Scotland's Flood Risk Management Conference 2017

Conference slides

SEPA
Scottish Environment Protection Agency

Flood Risk Management Conference 2017

David Pirie
Executive Director

Scottish Environment Protection Agency

SEPA
Scottish Environment Protection Agency

Capt. James Lancaster sailed from England to India in 1601 and conducted one of the earliest randomised trials of using citrus juice to control scurvy.

Result?

110 out of 278 sailors (40%) died of scurvy on he control ships.

0 died on the experimental ship.

SEPA
Scottish Environment Protection Agency

Flood Risk

108,000 properties at risk of flooding

2,000km of road network at risk

500km of rail pass through high risk areas

200,000ha agricultural land at risk

SEPA
Scottish Environment Protection Agency

Flood Risk

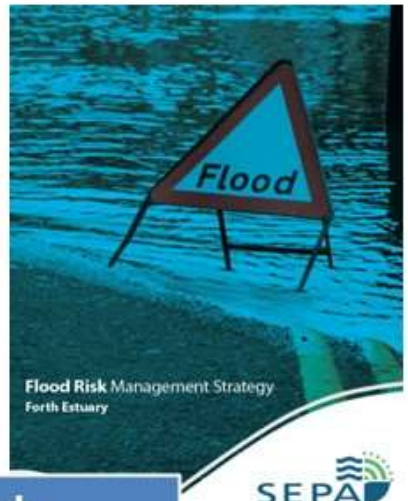
£252 million expected annual flood damage

23% surface water flooding

56% river flooding

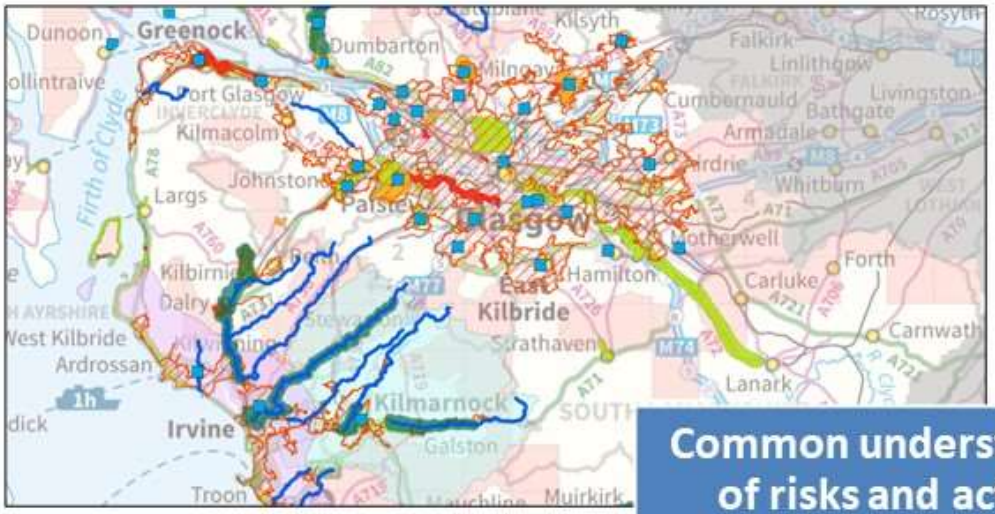
21% coastal flooding

Shared Understanding and Partnerships



14 Flood Risk Management Strategies

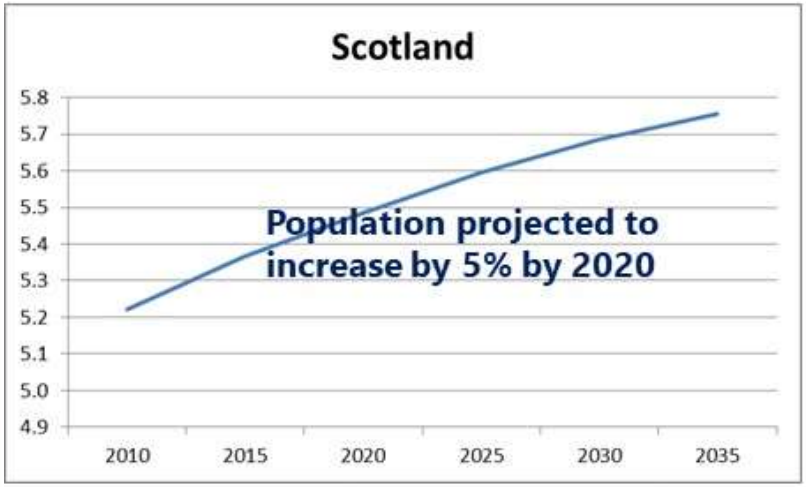
14 Local Flood Risk Management Plans



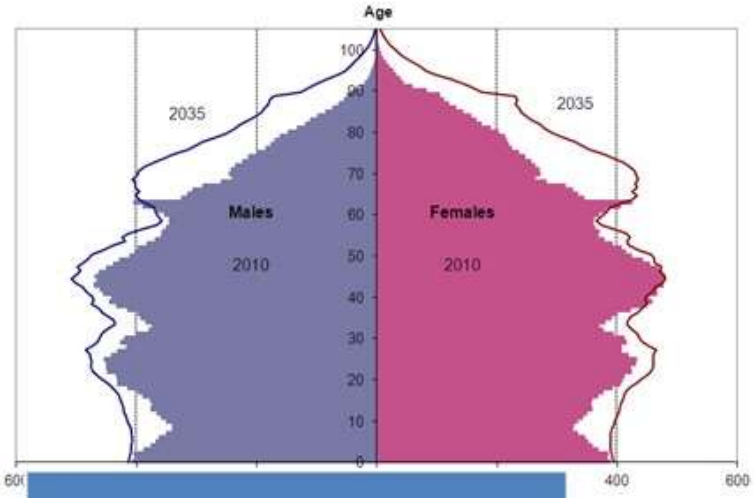
Common understanding of risks and actions

Climate and Population Change

60,000 more properties at risk by 2080



Population increase projections



Ageing population

SEPA
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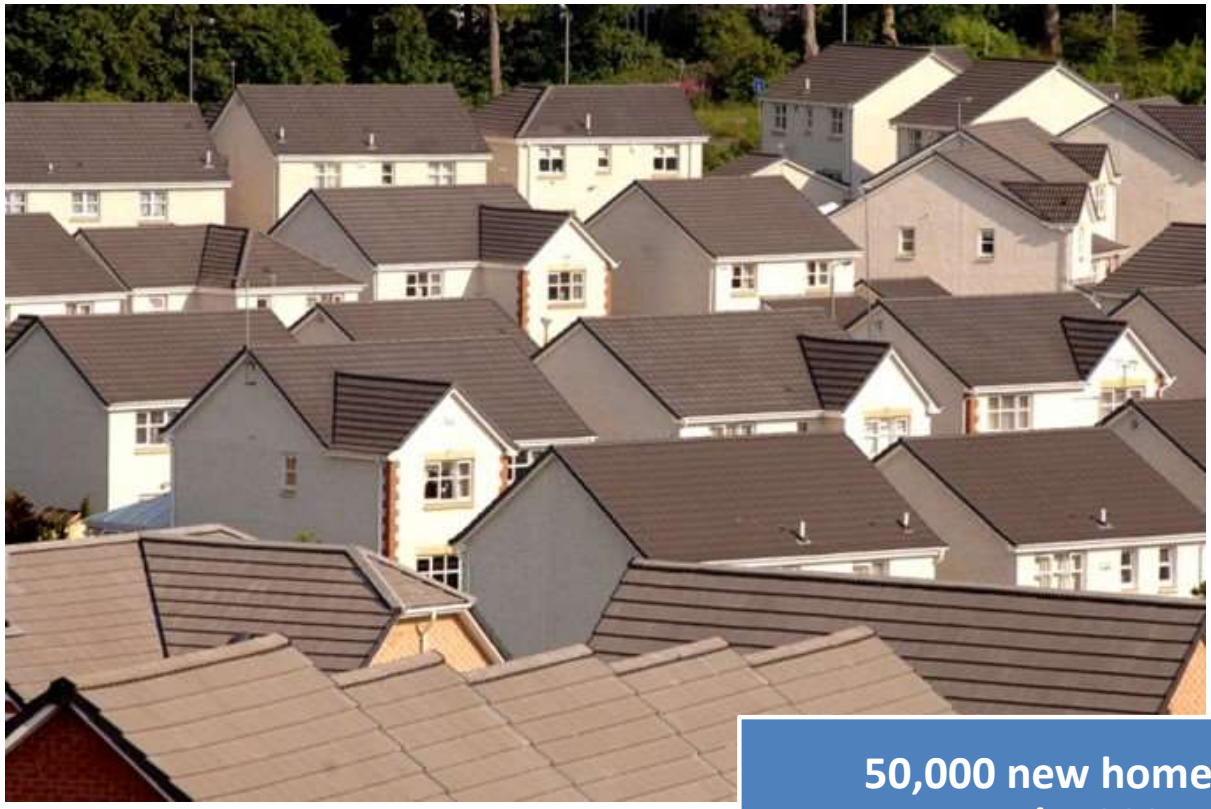
Land Use Change



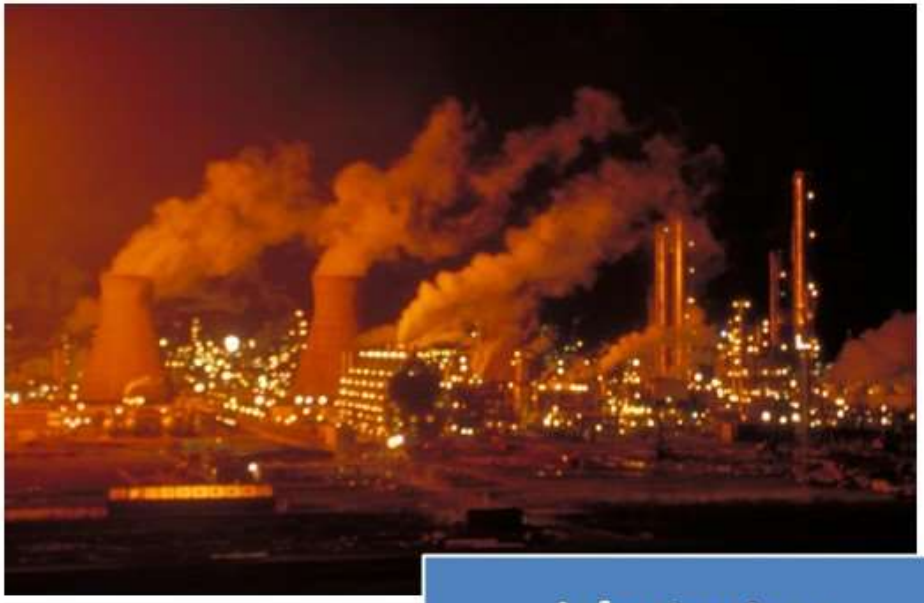
50,000 new homes target by 2021

Changing Role of Communities

People

"Major flooding ...
is something that will happen
in the UK most years"

Lord Krebs, Committee
on Climate Change



Infrastructure

SEPA
Scottish Environment Protection Agency

Do we have the right strategic direction for flood risk management in Scotland?

SEPA
Scottish Environment Protection Agency

Thank you

LEARNING FROM THE PAST TO INFORM THE FUTURE

Philip Wright
Chair, Scottish Flood Forum

Reflections – drivers of change over past 20 years

- Legislation
- Institutions and governance
- Flood events
- Capacity and resources
- Climate change and risk
- Building on the past

FRM – legislative drivers

Flood Prevention (Scotland) Act 1961	Flood Prevention and Land Drainage (Scotland) Act 1997	Flood Risk Management (Scotland) Act 2009
Powers / discretion / narrow in scope / lengthy statutory process	Powers + limited duties /extended scope /still lengthy process	Extensive duties + powers / strategic in scope / more streamlined process
Reactive	Reactive + some proactivity	Proactive / risk based
Lead - local authorities	Lead - local authorities	Lead SEPA, plus local authorities et al

Changes to institutional infrastructure and governance also impacted on FRM

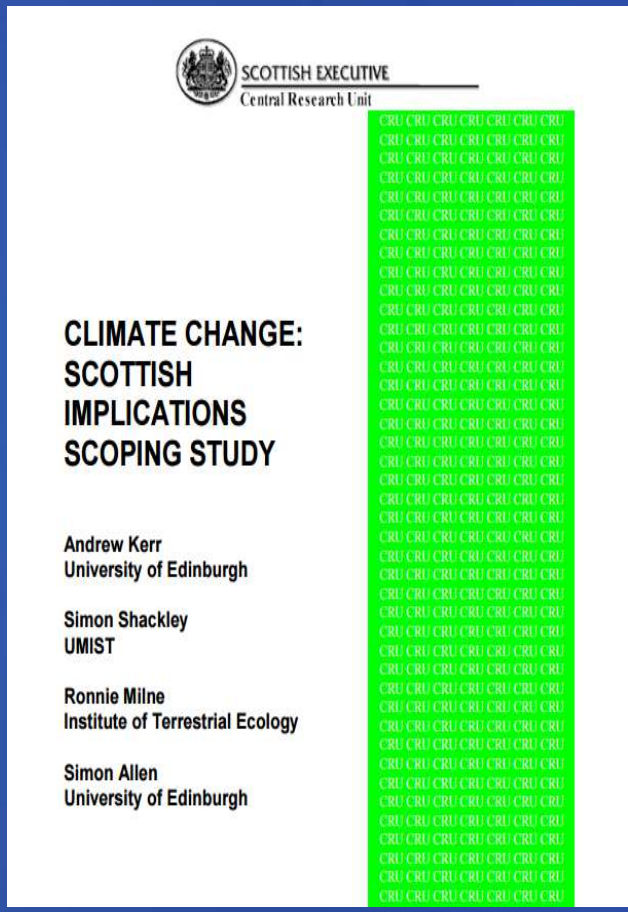
- Scotland Act 1998 - Devolution / Scottish Parliament - greater focus on flooding issues
- Re-structuring of local government -1996
- Establishment of SEPA – 1996
- Responsibility for water and sewerage transferred to new water authorities, subsequently to Scottish Water
- Decision-making more strategic / consistent – informed by local circumstances

Flood rich period – lots happening!

- Devolution coincident with decade of significant flood events – Elgin, Perth, Edinburgh, Glasgow, Paisley…..
- Response - major flood "prevention" schemes promoted using discretionary powers
- Increased funding to local authorities
- Increased funding to SEPA →step change in hydrological and communications capacity eg introduction of Floodline

Climate change - new kid on block!

- Climate Change: Scottish Implications Scoping Study 1999
- UK Climate Impacts Programme (UKCIP) climate projections → assessment of flood risk and production of indicative risk maps
- Clearer picture of properties and populations at flood risk and increasing level of risk
- Risk-based approach to flood management possible – and necessary, as now reflected in Flood Strategies and Action Plans
- Climate Change Adaptation Programme 2014



Lots of other developments

- National Flooding Framework – 4 “A”s - Awareness, Assistance, Alleviation, Avoidance
- National Technical Advisory Group (NTAG) and Flooding Issues Advisory Committee (FIAC)
- National Planning Framework – incorporating **Metropolitan Glasgow Strategic Drainage Partnership** as national development + Scottish Planning Policy
- Land Use Strategy – acknowledges contribution of natural flood management (trees versus concrete!)
- SuDS – sustainable urban drainage systems
- Scale - local to river basin
- National Flood Risk Assessment → PVAs
- Increased recognition of health and emotional impacts of flooding

Partnership working
Flooding Issues Advisory Committee

- FIAC set up to encourage partnerships between stakeholders (eg local authorities, Scottish Water, SEPA, Scottish Executive, Forestry Commission, SNH, environmental groups, landowners, academia, business and community sectors)

- Gave Scottish Ministers, SEPA and responsible authorities forum to work together in integrated fashion and co-operate with each other to promote SFM, as required by 2003 WEWS Act

- Agreed that FIAC proceedings must be open and transparent and should share information and knowledge that all stakeholders can access and learn from

Final report to Ministers formed basis for refreshed approach to FRM policy and implementation.

