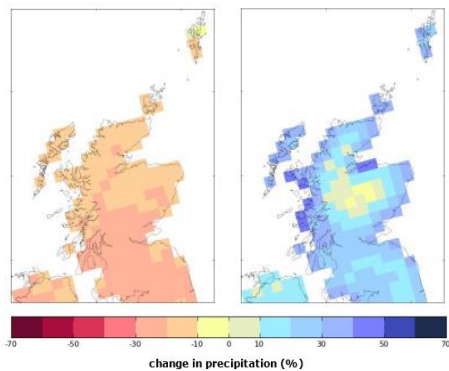
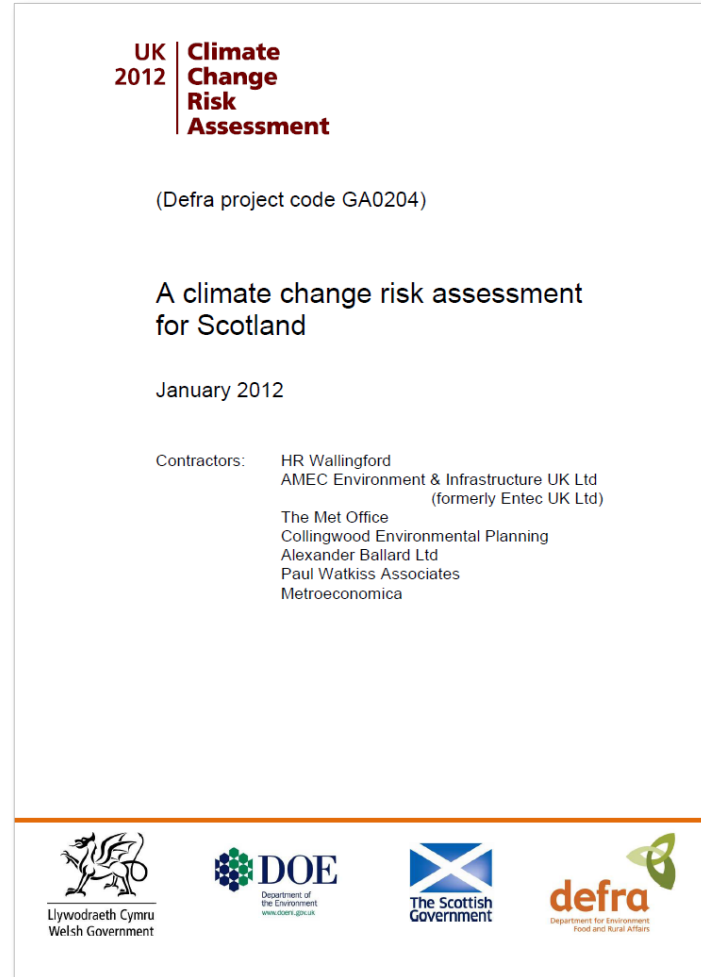
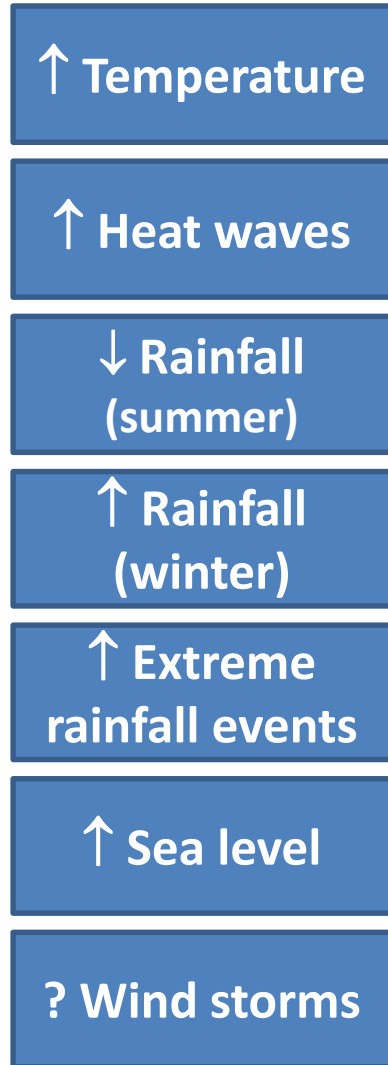


An overview of the *ClimateXChange Adaptation Indicators* for freshwater: approach, utility and the way forward

Anna Moss, University of Dundee
(a.z.moss@dundee.ac.uk)

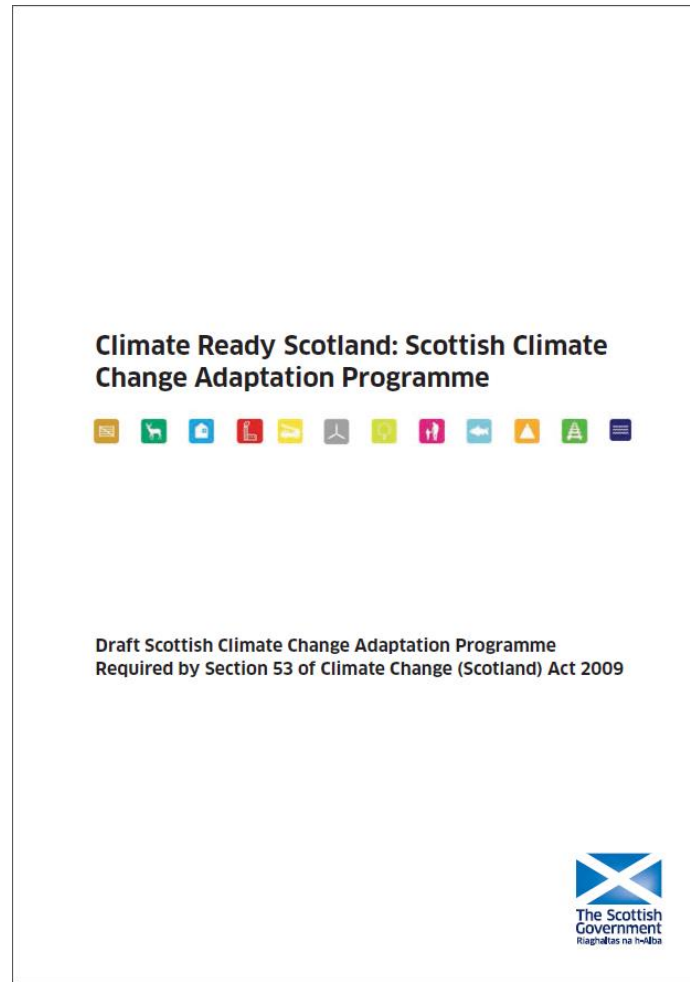


Adaptation Indicators- origin and policy context



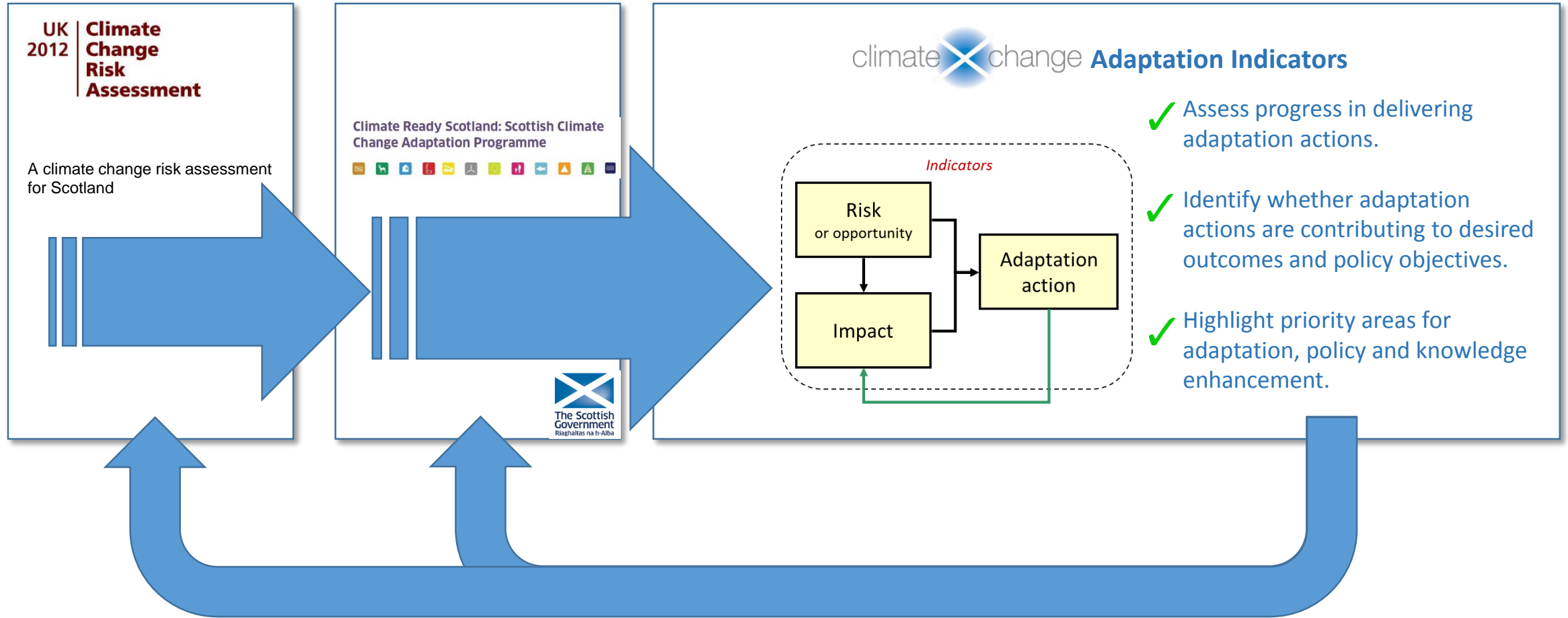
- Climate Change Act 2008: 5-yearly assessments of risk
- First Climate Change Risk Assessment (CCRA) published January 2012
- Assessment of **current and predicted threats and opportunities** from climate change up until 2100
- Five themes:
 - Natural Environment
 - Agriculture and Forestry
 - Business and Services
 - Infrastructure and Buildings
 - Health and Wellbeing

Adaptation Indicators- origin and policy context



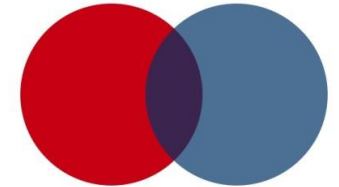
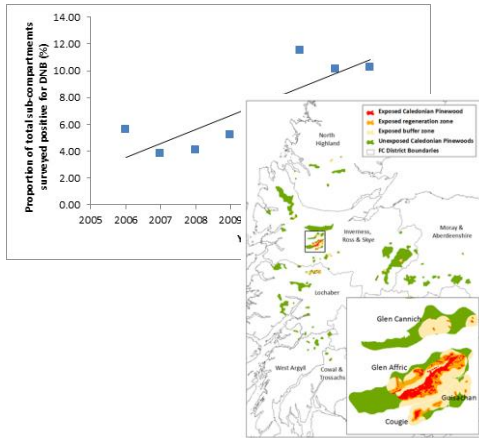
- Objectives in relation to adaptation to climate change
- Proposals and policies for meeting those objectives
- Three themes:
 - Natural Environment
 - Buildings and Infrastructure Networks
 - Society

