

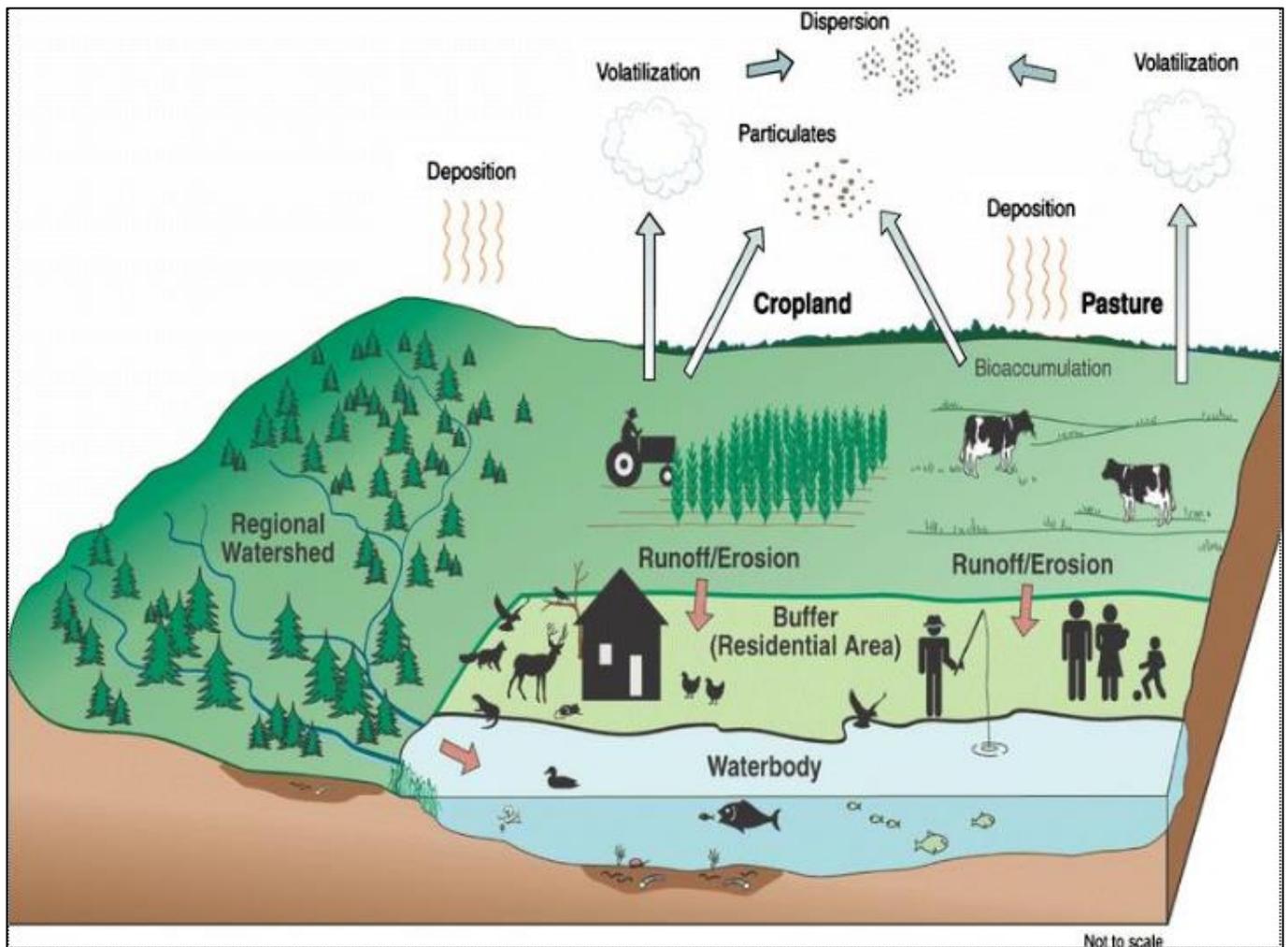
# **Community Concerns regarding the Impacts on Human Health and the Environment arising from the spreading of Sewage Sludge to land**

October 2021



Scottish Government  
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## Community Concerns regarding the Impacts on Human Health and the Environment arising from the spreading of Sewage Sludge to land



Report of a community engagement workshop held at  
 Avonbridge Community Hall, Falkirk,  
 31<sup>st</sup> May 2018

Rupert Hough, David Tompkins, John Williams, Dominic Duckett and Carol Kyle

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## **Executive Summary**

The practice of spreading sewage sludge to land has proved controversial with communities in proximity to affected areas. This report contains details of a community engagement workshop attended by local residents and invited citizens from other affected communities in Scotland.