Past → now → future

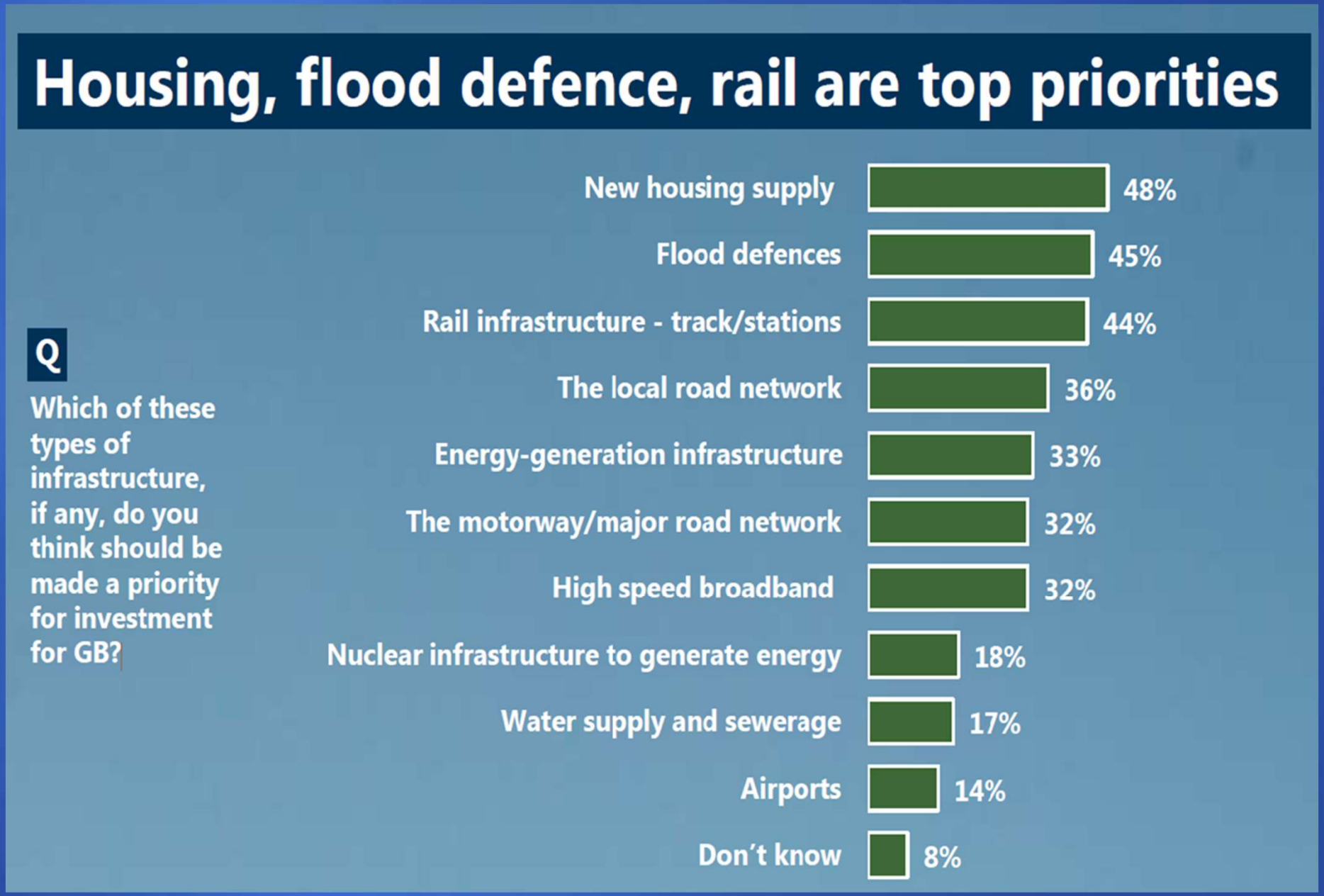
- Sound legislative and institutional foundation → coherent, coordinated, integrated national approach to addressing flood risk
- Climate change - the future but action needed now
- Climate Change Adaptation Programme - flood risk centre stage, politically and strategically
- Much enhanced capacity - funding, expertise, tools
- Proactive, risk-based approach – need to move on from only reactive response
- Novel approaches to FRM – natural flood management, attenuation, flood warnings (social media / community monitoring), property level protection (plp), etc
- Increased level of community interest and engagement
- But, NB community flood resilience groups easier to establish in response to flood event than simply on basis of risk

Flood District Management Plans

Portfolio of measures available:-	
Flood protection scheme / works	Flood forecasting
Natural flood management works	Property level protection scheme
New flood warning	Community flood action groups
Flood protection study	Self help
Natural flood management study	Awareness raising
Surface water plan study	Maintenance
Strategic mapping and modelling	Site protection plans
Maintain flood protection scheme	Emergency plans / response
Maintain flood warning	Planning policies

…..and it's no bad thing to remind ourselves why we're investing so much effort and money?

Interesting – Ipsos MORI poll 2016



So, yes, FRM developments over past 20 years have led to a more resilient Scotland now than then

BUT

much remains to be done

Essential not to rest on laurels

- Climate change – more needed to meet challenge?
- Need to re-visit and review existing defence schemes – may be happening? Flood defence asset database?
- Statutory process– streamlined enough?
- Funding – enough?
- Adequate control of development in flood risk areas?
- Resilience of development at flood risk?
- Sufficiency of information – implications for householders at flood risk – insurance implications – FloodRe?
- Effectiveness of engagement with communities?
- Effectiveness of partnership working?

FRM community of interest grown significantly – evidenced by today's conference – should ensure eye being kept on the ball

End

For more information on Scottish Flood Forum go to:-

http://www.scottishfloodforum.org/

From mountain to sea

Aberdeenshire COUNCIL

After Storm Frank: Restoring Aberdeenshire to Normality

Stephen Archer
Director of Infrastructure Services
Aberdeenshire Council

Aberdeenshire COUNCIL

From mountain to sea

Aberdeenshire Council Area

Area:
2,437 sq. miles

Population:
approx. 262,000

Households:
approx. 109,631

Aberdeenshire COUNCIL

From mountain to sea

Storm Frank – Areas of Impact

From mountain to sea

Aberdeenshire COUNCIL

Key Storm Frank Data

- Over 200mm rainfall
- 4 major rivers flooded
- 850 homes flooded
- 120 businesses flooded
- 8 Rest Centres opened
- 144 bridges damaged
- 50 caravans washed away

Aberdeenshire COUNCIL

Some Impacts

From mountain to sea

Aberdeenshire COUNCIL

From Emergency Response to Recovery

Working with Local Communities to Restore Aberdeenshire to Normality

Economic Development Housing Bridges and Roads

Education Waste Tourism Social Support

Communications Property Finance Transportation

Planning Environmental Health Flood Team

And out to communities and stakeholders

From mountain to sea

Aberdeenshire COUNCIL

The Budget

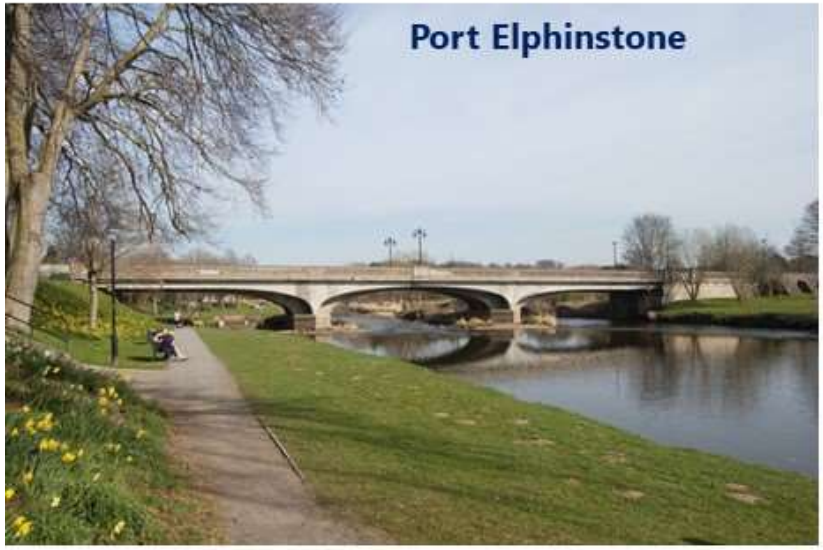
- Our Revenue cost - £4.6m
- Our Capital cost - £3.9m

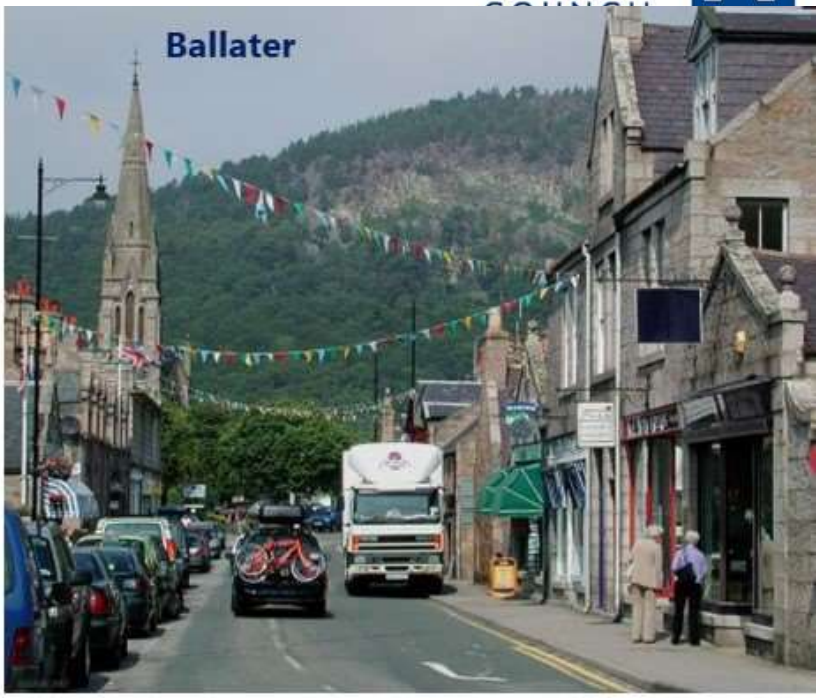
- Bellwin Grant - £2.06m
- Capital Grant - £1.675m
- Additional SG funding - £466k

- Outstanding Repair Costs circa £5m

Aberdeenshire

So Where Are We Now?

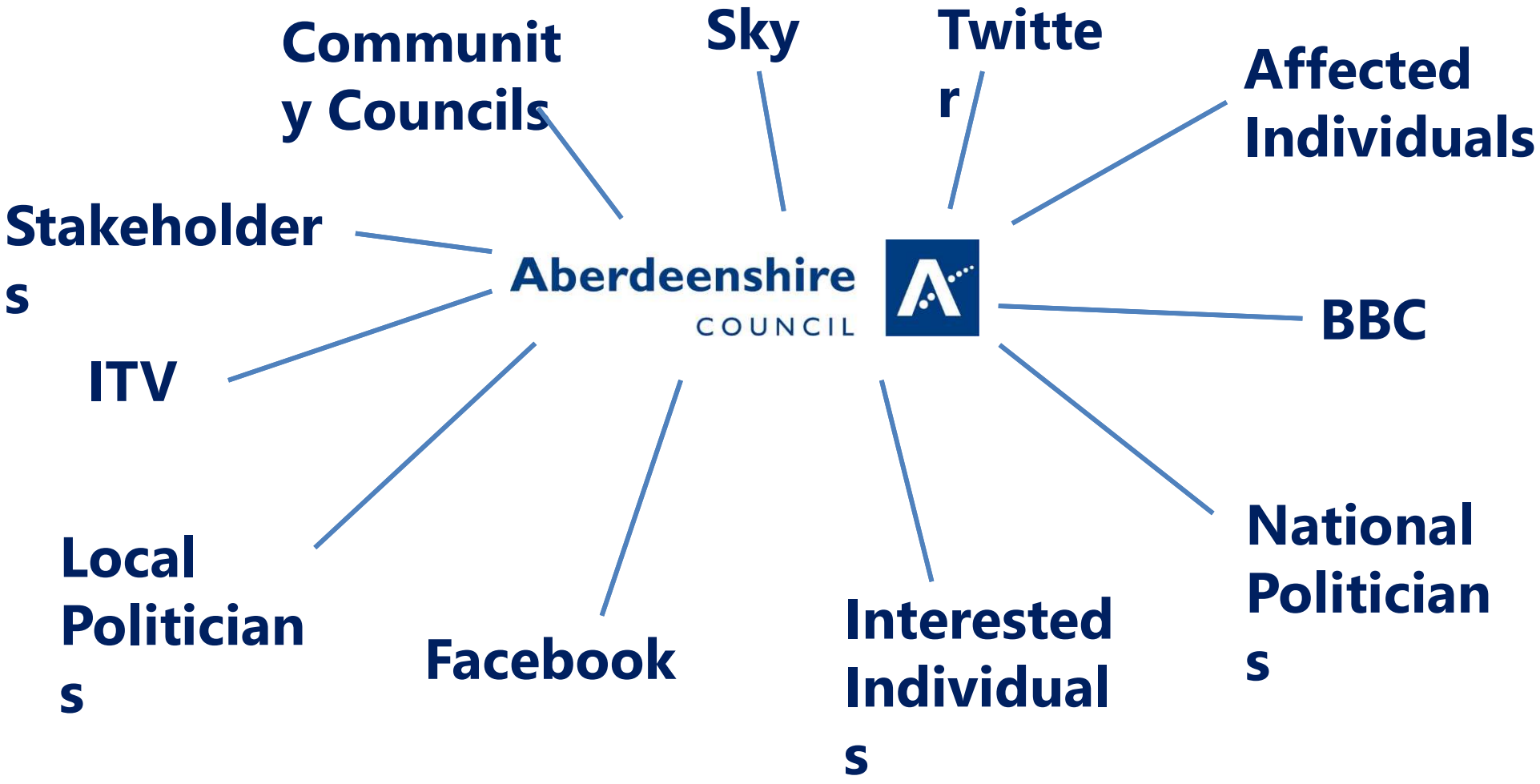




From mountain to sea

Aberdeenshire COUNCIL

Communities and Communication



From mountain to sea

Aberdeenshire COUNCIL

The Risk and the Reality

Flood Risk Management (Scotland) Act 2009
North East Local Plan

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

ABERDEEN CITY COUNCIL

Cairngorms NATIONAL PARK
Pàirc Nàiseanta a' Mhonaidh Ruaidh

the moray Council

Aberdeenshire COUNCIL

Scottish Water
Always serving Scotland

Forestry Commission Scotland
Coimisean na Coilltearachd Alba

From mountain to sea

Aberdeenshire COUNCIL

Conclusions

- Storm Frank caused a lot of heart ache.
- It cost ourselves and partners millions.
- Having buildings and contents insurance is a good thing!
- Emergency and Recovery Systems were actually pretty good.
- Communication at all levels is critical. Be strong in managing the media.
- You cannot control significant natural events.
- Development Plans need to reflect a changing climate.
- No one died or went to hospital with a flood related injury.
- If you’re ordering 56 fish and chips, ring ahead and warn the chippy!

From mountain to sea

Aberdeenshire COUNCIL

Thank you

Stephen Archer
Director

aberdeenshire.gov.uk

What does an adaptive society look like and how do we get there?

