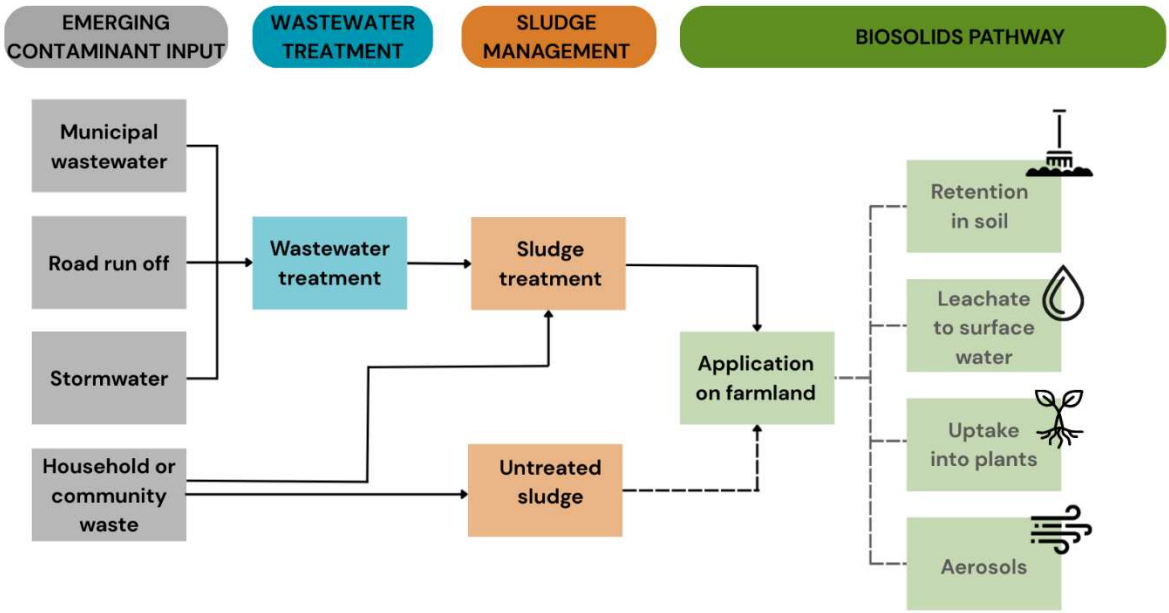


Figure 2. Sludge management pathway 1: application on farmland

d) The whole group should construct the network. Group all participants in front of a large wall so everyone can contribute to building the web based on the previous discussions.
e) Once the post-it notes from the previous activity have been grouped, the whole group is asked to discuss how the problems interrelate.
f) Consider the following types of interrelationships:
    a. Cause-effect. Use arrows to indicate such a relationship. If identifying causes is difficult, guide participants to find ways to produce failures. Questions such as "If I wanted to create this type of failure, how could I do it?" or “Can this consequence appear by itself or does it need something else to happen simultaneously?” Help them think creatively.
    b. Other conditions required for a problem to materialise (presence or occurrence of physical elements, institutions, people). This relates mainly to vulnerabilities such as a lack of information or awareness, economic resources, and regulation.
    c. Consider also the benefits.
    d. Mark the direction of impact with arrows. Feedback loops may occur[3] or loops.
    e. Use more Post-it notes to describe the types of interrelationships that participants identify. Be as detailed as possible.
g) Use as many paper sheets as necessary. You can build the network on the floor when there is no space on the board.

[3] *Feedback loops* are those cycles that are formed when an action generates a consequence that was previously established or when there is a monitoring of a variable at a point in the system and the operation of the system depends on the value of that variable.

h) Start building the network from the bottom of the board and moving upwards. This allows finding the root causes of the problems (bottom) and the ultimate consequences (top) (see Figure 3).
i) Add new elements to the network if necessary.
j) Take photos of the process and the result.