Adaptation Indicators- origin and policy context

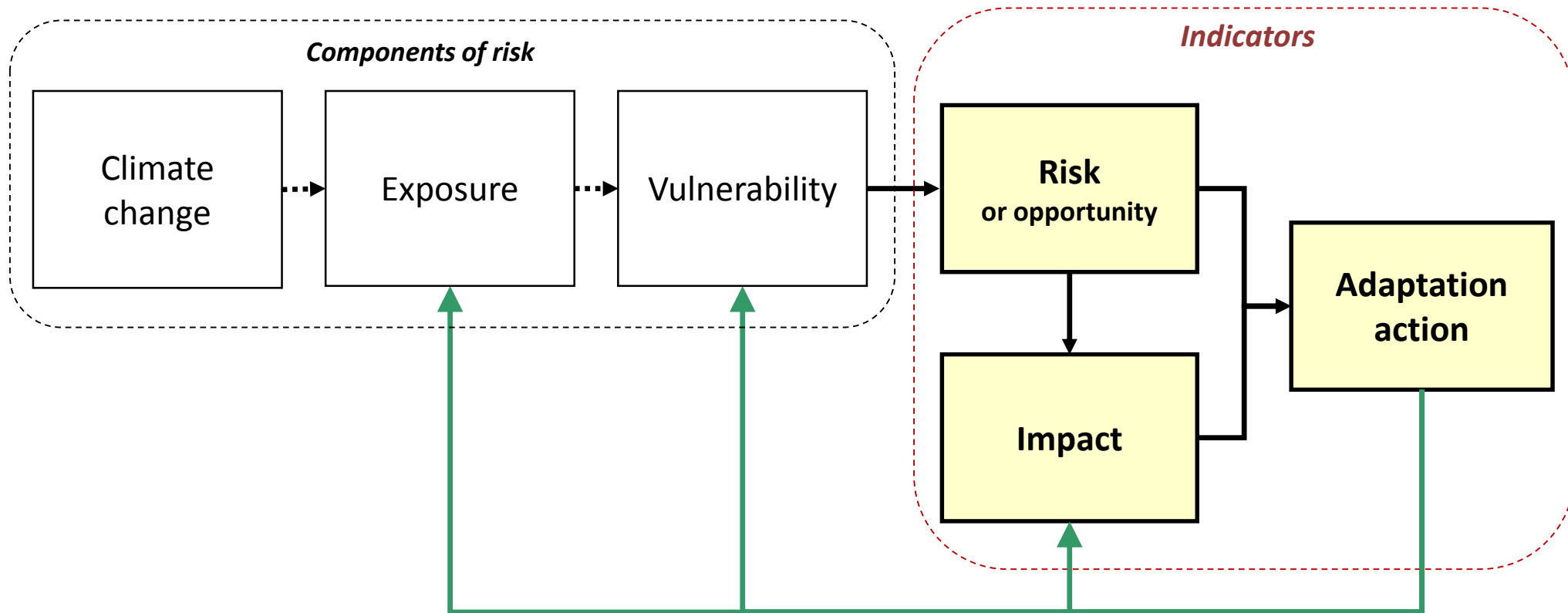


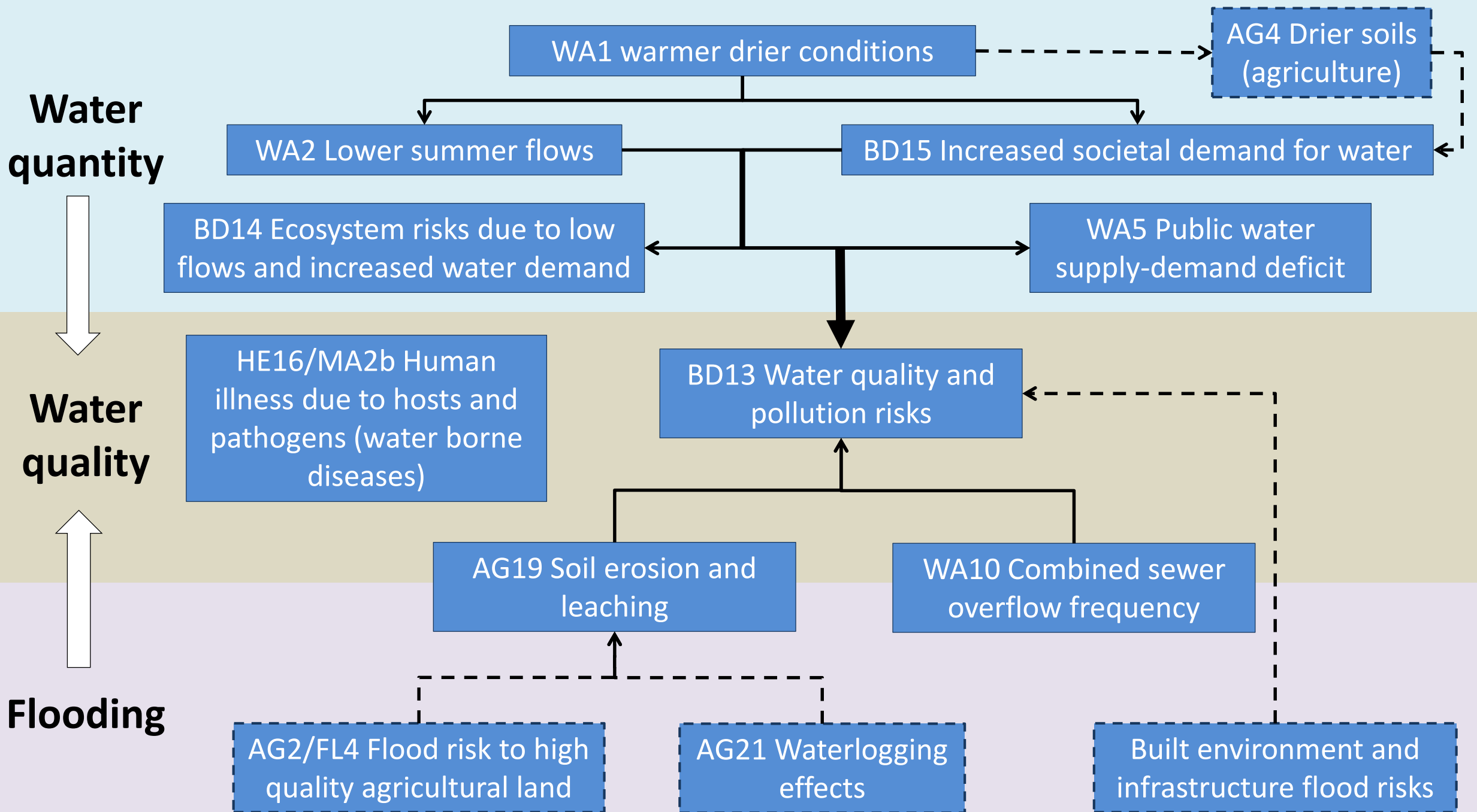
Indicator approach


- Priority – indicators relevant to Scotland
- Using existing indicators where appropriate
- Use existing data but some new analysis also
- High level and cross-cutting where possible
- Extensive stakeholder engagement



Indicator approach







BD5 Species unable to track changing climate space

BD3/4 Risks of pests and diseases to biodiversity

BD11 Generalist species more able to adapt than specialists

BD46 Loss of service through loss of keystone species

Freshwater indicators

Risk

Proportion of water bodies not meeting Good Overall Status

Summer low flow events in Scottish rivers (Normalised Flow Index)

Drought risk to agricultural land

Agricultural land at significant flood risk

Wetness risk for agriculture

Impact

Freshwater bodies affected by diffuse pollution due to agriculture

Abstraction of water for irrigation

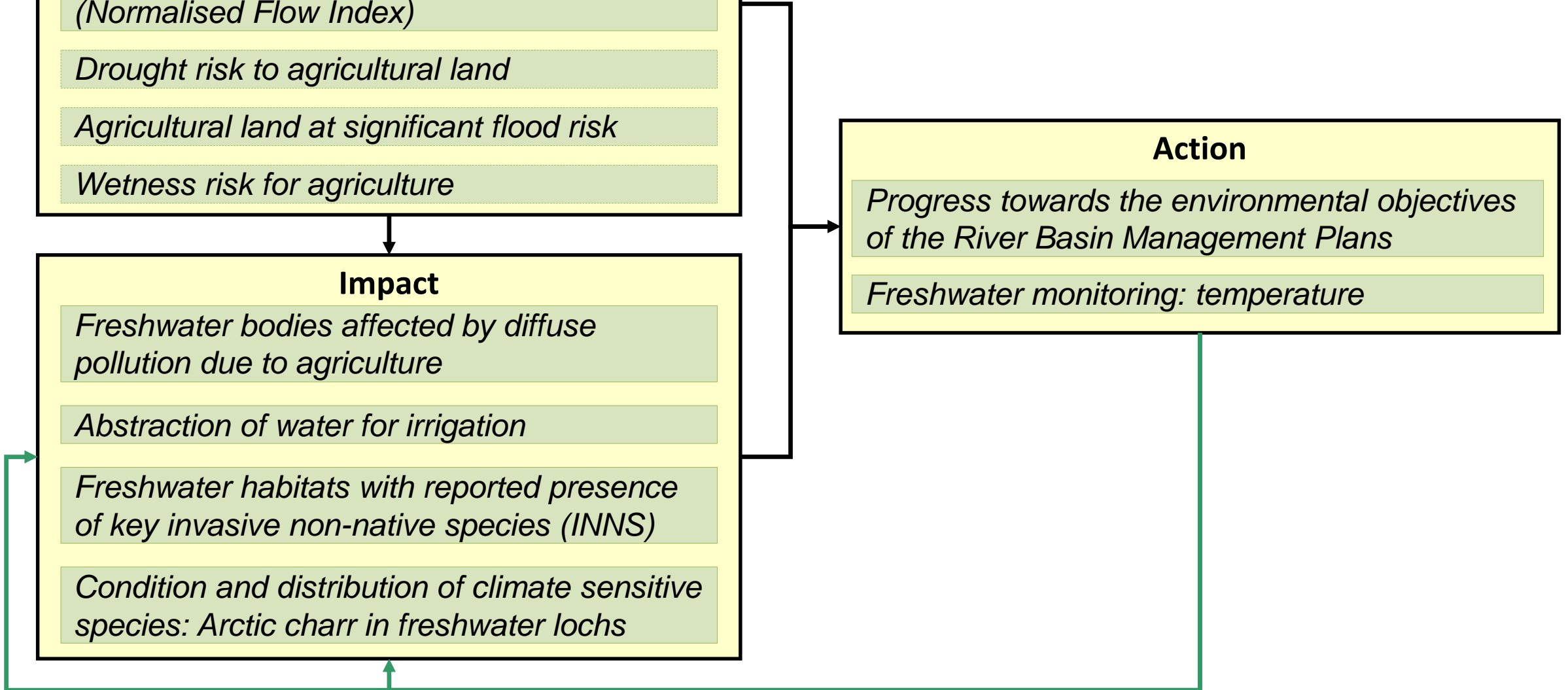
Freshwater habitats with reported presence of key invasive non-native species (INNS)

Condition and distribution of climate sensitive species: Arctic charr in freshwater lochs