Daniel Johns

Head of Adaptation

Committee on Climate Change

Sniffer flood risk management conference

Edinburgh, *7th February 2017*

@theCCCuk

@DanielJ88

The Adaptation Sub-Committee of the Committee on Climate Change

Statutory roles:

- To provide independent, expert advice on climate risks and opportunities (advisory role)
- To report to the UK and Scottish Parliaments on progress in preparing for climate change (scrutiny role)

Baroness Brown of Cambridge (chair)

Ece Ozdemiroglu

Prof Jim Hall

Prof Dame Anne Johnson

Rosalyn Schofield

Sir Graham Wynne

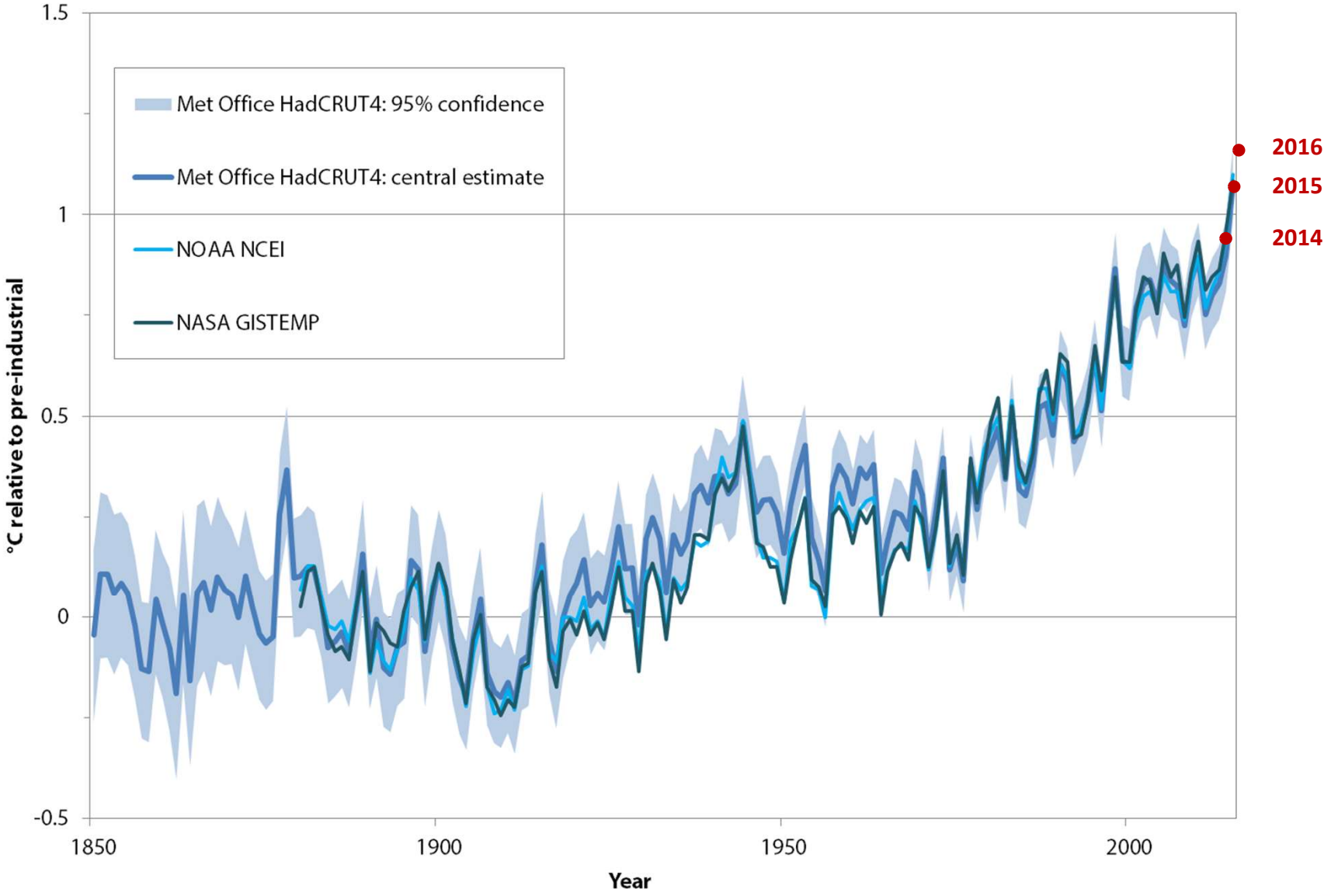
Committee on Climate Change

UK 2017 Climate Change Risk Assessment

UK Climate Change Risk Assessment 2017

Synthesis report: priorities for the next five years

2016 confirmed as the warmest year on record, the third record warmest year in a row

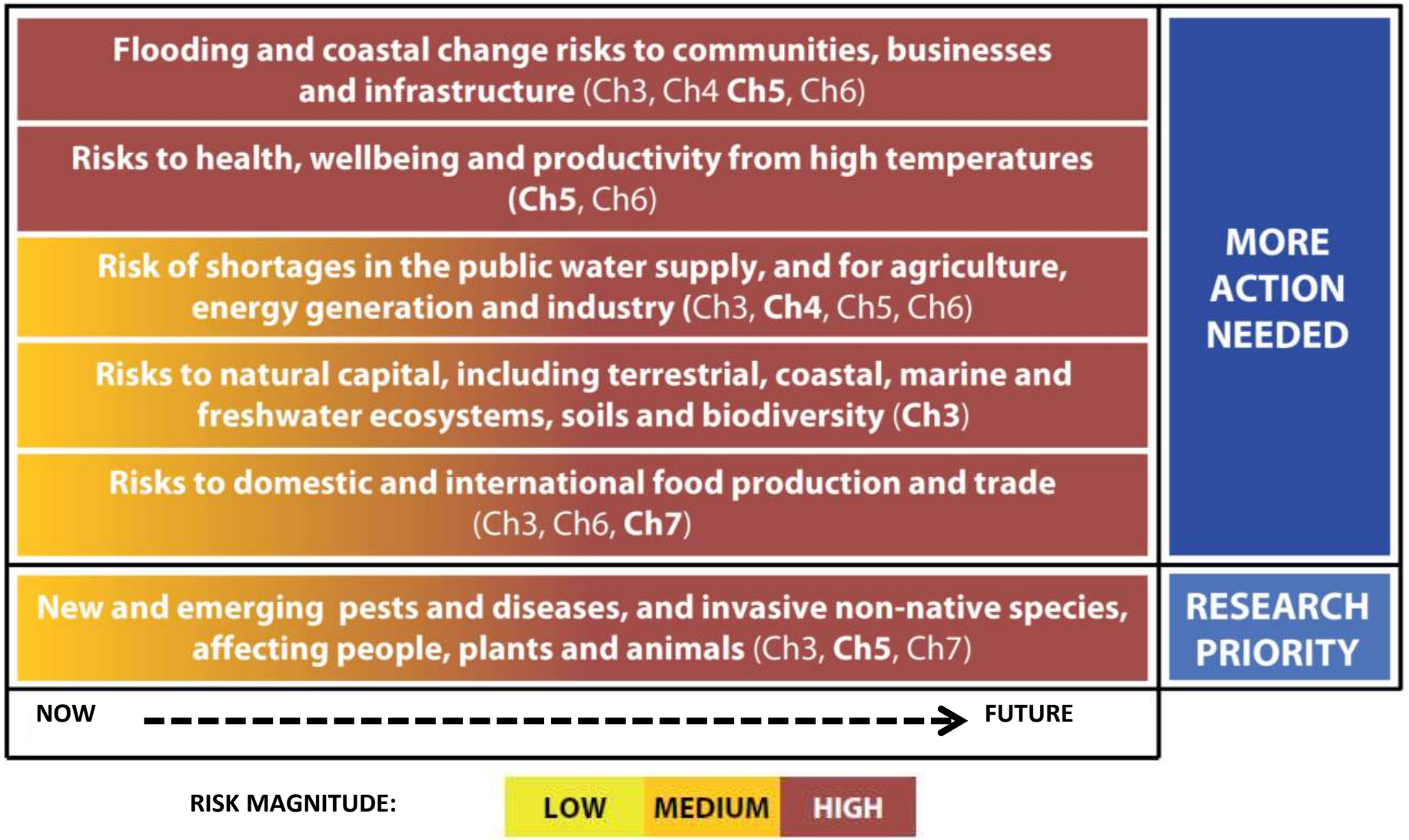


Source: Met Office, NASA, NOAA ('pre-industrial' baseline 1880-1899)

UK Climate Change Risk Assessment (in a nutshell)

- Climate change is happening here and its happening now
- The ~1°C warming to date has already affected weather patterns, including in the UK
- The Paris Agreement means 4-6°C of warming is less likely
- But further changes in the UK climate (and sea level rise) are inevitable
- Severe, pervasive and irreversible changes in climate cannot be ruled out

Six priority areas for the next National Adaptation Programme



Source: ASC (2016) *UK CCRA 2017 – Synthesis Report*

What should we do about it?

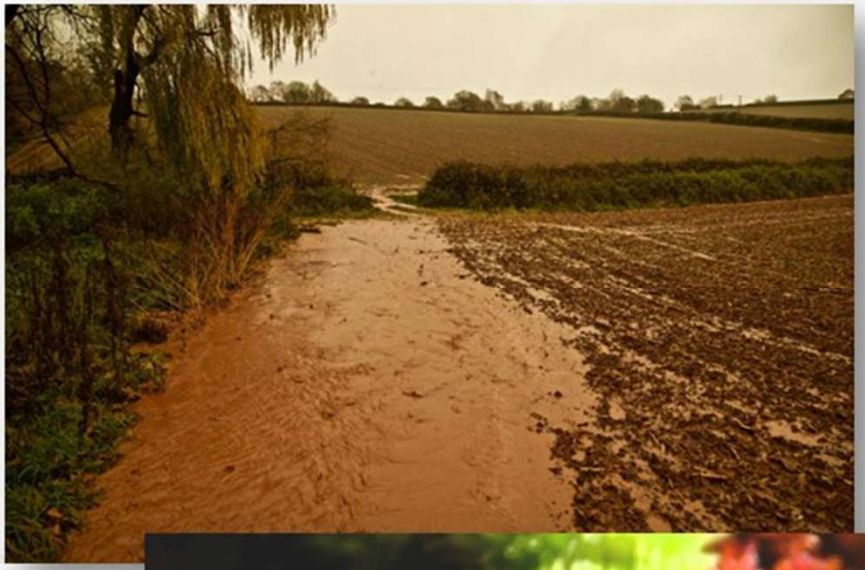
Actions with no/low regrets

Factor climate change into decisions that create 'lock-in'

Prepare now for long-term risks and impacts

Source: ASC (2016) *UK CCRA 2017 – Chapter 2: Approach and context*

Actions with no/low regrets



Vertically assembled anti flooding backwater drain check valve...

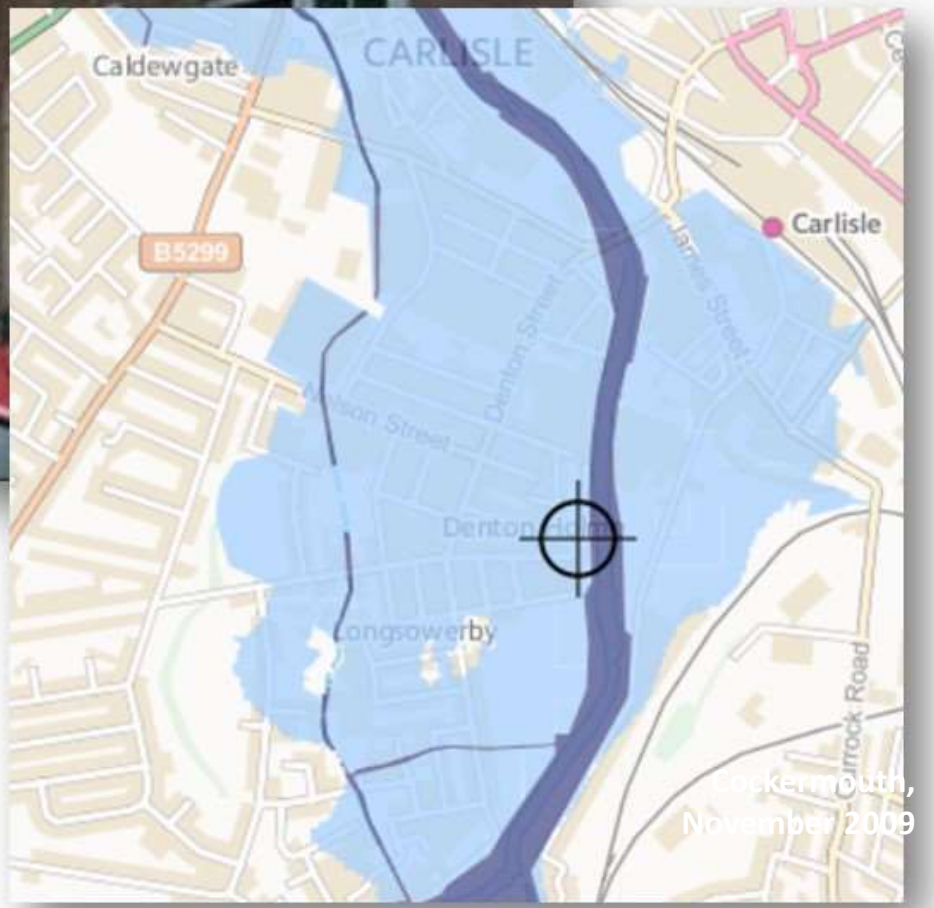
A backwater valve mounted on a vertical drain pipe is a comfortable, cheap and often the only way...

Free delivery

£89.99

ADD TO BASKET

Avoiding ‘lock-in’ – decisions that are difficult and costly to reverse



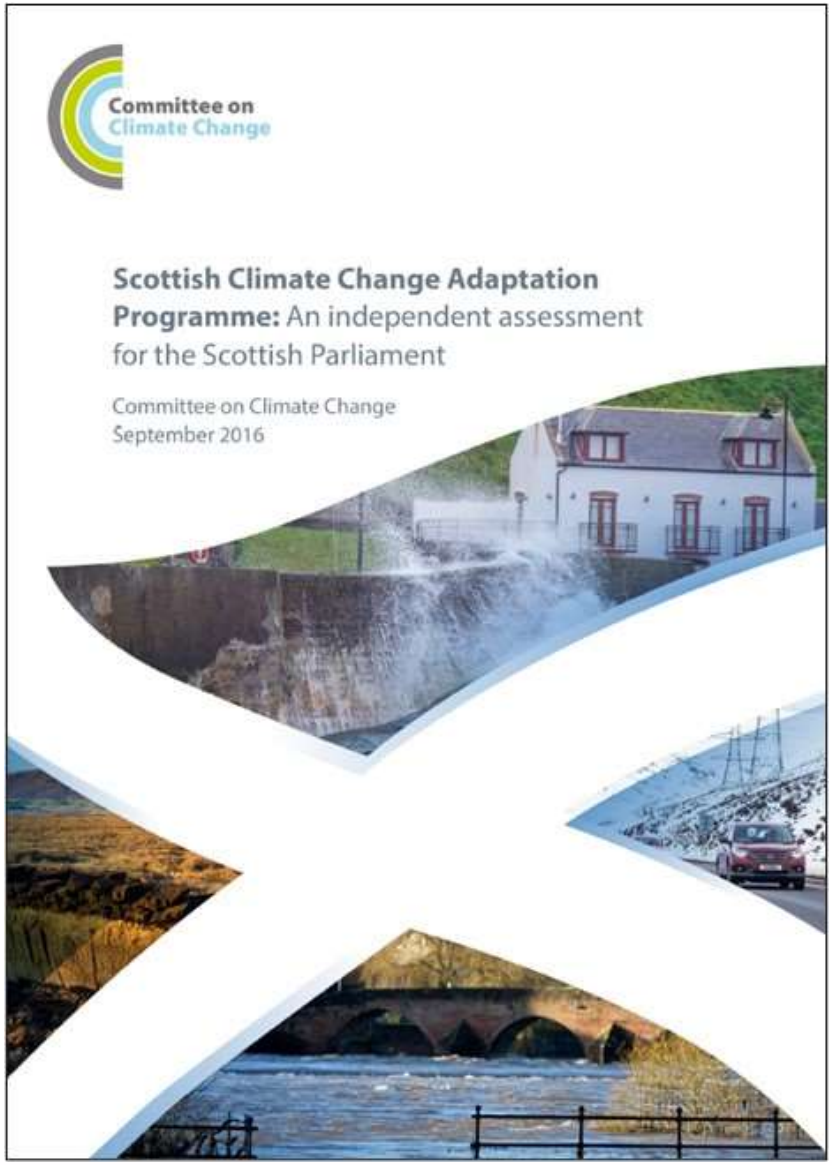
Cockermouth, November 2009

Mcilmoyle Way, Carlisle – flood wall, raised floor levels, ground floor used for parking

Preparing now for long-term risks and impacts

FLOOD RE

The ASC's independent assessment of the Scottish Climate Change Adaptation Programme



- Efforts are being made to manage flood risk from rivers and the sea
- Strategic approaches to planning for long-term coastal change are being taken in some areas
- But there has been no long-term assessment of flood risk management investment needs
- National planning policy on flood risk is not being consistently applied by local authorities.