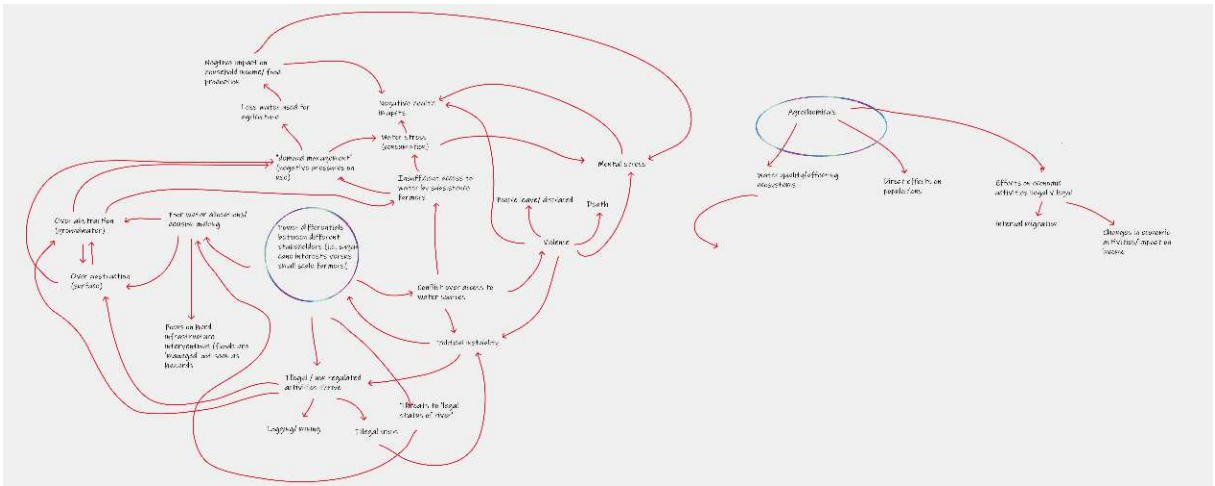


Figure 3. Example of a network of hazards and consequences

Section 02

02

Guide to Step 2

Creating risk matrices based on the MUISKA scales and dimensions.

Total duration: 2.5 hours - 150 minutes

Step 2 was adapted from the MUISKA approach, developed originally for water security risk analysis. Step 2 was designed to classify and describe all hazards and consequences identified in Step 1. Classification and description were based on participants' knowledge and experience.

Section 02

2 Guide to Step 2

Creating risk matrices according to MUISKA scales and dimensions

2.1 INTRODUCTION

This document guides the development of step 2 of the MUISKA approach: creating risk matrices based on the MUISKA scales and dimensions. This step is designed to be developed separately, with each relevant party group identified in step 0. These individuals received a formal invitation from the research team, were informed of the project's ethical considerations, agreed to participate, and signed informed consent.

2.2 OBJECTIVE

Create the risk matrices according to the MUISKA scales and dimensions, based on the network of hazards and consequences elaborated in step 1 for pathway 1, as appropriate, and on local knowledge from citizens and representatives of institutions related to sludge management and application on farmland in England.

2.3 KEY DEFINITIONS

To carry out this step of the MUISKA approach, it is necessary to define the scales and dimensions proposed in the MUISKA approach. For this reason, these definitions are summarised in Figure 4.

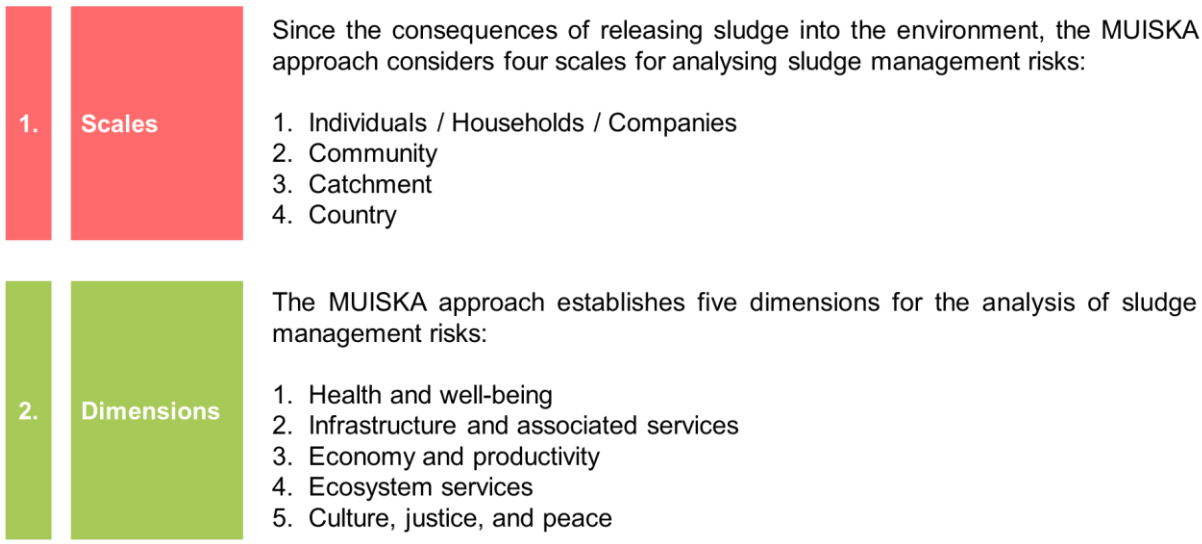


Figure 4. Scales and dimensions for classifying impacts according to the MUISKA approach