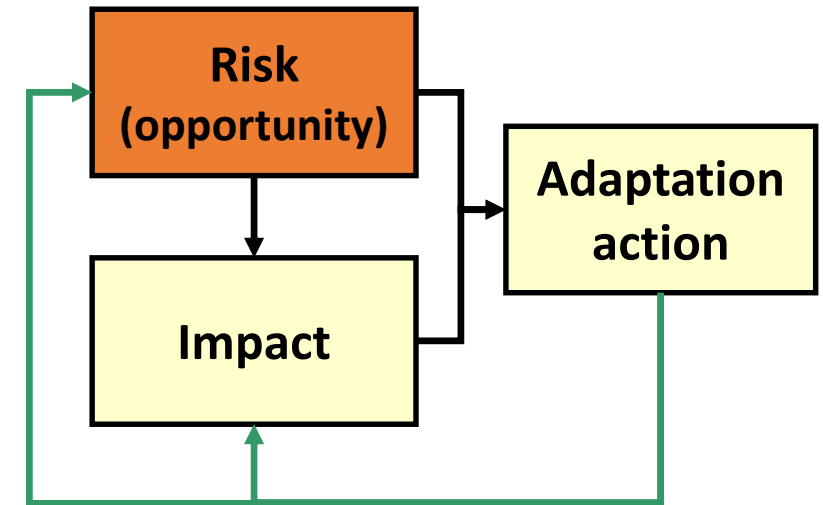
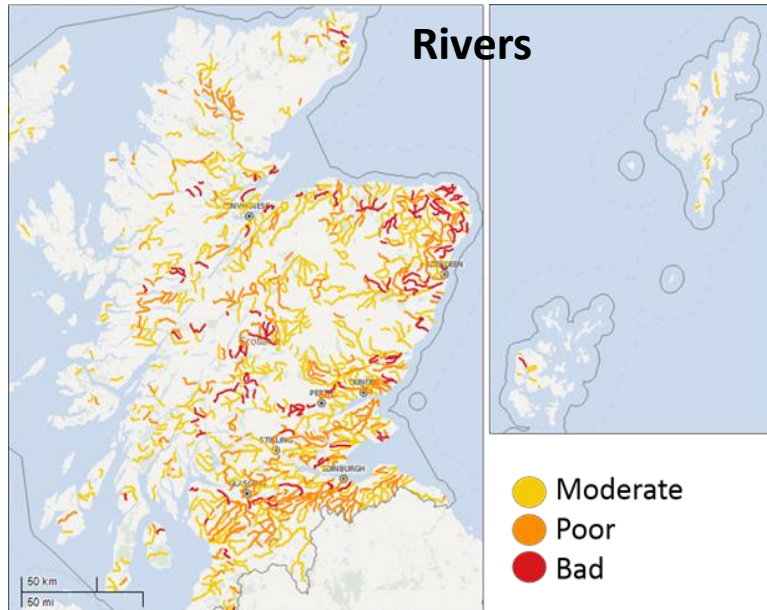
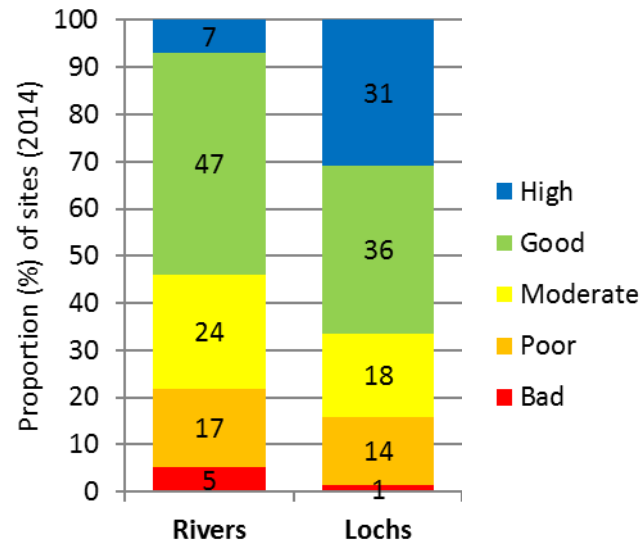
Action

Progress towards the environmental objectives of the River Basin Management Plans

Freshwater monitoring: temperature



Risk Proportion of water bodies not meeting Good Overall Status

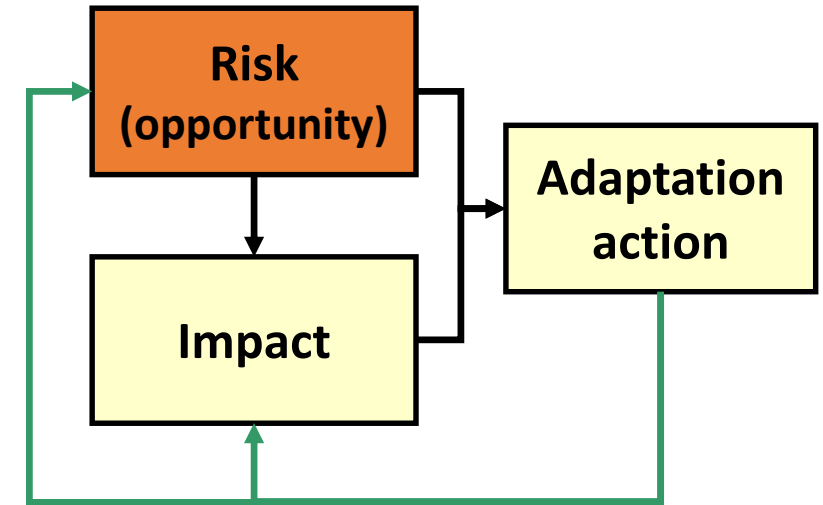
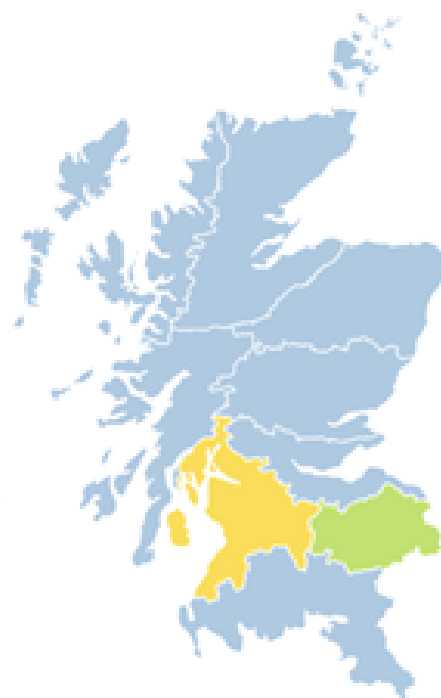
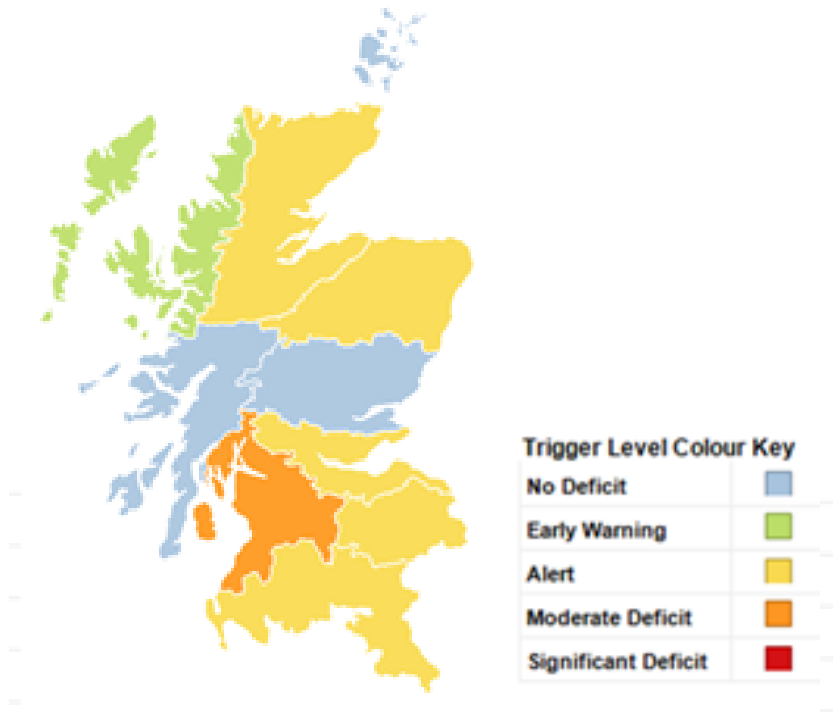


Source: SEPA WFD classification system

Risk Summer low flow events in Scottish rivers (Normalised Flow Index)

Summer 30-day low flow index

Summer 90-day low flow index

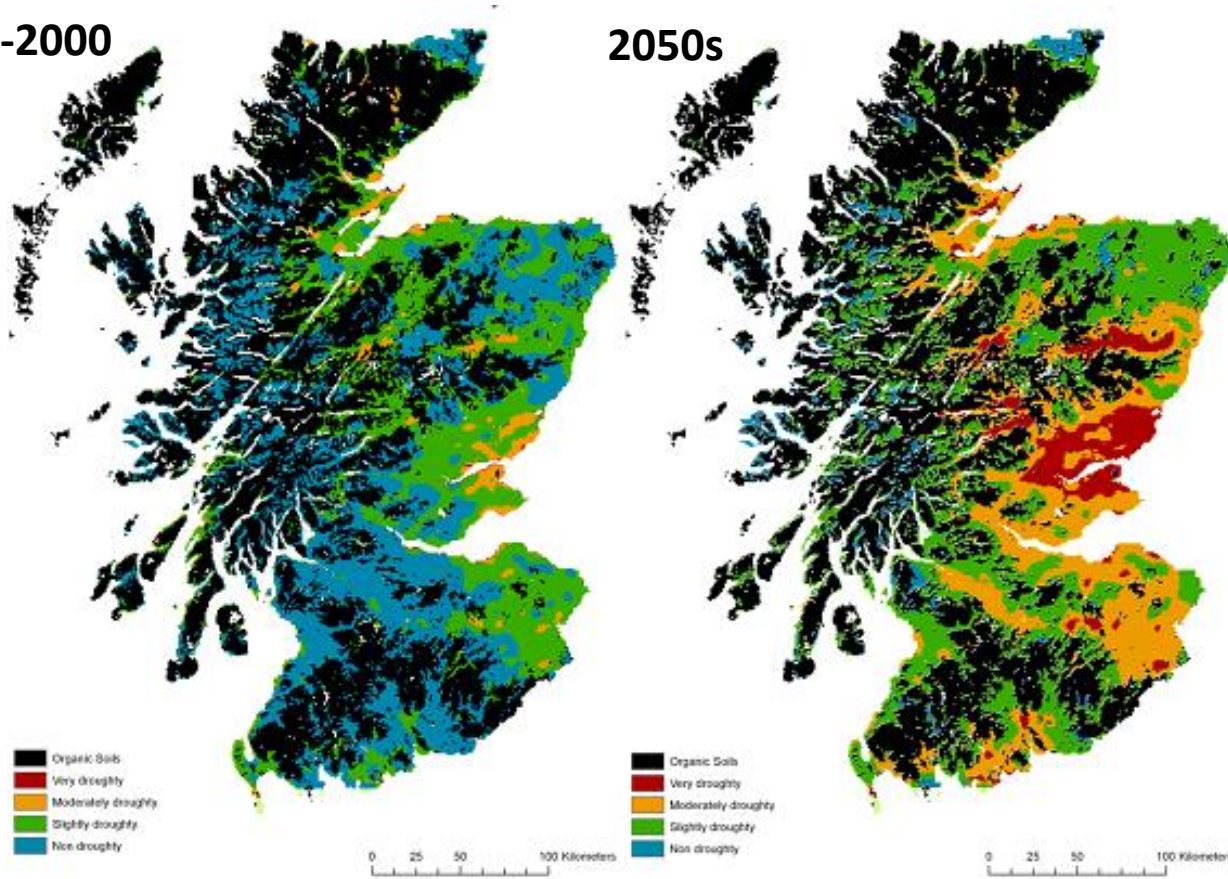


Source: SEPA- indices calculated from flow gauging station data

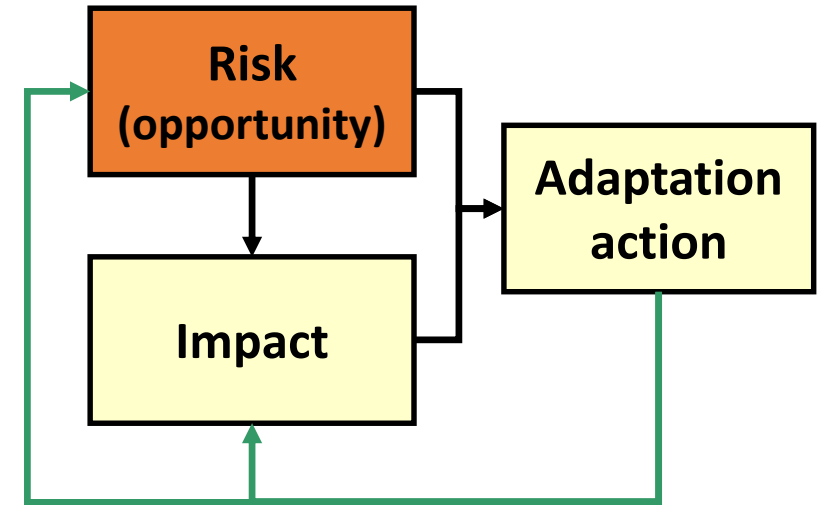
Risk Drought risk to agricultural land

1981-2000

2050s



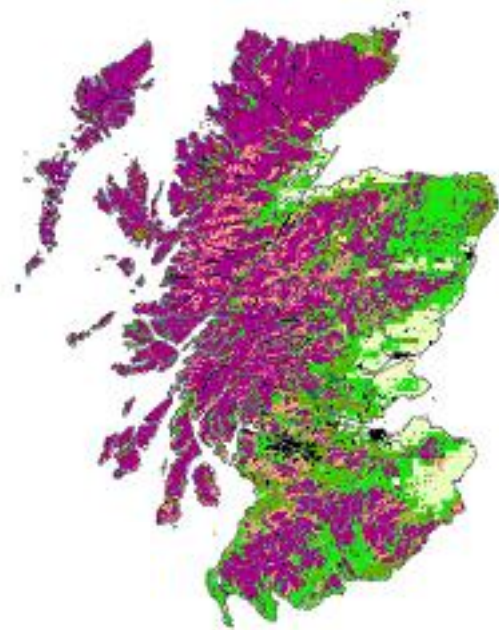
Drought risk for wheat (HadRM3 SCP q3 scenario)



