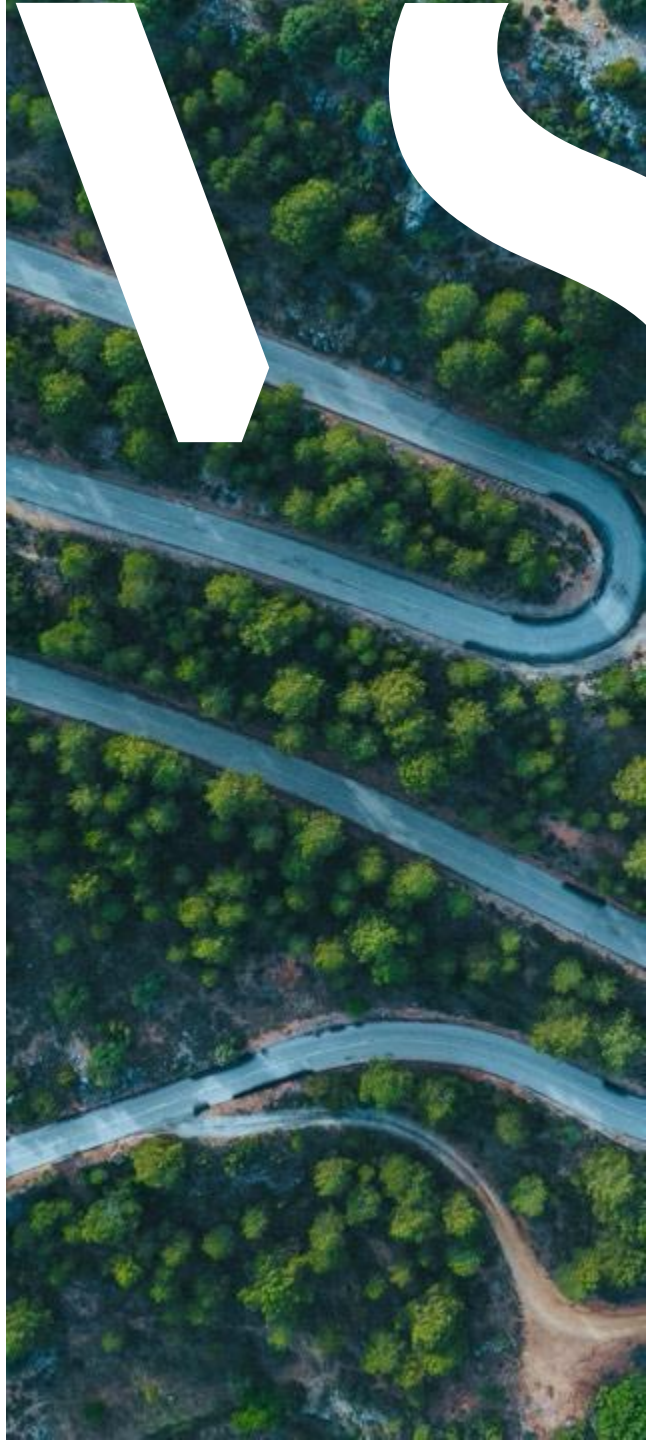
# Regulatory Considerations of Climate Change

A report to the Environment Agency from WSP UK Ltd

Presented by Katie Gamlin



# Introduction (1)

- WSP instructed to generate an evidence-based synthesis report to
- *'Inform regulatory considerations of climate change impacts and adaptation for waste deposit, landfill and land contamination.'*


- The Environment Agency (EA2025) seek to be a leader on climate adaptation and resilience.
- To assist in the development of an informed and consistent approach to accounting for future climate change
- The work is to support assessments and contribute to the Environment Agency's work on
  - Water Quality, Groundwater and Land Contamination
  - Nuclear Decommissioning and Clean-up programme,
  - Nuclear Outcome Plan

# Introduction (2)

- This report is a 'starting point'
- Future phases will be needed.
- Geographical domain has been England.
- Intended to assist decisions to address timescales of up to 1,000 years.
- The land systems under consideration
  - Contaminated land
  - Waste recovery on land, or deposit for recovery, when a party uses waste material instead of non-waste material to perform a function.
  - Landfill sites, areas of land in or on which waste is deposited as a disposal.
- All are presumed to be at or near surface. i.e., at the surface or down to tens of metres.
- In respect to near-surface deposits, facilities and landfills they may use the geology (rock structure) to provide an environmental safety function, but some may rely on Engineered Barrier Systems (EBS).