2.4 DEVELOPMENT OF STEP 2

2.4.1 Supplies

- Six printed copies of this guide
- Printed copies of the PowerPoint presentation
- Hazard and consequence network developed in step 1
- Rectangular coloured Post-it notes
- Coloured markers
- Masking tape
- Three large glue sticks
- Several rolls of paper
- Camera
- Refreshments
- Lunches

2.4.2 Creation of risk matrices by MUISKA scales and dimensions

Time allocated: 90 minutes

a) Display on the floor or the board (depending on the size) the network of hazards and consequences developed in step 1.

b) On one or more paper sheets, simulate the MUISKA matrix (Figure 5) and paste it on the wall or spread it out on the floor, depending on the size.

c) Ask participants to describe qualitatively each of the consequences classified. Depending on the number of participants, you can assign a specific number of consequences to each participant to ensure the activity can be completed within the allocated time.

d) Once they finish with the qualitative description, rank each consequence by scale and dimension according to Figure 5. Use single-coloured Post-it notes for each dimension to organise the consequences quickly.

e) Encourage participants to think about the people or elements affected by such consequences and the scales at which such consequences may be perceived. Use Figure 6 as a guide.

f) If necessary, modify the network of hazards and consequences developed in step 1, as participants may notice that consequences were missing. Use post-it notes for participants to write down the new consequences and add an asterisk to indicate that these are adjustments.

g) The expected output of this exercise is illustrated in Figure 7.

	Individual / Household / Company	Community	Catchment	Country
Health and well-being				
Infrastructure and associated services				
Economy and productivity				
Ecosystem services				
Culture, justice and peace				

Figure 5. MUISKA matrix of scales and dimensions

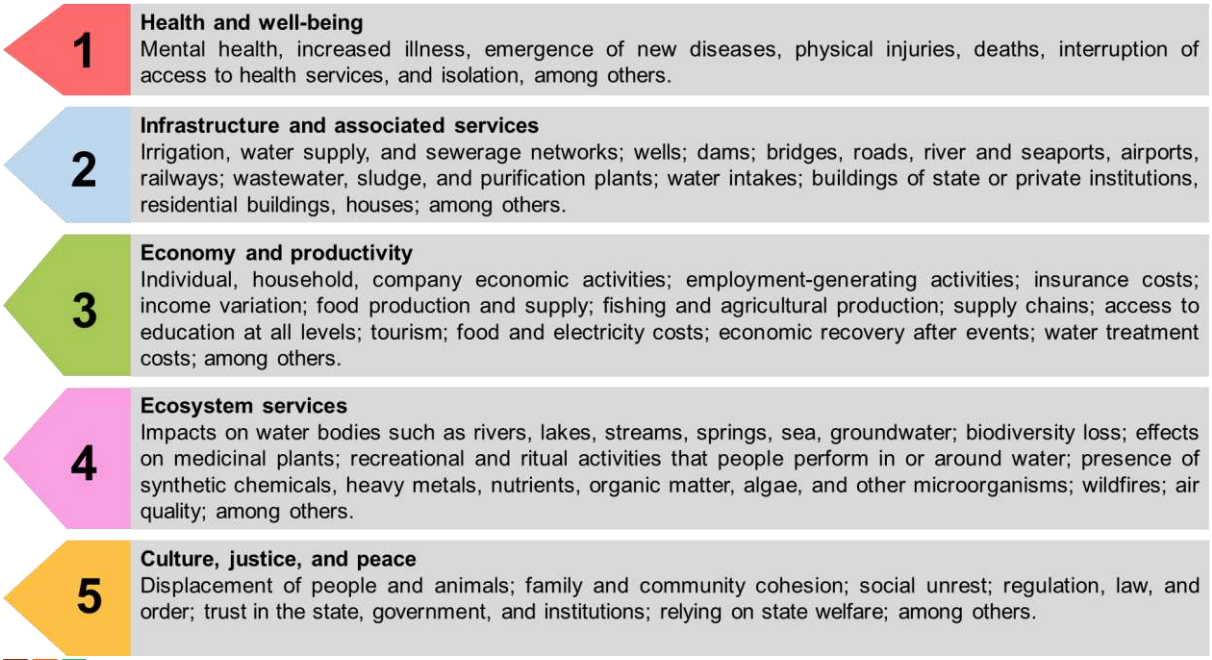


Figure 6. Aspects to consider when classifying consequences according to the five dimensions of MUISKA