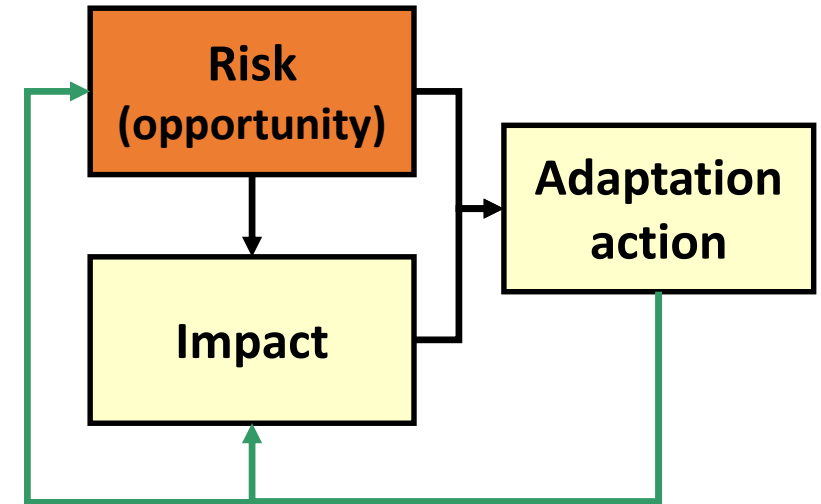
Source: JHI- Land Capability for Agriculture

Risk Wetness risk to agriculture

	Arable land	Improved grassland
Low risk	ca. 24000km ²	ca. 27000km ²
Medium risk	ca. 4000km ²	ca. 7000km ²
High risk	ca. 44000km ²	ca. 38000km ²



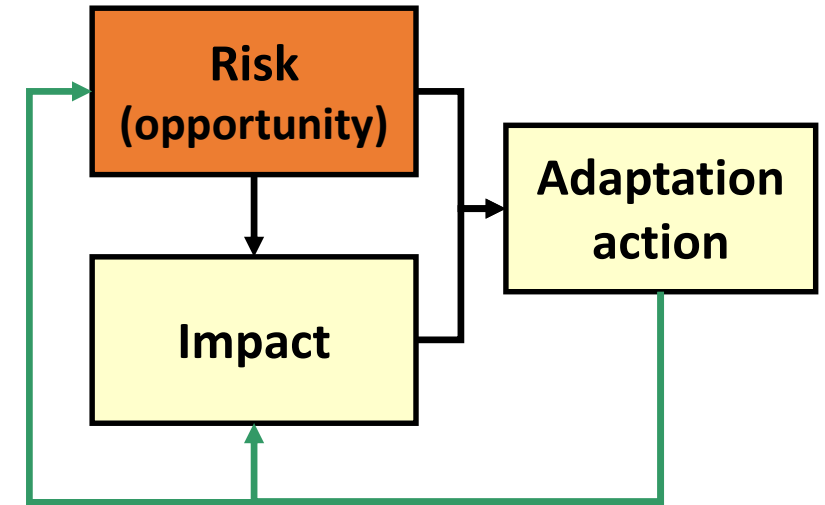
**Poaching and trafficability
risk for improved grassland
1991-2010**



Source: JHI- Land Capability for Agriculture

Risk Agricultural land at significant flood risk

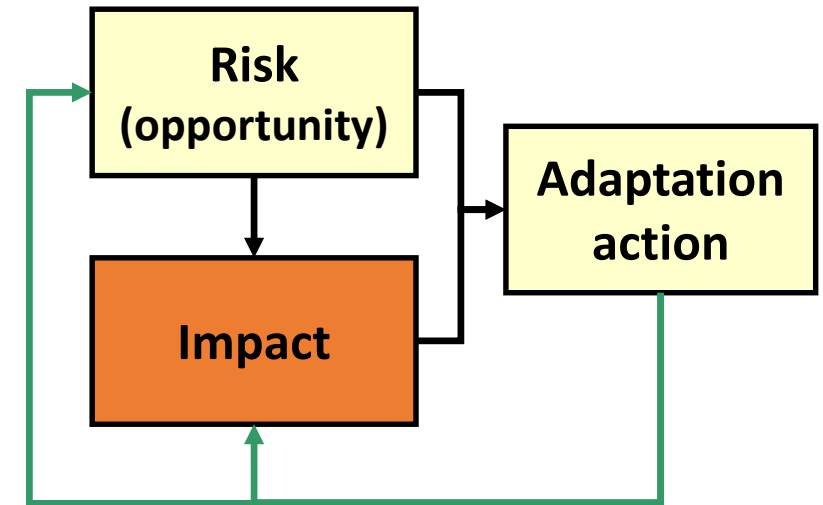
	Area of arable agricultural land at risk (ha)		
	10 year	50 year	200 year
Fluvial	150,000	170,000	190,000
Coastal	17,000	19,000	22,000



Source: SEPA- FRM Strategy
Characterisation Data

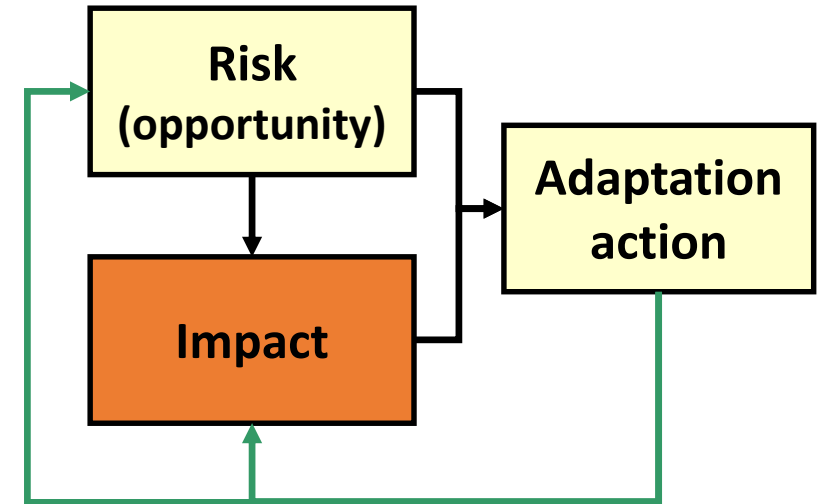
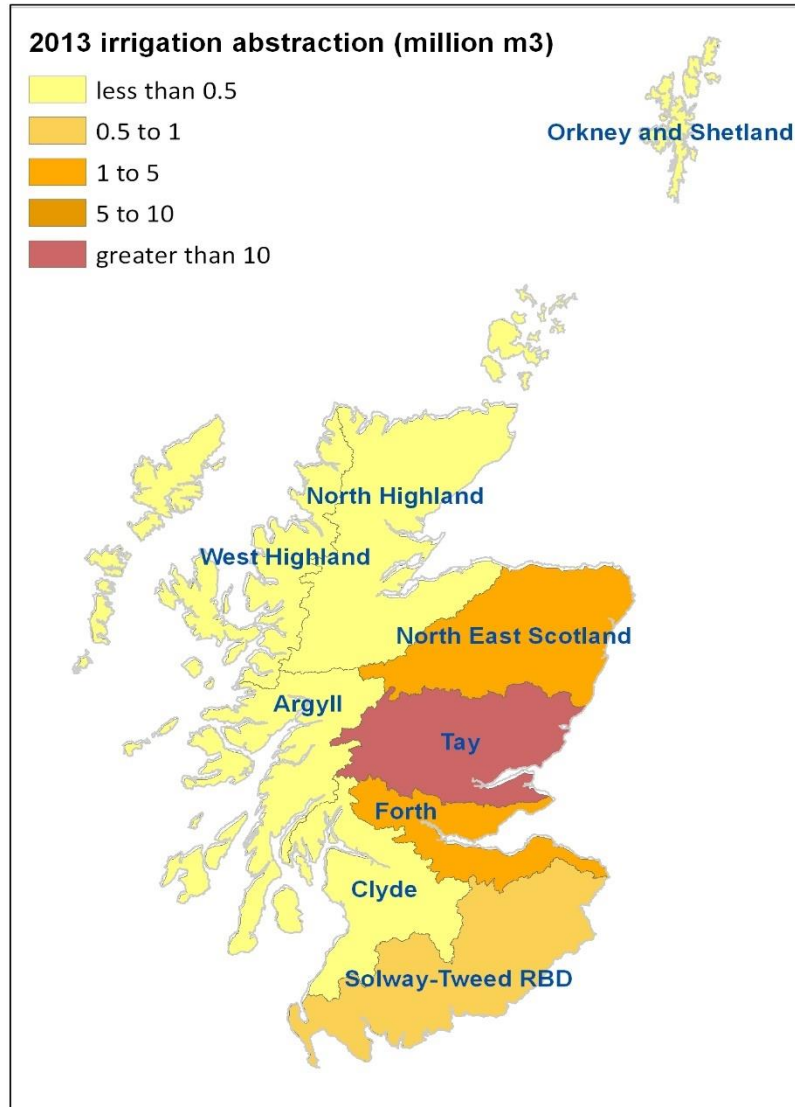
Impact Freshwater bodies affected by diffuse pollution due to agriculture

Water body type	Proportion of water bodies (%)	Proportion of area/ length (%)
River	9.4	9.3
Lake	7.5	3.5
Estuaries	4.1	1.1
Coastal	0.0	0.0
Groundwater	9.9	6.6