# The Parties

Environment Agency

Cyfoeth Naturiol Cymru
Natural Resources Wales

BGS British Geological Survey

Magnox

Dounreay

SoBRA
The Society of Brownfield Risk Assessment

ciria

SEPA
Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

LITHOS CONSULTING

LLW Repository Ltd

NDA

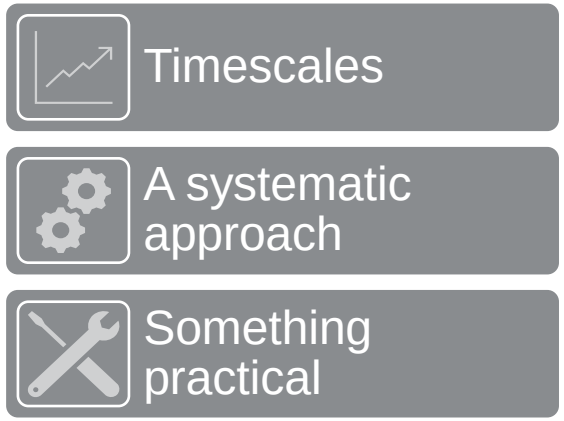
Sellafield Ltd

Ford Environmental Services

# Today's Presentation

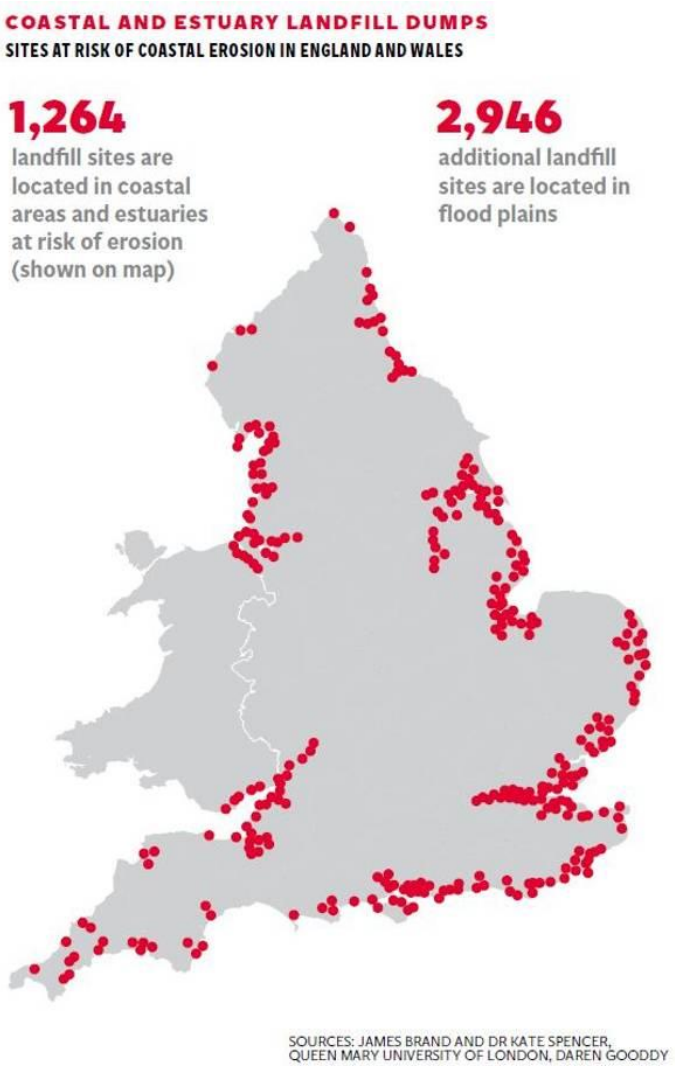
- To provide some context
- To share the key findings and identified vulnerabilities and needs

- Specific topics will include:




- Not going to talk about……..
  - Climate models /scenarios
  - Sea level change and specific vulnerabilities
  - Modelling solutions
  - Coastal change and response
  - Engineered barrier response

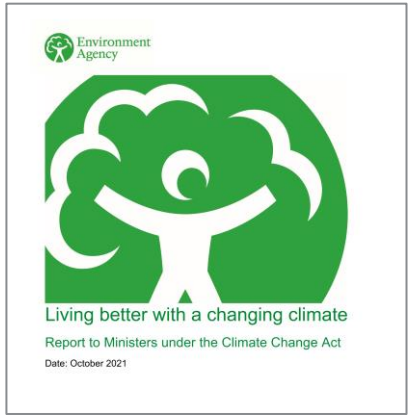
# Context (1) – potential impacts




- Increased contaminant mobility - solubility, viscosity, volatility, etc
- MNA success?
- Pathway interruption e.g. PRB, EBS etc
- Clay caps, overlying soils vulnerable to desiccation, fissuring
- Cover soils subject to increased erosion = exposure of membranes more rapid (oxidation, shrinkage etc)
- >1,200 coastal landfills in England
  - 10% could start to erode by 2055
  - Limited assessememt of pollution eroded mass
  - Seawater intrusion – mobilise inorganic contamination?