Sewage sludge is a valued source of plant nutrients as well as organic matter and thousands of tonnes of sewage sludge are spread to land in Scotland each year. However, it does contain various potentially hazardous agents that need to be managed appropriately and there is a recognised impact on the wellbeing of residents in the proximity of sites where sewage is spread as well as issues due to malodour. In order for researchers to share information with community members to ground the investigation in a real-world context and for legitimate concerns to be raised and reported to Scottish Government and other members of the project Steering Committee (namely SEPA and Health Protection Scotland) a community engagement workshop was held.

## **Summary of the stakeholder engagement**

A community engagement was conducted in Avonbridge Community Hall in the Falkirk area (see map). At the request of the steering committee two members of Avonbridge and Standburn Community Council, who were known to be at the centre of complaints around the issue of spreading sewage sludge to land, were contacted. Their activism appears to have helped galvanise local opposition to the practice of sludge spreading and the workshop was mainly attended by local residents with concerns about the practice who had been recruited by the community councillors. The workshop participants were, to varying degrees, already opposed to the practice that they viewed as detrimental to their wellbeing. They were willing to share their experiences, interested in discussing issues with the project team and seemed engaged in the workshop exercises which had been designed, using principles of participatory research, to capture their perspective and to be a site of co-construction. Participants expressed concerns apparently stemming from malodour but ranging across many issues. It is possible to divide the concerns into those associated with the possible effects of the substance being spread and those concerning the practices and alleged malpractices surrounding the spreading. These latter included transportation, application to land and general governance arrangements (for example, inspection).

## **Substance Effects**

Regarding the actual substance, participants regarded the odour nuisance as a severe detriment to their wellbeing. Normal life, from the enjoyment of the outdoors to opening windows at home was said to be compromised by frequent strong and unpleasant odours. Many felt that their health was at risk from a level of odour that made them feel nauseous. Some felt that animals must also be suffering particularly farm animals grazing in areas subject to spreading. There were fears expressed about the possible toxic effects of the material in aerosol form and about potential environmental damage. It was noted that half the participants thought that there should be a ban on all application until further research can prove that the application of sewage sludge to land carries no risks.



**Figure 1. Avonbridge and Standburn Community Council area**

**Malpractice**

Several participants were particularly agitated about aspects of the transportation of the material. Some had taken it upon themselves to log the frequency, number and times of vehicle movements which they considered to be detrimental to their wellbeing. Allegedly,

too many lorries were active in the locality throughout the day and altercations between residents and lorry drivers were reported. Residents were also concerned about odour emissions and spillages from the lorries.

The project team outlined best practice and regulation regarding quantities and frequencies of application to land which many participants strongly felt did not reflect their experience. Some participants described more frequent and more concentrated applications in the locality. Several believed that contractors routinely exceed the legislative requirements of application in their area.

Regulatory bodies came in for sustained criticism at the workshop. They were held to be ineffectively carrying out testing and monitoring. There was general agreement that controls need to be improved to better monitor the contractors and enforce good practice. There was also evidence of a general lack of understanding about which agency was responsible for what. Participants recounted frustration in communicating with authorities who were accused of 'passing the buck'. Between Scottish Water, SEPA and the local authority, participants complained that it was difficult to pursue their grievances. Some of the participants suggested that better governance would be likely to mitigate their concerns whereas others felt that only a complete ban would be an acceptable outcome.

### **Additional findings**

One key observation that the project team made was that some of the participants aggregated the spreading of agricultural slurry and the spreading of sewage. The overarching matter of odour seemed to compound these two issues. It was difficult to disentangle which was which at the workshop where participants had little specific evidence to present although our experts considered anecdotes relating to wet application to be highly likely to relate to slurry rather than sewage given that sewage is generally converted into dry pellets prior to application to land. This conflation might be a serious obstacle to achieving public support for this practice given that odour appears to be the catalyst for opposition.

A wider point worth noting is that the activities of local activists can often be significant in politicising issues and bringing them to the attention of national authorities (Riverstone-Newell 2009) <https://academic.oup.com/publius/article/42/3/401/1825241> which appears to be the case here. From this local engagement it is difficult to ascertain the extent of public concern, but it could be relatively localised and as a result more manageable than other environmental nuisance issues.

## **Introduction**

The James Hutton Institute, together with RSK ADAS and Aqua Enviro, were contracted by Scottish Government to deliver a project that will extend current guidance (on how sewage sludge is used on land restoration sites) to include agricultural land. The project is reviewing data on the characteristics of sewage sludge relevant to human health and environmental impact, measuring the odour potential of sludge from different treatment processes, and comparing these with existing regulatory and best practice controls to understand where there might be gaps. Engaging with community groups is a key part of understanding where those gaps might be, and how they can be closed.

While sewage sludge is a valued source of plant nutrients as well as organic matter, it does contain various potentially hazardous agents that need to be managed appropriately. Around 70,000 tonnes of sewage sludge are spread to land in Scotland each year. While this represents less than a quarter of one percent of all organic materials spread to land, a significant body of work has been undertaken over the decades with the aim of investigating and managing environmental safety, potential impacts on the food-chain, and possible human health implications. These studies, and the development of legislative and other 'good' practice, have by and large been the basis for the management of the chemical and pathogenic risks associated with sewage sludge.