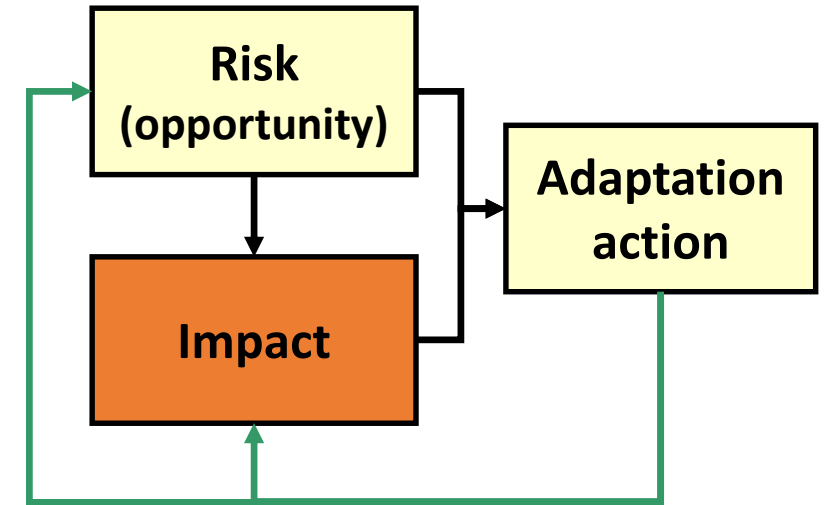
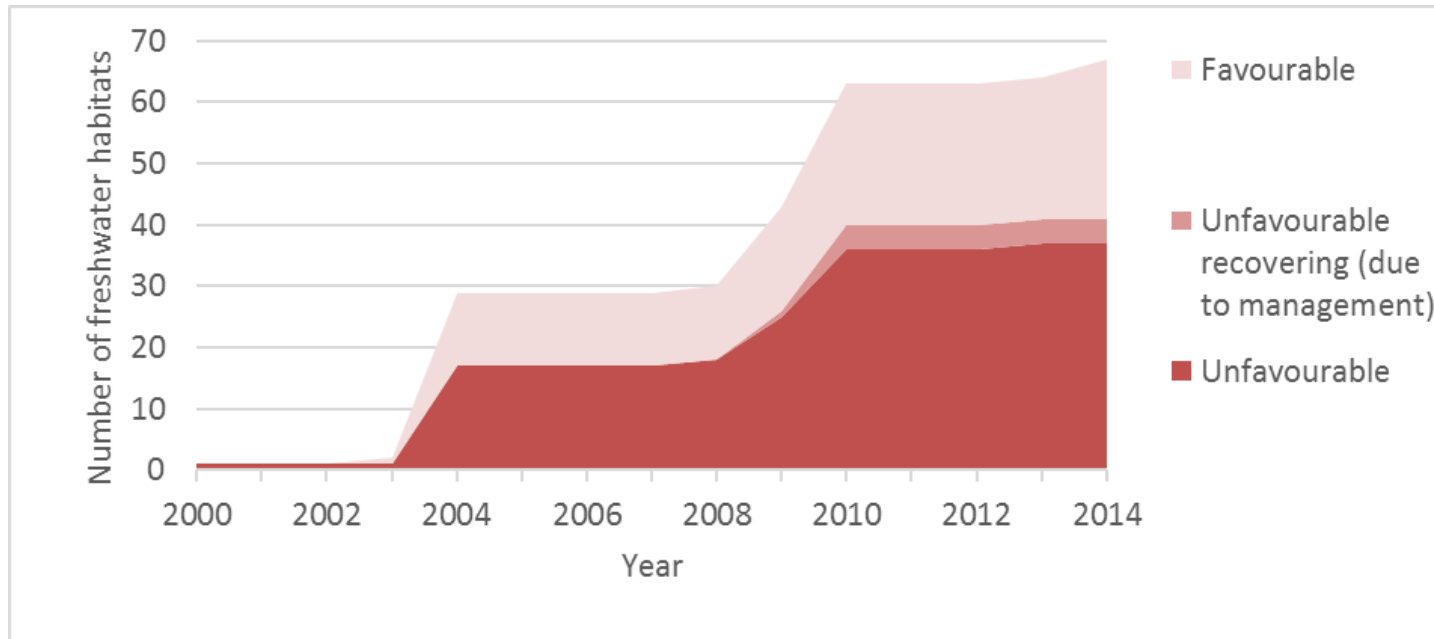
Source: SEPA- All pressure and measure data

Impact Abstraction of water for irrigation



Source: SEPA- analysis of Controlled Activities Regulations Water Use Licences and Water Resources Data Returns

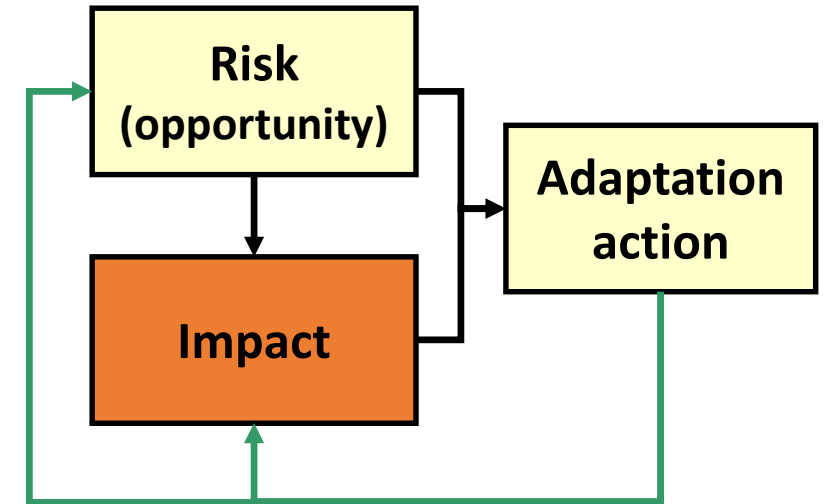
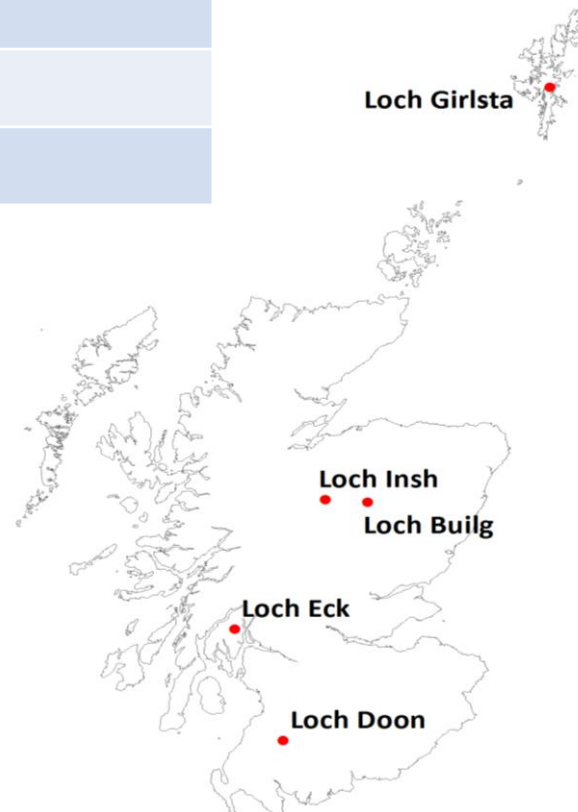
Impact Freshwater habitats with reported presence of key invasive non-native species



Source: SNH- Site Condition Monitoring

Impact Condition and distribution of climate sensitive species: Abundance of Arctic charr in freshwater lochs

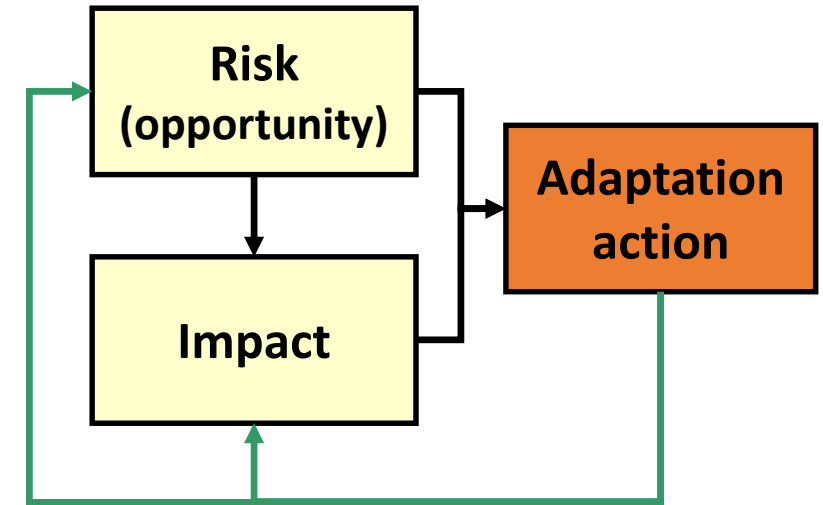
Location	Significant trend (P < 0.05)
Loch Builg	↓
Loch Doon	↓
Loch Eck	↓
Loch Gairlsta	↑
Loch Insh	↓



Source: Winfield *et al*-
Hydrobiologia (2010)

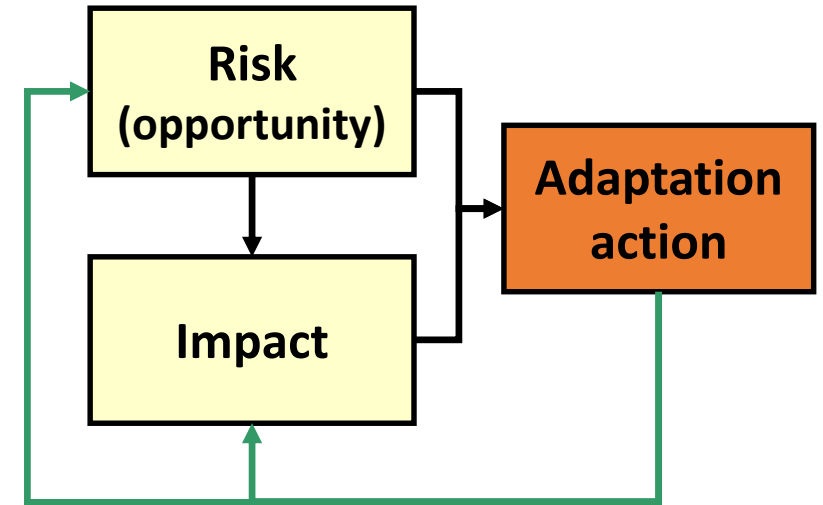
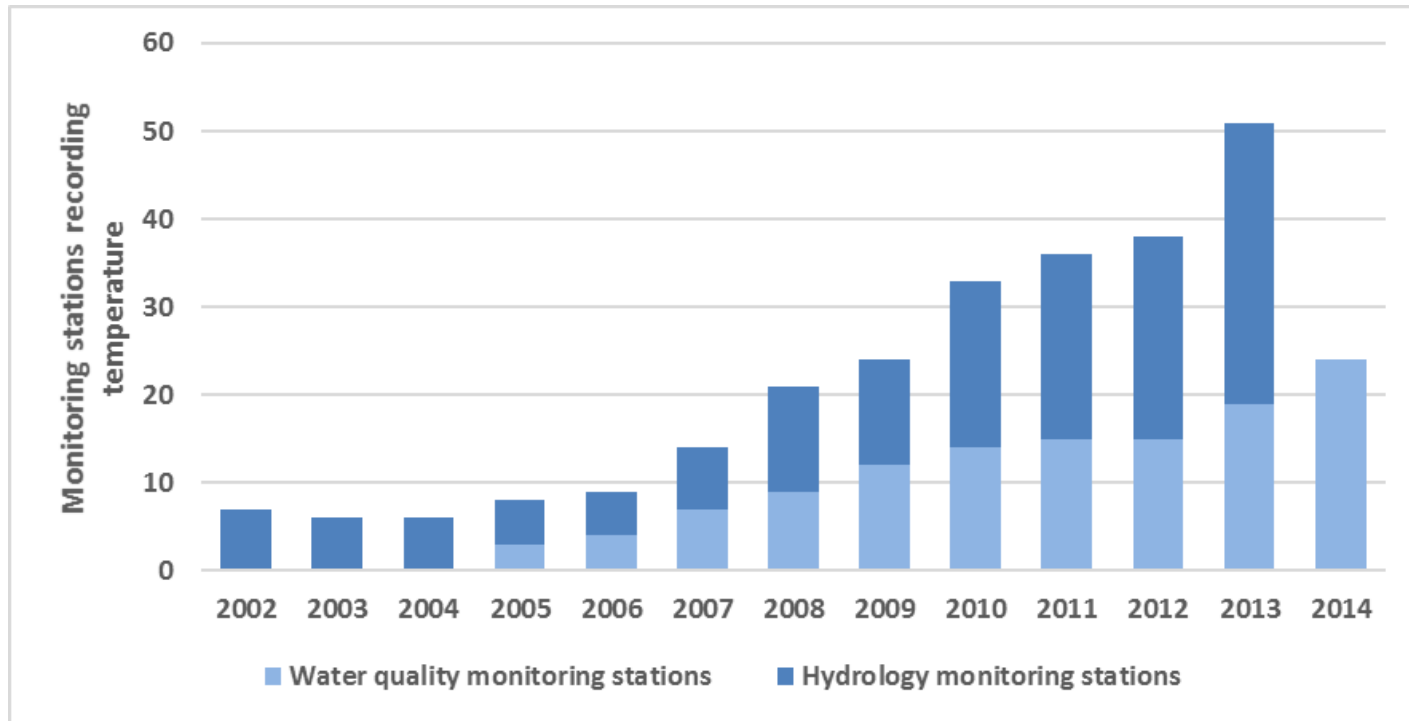
Action Progress towards the environmental objectives of the River Basin Management Plans