**Etc Etc Etc**

# Context (2) – the emergency and the current address




**UNEP, 2019**

Emissions of GHGs have continued to rise at an average of 1.5% per year in the last decade

2 °C = 25% reduction in emissions by 2030

1.5 °C = 55% reduction in emissions by 2030

**COP26, 2021**

Net zero by 2050 to keep 1.5 °C degrees of warming within reach

**IPCC, 2022**

Dire warning that the world faces unavoidable multiple climate hazards over the next two decades with global warming of 1.5°C (2.7°F)

**EA, 2021**
**3rd Adaptation Report.**

Environmental **regulation** is not yet ready for a changing climate.

Climate change will **exacerbate** risks from (and to) regulated industries.

**'high severity'** and **'high urgency'** threats identified including to waste deposit, landfill and legacy contaminated land

# Context (3) – what is needed?

Inevitably **transformational changes** in society will be required

An understanding of **scale** and **timescales** is needed

An understanding of **vulnerability** is needed

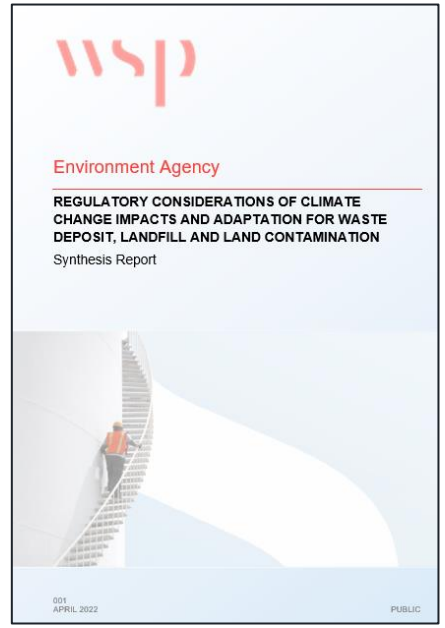
Need to be able to **identify, prioritise and develop** a framework change in the **regular assessment of risks** for adaptation

An ‘impact-specific’ approach is based on the logic of planning. Given a set of needs, what actions are needed, and which have highest priority?

# The Report

Runs to 500 pages, 34 recommendations (grouped and scored)

- What are the timescales that we should be considering and why?
- What climate change projections and models are available over this same period and how can they be accessed?
- Are reliable coastal change models available, and what are the next steps?
- Can we apply case studies to identify current learning and vulnerabilities to climate change?
- By interrogating current models can we identify sensitivities and how they may be pragmatically managed?
- Can we propose a systematic approach to deliver better consistency to the assessment and identification of vulnerabilities?
- What do we consider to be the priority vulnerabilities/adverse impacts?
- How may we handle uncertainties in future assessments?
- What should the assessment cycle maybe look like?
- The development of modelling practices
- In respect of adaptation what are the likely impacts on Engineered Barrier Systems and liners?
- Coastal  adaptation



# Key findings(1)

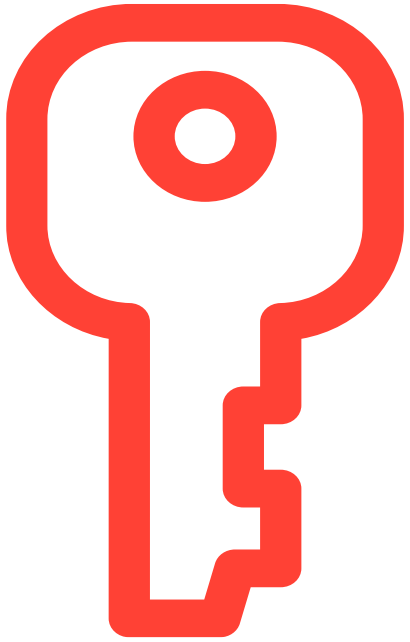
- Existing approaches to CC assessment are generally limited.
- Radioactive waste disposal operators tend to quantify future changes to pollutant linkages using site-specific detailed models more than operators of conventional landfill or owners of land contamination problems.
- The project did not identify an assessment of land contamination that took account of climate change.
- No evidence has been uncovered suggestive of routine assessment to periods beyond 2100.
- No singular repository/listing of potential adverse effects has been identified to guide assessors or reviewers, → responsibility for identifying potential adverse impacts placed on the assessor.
- No direction given towards which climate scenario an assessor should consider?

# Key Findings(2)

But… Common elements do exist, including a need for

- Risk-based, proportionate process
- Incorporating adaptive management and ongoing reviews.
- A tiered approach already forms the basis of the UK risk assessment doctrine. It would be consistent and logical that a tiered approach also be followed when addressing climate change impacts
- Focus should not be upon reinvention but rather orchestrating change and marketing the expectation of its urgent inclusion in assessments i.e. a policy requirement

# A Key Point



- An aspiration must be  to avoid a future of overly precautionary regulation and undue cost burden on problem holders.
- An assessor should not seek to overengineer a site at the cost of an unsustainable environmental footprint in fear of an inflated risk.
- Decisions should be based on a scientific examination of the issue.
- Need for justification and optimisation.
- Any intervention must seek to balance risk and sustainability.