Source: ASC (2016) ***SCCAP: Independent assessment for the Scottish Parliament***

Adaptation Sub-Committee

www.theccc.org.uk

Email: daniel.johns@theccc.gsi.gov.uk

@theCCCuk

@DanielJ88

Flood risk: what demographic change can we expect and what does it mean for Scotland

Source: BBC Scotland website

Bruce Whyte (bruce.whyte@glasgow.ac.uk), Glasgow Centre for Population Health, Scotland

Managing Flood Risk in the Context of Change, Our Dynamic Earth, 7th Feb 2017)

Mapping Flood Disadvantage

- **Social vulnerability in this report is understood as the degree to which people's health and well-being would be negatively affected if they came into contact with flooding.**

Social vulnerability is a combination of:

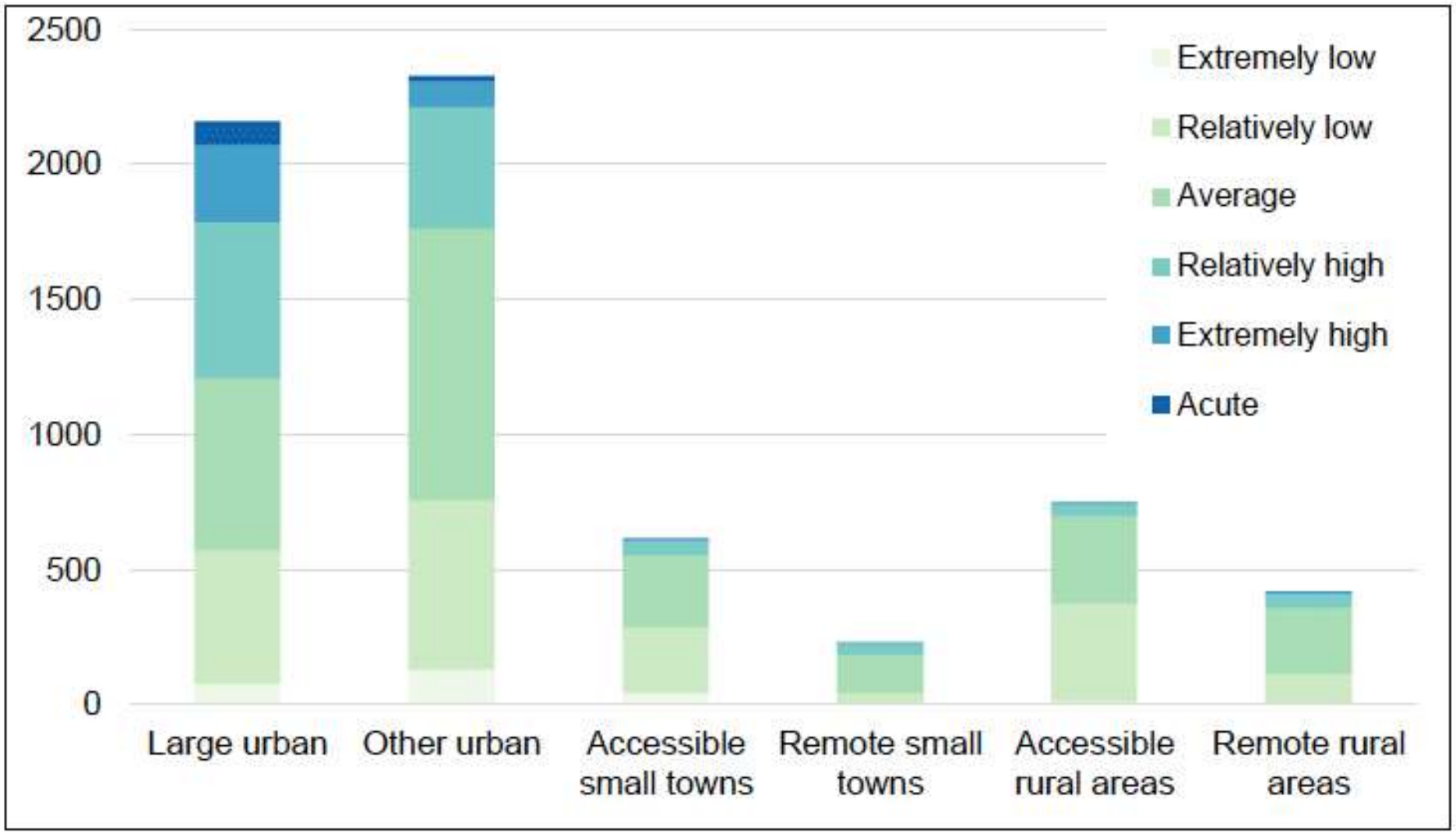
- **Sensitivity (personal characteristics that increase the likelihood that a flood event will have negative health and well-being impacts on people)**
- **Adaptive capacity (the ability of people to prepare for, respond to and recover after flooding, related mainly to their social and material situation),**
- **Enhanced exposure (the aspects of the physical environment, such as housing and presence of permeable surfaces, which accentuate or offset the severity of flood events).**

Mapping Flood Disadvantage in Scotland 2015: Main Report

Mapping Flood Disadvantage

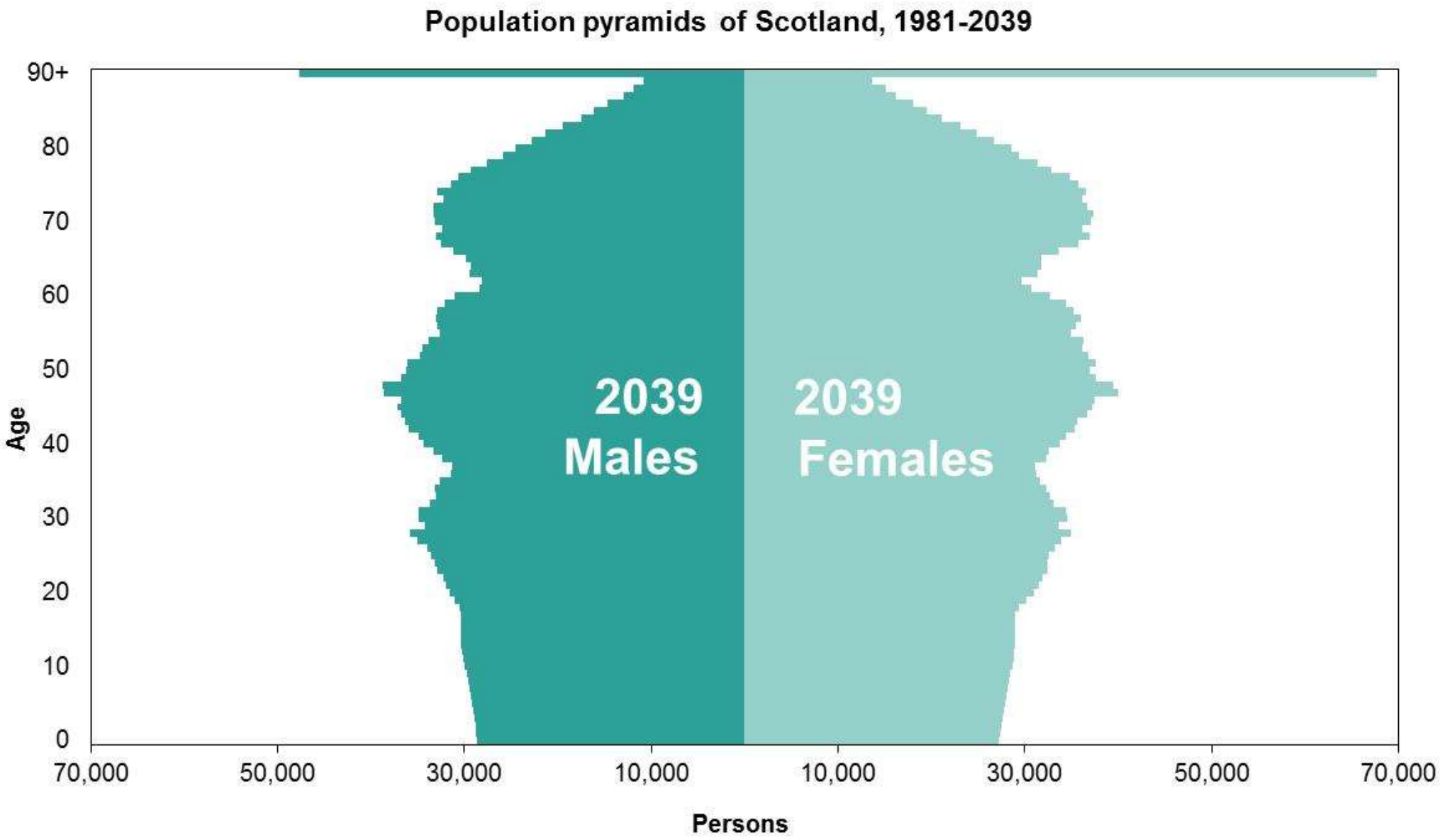
Geographical distribution of social vulnerability to flooding and flood

Figure 19. Social vulnerability to flooding: number of data zones by six-fold urban-rural classification.



Social vulnerability and flood disadvantage concentrated in coastal areas.

The changing shape of the Scottish population



A summary of Scotland's population projections to 2039

https://www.nrscotland.gov.uk/files//statistics/population-projections/2014-based/pp14-corrected.pdf

- The population of Scotland is projected to rise from 5.35 million in 2014 to 5.7 million in 2039 – an increase of 7% over 25 year period.

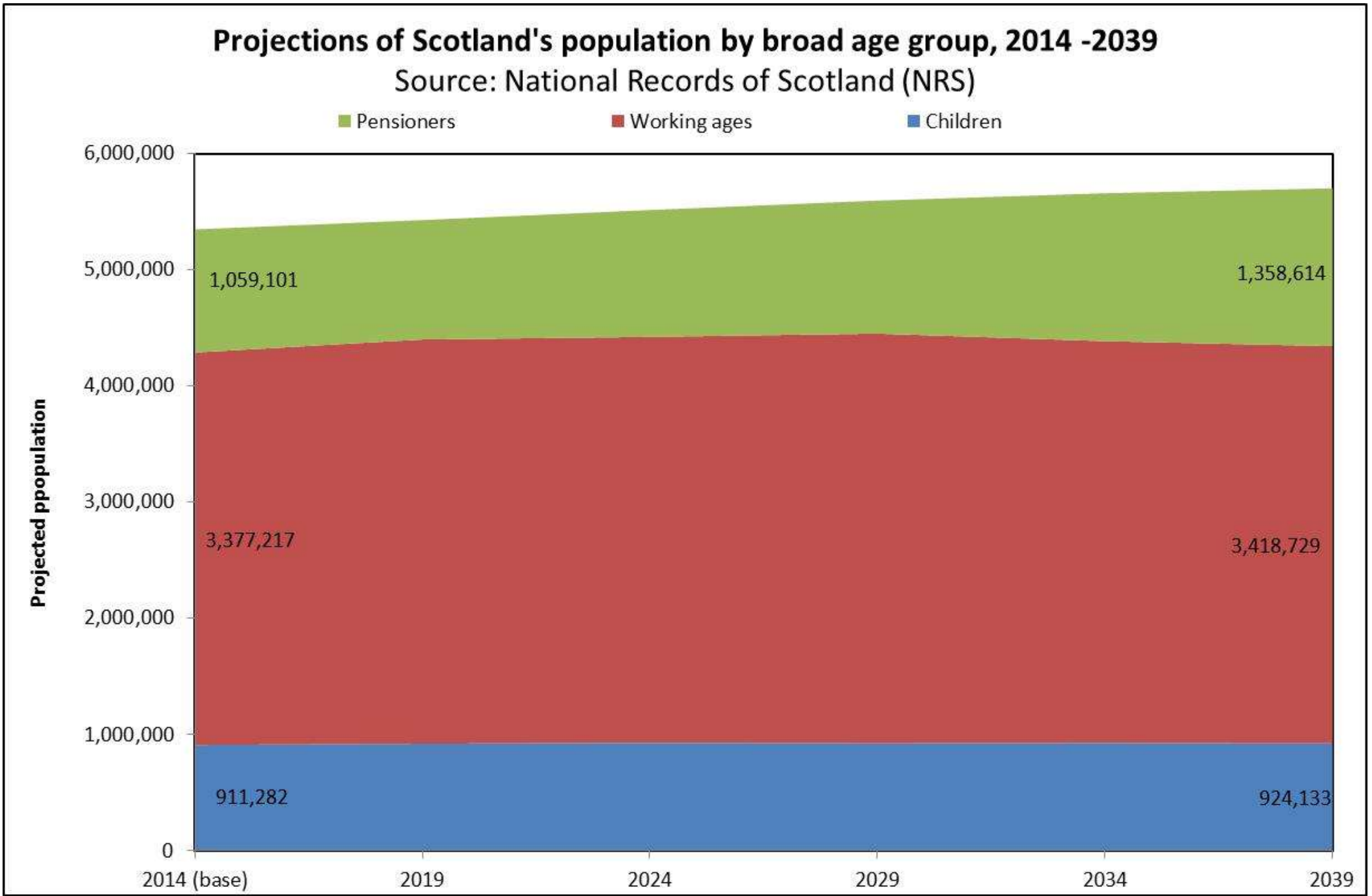
- Over the next decade, **10%** of the projected increase in Scotland's population attributed to **natural increase** (more births than deaths) while **90%** of increase due to continuing **inward net migration**

- Between 2014 and 2039, the nunber of **children** is projected to increase overall by one per cent from 0.91 to 0.92 million.

- The population of **working age** is projected to show a one per cent projected increase over the 25 year period.

- Over the period 2014 to 2039, the number of people of **pensionable age** and over is projected to increase by around 28 per cent compared with 2014

A summary of Scotland's population projections to 2039



A summary of Scotland's population projections to 2039

- The number of **people aged 75 and over** is projected to increase from 0.43 million in 2014 to 0.8 million in 2039 – an increase of 85 per cent over the 25 year period.

- The **dependency ratio** – *the ratio of people aged under 16 and of pensionable age and over to those of working age* – is projected to rise from around 58 dependants per 100 working population in 2014 to 67 per 100 in 2039.

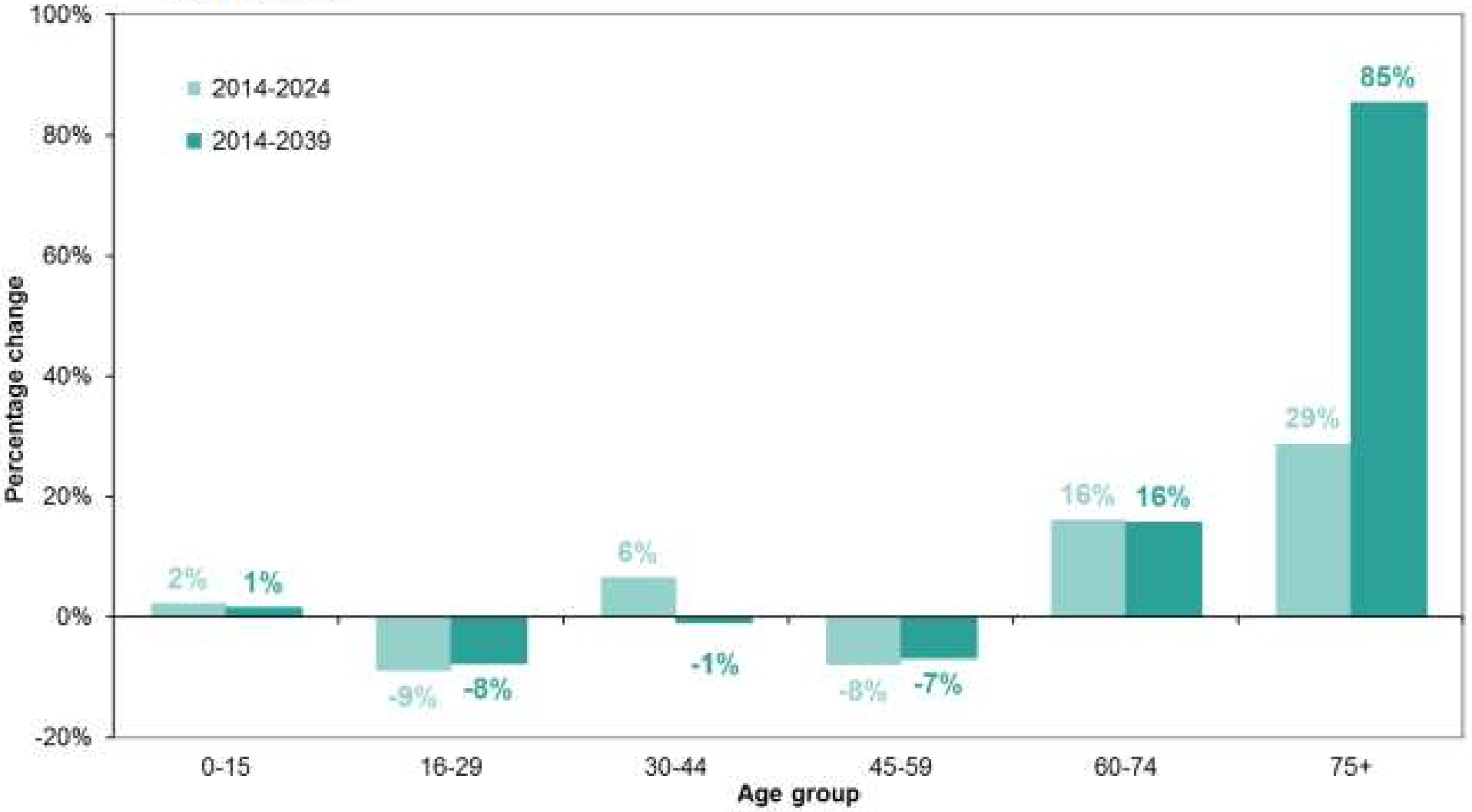
- All the variant projections forecast Scotland's population ageing over the next 25 years with the number of people aged 75+ projected to increase by between 72 per cent and 99 per cent under depending on different variant assumptions.

https://www.nrscotland.gov.uk/files//statistics/population-projections/2014-based/pp14-corrected.pdf

A summary of Scotland's population projections to 2039

https://www.nrscotland.gov.uk/files//statistics/population-projections/2014-based/pp14-corrected.pdf