Surface water bodies	Proportion meeting 2015 objective (%)	Proportion in good or better status (%)*	
		Scotland RBD	Solway RBD
Rivers	75	55 (63)	46 (52)
Lochs	82	70 (71)	16 (52)
Estuaries	82	90 (85)	90 (83)
Coastal	83	97 (97)	100 (100)
		* 2015 target in brackets	



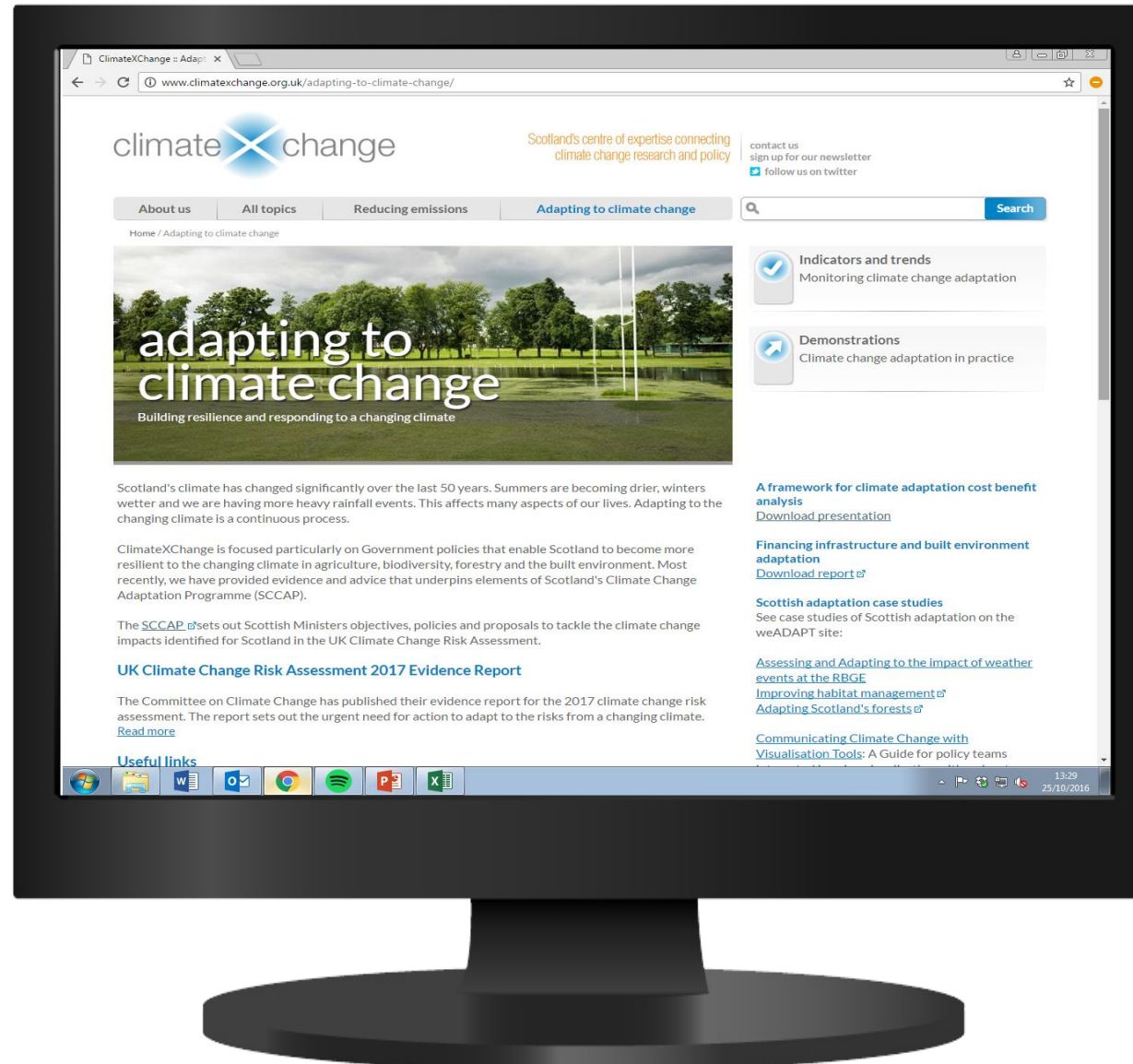
Source: SEPA- RBMP data

Action Freshwater monitoring stations: temperature



Source: SEPA- monitoring station records

Communication of Adaptation Indicators: Website



Communication of Adaptation Indicators: Indicator guide



Climate Change in Scotland: Risks, Impacts and Actions



climate X change

Scotland's centre of expertise connecting climate change research and policy

A guide to the CXC Adaptation Indicators

The CXC Adaptation Indicators project - capturing the 'state of the nation'

CXC has by mid-2016 published over 100 indicators measuring and monitoring progress in building a Climate Ready Scotland.

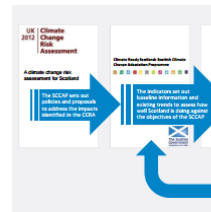
The indicators support Scottish Government policy in three key areas:

- Inform and analyse risks identified for Scotland in the UK's Climate Change Risk Assessment (CCRA)
- Show progress towards the objectives set out in Scotland's Climate Change Adaptation Program (SCCAP)
- Inform the independent assessment of the SCCA carried out by the Adaptation Sub-Committee of the UK Committee on Climate Change

RISK/OPPORTUNITY and IMPACT indicators explore risks and opportunities Scotland faces as a result of current climate change (identified from the CCRA/SCCAP), and quantify the impacts across sectors and the regions of Scotland.

Approach

The indicators were built around policy need. The objectives of the SCCAP.



2 A guide to the CXC Adaptation Indicators

ACTION indicators look at what is being done. Are current policy and climate change adaptation actions having the desired effect?

The indicators are multidisciplinary and cross-sectoral. As such they are relevant to the work of a wide range of government policy teams, agencies,

Natural Environment

Indicator ID and Name		Type	Target	SCCAP	CCRA	Narratives
N10	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N10	N10	Condition of Scotland's National Forest Estate, including woodlands and parks
N11	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N11	N11	Condition of Scotland's National Forest Estate, including woodlands and parks
N12	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N12	N12	Condition of Scotland's National Forest Estate, including woodlands and parks
N13	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N13	N13	Condition of Scotland's National Forest Estate, including woodlands and parks
N14	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N14	N14	Condition of Scotland's National Forest Estate, including woodlands and parks
N15	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N15	N15	Condition of Scotland's National Forest Estate, including woodlands and parks
N16	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N16	N16	Condition of Scotland's National Forest Estate, including woodlands and parks
N17	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N17	N17	Condition of Scotland's National Forest Estate, including woodlands and parks
N18	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N18	N18	Condition of Scotland's National Forest Estate, including woodlands and parks
N19	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N19	N19	Condition of Scotland's National Forest Estate, including woodlands and parks
N20	Land area and condition of Scotland's National Forest Estate, including woodlands and parks	Area	12	N20	N20	Condition of Scotland's National Forest Estate, including woodlands and parks

Buildings & Infrastructure Networks

Indicator ID and Name	Type	Target	SCCAP	CCRA	Narratives
B10: Number of people at significant risk of flooding	People	10%	B10	B10	Number of people at significant risk of flooding
B11: Number of people at significant risk of flooding	People	10%	B11	B11	Number of people at significant risk of flooding
B12: Number of people at significant risk of flooding	People	10%	B12	B12	Number of people at significant risk of flooding
B13: Number of people at significant risk of flooding	People	10%	B13	B13	Number of people at significant risk of flooding
B14: Number of people at significant risk of flooding	People	10%	B14	B14	Number of people at significant risk of flooding
B15: Number of people at significant risk of flooding	People	10%	B15	B15	Number of people at significant risk of flooding
B16: Number of people at significant risk of flooding	People	10%	B16	B16	Number of people at significant risk of flooding
B17: Number of people at significant risk of flooding	People	10%	B17	B17	Number of people at significant risk of flooding
B18: Number of people at significant risk of flooding	People	10%	B18	B18	Number of people at significant risk of flooding
B19: Number of people at significant risk of flooding	People	10%	B19	B19	Number of people at significant risk of flooding
B20: Number of people at significant risk of flooding	People	10%	B20	B20	Number of people at significant risk of flooding

Overview of findings

To understand and manage the complex and multi-faceted issue of adapting to climate change, we need to know and quantify the risks and realised impacts, and identify the outcomes of our actions.

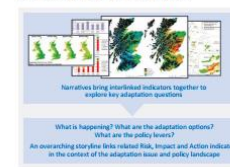


Buildings & Infrastructure Networks

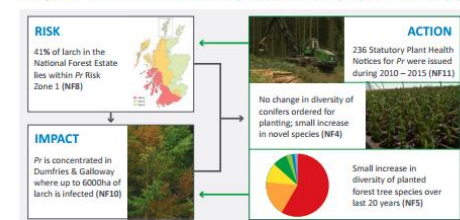
Indicator ID and Name			Type	Target	SCCAP	CCRA	Narratives
B10: Number of people at significant risk of flooding	People	10%	B10	B10	B10	B10	Number of people at significant risk of flooding
B11: Number of people at significant risk of flooding	People	10%	B11	B11	B11	B11	Number of people at significant risk of flooding
B12: Number of people at significant risk of flooding	People	10%	B12	B12	B12	B12	Number of people at significant risk of flooding
B13: Number of people at significant risk of flooding	People	10%	B13	B13	B13	B13	Number of people at significant risk of flooding
B14: Number of people at significant risk of flooding	People	10%	B14	B14	B14	B14	Number of people at significant risk of flooding
B15: Number of people at significant risk of flooding	People	10%	B15	B15	B15	B15	Number of people at significant risk of flooding
B16: Number of people at significant risk of flooding	People	10%	B16	B16	B16	B16	Number of people at significant risk of flooding
B17: Number of people at significant risk of flooding	People	10%	B17	B17	B17	B17	Number of people at significant risk of flooding
B18: Number of people at significant risk of flooding	People	10%	B18	B18	B18	B18	Number of people at significant risk of flooding
B19: Number of people at significant risk of flooding	People	10%	B19	B19	B19	B19	Number of people at significant risk of flooding
B20: Number of people at significant risk of flooding	People	10%	B20	B20	B20	B20	Number of people at significant risk of flooding

Navigating the indicators

The table [pages 4 & 5] provides a complete at-a-glance list of all 105 indicators, listed by SCCAP theme (Natural Environment, Buildings and Infrastructure Networks, Society) and by sub-theme to help navigate the array of information. The SCCAP policy objectives and the CCRA risks/opportunities that each indicator addresses are presented together with the narratives that set the individual indicators in context.



Example 1: Related indicators: The risk of tree pests and diseases, *Phytophthora ramorum* (Pr)

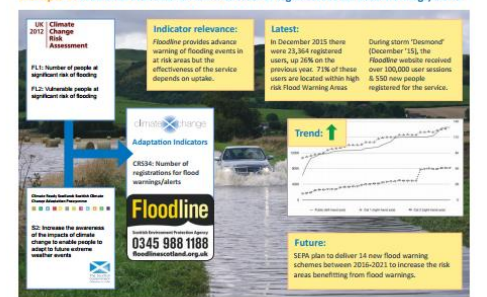


Indicators:

- N10: Proportion and area of land within Pr Risk Zone 1
- N11: Forest area infected by Pr
- N12: Number of forest sites served by a Statutory Plant Health Notice (SPHN) for Pr
- N13: Diversity of tree species ordered for planting in Scotland
- N14: Planted forest tree species diversity index

Phytophthora ramorum (Pr) is a significant RISK for Scotland's commercially important forest trees. Pr has spread rapidly in recent years. As it thrives in mild and wet conditions, projected climate change could increase the IMPACT resulting from more widespread infection. The indicators monitor key management ACTIONs and strategies which either target specific control measures or increase the general resilience of Scotland's forests.