	Individual / Household / Company	Community	Catchment	Country
Health and well-being				
Infrastructure and associated services				
Economy and productivity				
Ecosystem services				
Culture, justice and peace				

Figure 7. Expected output of step 2

Section 03

03

Guide to Step 3

Prioritisation of consequences for which risks will be assessed.

Total duration: 2.75 hours - 165 minutes

Step 3 was adapted from the MUISKA approach, developed originally for water security risk analysis. Step 3 was designed to enable participants to prioritise a set of risks for full assessment in the future.

Section 03

3 Guide to Step 3

Prioritisation of consequences for which risks will be assessed

3.1 INTRODUCTION

This document is a guide to develop step 3 of the MUISKA approach: Prioritise the consequences for which risks will be assessed.

3.2 OBJECTIVES

- Prioritise impacts according to three criteria.
- Preliminarily identify potential power relations that influence prioritisation.

3.3 DEVELOPMENT OF STEP 3

3.3.1 Supplies

* Six printed copies of this guide
* Printed copies of the PowerPoint presentation
* Hazard and consequence network developed in step 1
* Copies of Form 1 (Table 1)
* Codes for consequences according to their scales and dimensions.
* Copies of Form 2 (Table 2)
* Copies of Form 3 (Table 3)
* Coloured markers
* Several rolls of paper
* Camera
* Refreshments
* Lunches

3.3.2 Preparation during the lunch break

Facilitators will record the consequences listed in the network in Form 1, along with consecutive codes (1, 2, 3, …, n), to facilitate analysis of consequences for each filter in this step of the MUISKA approach. The coding system is presented as follows. Use a pen or marker to write the codes in the column “Consequence code” in Form 1, followed by the consequence title in the second column of this form. In forms 2 and 3, the participants will refer to the code, so they do not have to repeat the consequence titles.

3.3.3 Methodology explanation

Time allocated: 10 minutes

a) The methodology of this prioritisation is based on criteria that act as filters to discard at each stage a certain number of consequences included in the network elaborated in step 1 (Figure 8).

b) Session facilitators should introduce the following criteria and explain their application so that participants can assimilate the general way in which the consequences will be prioritised.

c) Answer participants’ questions so the methodology is transparent for everyone before starting.

d) Consider the following preliminary criteria and sub-criteria:

* Magnitude of consequences according to the network developed in step 1.
* MUISKA scales and dimensions.
* Governance to manage risks:
  - Degree of power the relevant party possesses to decide what actions are required to manage the risk.
  - Degree of power the relevant party has to influence the design of the actions required to manage the risk.
  - Degree of power the relevant party has to allocate financial resources to design or implement actions required to manage the risk.
  - Degree of power the relevant party has to implement actions required to manage the risk.
  - Relevant party empowerment opportunities.