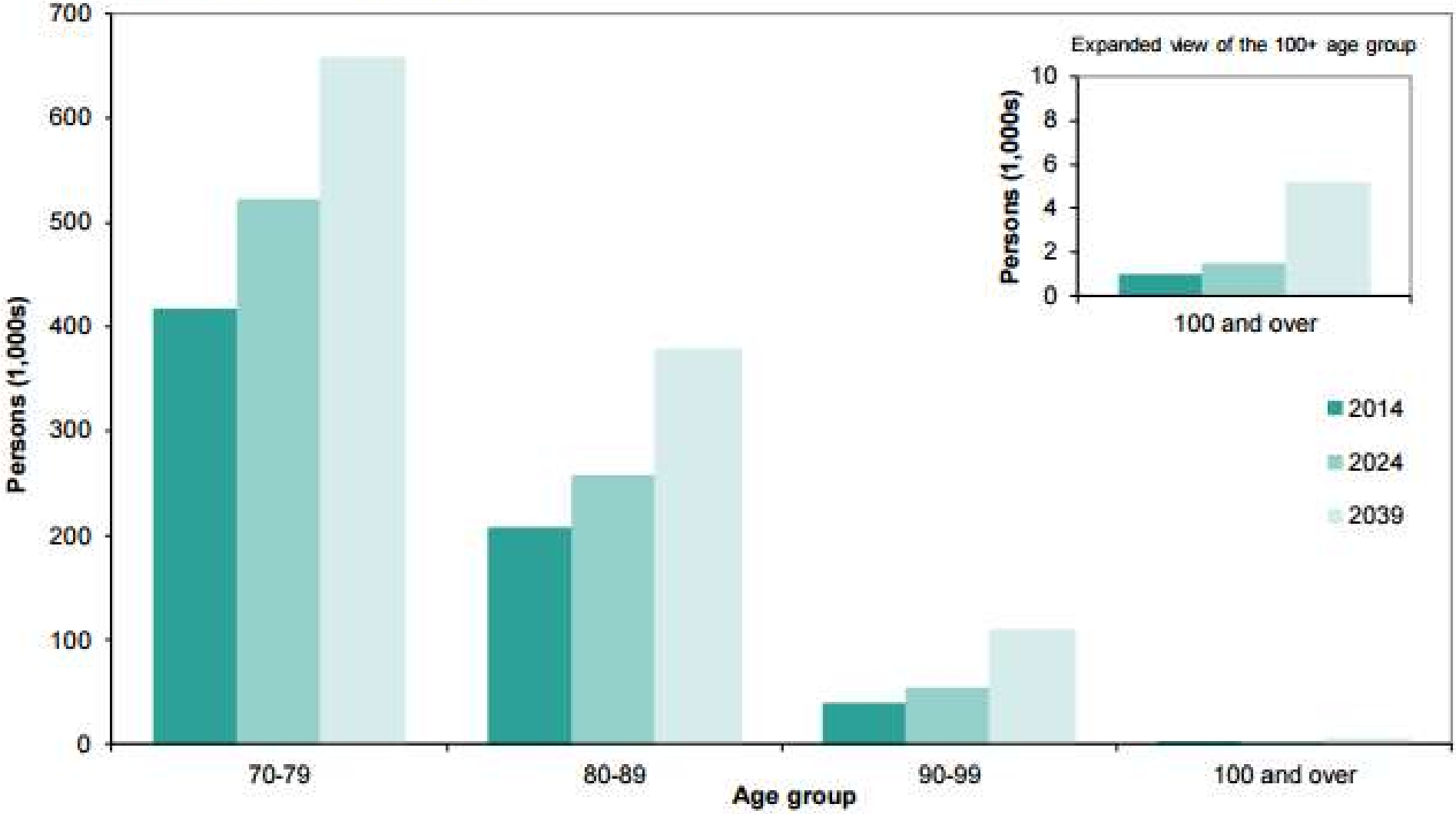
Figure 5: The projected percentage change in Scotland's population by age group, 2014-2039



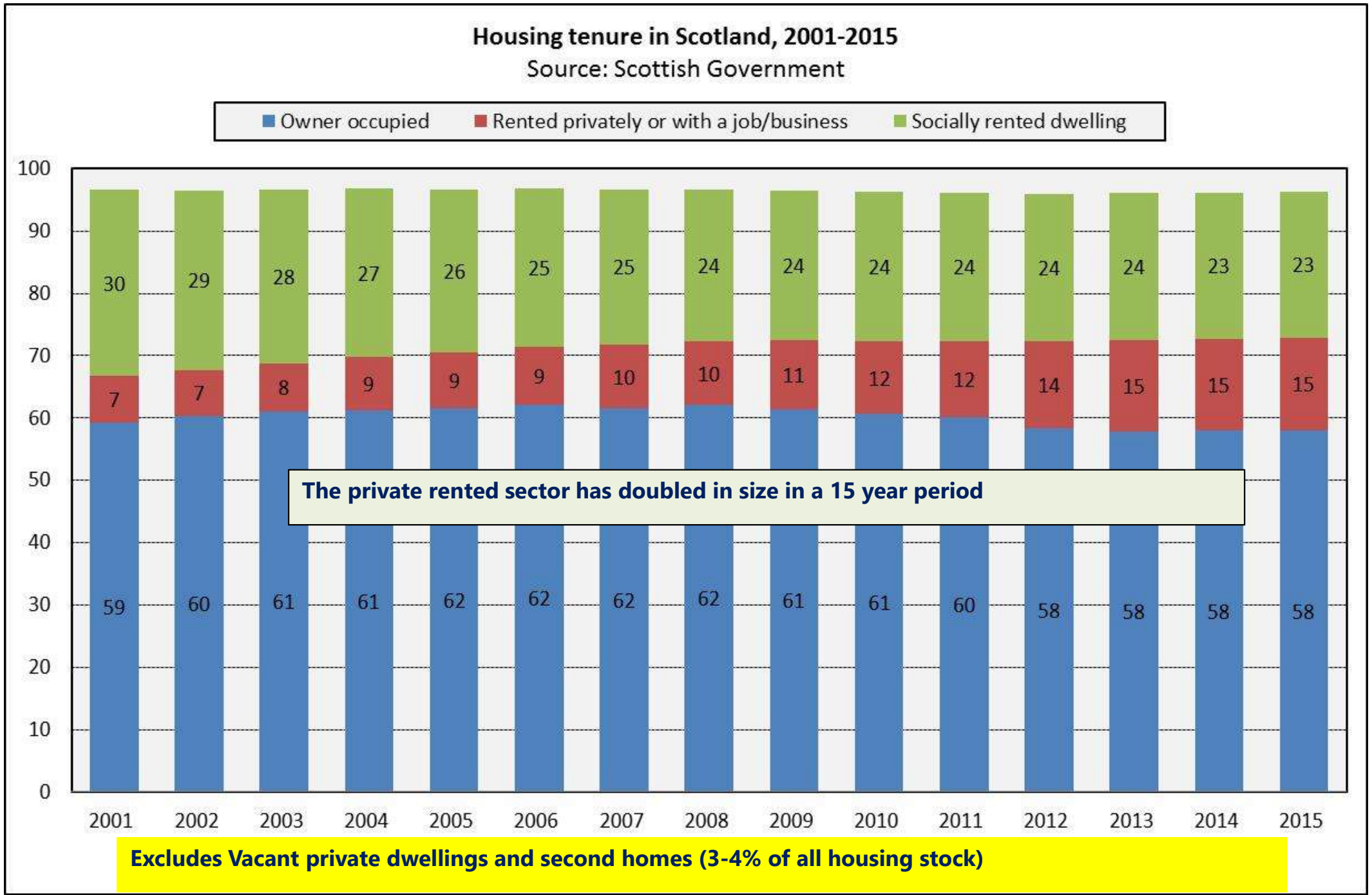
A summary of Scotland's population projections to 2039

https://www.nrscotland.gov.uk/files//statistics/population-projections/2014-based/pp14-corrected.pdf

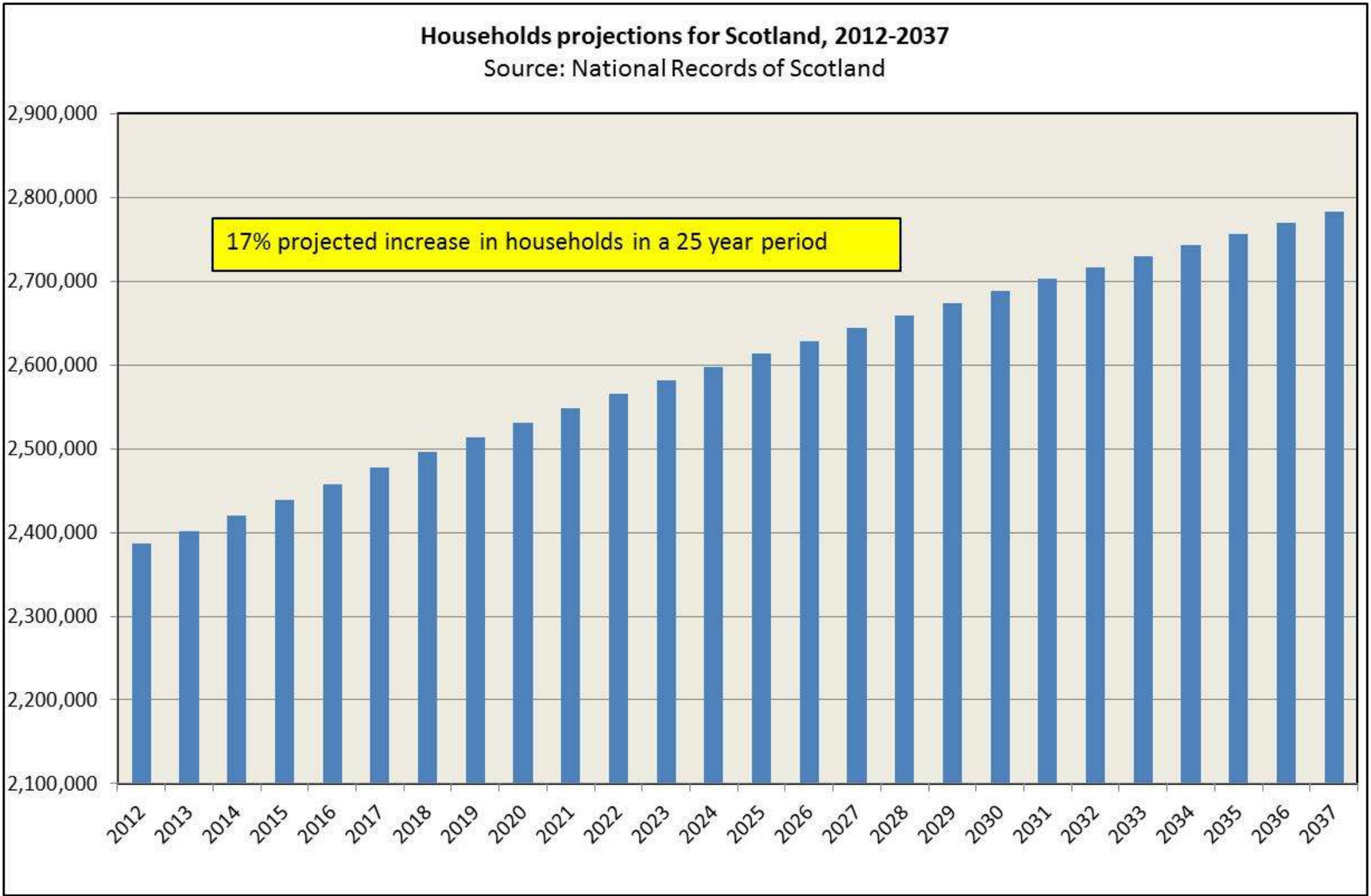
Figure 7: Estimated and projected population aged 70 and over, Scotland, mid-2014, mid-2024 and mid-2039