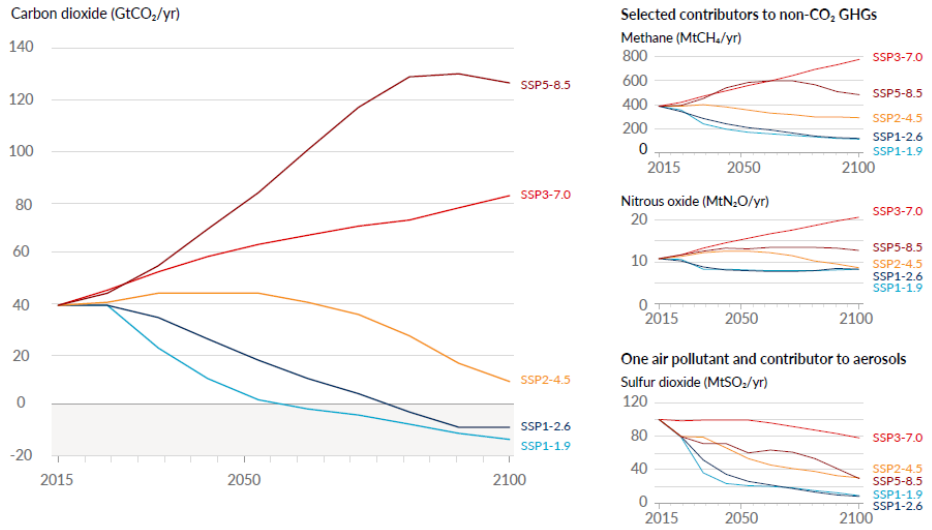
**EVOLVING AREA OF GUIDANCE AND POLICY**

# So Something Credible.....Timescales

**Q - What are the timescales that we should be considering and why?**

- Existing variability in the approach to timescales
- Timescales should not be prescriptive/arbitrary – context driven.
- They should be based on the nature of the hazard i.e., led by scale and magnitude of the problem.
- Limitations of many assessment-ready datasets – projection timeframe

Assessment context should be explicit not implicitly assumed



# So Something Credible ..... A systematic approach (1)

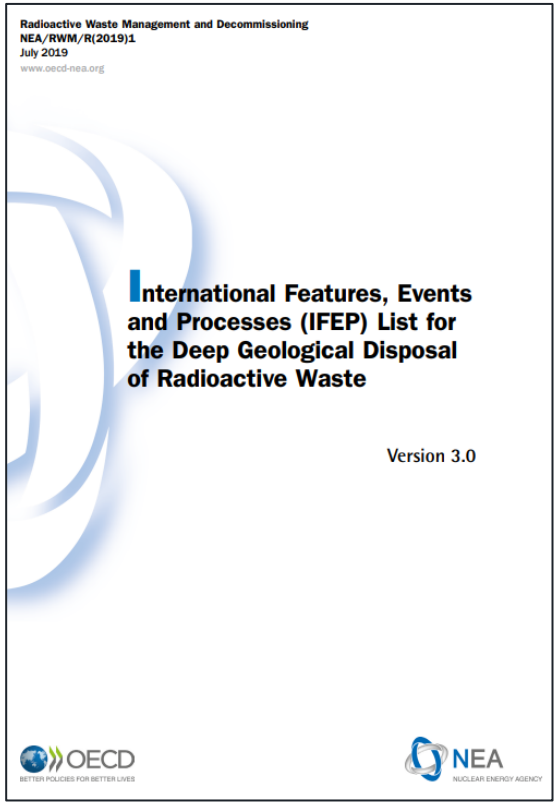
**Q - Can we propose a systematic approach to deliver better consistency to the assessment and identification of vulnerabilities?**

- The responsibility and onus for identifying relevant adverse impacts is placed on the assessor.
- Inconsistent approaches may evolve without the delivery of informed direction.

