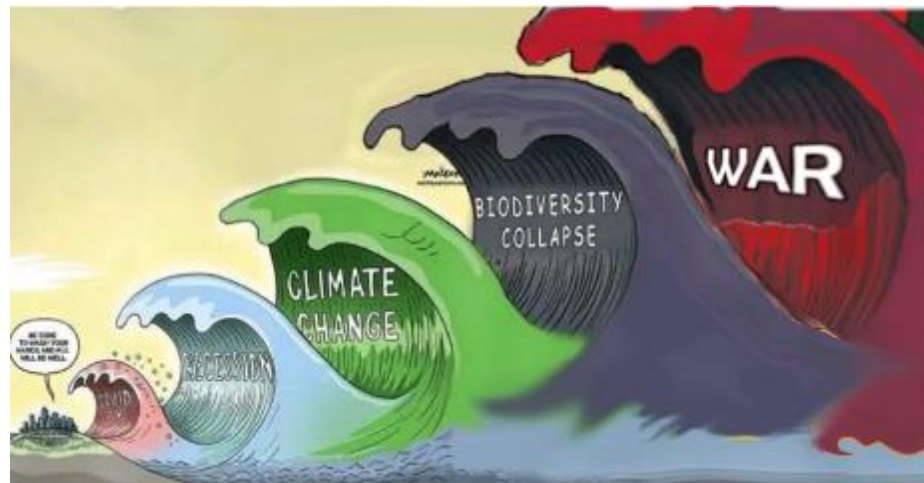
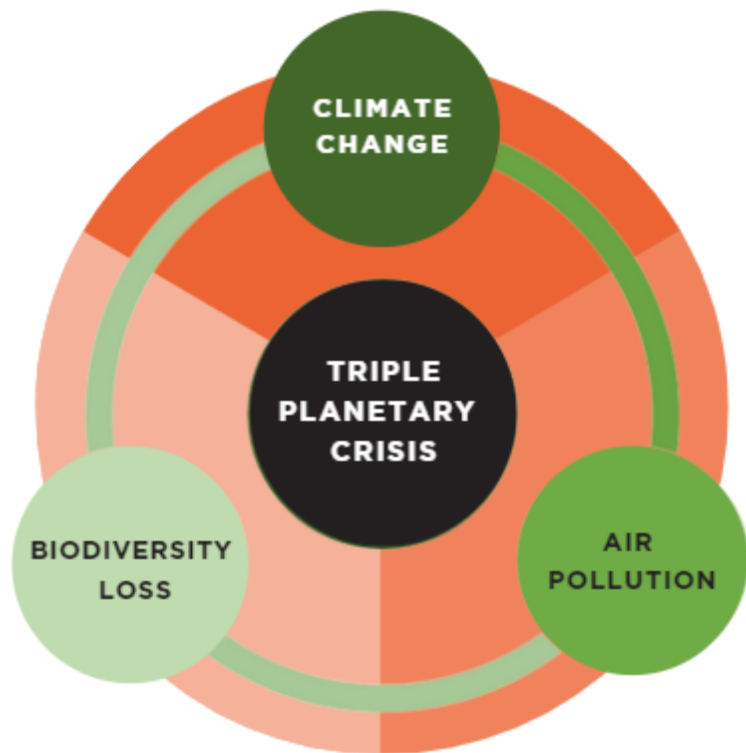


# Science and our laboratories supporting the Scottish Environment Protection Agency

Overview of the role of science in SEPA

## Global threats



Credit: Graeme Mackay (mackaycartoons.net)

## Role of the Scottish Environment Protection Agency (SEPA)

- Protect and improve the environment as Scotland's principal environmental regulator
  - Improving the health and well being of the people of Scotland
  - Managing natural resources in a sustainable way
  - Achieving sustainable economic growth
- The future:
  - Global challenges – climate change, biodiversity loss, pollution, Covid-19
  - Emerging threats – e.g. antimicrobial resistance, endocrine disrupters
  - List of chemicals ever increasing – approach to controls different for different chemicals
  - Net Zero – considering new technologies to support business achieve 'Net Zero' justly