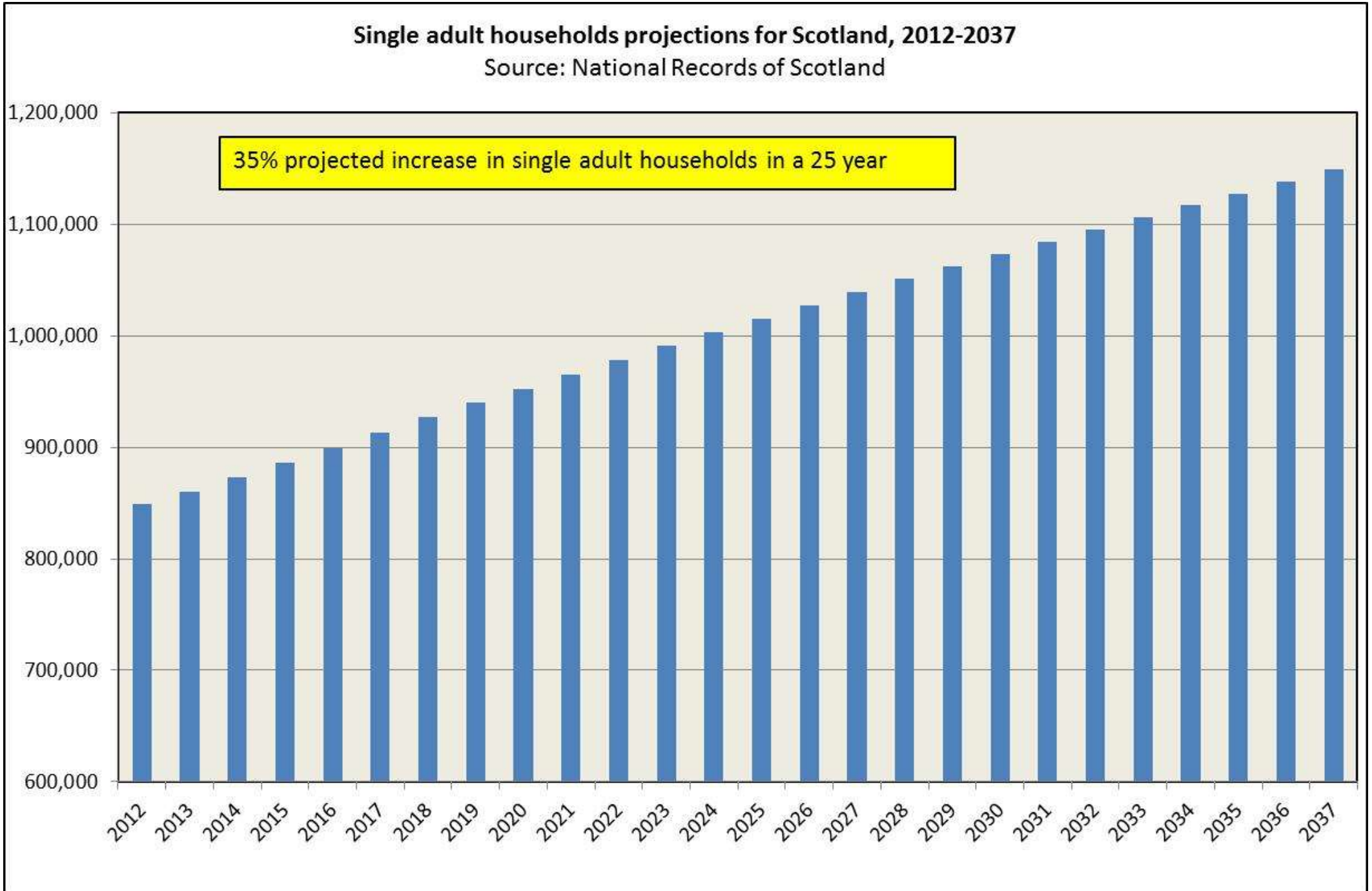
Housing tenure in Scotland



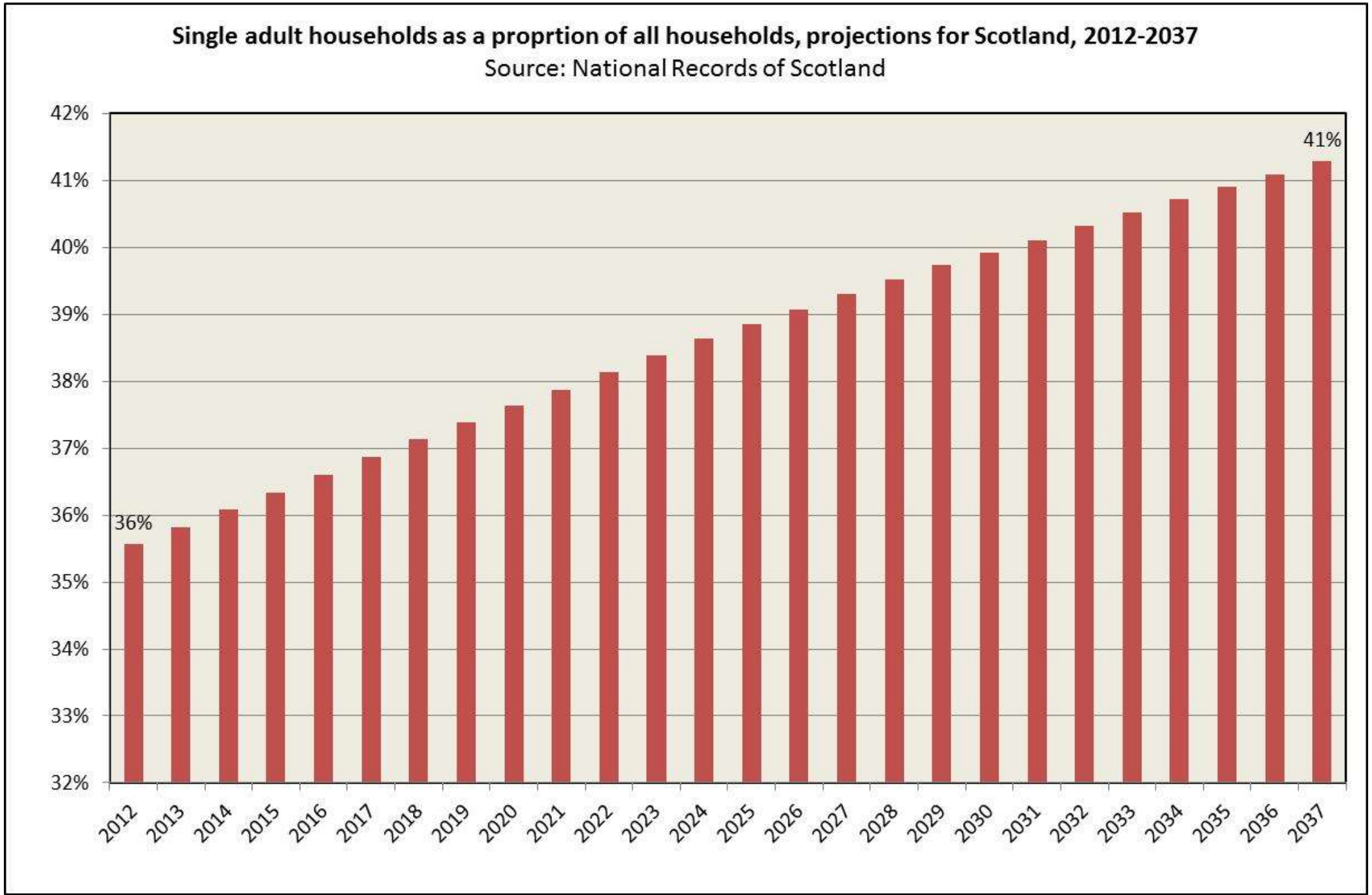
Projected household trends in Scotland



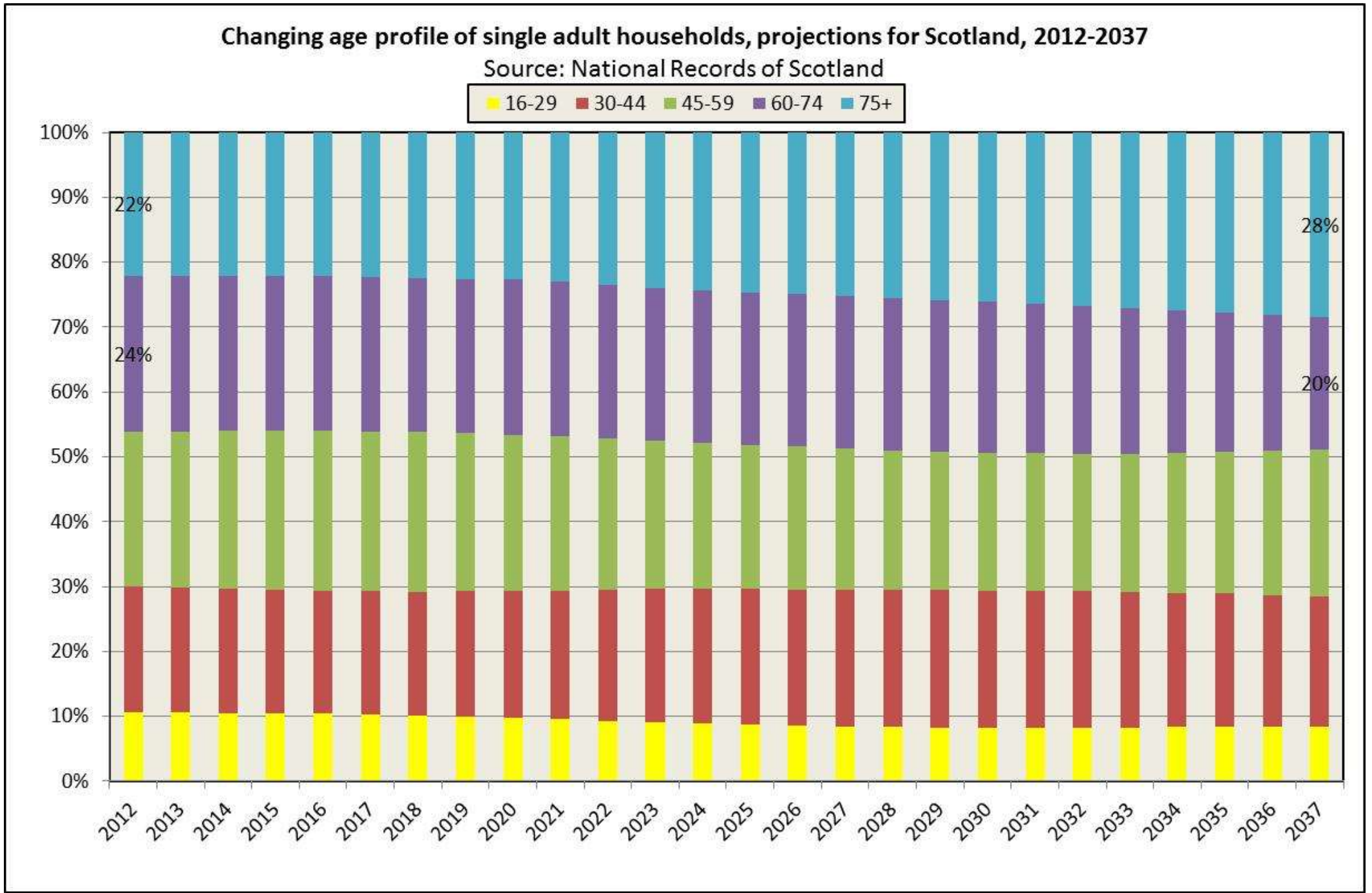
Projected single adult household trends in Scotland



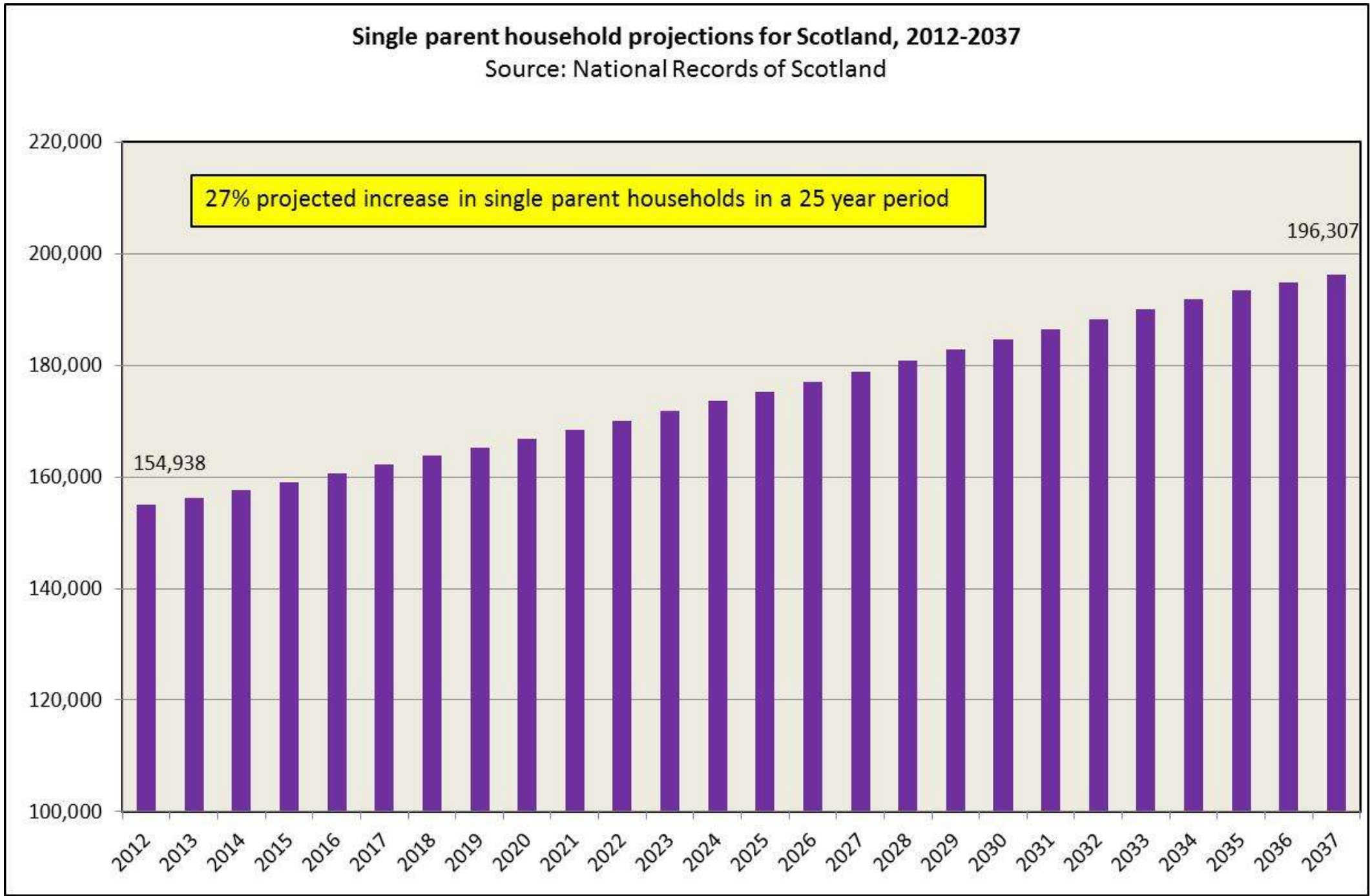
Projected trend in proportion of single adult households in Scotland



Projections of age profile of single adult households in Scotland

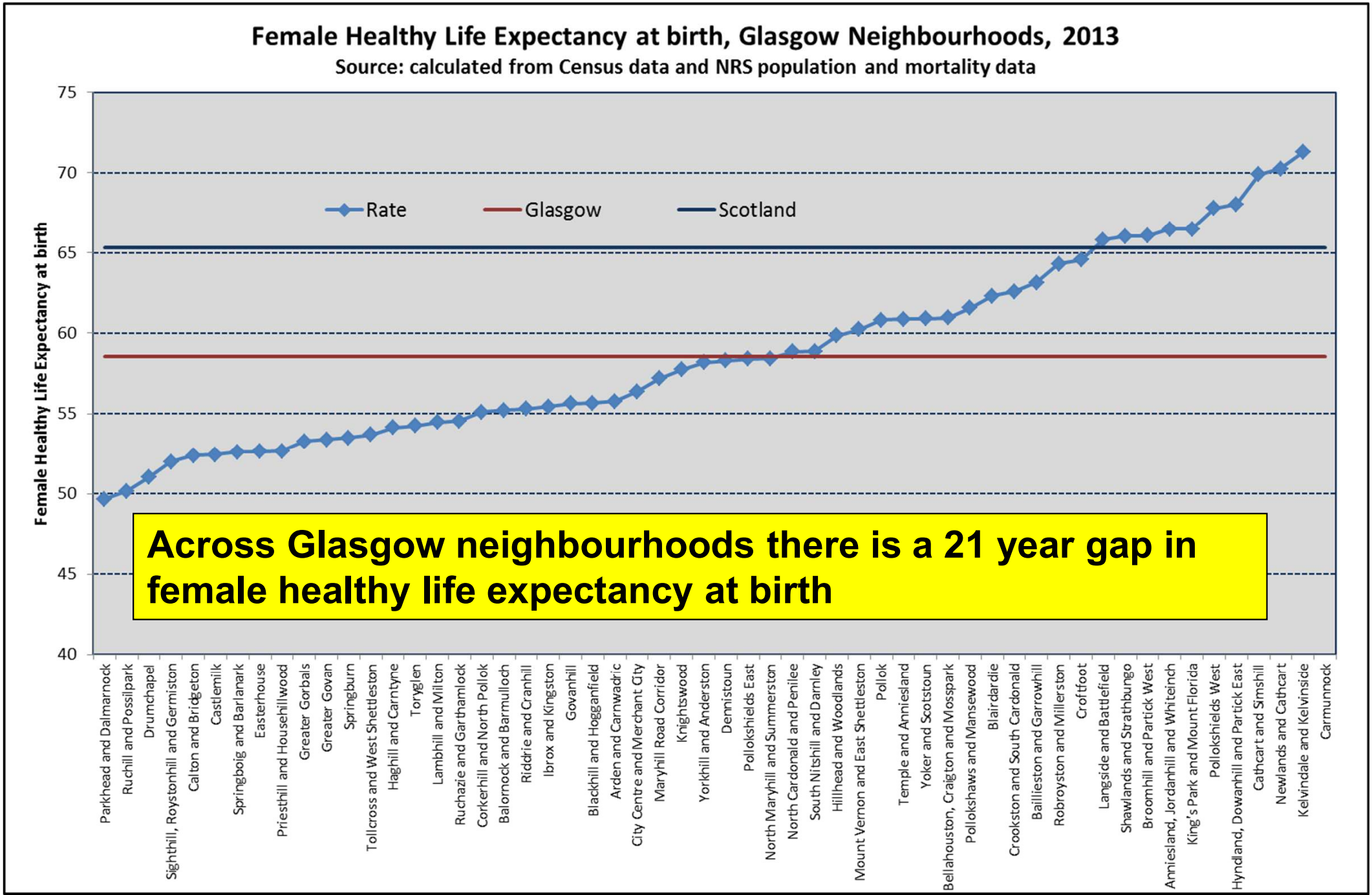


Projected trend in single parent households in Scotland

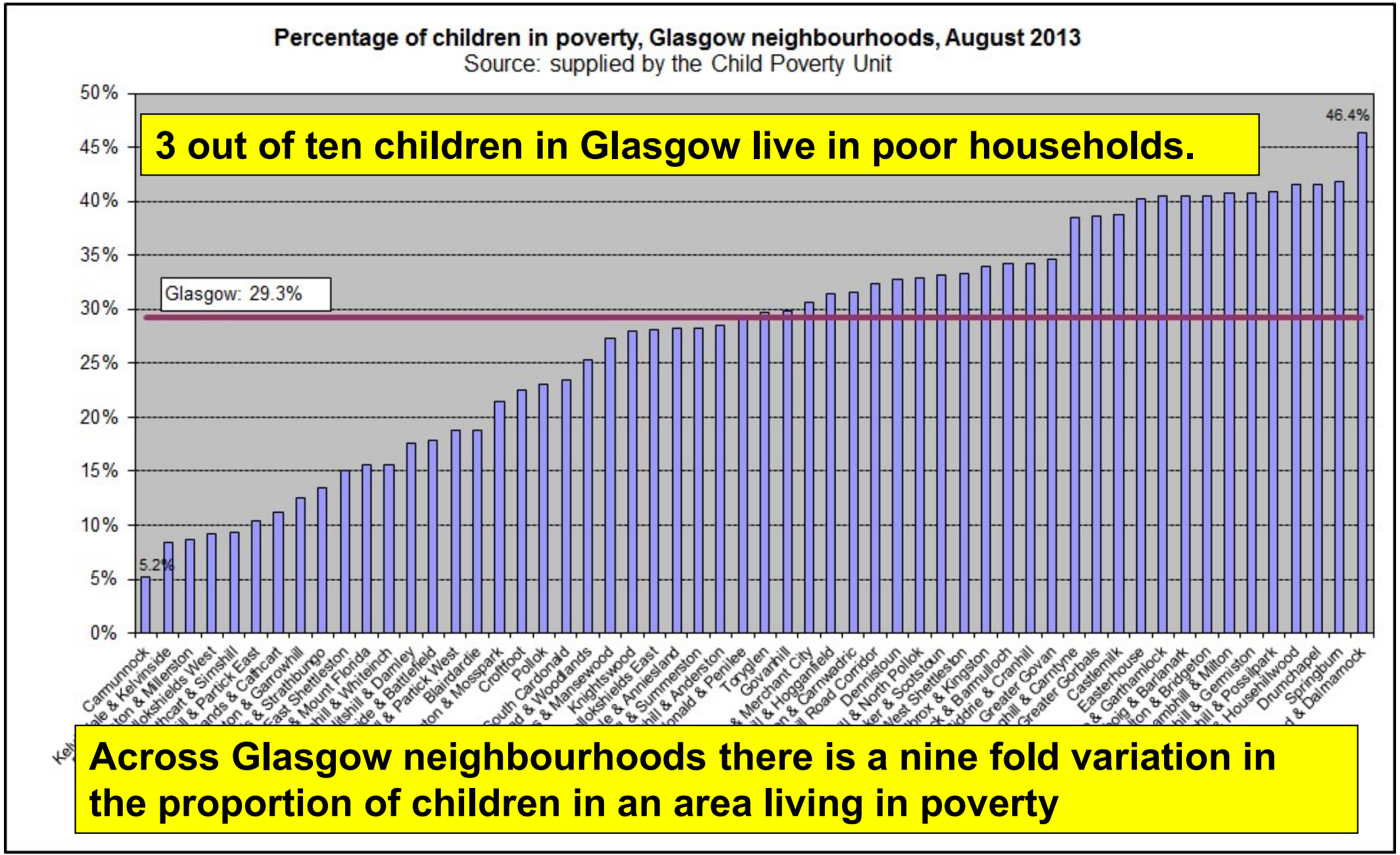


Inequalities in Glasgow

Female healthy life expectancy at neighbourhood level in Glasgow



Child Poverty



Conclusions

- Very difficult to look into the crystal ball, but…..
- Populations across Scotland will continue to get older
- It looks likely that there will be a lot more single adult households, potentially accounting for 41% of all households
- Single parent households look set to rise also
- Trends in health and social inequalities are and will be important
- Scotland has wide health and social inequalities. There are examples across Scotland of persistent local concentrations of poverty, poor health and vulnerability.
- The success of current efforts to reduce social, educational, environmental and health inequalities will to a large part determine how vulnerable or resilient to the impacts of climate change (and other global socio-political forces) our communities are in the future

Questions

- Do these projections and statistics surprise you?