- **A starting point and way forward for the development of individual impact assessments is required.**
- Such a framework must not be onerous but proportionate and flexible to the scale, setting and complexity of a site (see assessment context).
- A modified FEP list **ONE** such starting point for both assessors and regulators in the assessment of more complex cases

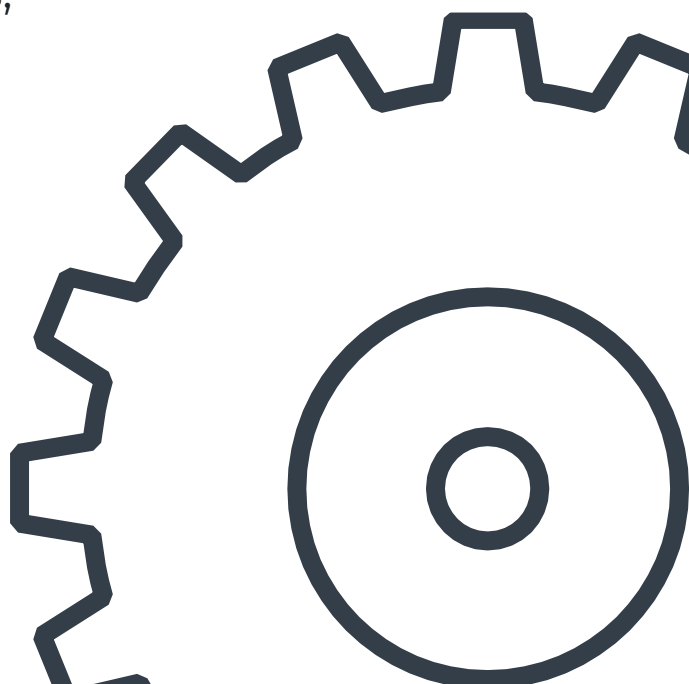
# So Something Credible…….. A systematic approach (2)

- Compiled by the NEA in the 1990s - lists and databases of features, events and processes (FEPs) that may affect safety performance
  - **“Features”** are physical components of a system and or environment being assessed.
  - **“Events”** are dynamic interactions among features that occur over time periods e.g. coastal disruption of a landfill or contaminated soils
  - **"Processes"** are issues or dynamic interactions among features that generally occur over a significant proportion of the assessment timeframe and may occur over the whole of this timeframe e.g. climate change.
- Events and processes may be coupled to one another (i.e. may influence one another) e.g. climate change may influence infiltration and groundwater flows.