During the last 10 years, various so called 'emerging' contaminants have been identified in sewage sludge. It has also become apparent that wider health and well-being issues, including the impact of malodour, have largely been ignored by previous investigations. Therefore, a re-assessment of the chemical and pathogenic safety was commissioned that also included impacts from malodour on health and well-being (this project).

To date we have used mathematical techniques to estimate risks to human health via the food-chain and inhalation routes for more than 60 'emerging contaminants' including organic substances, pharmaceuticals and personal care products; as well as considering microplastics and pathogens. We have also built a computer model that explores the relationships between sewage sludge products and handling, weather conditions, distance, etc. and impacts of malodour.

## **Stakeholder engagement**

For the purpose of modelling we have to assume compliance with legal requirements as this provides a solid basis for subsequent understanding of the impacts of non-compliance and /or non-adherence to good practice. However, we recognise that it is important to set our findings within a real-world context as there may be deficiencies in current systems that arise from poor practice or from constraints under which agencies and contractors operate. For the regulatory framework under which sewage sludge is spread to land in Scotland to both respond to advances in scientific knowledge and take account of the lived experience of Scottish communities we need to understand community perspectives and experiences.

It is in light of community-based concerns that we invited participants to a workshop in an area where there is a sewage treatment plant and sewage sludge is regularly spread in the locality.

The workshop was designed to inform participants of the project and the work carried out to date, answer questions about the project and draw out and record participants concerns and issues regarding the application of sewage sludge to land in their locality.

5 project team members were present to lead the workshop and share information: Rupert Hough, Dominic Duckett and Carol Kyle, researchers from the James Hutton Institute, David Tompkins, an environmental consultant from Aquaenviro (<https://www.aquaenviro.co.uk>) and John Williams an environmental consultant from RSK ADAS (<http://www.adas.uk>)

### **Who are you, why are you here?**

Following a short introduction of the facilitators, a brief overview of the agenda and an explanation of the “rules of engagement”, (ethics procedures, preserving anonymity and mutual respect), the participants were asked to introduce themselves. They included members of the Avonbridge and Standburn community council local residents and invited citizens from other affected communities in Scotland who wished to raise concerns and learn more about sewage sludge in general. In total 26 people attended (10 men and 16 women).

In order to understand why people attended the meeting they were asked to write their reasons on post-it notes.

Their reasons were diverse and are recorded in appendix 1 but they could be clustered into 5 main categories:

- Concerns around health and wellbeing, primarily of people but also livestock.
- Odour (from the treatment works and following sludge application)
- Apparent violations of regulations by the sludge contractors and lack of regulation
- Concerns about pollution of the local environment, land and waterways.
- To question the need for this [use of sewage sludge in agricultural production] practice

Later in the workshop participants were asked to nominate which of the concerns were most important to them. ‘Pollution of the local environment’ (8 votes) and ‘violation of regulations and lack of regulation’ (8 votes) received most nominations, followed by concerns about the ‘odour’ (6 votes) then ‘effects on human health and well-being’, ‘animal health’ and ‘why are we still doing it?’ (4 votes). The exercise helped the researchers understand the participants motivations for attending the workshop.

## Project overview- what we're measuring, what we're finding.

Researchers from the James Hutton Institute gave a short presentation about the project and the project specification going forward. The remit is to undertake an impartial study into potential negative impacts of sewage sludge on human health, to update existing guidelines on how sewage sludge is used on land and provide evidence –based recommendations for better practices. (See appendix 3 for the full presentation).

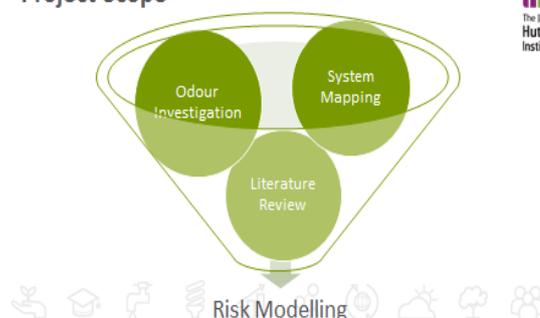
Following the presentation participants were invited to take part in a question and answer session with the researchers. There were several questions predominantly centred on those shown in Table 1 and comments that weren't actual questions but are recorded below Table 1

**Table 1. Questions and Answers**

Questions from participants	Answers from researchers
Does the project remit include finding alternatives?	No, that is out-with this projects remit
Will the project look at the dangers of prions	No, that is out-with this project remit at this stage
Why is sludge spread on land?	Because there are limited alternatives, it provides a good form of fertilizer, and the process is in line with SG aspirations for a Circular Economy
How often should it be spread?	It depends on type of crop and soil analyses. Typically 20T/ha, 250 kg/ha Nitrogen
Why isn't it banned as in other countries?	That is a question for Government
Are farmers / land managers expected to test soil prior to sludge application?	Yes, initially before the first application and then at 20-year intervals (depending on metal concentrations in the soil)
What happens to sludge in countries where application to land is banned?	It is digested for methane production and then incinerated.