- How are you planning for demographic change?

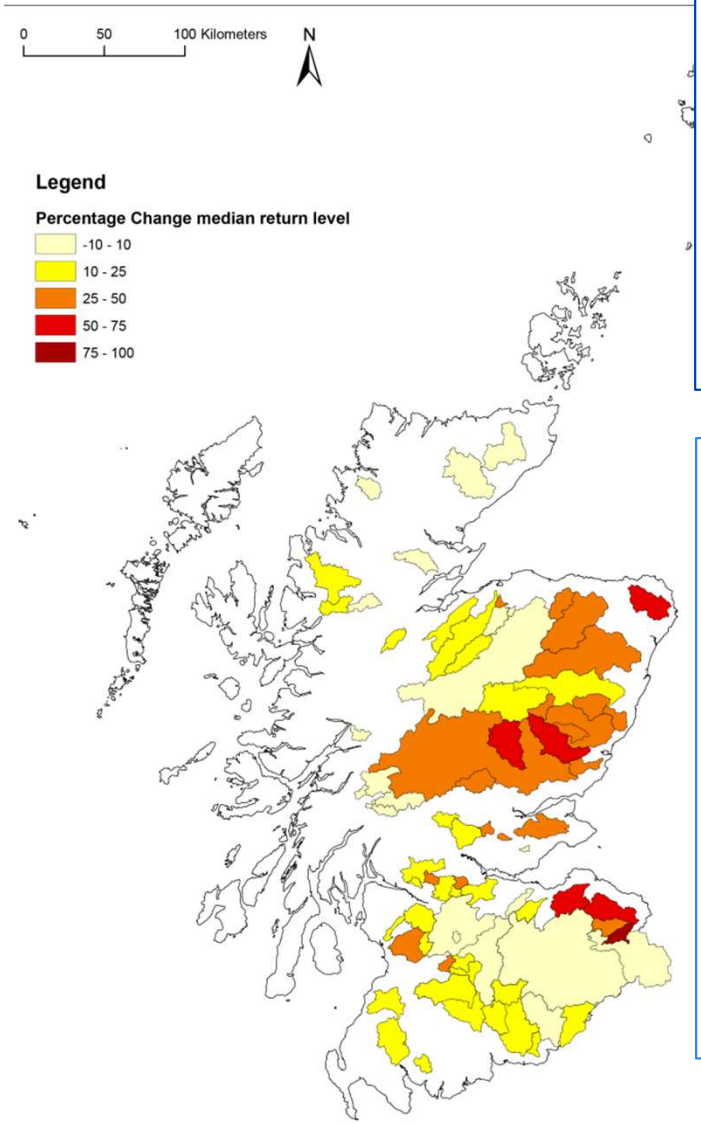
Water Resilient Cities: A systems approach to flood risk?

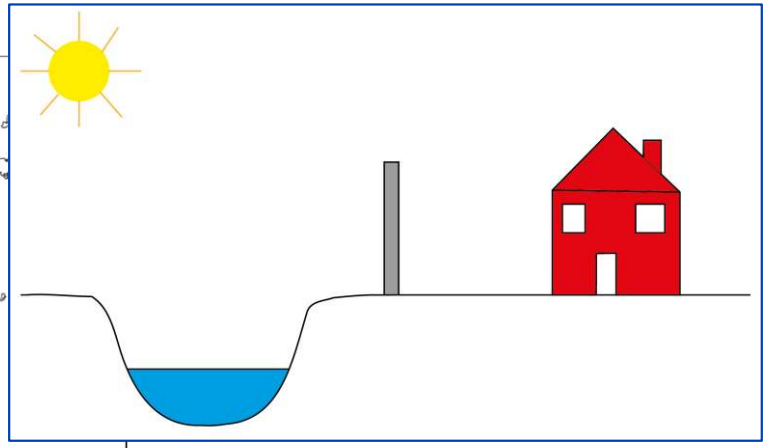
Dr Lindsay Beevers, Dr Guy Walker and Dr Lila Collet

l.beevers@hw.ac.uk

Distinctly Global
www.hw.ac.uk

Context:





Vulnerability: the extent to which a system is *susceptible* to floods due to *exposure*, and its ability to cope, recover or adapt (*resilience*)

- Flood exposure
- Future increase to exposure but uncertainty in predictions
- Newly exposed populations
- Coupled human-physical environment

New approach?

RISK MANAGEMENT IN A DYNAMIC SOCIETY: A MODELLING PROBLEM

Jens Rasmussen

Hurecon, Smorum Bygarde 52, DK 2765 Smorum, Denmark

the present dynamic society? The socio-technical system involved in risk management includes
system operators.
This system is presently stressed by a fast pace of technological change, by an increasingly
aggressive, competitive environment, and by changing regulatory practices and public pressure.
by a particular academic discipline, and
modelling is done by generalising across systems and their particular hazard sources. It is
argued that risk management must be modelled by cross-disciplinary studies, considering risk
ture involving all
levels of society for each particular hazard category.

Furthermore, it is argued that this requires a system-oriented approach based on functional abstraction rather than structural decomposition. Therefore, task analysis focused on action sequences and occasional deviation in terms of human errors should be replaced by a model of behaviour shaping mechanisms in terms of work system constraints, boundaries of acceptable
a convergence of research paradigms in human reliability analysis is found to support a
supports this approach. A review of this convergence within decision theory and management
presented in comparison with the evolution of paradigms within safety research.

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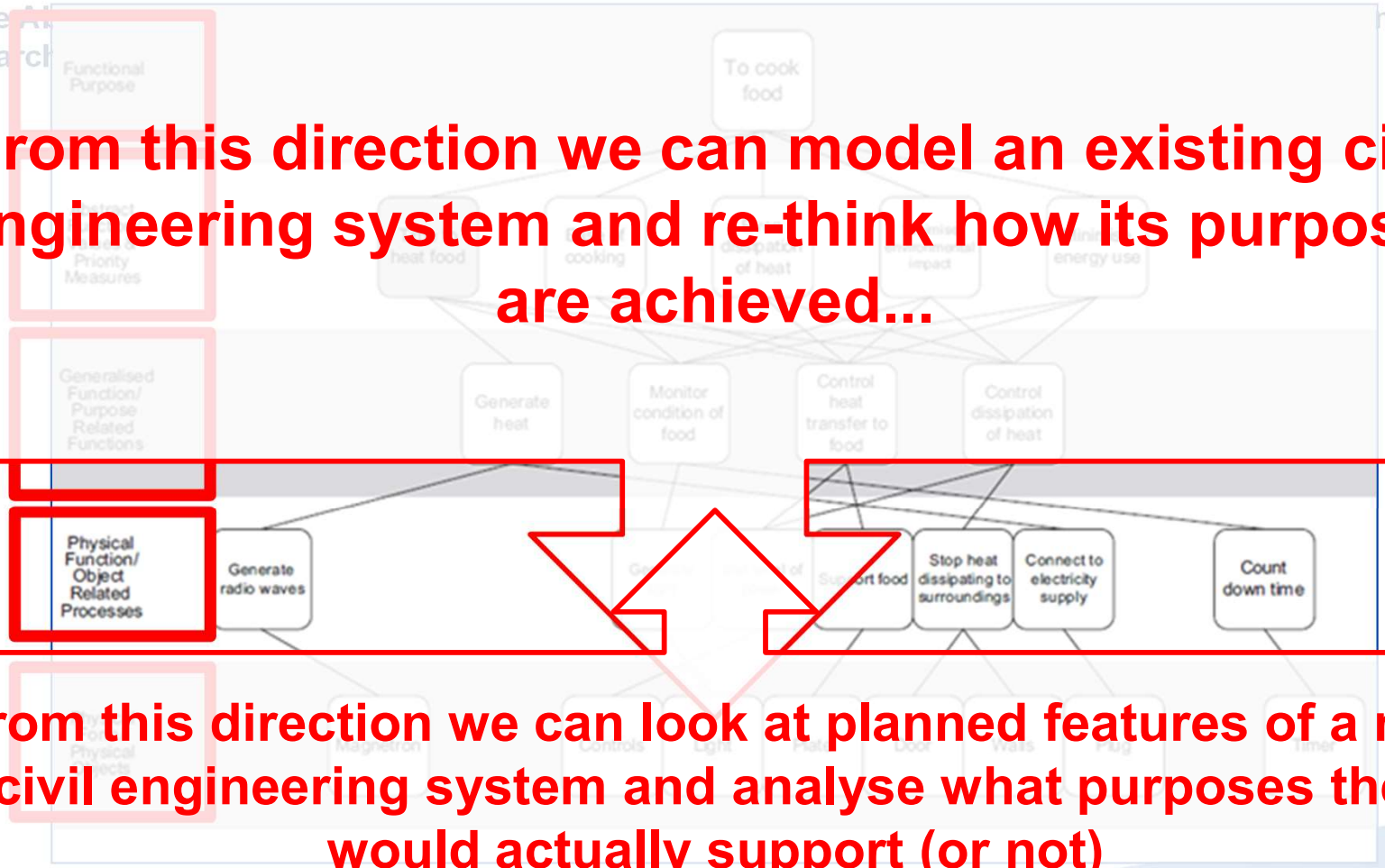
Civil engineering systems are presently stressed by a fast pace of technological change, by an increasingly aggressive, competitive environment, changing regulatory practices, public pressure and, of course, climate change…

Traditionally, each level of this is studied separately by a particular academic discipline…

A system-oriented approach based on functional abstraction rather than structural decomposition

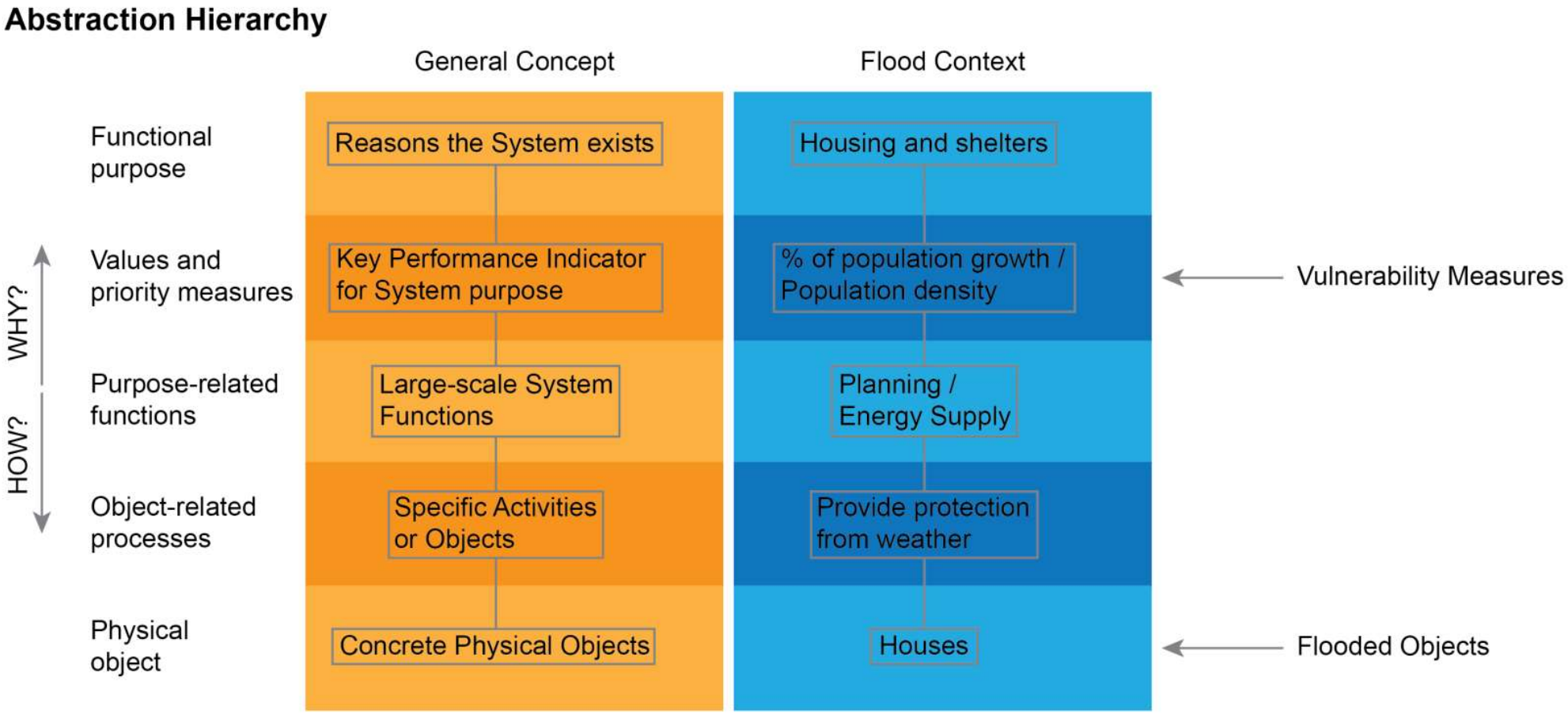
The Abstraction Hierarchy

From this direction we can model an existing civil engineering system and re-think how its purposes are achieved...