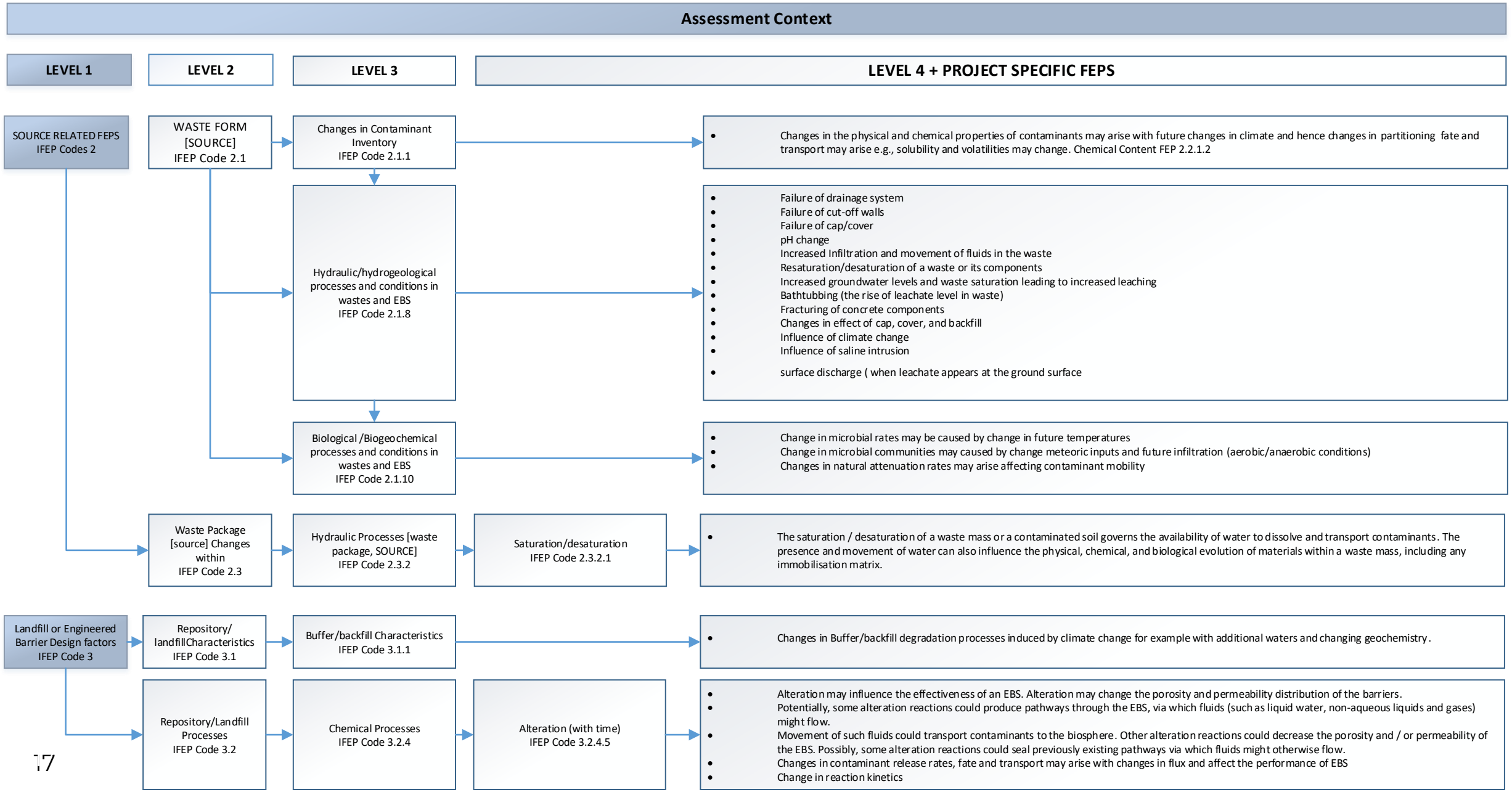


# So Something Credible…… A systematic approach (3)

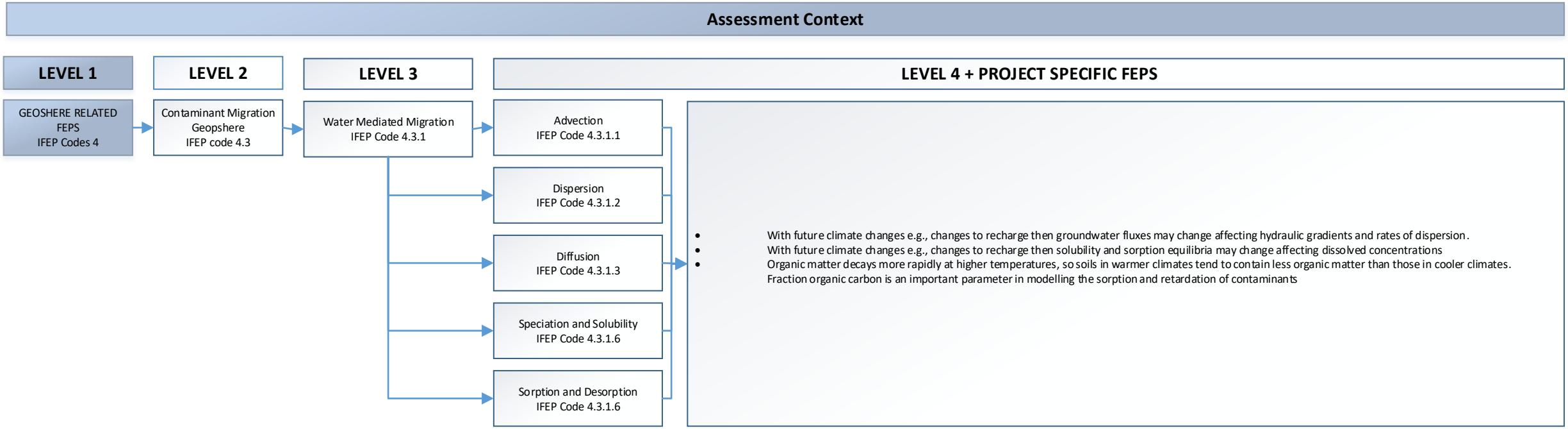
- 268 FEPs (including FEP groups and subgroups) are contained within version 3.0 of the IFEP List.
- But  they are a further starting point
  - relevant to land contamination, near surface waste deposit and landfill on the timescales of <1,000yrs
  - provide an audit to check the completeness of scenarios, conceptual models
  - Tiered approach  Level 1 categories into 3+