In addition to the questions, participants voiced concerns about the apparent disregard by the industry to follow legislation and guidelines, the issues around health and welfare of humans and livestock and the effect of application to land on the general environment.

### Project Scope



## What can we do?

Participants were divided into 4 groups and asked to discuss their issues and expectations loosely structured around “What can the project do, what can Scottish Water do, what can Scottish Government do and what can the community do”? Post-it notes were used again to enable all participants to take part and express themselves. Four researchers facilitated the discussions and took notes, while the remaining researcher sought to get an overview of all group discussions and summarise these.

The comments on the post-it notes can be found in appendix 3. The facilitators recorded that participants were keen that their concerns should reach the appropriate authorities (Scottish Government, local authority council, SEPA, Scottish Water) particularly around inadequate inspection and perceived lack of effective regulation.

Participants generally had no faith in the practice of self-testing of soil, believing that there is a conflict of interest. Some criticized the testing regime considering it to be neither independent nor objective and many appeared to think that rules are being flouted with one contractor in particular being, as expressed by one participant, “a law unto themselves”.

There has been an apparent breakdown in trust between the community and the groups responsible for managing sludge applications to land (Scottish Water, PFI, Contractors, and SEPA) with neither SEPA nor Scottish Water <sup>1</sup> believed to be listening reactively to complaints and issues. In addition, it was said that no-one seems willing to either take responsibility or be held accountable when issues are raised. Overall the feeling was that a greater regulatory oversight of the industry is required, perhaps by incentivising good practice rather than penalising (or not, as many believed to be the case) bad practice. Participants also thought that individual community councils could exert more influence by being better organised, sharing information and being more cohesive.



In general, the inspection regime was characterised as inadequate and SEPA were said to be ineffective. A notable anecdote described one case where an inspector was subjected to intimidation from a land owner benefitting from the practice. ‘They don’t inspect enough; they should be out at all times doing spot checks; [we want] SEPA to turn-up on a Sunday!’...

There were allegations of intimidation of local residents by contractors, including children, and complaints about the number, size and condition of lorries going to and from the treatment plant. Some residents have been logging

this activity and will continue to do so and questions were asked about where all the material was coming from.

<sup>1</sup> It was noted that participants commented that Scottish Water had “significantly improved lately”

Several participants were convinced that contractors exceed the recommended applications of sludge onto land, claiming to have observed thick layers of sludge, a noticeable drop in wildlife in some areas accompanied by unpleasant odour. Consequently, they suggested that much larger concentrations of contaminants are included in the project Risk Assessment Models than the regulatory concentrations used at present.

People were concerned about the potential effect of sewage sludge application on their health with some participants complaining of headaches and breathing difficulties during times of heavy application. There was unanimous agreement that the odour was of major concern and some residents claimed that they regularly experienced odour issues in their homes even with all doors and windows closed making them feel like ‘prisoners in their own homes’.

### What are the major concerns?

As before the facilitators clustered groups of similar issues and ideas. Participants were given sticky dots and invited to visit each other’s break-out stations and vote on those statements most important to them as individuals. The complete list of statements can be found in appendix 2.

The main clusters (Table 2) were then used to lead a plenary discussion



**Table 2. Major concerns**

Clusters	Votes
Independent soil testing / annual testing	38
SEPA not regulating / need to be more involved	34
Who is responsible /accountable?	18
Should be banned	13
[Project] Investigate alternatives	9
[Community] independently log loads and destinations	6
[Contractors should] Adhere to regulations	5
Project to presume criminal behaviour [risk assessment models]	4
Better policing	4
Communities share information	3
[Access to] Map of metal concentrations	1
Ban until proved safe	0

## Plenary

During plenary some participants re-iterated issues around a perceived lack of support from governing bodies and the belief that there is a requirement for additional, independent regulation of the industry and of soil testing on land where sludge is being applied. Several highlighted the apparent flouting of legislation by contractors and the stress caused to the community by the unpleasant odour and a seemingly endless stream of lorries going to and from a particular treatment plant.

Some were concerned about the effects of application on human health and suggested that their doctors could be contacted for further information, although this would be difficult given confidentiality procedures. One participant spoke of the deaths, low birth rates and birth abnormalities among sheep on a local farm and was concerned that sheep from the affected flock had since been sold and perhaps entered the food chain. “Perhaps local vets or the knacker could provide information about livestock related concerns?”