## Scientific expertise in SEPA

Evidence to support regulatory decisions



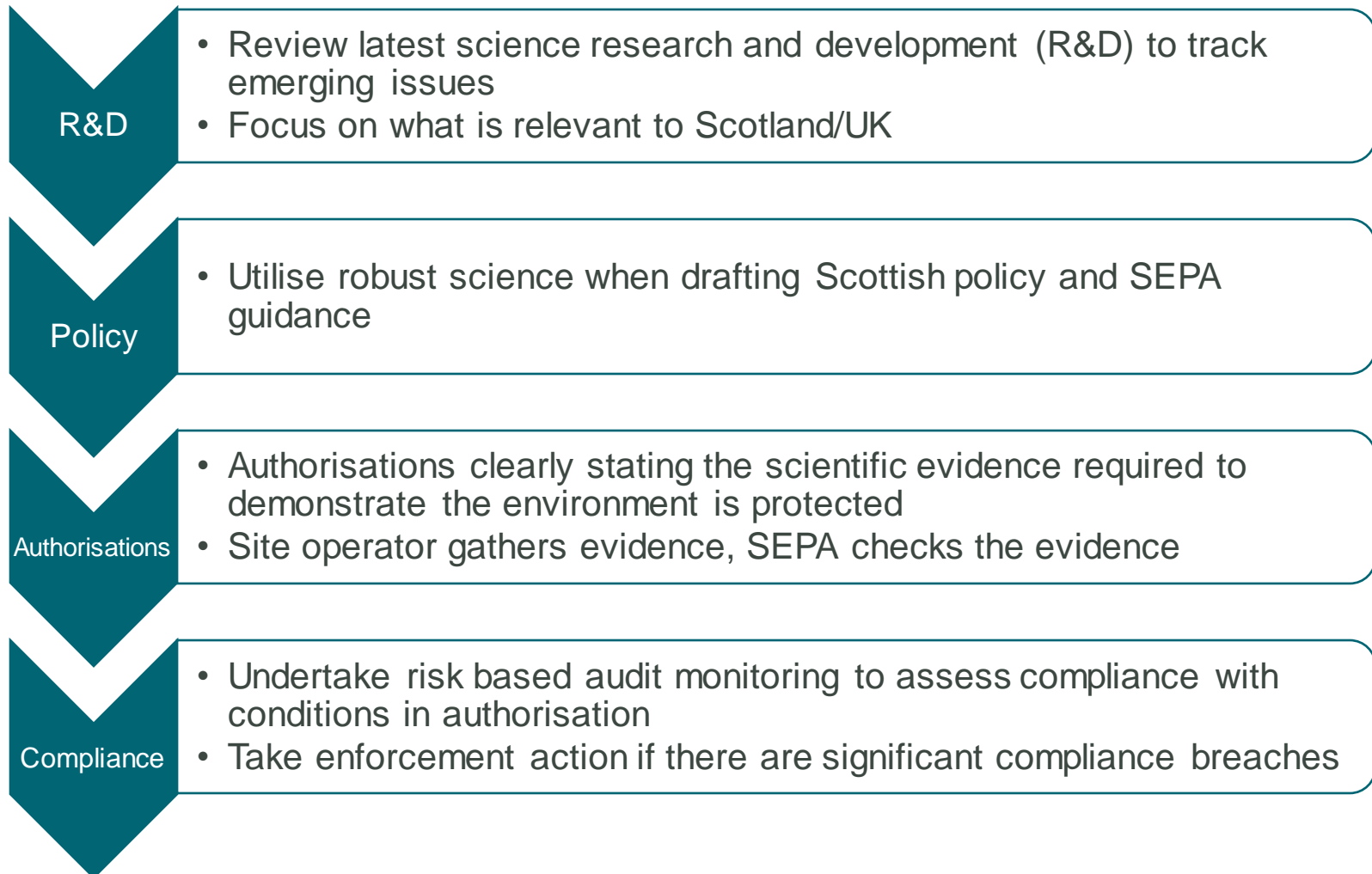
Quantifying the state of the environment



Identifying emerging issues



## Scientific expertise - supporting regulation



## Shaping our evidence needs



- Before undertaking sampling and analysis we must have clear outcomes
- Ensures the right data is collected to answer the environmental or regulatory question



- Different approaches can be used – targeting the largest effort to the biggest risk
- If scientific evidence can't answer the question, other lines of evidence may be required