Example 2: Individual indicator: CRS34 – Number of registrations for flood warnings/alerts

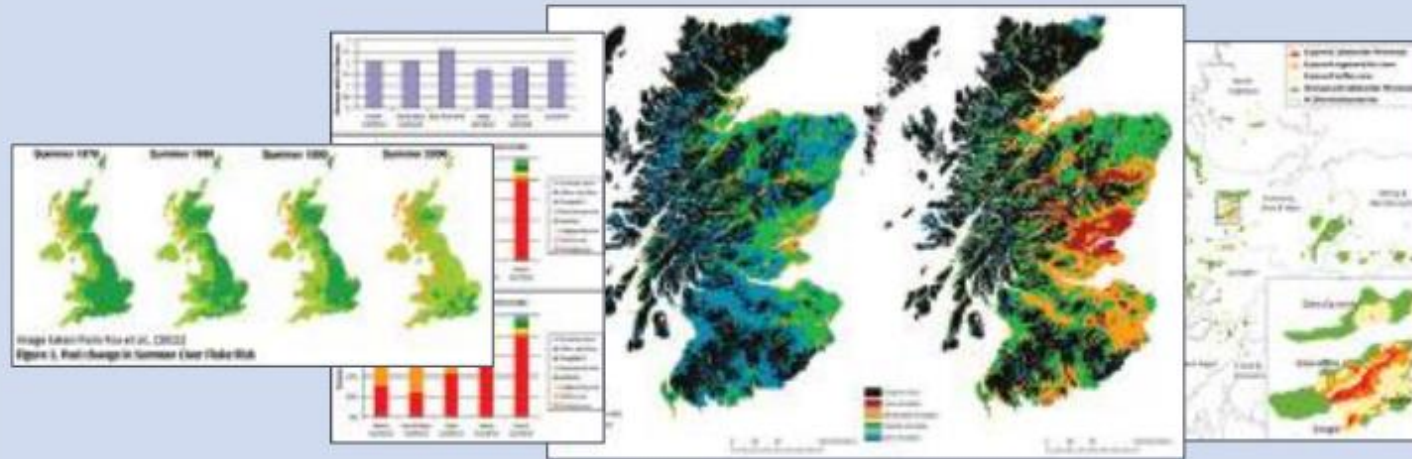


Going forward

Policy makers and practitioners are generally trying to meet multiple economic, social and environmental objectives. Climate change risk and adaptation action plays into many of these, sometimes magnifying existing challenges and other times offering ways of achieving multiple benefits. Our indicators recognise the complexity of decision making and provide a 'way in' to understanding climate change that explicitly links to other policy aims and challenges. It is vital that we continue to gather evidence to ensure that Scotland's adaptation response is informed, flexible and can achieve the best outcomes for all.

6 A guide to the CXC Adaptation Indicators

Communication of Adaptation Indicators: Narratives



Narratives bring interlinked indicators together to
explore key adaptation questions

What is happening? What are the adaptation options?
What are the policy levers?

An overarching storyline links related Risk, Impact and Action indicators
in the context of the adaptation issue and policy landscape

Communication of Adaptation Indicators: Narratives

Natural Environment:

- Tracking suitable space in a changing climate
- Resilience of the natural environment (terrestrial)
- Pests, diseases and invasive species (forestry)
- Suitability and productivity (forestry)
- Suitability and productivity (agriculture)
- Sustainable agriculture
- Condition of agricultural soils
- **Water quality and availability**
- Marine and coastal change

ClimateXChange: Water

www.climateexchange.org.uk/adapting-to-climate-change/indicators-and-trends/water-quality-and-availability/

climateXchange

Scotland's centre of expertise connecting climate change research and policy

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Water quality and availability

SCCAP theme:
Natural environment

Download full narrative PDF

SCCAP objectives:
N1: Understand the effects of climate change and their impacts on natural environment

How is climate change affecting Scotland's natural water environment?

Scotland's water environment provides resources essential to the country's health and prosperity-drinking water, water supply for agriculture and industry, as a source of energy and location for recreation. Furthermore, Scotland's lochs, rivers, estuaries and coast support a great diversity of habitats and species, with many of national and international importance. The management of Scotland's water resources is likely to face important challenges due to the impacts of climate change. Projected changes in the condition of water environments is likely to lead to significant changes in how ecosystems function, which in turn will affect the provision of ecosystem services, and the associated goods and services (e.g. clean water, food and energy) that are important to human well-being.

- Rising mean water temperatures and an increase in extreme temperature events combined with changes in precipitation patterns are likely to impact on the growth and survivorship of freshwater fish; enhance plant/algal growth; and alter the distribution and abundance of both native and invasive species.
- Increased temperatures and reduced precipitation will result in low summer flows and increase the vulnerability of aquatic ecology when water temperature is at its highest and habitat space and dissolved oxygen are at their lowest; migratory fish may also be prevented from moving upstream.
- An increase in high intensity rainfall events is likely to result in an increase in erosion of river banks, particularly where they have been destabilised by the removal of tree cover and other deep rooting vegetation.

The water environment cannot be viewed in isolation from the terrestrial environment in which it sits. Many of the risks posed by climate change to water bodies are due to knock-on impacts from the surrounding land and from potential changes in land use.

List of all indicators

Read our guide to the adaptation indicator project

Key

Understanding the indicator icons

Upward trend Downward trend No significant trend No trend possible

The colour of icon indicates whether the trend is positive (desirable), negative (undesirable) or neutral (neither desirable or undesirable) as follows:

Positive Negative Neutral

11:16 25/10/2016

Communication of Adaptation Indicators: Indicator documents

Indicators and trends Monitoring climate change adaptation

Indicator name	Version
NB24 Proportion of water bodies not meeting Good Overall Status	15/04/16
Indicator type:	Risk/opportunity
Impact	Action
SCCAP Theme	SCCAP Objective
Natural Environment	N2 Support a healthy and diverse natural environment with the capacity to adapt
	CCRA risk/opportunity
	<ul style="list-style-type: none"> • B013 Water quality and pollution risks • B014 Ecosystems risks due to low flow and increased water demand

At a glance

- Water bodies which are not in good overall condition are likely to be less resilient to additional pressures due to climate change and therefore less able to provide a healthy resource that can benefit wider climate change adaptation.
- Between 2008 and 2014, all water body types showed no overall increase in the number of sites failing to meet good status, though changes in the assessment methodology make it difficult to assess the significance of any changes.
- Some real improvements have however been secured, largely by e.g. requiring licensed operators to reduce impacts arising from discharges of pollutants or water abstractions; collaborative working to remove barriers to fish migration.
- The River Basin Management Plan process aims to reduce the pressures on water bodies in a sustainable way via a legislative framework, supported by economic incentives and funding and education to promote, encourage and support action.

Latest Figure	Trend
Proportion* of water bodies not meeting Good Overall Status (2014):	Change in proportion* of sites not GOS
Rivers (2406)	46%
Lochs (334)	34%
Estuaries (48)	14%
Coastal (457)	9%
Groundwater	22%
*Proportion is based on numbers of sites	*Proportion is based on numbers of sites
Data is for both the Scotland and Solway Tweed River Basin Districts	Data is for both the Scotland and Solway Tweed River Basin Districts

(Total number of water bodies in brackets)	NB Changes are partly due to improvement of understanding of the water environment and adjustments to assessment methodology (see 'Interpretation of indicator trends' for details)
	# All the groundwater bodies were redefined in 2012. No historical data for the current groundwater bodies are available before 2012.

Why is this indicator important?

Scotland is renowned worldwide for the environmental quality of its water resources. Its water habitats support a great diversity of habitats and species, and some of these are of national and international importance. They also provide benefits essential to Scotland's health and prosperity for example, by providing drinking water, water for use in industries such as whisky making and fish farming, energy from waves, tides and hydropower, and recreation opportunities. Scotland's water environment is an integral part of Scotland's cultural fabric (Scottish Government, 2009).

Projected climate change will have significant direct and indirect impacts on Scotland's water environment e.g. rising mean water temperatures and an increase in extreme temperature events; an increase in high intensity rainfall events and/or summer low flows. The ability to withstand these additional stressors and maintain important ecosystem functions will to a great extent depend upon their general condition. The Scottish Government (2013) identify the need to improve the condition of the water environment in order to make it both more resilient in itself to the consequences of climate change as well as to provide a healthy resource that can benefit wider climate change adaptation.

The monitoring of the status of Scotland's water environment is a requirement of the European Water Framework Directive and is carried out on behalf of Scottish Government by the Scottish Environment Protection Agency (SEPA). The Directive requires a broader and more holistic approach to the monitoring of water quality than previously. Under this monitoring, water management units, otherwise known as 'water bodies' are identified. Each year, each water body's overall status is classified as being either: High, Good, Moderate, Poor or Bad¹. The purpose of the classifications is to show where the water environment is in a good condition and where improvements need to be made. The classification of surface water bodies shows how much their condition differs from near natural conditions, with water bodies in a near natural condition being of High status and those whose ecological quality has been severely damaged as in Bad status. The classification of groundwater describes whether or not waters are polluted and whether or not the volume of any water abstracted from them is sustainable. Two classes are used to describe the status of groundwater - Good and Poor.

This indicator reports on the proportion of water bodies not meeting Good Overall Status. In other words, those classified as being in Moderate, Poor or Bad status under SEPA's classification system (see below for details). This indicator is important as it provides an understanding of the likely

¹ Water bodies which are heavily modified by human activities are assigned an overall status of maximum, good, moderate, poor or bad ecological potential. For simplicity, these have been presented as high, good, moderate, poor or bad.

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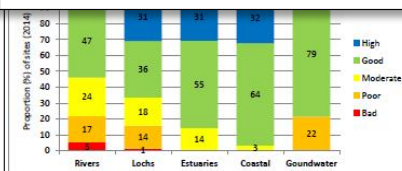


Figure 1 Latest (2014) overall status of waterbody sites in Scotland as a proportion of total

Figure 2 shows the distribution of all water bodies at less than good status. As would be expected, there are concentrations of water bodies in less than good status in the more populated and intensively farmed areas.

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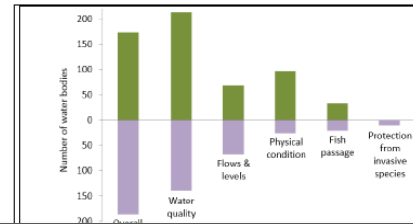
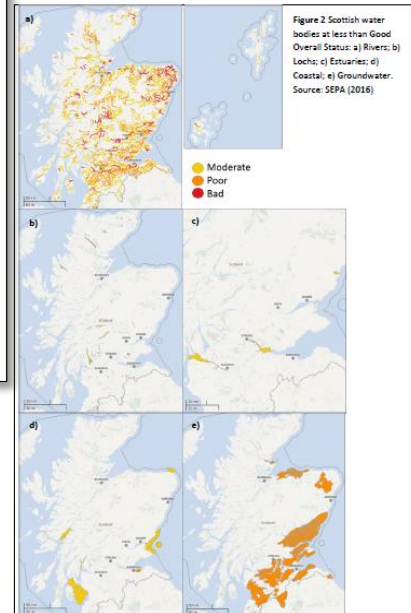


Figure 2 Scottish water bodies at less than Good Overall Status: a) Rivers; b) Lochs; c) Estuaries; d) Coastal; e) Groundwater. Source: SEPA (2016)



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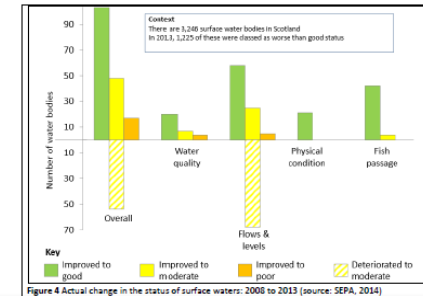


Figure 4 Actual change in the status of surface waters: 2008 to 2013 (source: SEPA, 2014)

SEPA has significantly improved over the last few decades as been significant progress in preventing and reducing the length of rivers in Scotland that were affected (SEPA, 2009).