Several participants couldn't understand why sewage sludge application to land is still deemed acceptable in Scotland when it is no longer acceptable to dispose of it at sea and other countries have banned it. “Why does the government refer to reports from other countries [on other pertinent issues] before making a decision yet seem unwilling to do so in the case of sludge application to land”? Following a show of hands, the majority of participants expressed support for a blanket ban on spreading sludge at least until application could be proven safe and for alternative methods of disposal to be researched or adopted where available.

## Summary conclusions

The research team engaged with stakeholders who were by and large already opposed to the practice of sewage spreading to land which that they had come to view as detrimental to their wellbeing. Their opposition was grounded in their experience of the practice at this locality, namely, Avonbridge and Standburn.

It is possible to divide the concerns into 2 groups:

- i) **Concerns about possible adverse effects of the substance being spread**
  - Odour – malodour is a prominent concern and may underpin wider community concerns.
  - Human health – participants generally believe that there are real risks to health both physical and psychological.
  - Aerosol toxicity – health concerns centre around breathing noxious substances.
  - Environmental damage – spreading is viewed as an environmental pollutant.
  - Animal health – several participants are convinced that spreading is injurious to other species particularly grazing livestock.
  
- ii) **Concerns about processes and practices (malpractices)**
  - Transportation: various worries include too many lorries in a small area, associated odour, spillages and hostile confrontations with operators. Residents considered transport issues poorly policed and ineffectively regulated.
  - Application to land – Views were expressed that best practices regarding volumes and frequencies are being flouted.
  - General governance arrangements: inspection, testing and monitoring were said to be ineffective and too weak. 7 day a week inspection is called for. Self-regulation was criticised. It is too difficult to peruse grievances and agencies ‘pass the buck’, according to complainers.

Two further points of note were:

- i) The research team believed that stakeholders are confounding the application of sewage sludge with other agricultural spreading (e.g. slurry). This was out of scope for the project but understandably of concern to a community where malodour was the overarching driver.
- ii) Anecdotal evidence indicates that nationally this issue is confined to a small number of hotspots. Further work might better characterise the scale of the problem. Complaints received by Scottish Government may reveal other sites of interest and a national picture could be built.

## Acknowledgements

The project team would like to thank members of Avonbridge and Standburn Community Council for their help with organising this workshop and to all the participants who freely gave their time to attend and enthusiastically shared their concerns with us. Thank you also to the members of the local hall who looked after us so well.

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The views expressed are those of the authors and do not necessarily reflect those of the Scottish Government.



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## Appendix 1

### Why are you here? Statements from participants

- Want to know the effect of sludge
- Wellbeing of all, disease, prions
- Health worries
- Unrecognised bacteria
- Pathogens
- Harm to livestock
- Smell (x 7)
- Environment
- Pollution of loch Ellrig and river Avon
- Pollution of loch
- Rat infestation
- Pollution
- Harm
- Concerned re unsafe working practice of contractor. Sewage sludge not treated to high enough temperature to kill pathogens
- Self-certification of soil samples shouldn't be allowed
- The law and storage for spreading
- Overloading on park [field]
- Recent experience of dumping waste in Dunfermline
- Recent experience in Dunfermline- Muir Dean site
- Why self-regulation?
- Transport
- Speeding vehicles on Blinkbonnie Road

## Appendix 2

### Statements from participants around “What can the project do, what can Scottish Government do, what can Scottish Water do and what can the community do”?

- Make strong recommendations from the group
- Raise concerns to bodies for better regulation
- Recommend better policing
- Extend models to presume criminal levels of spreading
- Investigate sustainable alternatives
- Seek alternative model for contractor / company relationships
- To look into data of contractors
- Look at individual areas [which are] highly affected
- Project needs to recognise that many of the contractors and the industry do not comply with legislation or best practice
- Make sure there is complete understanding of what is actually happening and the impact on people's lives
- Consider how long materials are stock-piled, well in excess of recommendations
- Where is the map of metal contents of land and it's availability
- Clarify who is responsible for the heat treatment of sludge

## **Scottish Government**

- Listen to issues and react
- Carrot not stick? Reward good practice
- SEPA to turn up on Sunday [not sure what was happening on Sunday]
- SEPA needs to be more in evidence / needs to be consulted more
- Regulation must be adhered to
- Contractors should not be allowed to self-test samples
- Planning legislation- no planning application for sewage treatment, liquid waste lagoon, land fill
- Legislation and enforcement
- Current legislation is open to misinterpretation letting regulatory bodies do nothing
- SEPA stop re-issuing mobile licence over and over again
- SEPA be more proactive in checking operators activities
- Regulatory bodies held to account for lack of support or action. SEPA, SW, Falkirk council
- A single entity is required to regulate the industry. It must be fully funded and not rely on fines in the industry to pay for enforcement
- The spreading of sewage sludge must be banned until the product is proved to be safe and the industry controlled
- Consider costs to the country of the violations in the industry i.e. closure of rail line
- Legislate to protect communities
- SEPA inspect properly any risk management licences
- SEPA do not respond to complaints actively. Staff seem unaware of recommendations
- Protocols ignored, No scrutiny
- Quantities should be monitored and checked that they are not putting more on than allowed
- Annual testing of sludge land
- Regular impact studies of sludge testing
- Make contractors accountable- independent testing, enforced regular inspections
- Follow the example of Switzerland