## SEPA's role for Scotland's Environment



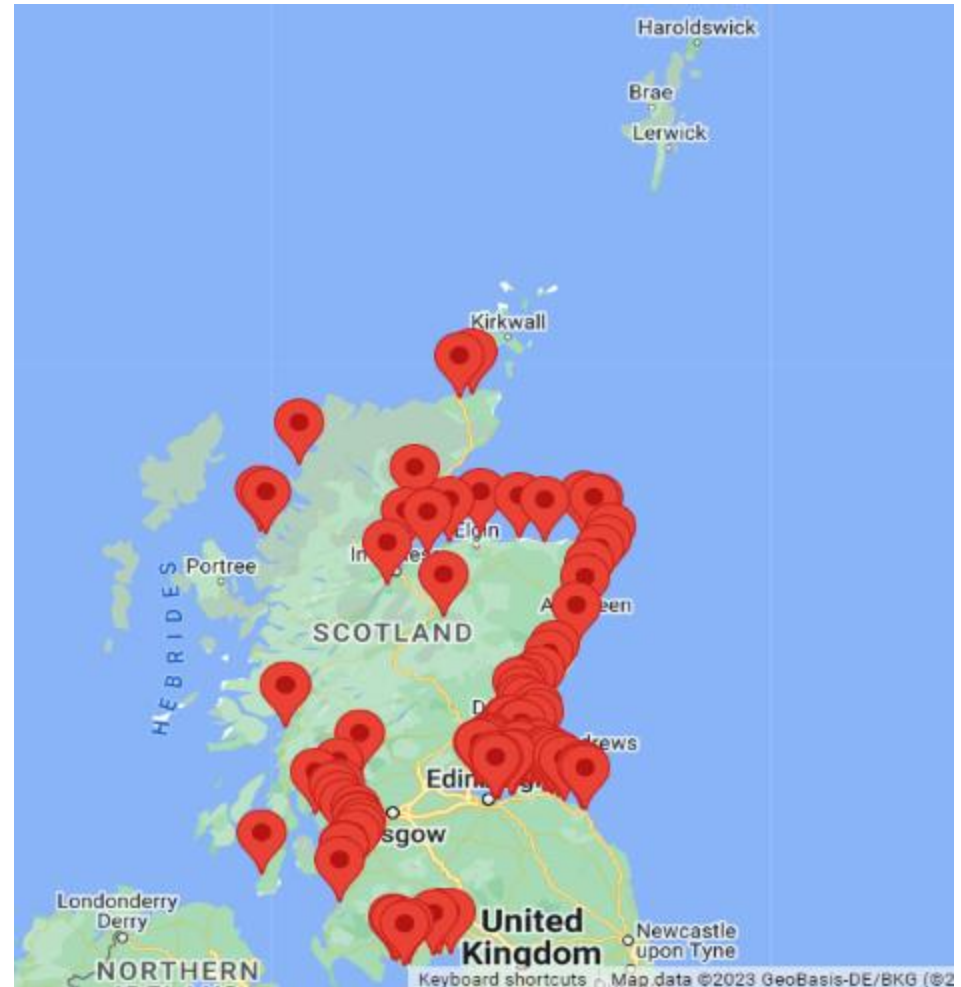
Large team of staff who undertake a wide range of water, waste, soil and air sampling across Scotland

Samples are

- Collected using best practice
- Stored under controlled conditions

Must preserve sample integrity

## Gathering evidence – Sampling



## Gathering evidence – Field Measurements

- Range of staff who take measurements in the field
- Using a wide range of techniques and kit
- Using reference methods and instrumentation to robust quality controls
- Examples of data collected include:
  - hydrometry measurements
  - chemicals in ambient air and stacks
  - ground and landfill gas
  - soil/waste
  - Measurements of the marine environment





## SEPA's scientific expertise – ecological impacts

Kick net sampling to collect macro-invertebrate fauna in rivers and lochs.

Used to assess:

- general water quality,
- impacts of acidification,
- pesticides,
- fine sediment deposition,
- nutrient pressures



Macrophytes: large plants visible by eye. Used to assess nutrient levels



Diatoms: algae that form a biofilm on river substrate. Used to indicate status of water body from nutrient pressures

## Gathering evidence – Lab Measurements

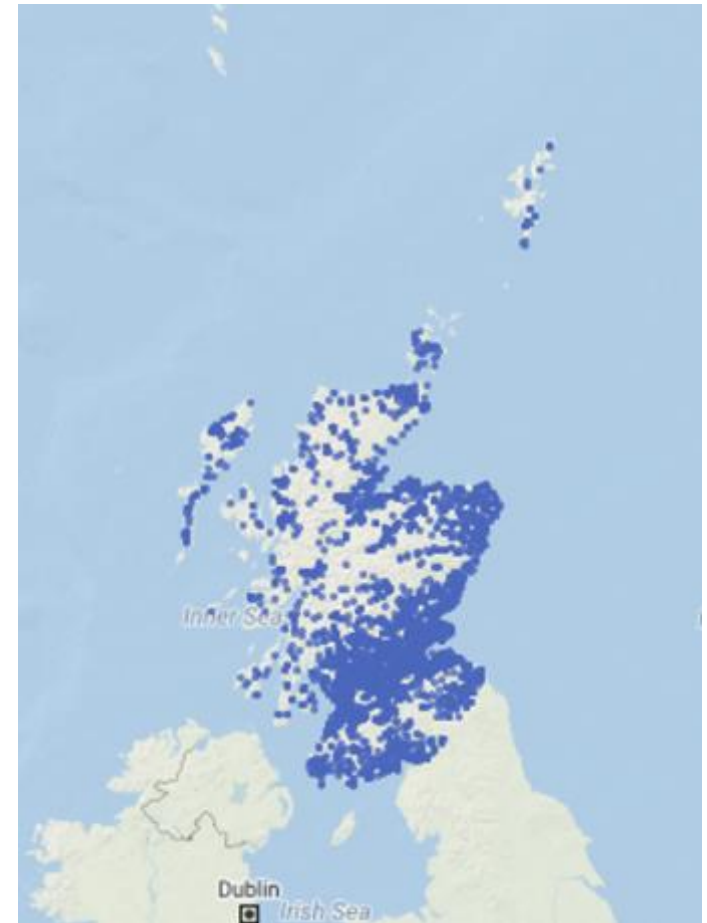
- Wide range of laboratory expertise and instrumentation
- Analytical capabilities developed based on reference methods, to robust quality control procedures and verified by external auditors
- Produce a huge range of data points on microbiological, chemical and ecological indicators
- Analysis of a range of sample matrices – freshwater, lochs, transitional and marine waters, groundwater, soil, waste