Management Plans, all water body types have shown no overall good status, with both lochs and coastal waters (Table 1). However, changes in the assessment methodology of any trend (see 'Interpretation of indicator trends' for details). There have been real improvements in around 100 already restored to good status by the land's river network (SEPA, 2014). These improvements are due to a combination of factors including licensed operators to reduce impacts arising from as well as by working with organisations such as the Scottish Environment Protection Agency (SEPA, 2014).

Using Good Overall Status (2008-2014). Figures are for river basin districts combined

	2009	2010	2011	2012	2013	2014
Rivers	46	46	46	44	45	46
Lochs	37	37	38	37	33	34
Estuaries	16	14	14	14	12	14
Coastal	5	4	4	3	5	3

SEPA sets out how improvements to Scotland's water environment have been designed to take account of the time needed to make the required investments and adjustments (Scottish Government, 2009). The aim is to both protect 'better' status whilst prioritising the restoration of poorer status water bodies to good status by the end of 2027.

SEPA has been progressively improving the understanding of the state of the water environment in Scotland, and since 2009 a number of changes have occurred to the way data is collected and analysed:

- increasing the amount of environmental data on which the assessments are based;
- developing and refining the models used to interpret data and make assessments;
- and refining the delineation of bodies of groundwater and surface water to ensure there are not significant differences in environmental quality in different parts of the same water body (SEPA, 2014)

There are therefore some changes within the data over this period that reflect a change in understanding rather than an actual change in the water bodies. Figure 3 presents the number of sites that have been downgraded and those that have been upgraded as a result of improved understanding over this period.

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Many of the water bodies which are currently at high status are in upland areas and they therefore support species which are adapted to colder temperatures which may make these communities less resilient to projected increases in temperature.

Patterns of change

Between 2008-13, there was not a consistent picture across water bodies in all eleven Area Advisory Groups (Table A1, Appendix 2). NB this analysis does not include the latest (2014) available data.

Rivers

There was an increase of over 17% in rivers in less than good status in the Orkney and Shetland area (though it should be noted that this AAG contains the smallest proportion of rivers in Scotland). The greatest improvements over this period were in the Forth and Tweed areas, with both decreasing the proportion not in good status by over 7%.

Lochs

The proportion of lochs not in good status remained either stable or decreased in all AAGs during this period. Most notably, the Tweed area was assessed as having no lochs at 'less than good status' by the end of 2013.

Estuaries

The only change over this period was in the Solway area, which was assessed as having no stretches of estuaries in 'less than good status' by the end of 2013.

Coastal

Over this period, the most significant change was in the Forth AAG which was assessed as being entirely at 'less than good' status by the end of 2013. Argyll and Solway areas showed the greatest improvement in condition between 2008-13.

Interpretation of indicator trends

SEPA has been progressively improving the understanding of the state of the water environment in Scotland, and since 2009 a number of changes have occurred to the way data is collected and analysed:

- increasing the amount of environmental data on which the assessments are based;
- developing and refining the models used to interpret data and make assessments;
- and refining the delineation of bodies of groundwater and surface water to ensure there are not significant differences in environmental quality in different parts of the same water body (SEPA, 2014)

There are therefore some changes within the data over this period that reflect a change in understanding rather than an actual change in the water bodies. Figure 3 presents the number of sites that have been downgraded and those that have been upgraded as a result of improved understanding over this period.

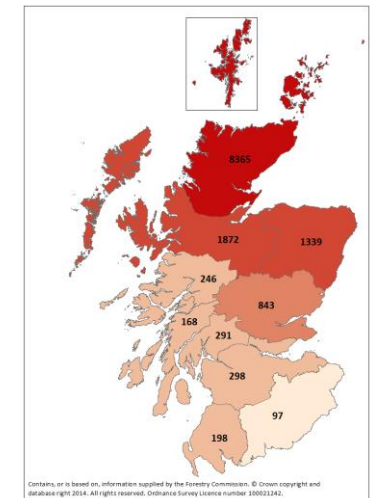
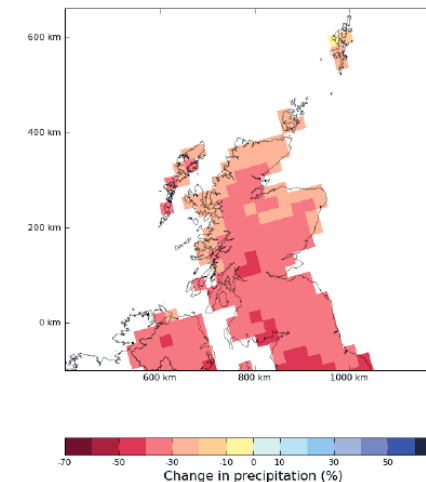
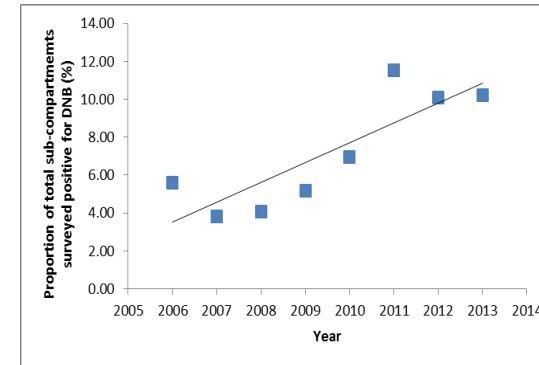
¹ 11 multi stakeholder advisory groups are in place to contribute to river basin management plan development and delivery within their areas and contribute their local knowledge to the process

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Communication of Adaptation Indicators:

Context and analysis

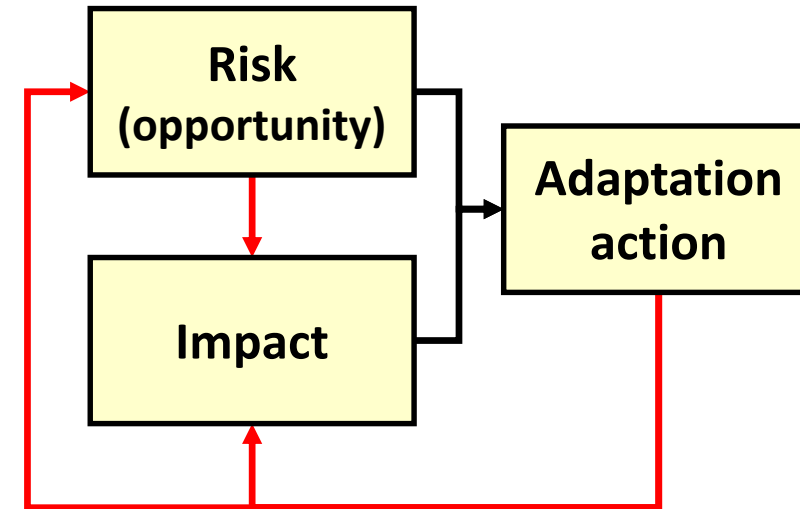
- Relevance: to the climate risk, to other indicators and policy context
- Current state; past trend; future projection
- Critical spatial, temporal or categorical patterns
- Context: climatic and non-climatic drivers



Adaptation Indicators- Development

Quantifying the system

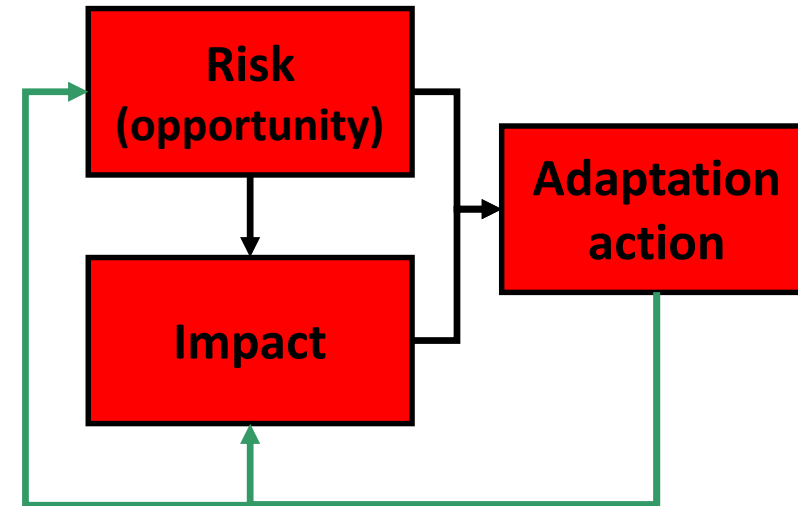
- How significant are climatic drivers in comparison to others?
- How effective are adaptation measures in reducing exposure or vulnerability to that exposure?



Adaptation Indicators- Development

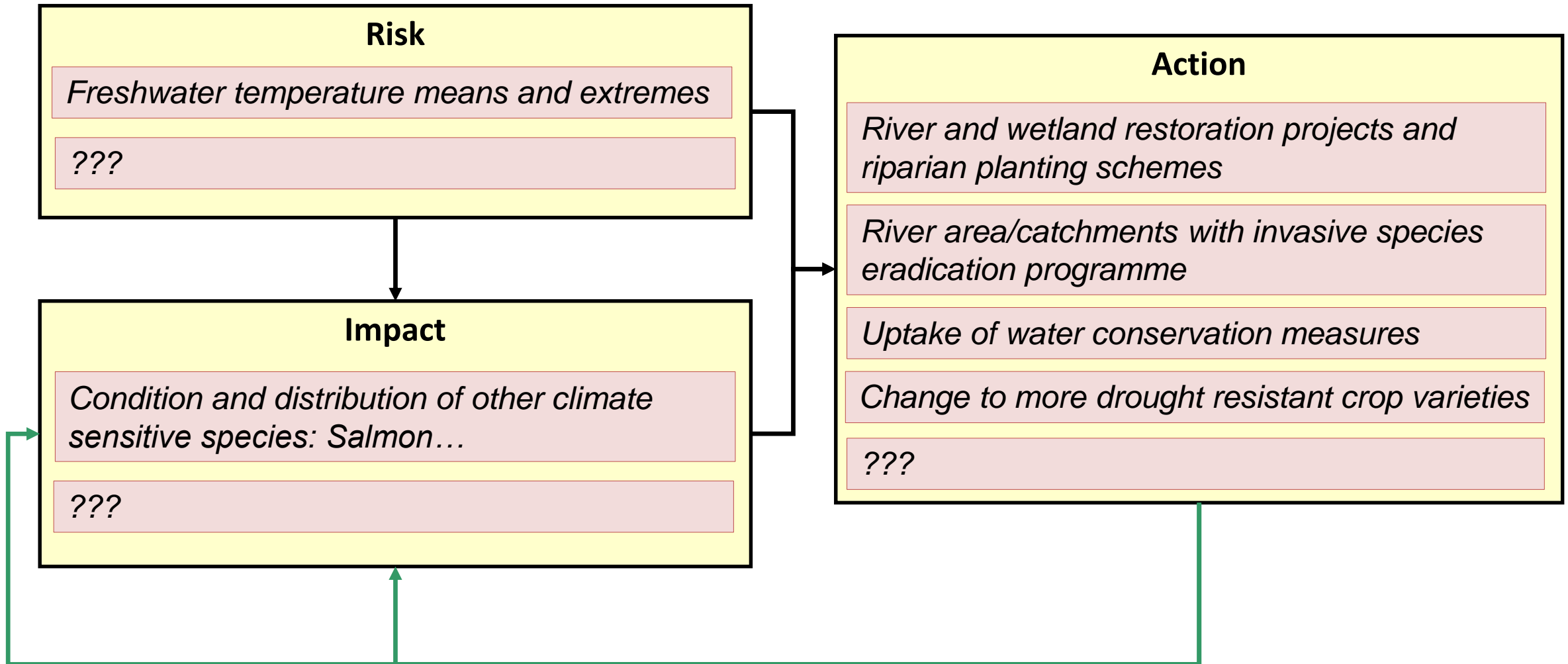
Data gaps

- Lack of data
- Lack of suitable data
- Lack of available data



Adaptation Indicators- Development

Freshwater indicator gaps



Thank you

<http://www.climateexchange.org.uk/>

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