## **Scottish Water**

- Be proactive and monitor / test / research alternatives
- SW should monitor that contractors are processing properly
- More inspections by SW and SEPA
- React promptly to complaints
- Clarify legislation on who is responsible for pollution- 3rd party
- Vehicles that carry waste are unsuitable

## **Community**

- Community councils should share information
- Interact more regularly
- Independently log loads and destinations
- Report smells to SEPA
- Report lorry activity to community council
- Who is responsible for following up/ handling complaints?
- Lack of trust

## **Other comments**

- Same consultant works for contractor and Falkirk council
- Who regulates soil testing?
- Intimidation of public and inspectors [by contractors?]
- Why is sewage brought [here] from all over Scotland? Glasgow, Oban, Lossiemouth, Lochgilphead
- Ban until proven safe. Widespread abuse out of control
- Animal deaths / abnormalities in livestock
- Damage to businesses with pollution caused by over spreading
- Hours of operation, can go on all night
- No planning requirement for sewage operation
- Regulations for haulage not being followed (bring sludge up from Ayrshire)
- Could spread be decreased and incineration increased?
- Contractor putting slurry on peat at Gardrum Moss. Is that legal / appropriate?

## Appendix 3

### The impacts on human health and the environment (presentation)



## The impacts on human health & the environment arising for the spreading of sewage sludge to land

Rupert Hough, David Tompkins, John Williams & Dominic Duckett

31<sup>st</sup> May 2018  
Avonbridge Community Hall, Falkirk



The James Hutton Institute

## Project Overview



- The James Hutton Institute, together with RSK ADAS and Aqua Enviro, have been contracted by Scottish Government to:
  - **Undertake an impartial study** into potential negative impacts of sewage sludge on human health
  - **Update existing guidance** on how sewage sludges are used on land restoration sites,
  - Include guidance on how sewage sludges should be used on farm land
  - **Evidence-based recommendations for better practices**



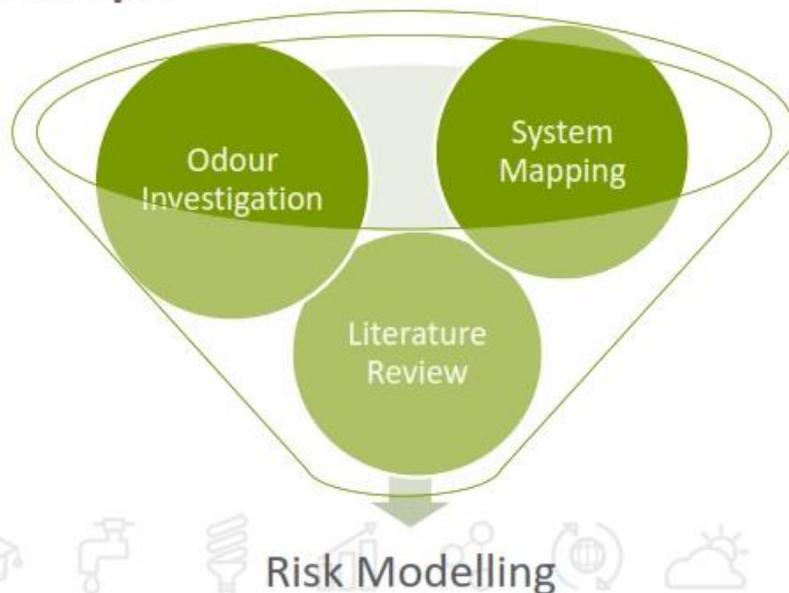
## Where you can help

### Evidence-based recommendations for better practices

- You can help us understand where issues have arisen and under what circumstances
- This helps develop recommendations for changes to best practice or (if essential) legislation
- Not all issues will be within scope of the project
- Beyond this, we can record concerns and ensure that they feature in our report to Scottish Government