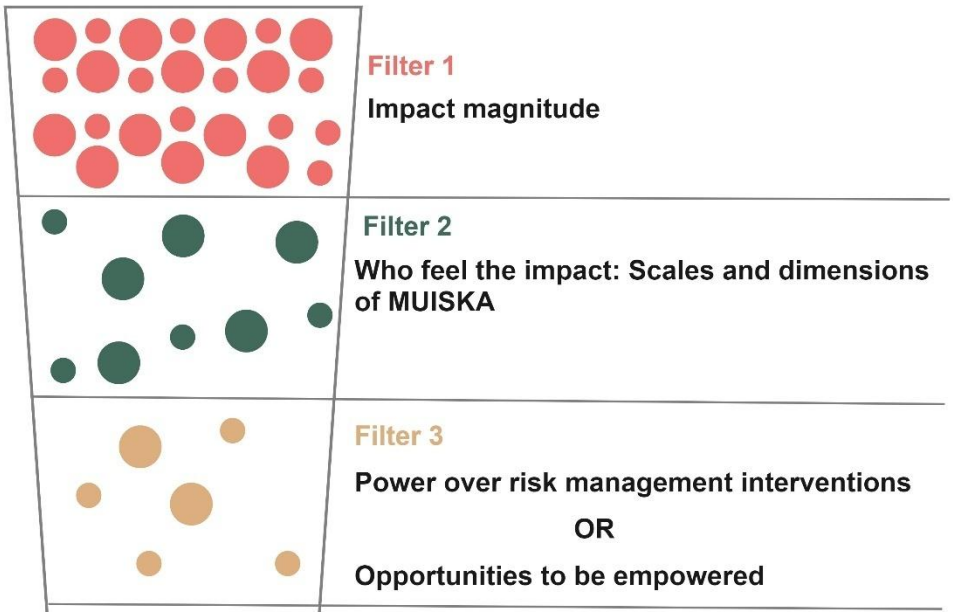


Figure 8. Filter criteria for prioritising consequences to be subjected to risk assessment in MUISKA Step 4

3.3.4 Prioritisation of Consequences

Time allocated: 2.5 hours - 150 minutes

a) Display the network of hazards and consequences developed in step 1 on the wall or floor of the room according to size.

b) Apply filter 1. Together, we count the number of direct and indirect causes for each problem in the network. Involve research participants in counting one or more branches of the network to keep them engaged.

c) Use Form 1 to record the number of direct and indirect consequences (Table 1).

Table 1. Form 1 for analysing each network consequence according to the magnitude of the impact

Consequence code	Consequence title	Number of negative consequences with which it is connected		Number of positive consequences with which it is connected		Does it pass for risk assessment ? (Yes / No)	Observations
		Direct	Indirect	Direct	Indirect		
1							
2							
3							
...							
n							

According to the results of Table 1, ask participants to identify the consequences with the most and fewest upward connections. Explain that these are root causes and ultimate consequences, and discuss with them whether they have any power to solve those problems and whether, by solving them, there are cascading consequences being addressed as well.

The goal of this criterion is to help participants think in systems to prioritise the first group of consequences. Each relevant party group is free to discuss internally what its best approach is for selecting its consequences in this phase.

d) Coffee break for 20 minutes | 14:30 – 14:50

e) Apply filter 2. From the consequences that passed the previous filter, use Form 2 (Table 2) for participants to rank the consequences by MUISKA scales and dimensions to consider what and who suffer the consequences.

Based on the above results, ask participants to discuss what and who suffer from each of these consequences. Use Form 2 (Table 2) to list the consequences they would like to see moved to the next prioritisation stage and describe why they chose them.

Table 2. Form 2 for listing the consequences that go to the next phase of prioritisation

Consequence code	Dimension	Scale	Does it pass for risk assessment? (Yes / No)	Explain the reasons why they chose this consequence.
1				
2				
3				
...				
n				

f) Apply filter 3. Bearing in mind that the consequences prioritised in this step will be the risks assessed in a potential future risk assessment, it is necessary to include, as a criterion, the degree of power each relevant party group (as representatives of their organisations) has to influence decision-making on interventions to manage the risk. Include the following sub-criteria and ask each participant to use Form 3 (Table 3) to analyse the governance of risk management interventions and decide whether the consequence should be prioritised for risk assessment.

- The degree of power the actor has in deciding what actions are required to manage the risk.
- Degree of power the relevant party has for influencing the design of the actions required to manage the risk.

- Degree of power the actor has for allocating financial resources to design or implement actions required to manage risk.
- Degree of power the actor has for implementing actions required to manage the risk.
- If the relevant party does not have any level of power over the interventions to manage the risks, could those empower them through training, technology transfer, participation in advisory committees, etc.?

3.4 CLOSING

Time allocated: 40 minutes

a) Ask each group to present their results.
b) Express gratitude and inform the participants about the next steps during the project.

Table 3. Form 3 for analysing governance on interventions to manage risk from the point of view of participants as representatives of their organisations

Consequence code	How much power does your organisation have over the following? None/Low = No or low degree of power (there is nothing or little I can do), Medium = certain/shared degree of control, High = high degree of control (my organisation's signature is enough for the following to happen)				If it lacks any degree of power, could a potential intervention empower me through training, technology transfer, participation in advisory committees, etc.?	If the consequence cannot be analysed properly due to the lack of information, indicate if further research is needed and offer as many details as possible.	Pass for risk assessment? (Yes / No)	Observations
	Decide on interventions	Influencing the design of interventions	Allocate financial resources to design or implement interventions	Implement the actions				
1								
2								
3								
...								
n								

Get in touch

Contact the Sludge Futures team

Questions about this document or the project's findings are always welcome.

F.Prosenc@leeds.ac.uk
C.MontoyaPachongo@leeds.ac.uk