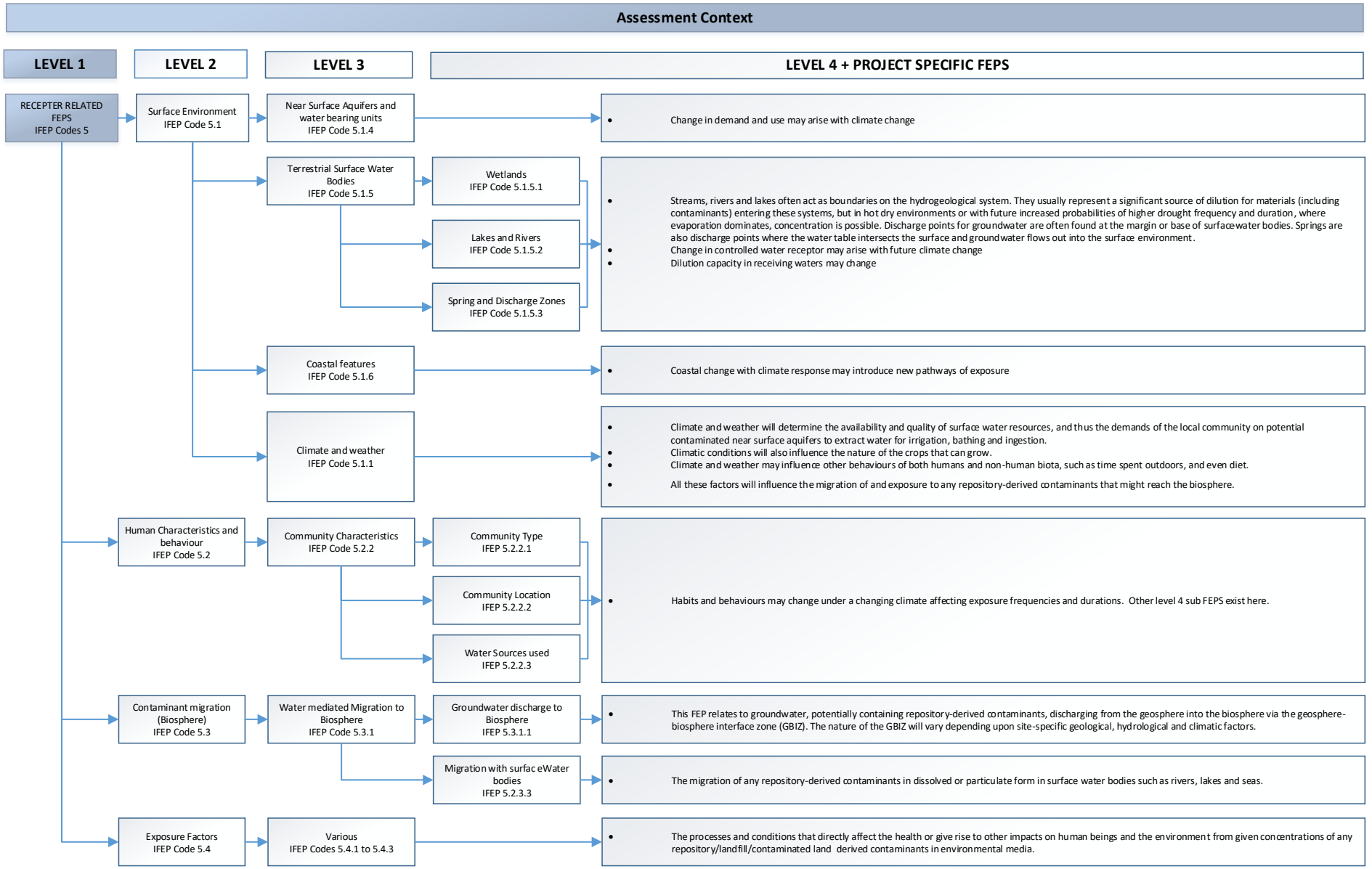
# Example Source FEPs



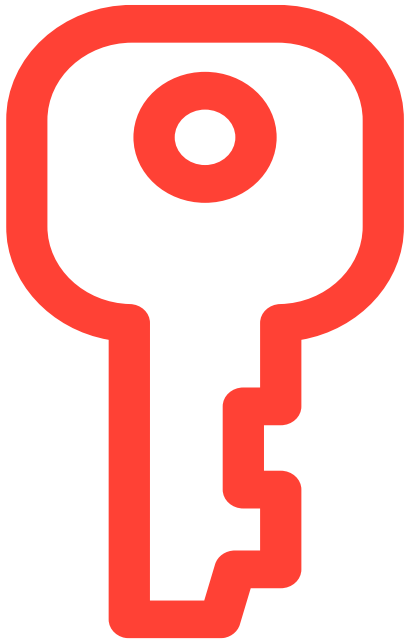
# Example Pathway FEPs



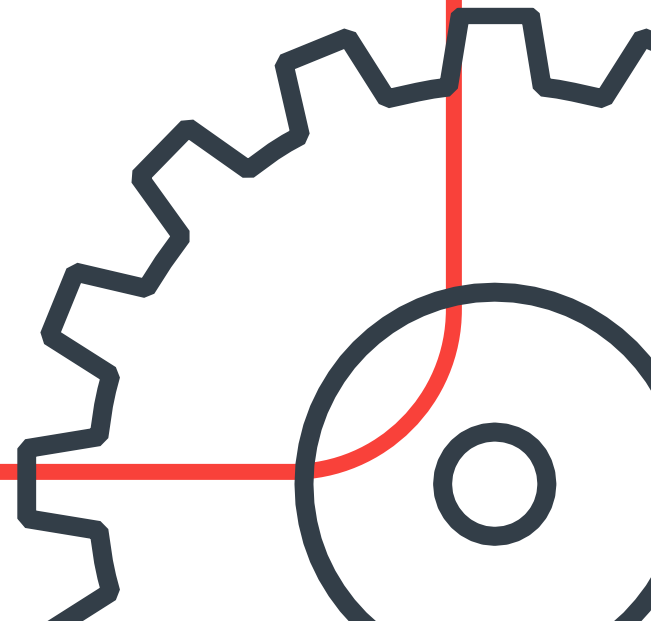
# Example Receptor FEPs



# FEPs or other……



- Reduced list could be developed further
- Application should be proportionate to the problem – an audit tool
- Simply part of an overall assessment cycle