## Project Scope

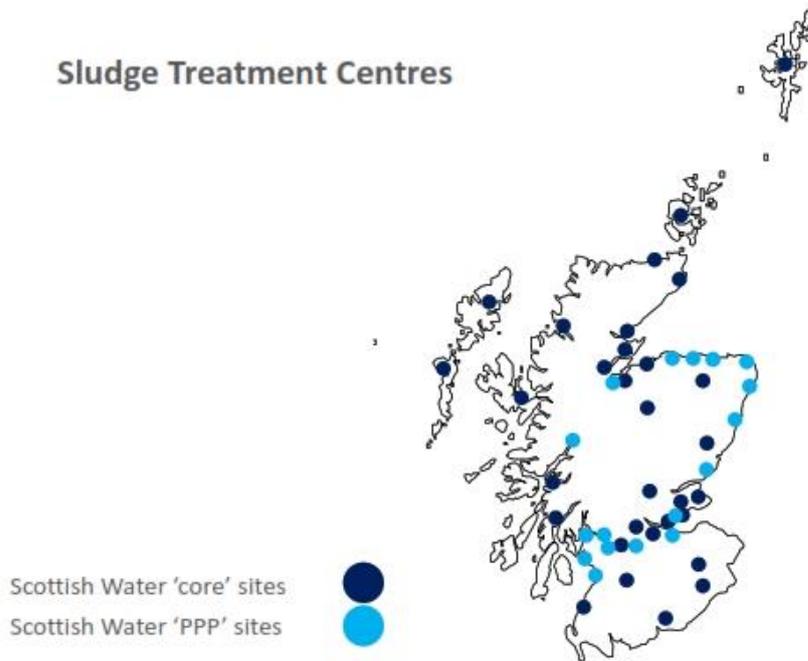


## System mapping

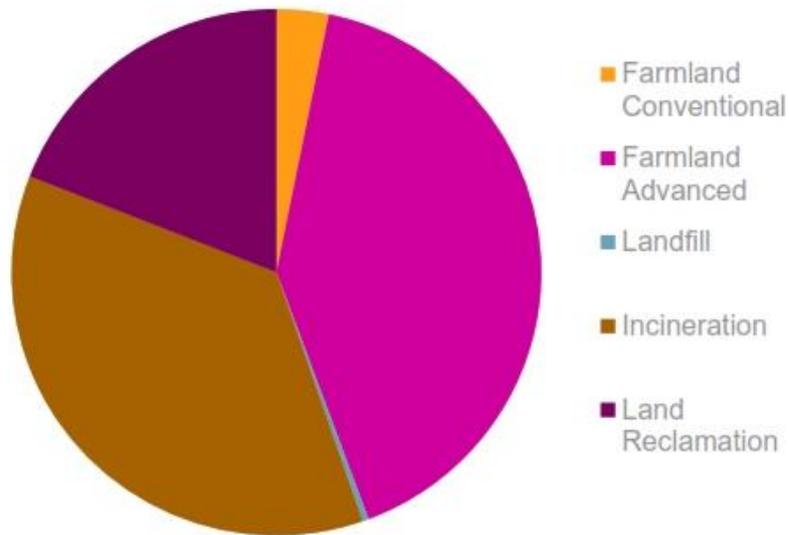
- Primary aim is to understand the amounts of different sewage sludges produced in Scotland
- Who and how these are handled
- Volumes spread to land (and where)



### Sludge Treatment Centres



### Sludge markets in 2017 (tonnes dry solids)

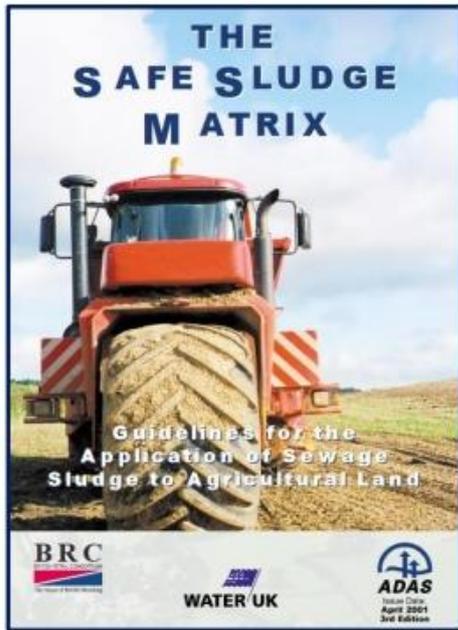


### Regulations and Codes of Practice



- Sludge Use In Agriculture Regulations (metals)
- Safe Sludge Matrix (microbial pathogens)
- PEPFAA and SNIFFER Codes (water and air pollution)
- Biosolids Assurance Scheme





CROP GROUP	UNTREATED SLUDGES	CONVENTIONALLY TREATED SLUDGES	ENHANCED TREATED SLUDGES
FRUIT	X	X	✓
SALADS	X	X (20 month harvest interval applies)	✓
VEGETABLES	X	X (12 month harvest interval applies)	✓
HORTICULTURE	X	X	✓
COMBINABLE & ANIMAL FEED CROPS	X	✓	✓
GRASS & FORAGE	X	X (Deep injected or ploughed down only)	✓
- GRAZED	X	✓	✓
- HARVESTED	X	✓ (No grazing in season of application)	✓