## Gathering evidence – Traditionally

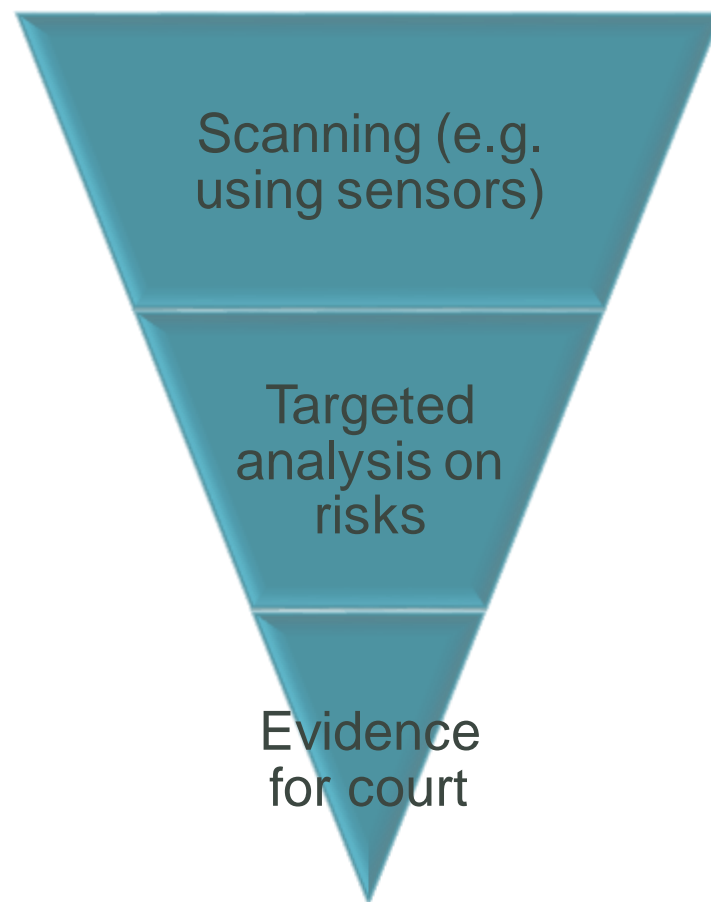
### Previously

- Detailed measurements using lots of individual instruments
- Big focus on water monitoring (see map)
  - Measurement of chemical and ecological effects in water
  - Large monitoring network of nutrients
  - Limited monitoring of toxic substances
- Limited monitoring of air, soil and waste



## Gathering evidence – Future

- New approaches
  - Exploring wider range of techniques
  - Use of screening methods and remote sensors for greater coverage
  - Targeting reference methods on prioritised risks
- Use Research and Development
  - Highly bespoke investigations
  - Testing new methods



## New – Field approaches (example)

### Unmanned Aerial System (UAS) or drone

UAS imagery helps determine waste volumes

Use to

- understand compliance with licence conditions or
- measure scale of illegal waste deposit to assess financial benefit of landfill tax avoidance



SEPA Science staff collecting UAS imagery

## New – lab approaches (example)

### LC-HRMS screening method

- Expanding our trace organic analysis capabilities
- Use one instrument to screen for over 400 substances
- Also screen for unknown substances
- Aim to expand the range of sample preparation methods to analyse a wider range of environmental media
- Used to: understand wider range of chemical pressures on the environment



# SEPA's scientific expertise – communication



Policy questions must be clear to ensure the scientific evidence answers the questions definitively



Answers must be measurable and uncertainties clearly communicated



Understanding the audience is key (e.g. public, stakeholders)



Translate technical information into useable messages

# Thank you

## Contact details

Olivia Downey  
Principal Specialist Scientist  
Chemistry Department, SEPA  
Email: [olivia.downey@sepa.org.uk](mailto:olivia.downey@sepa.org.uk)

[sepa.org.uk](http://sepa.org.uk)