# Something more concrete for NOW….

**Q - By interrogating current models can we identify sensitivities and how they may be pragmatically managed?**

ConSim

LANDSIM

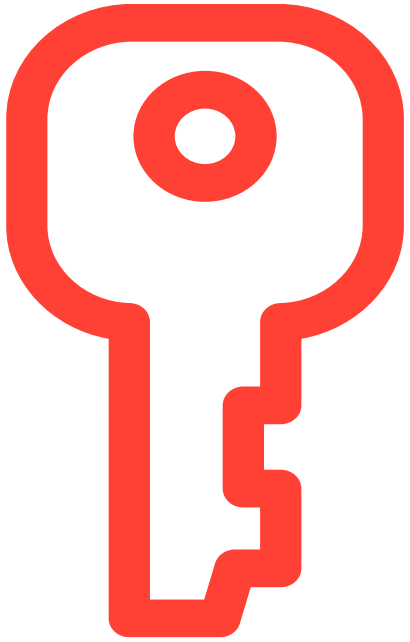
GASSIM 2.5

**Contaminant Fluxes from Hydraulic Containment Landfills**

**The Remedial Targets Methodology (RTM)**

- Development of a robust CSM
- In delivery of any risk assessments foremost is to ensure model describes and reflects the CSM
- BUT can a commonality be identified to direct interim and next steps

# Key Points on Existing Model sensitivity

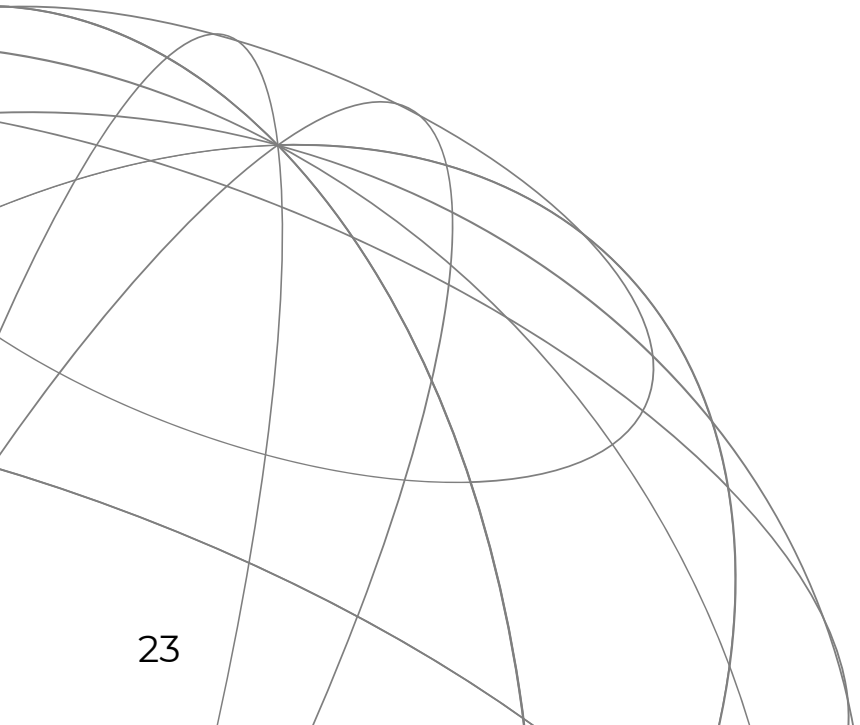


- 3 parameters exert order of magnitude
  - infiltration, groundwater levels, and fraction organic carbon
- Probability Density Functions of mean monthly temperature and precipitation values are available from UKCP18 for any location in the UK and can be readily downloaded (e.g. IPCC Interactive Atlas, CEDA archive)
- Groundwater level and recharge projections available from eFLAG
- But… importance of FoC subject of further literature review

# The Bottom Line

- Consideration of adverse climate change is a topic of acute industry interest.
- A lack of both a framework and details on delivery is evident.
- Consideration of CC should become part of regular risk assessment process.
- Strong regulatory leadership and policy change needed including
  - A clear explicit statement of regulatory expectation/requirements
  - A framework and guidance in which operators and problem holders may work
  - Direction to datasets and how to apply them
  - Areas of priority research

**This journey is only just starting**



# Thank you

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