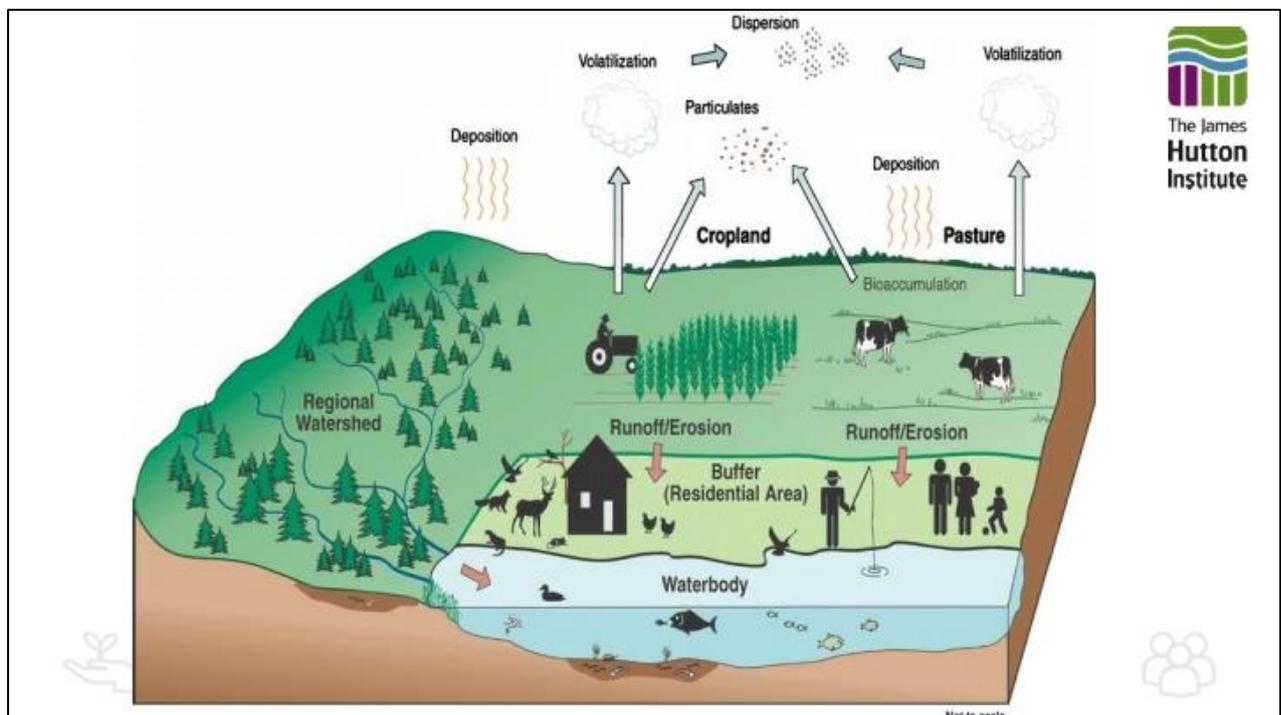
Treatment type	What it means for treated sludge quality
Conventional	99% pathogen destruction
Enhanced / Advanced	99.9999% pathogen reduction + Zero Salmonella

## Odour Measurements



# Risk Modelling/Assessment

- Risk Assessment estimates **potential** for something to happen
- The approach tends to err on side of caution
- Risk Assessment flags up where further investigation may be needed...
- ...or what measures should be taken to reduce risks
- It cannot tell us that harm is actually occurring



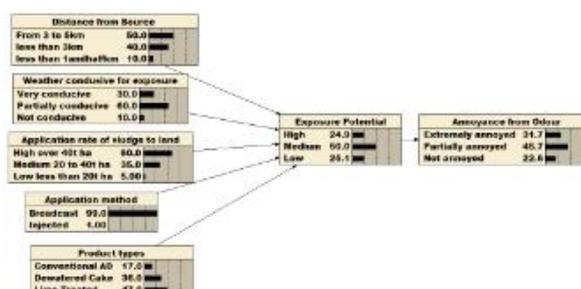
## Approaches (I)

- Commentary
  - Information either very poor, incomplete or missing
  - Based on literature review and expert judgement
- Microplastics



## Approaches (II)

- Bayesian networks



- Computer models that aid decision making
- Used where data have large uncertainties, making fully quantitative estimates of risk less meaningful
- Mixture of 'hard' data, judgement and opinion
- Explores interaction between different factors
- Odours



## Approaches (III)

- Fugacity modelling
  - Based around chemical partitioning
  - If a chemical is placed in an oil:water mixture, does it partition mainly to oil or water?
  - This tells us something about how the chemical might move in the environment
  - Lots of assumptions... Tends to over-estimate risk
  - 'Emerging' contaminants.... Pharmaceuticals, personal care products, etc.



Thank you





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