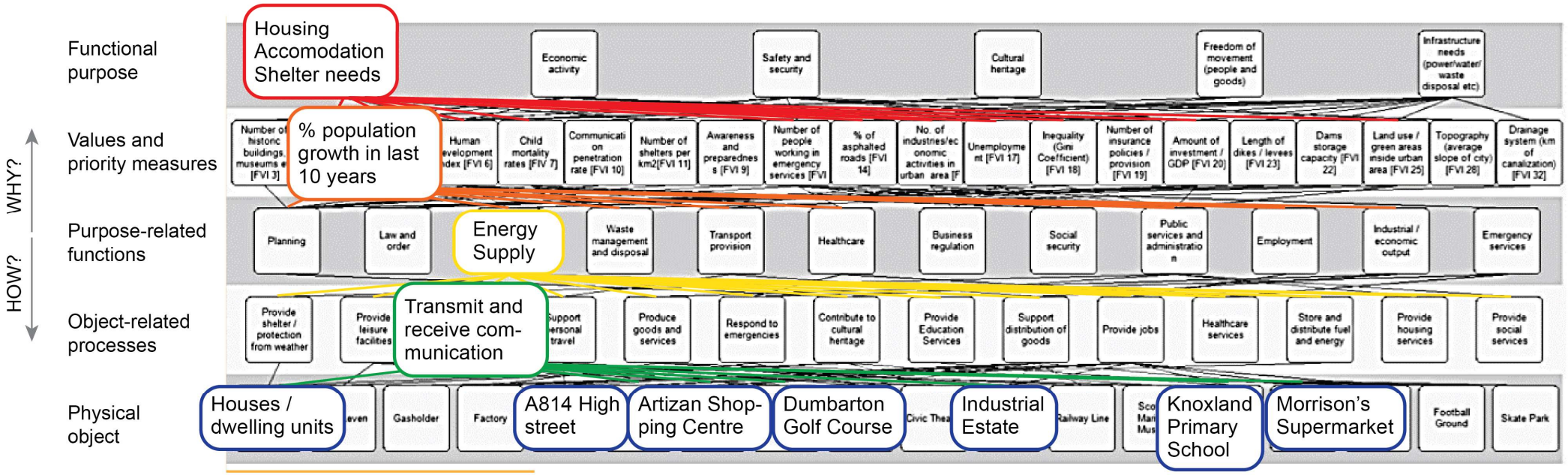
From this direction we can look at planned features of a new civil engineering system and analyse what purposes they would actually support (or not)

An application to flooding



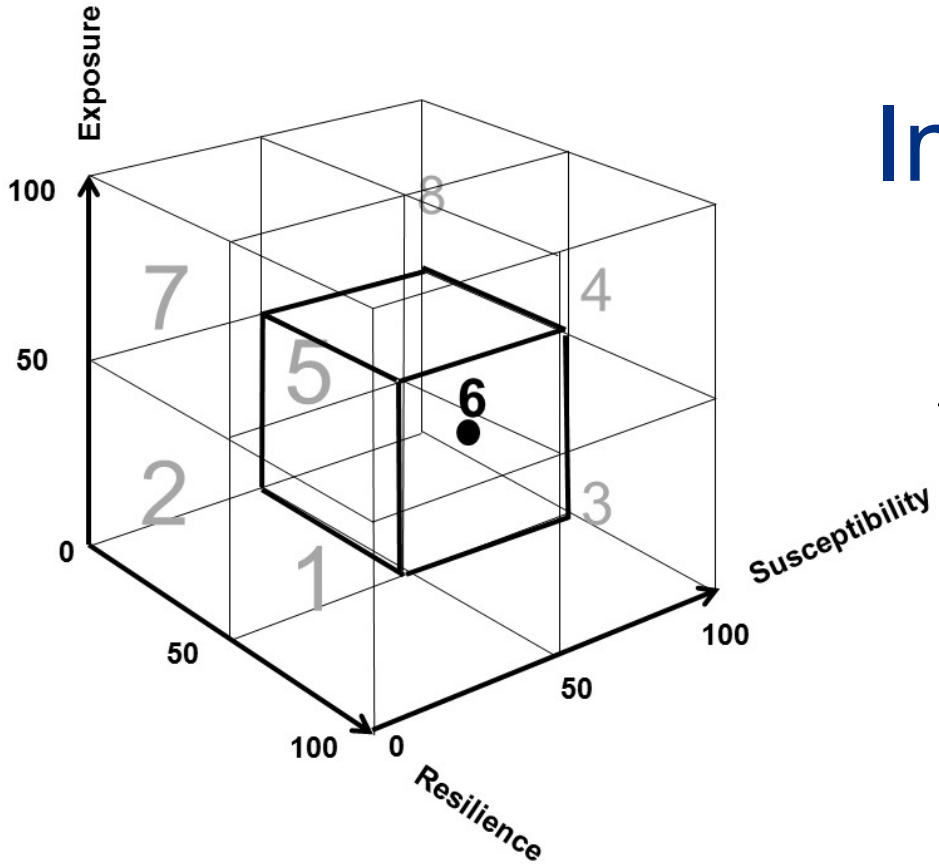
Applied to four Scottish towns

Abstraction Hierarchy



- Dumbarton
- Dumfries
- Stranraer
- Moffat

- **Different exposure, susceptibility and resilience**
- **Analyse components of network**



Initial results

- **Socio-metric status**
- **Criticality of a node**
- **Using the vulnerability indicators plot into the problem space**
  - ***Exposure, susceptibility and resilience***

	Exposure	Resilience	Susceptibility	Description
1	Low	High	Low	Best
2	Low	Low	Low	Low resilience, low risk…
3	Low	High	High	High susceptibility, resilient…
4	High	High	High	High exposure, resilient…
5	High	High	Low	High exposure, resilient…
6	Low	Low	High	Low res & high susceptibility
7	High	Low	Low	Low res & high exposure
8	High	Low	High	Worst

Considerations for flood management

- **Exposure is often our focus**
- **Susceptibility and resilience may be at least as important**
- **The challenge: move from zone 6 to zone 1**
- **Plan/design interventions which work on all three aspects**

The Future?

- **Consider the coupled physical and human systems**
  - **Resilience in the coupled system**
  - **Interdisciplinary approach**
  - **Engagement and collaboration with practitioners and decision-makers**
- **Future planning and response needs to capture uncertainties**

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Thank you

Any questions?

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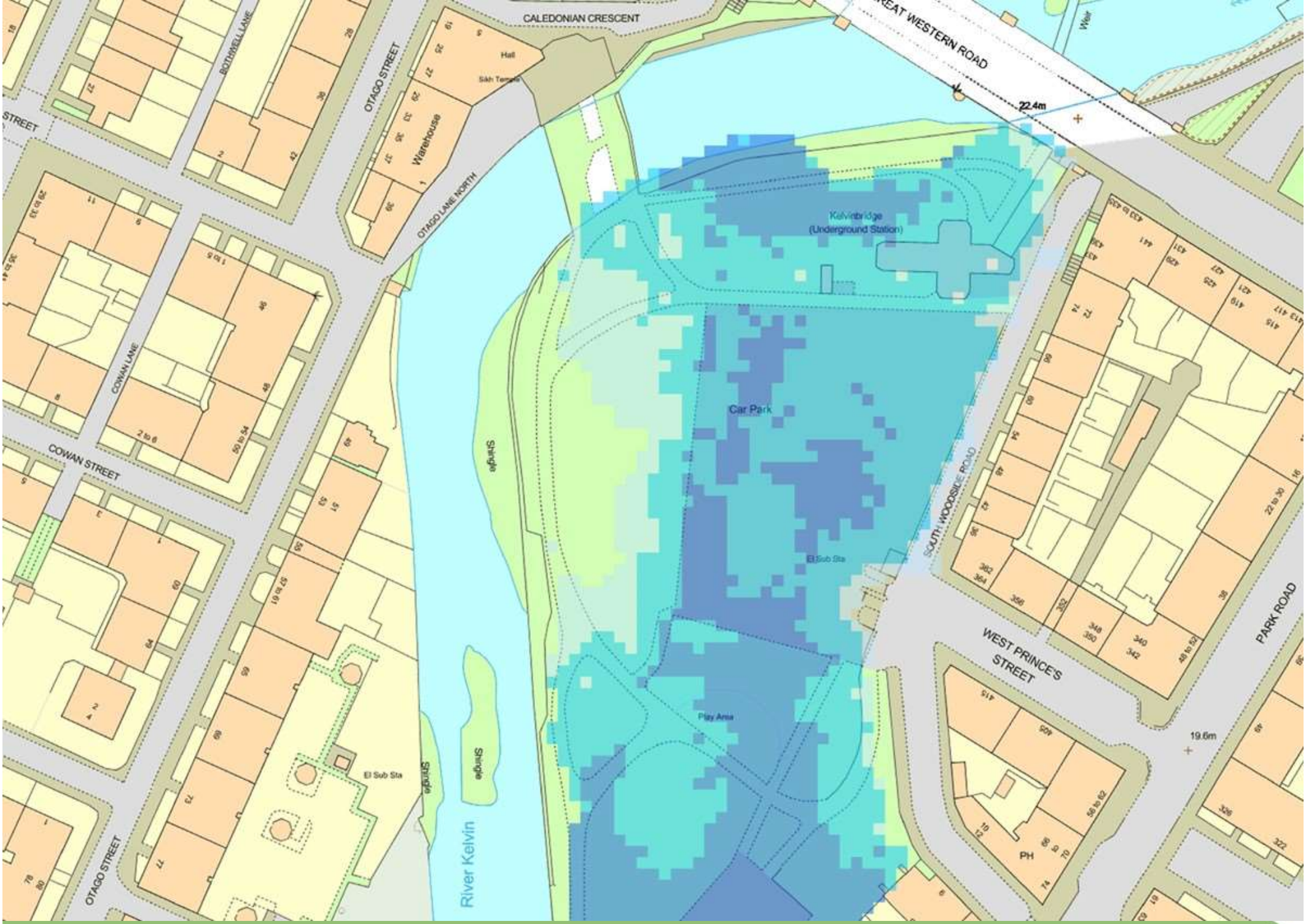
Changing climate, changing information, changing guidance

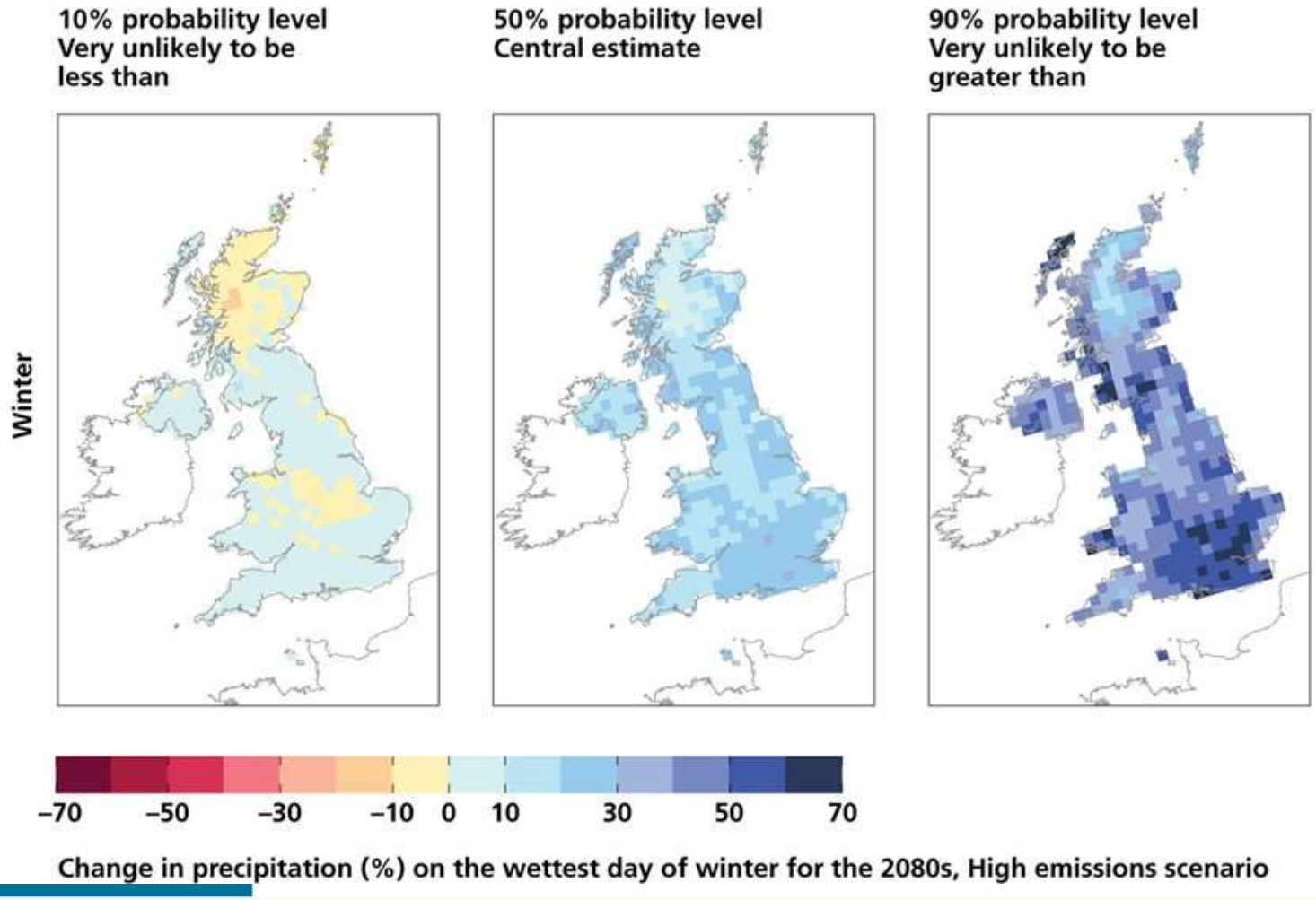
Fiona McLay, Mark McLaughlin and Elaine Fotheringham (SEPA)

E-mail: fiona.mclay@sepa.org.uk

http://www.sepa.org.uk/environment/water/flooding/developing-our-knowledge/#FRM_climate_change


CALEDONIAN CRESCENT
GREAT WESTERN ROAD
22.4m
Weir
OTAGO STREET
OTAGO LANE NORTH
ROTHESAY LANE
Hall
Sikh Temple
Warehouse
Kelvinbridge
(Underground Station)
Car Park
El Sub Sta
SOUTH WOODSIDE ROAD
WEST PRINCE'S STREET
PARK ROAD
19.6m
COWAN STREET
COWAN LANE
Play Area
Shingle
River Kelvin
PH

What information do we have for Scotland? – climate variables



UKCP09

- Sea level rise
- Surge
- Daily rainfall
- Temperature

UKCP18 due March 2018.

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Coastal

Climate Change

Storminess?
- Waves
- Surge

Mean sea level
- Thermal expansion
- Land Ice melt
- Local circulation

Present

Waves

Still Water Level
- Tide
- Surge

UKCP09

Flood and Coastal Erosion Risk Management Research and Development Programme

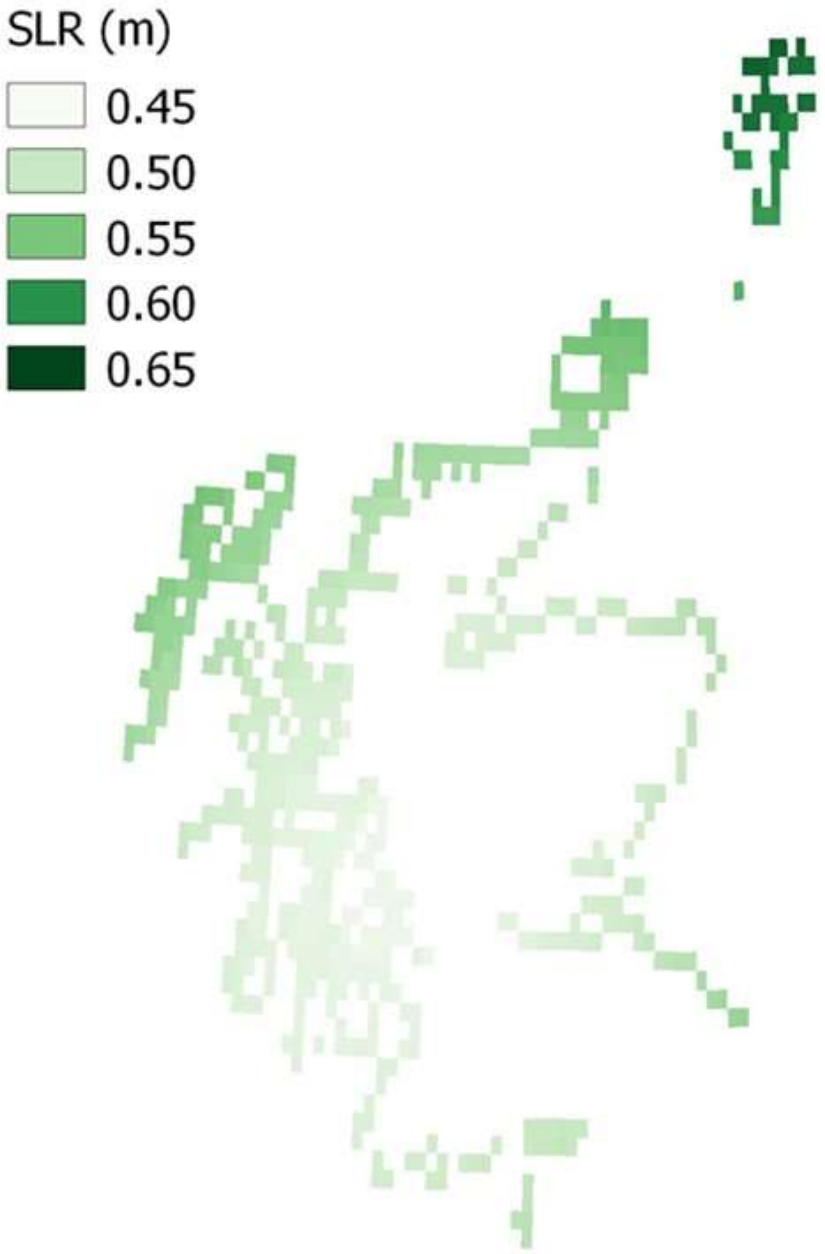
Met Office Hindcast?

Coastal Flood Boundary Conditions

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

Coastal - Practicalities

- Global mean sea level rise predictions higher than in UKCP09
- CFB update late 2017.
- UKCP09 user interface.
- Waves
- Impact on flood defence condition



High Emissions Scenario 95th%ile

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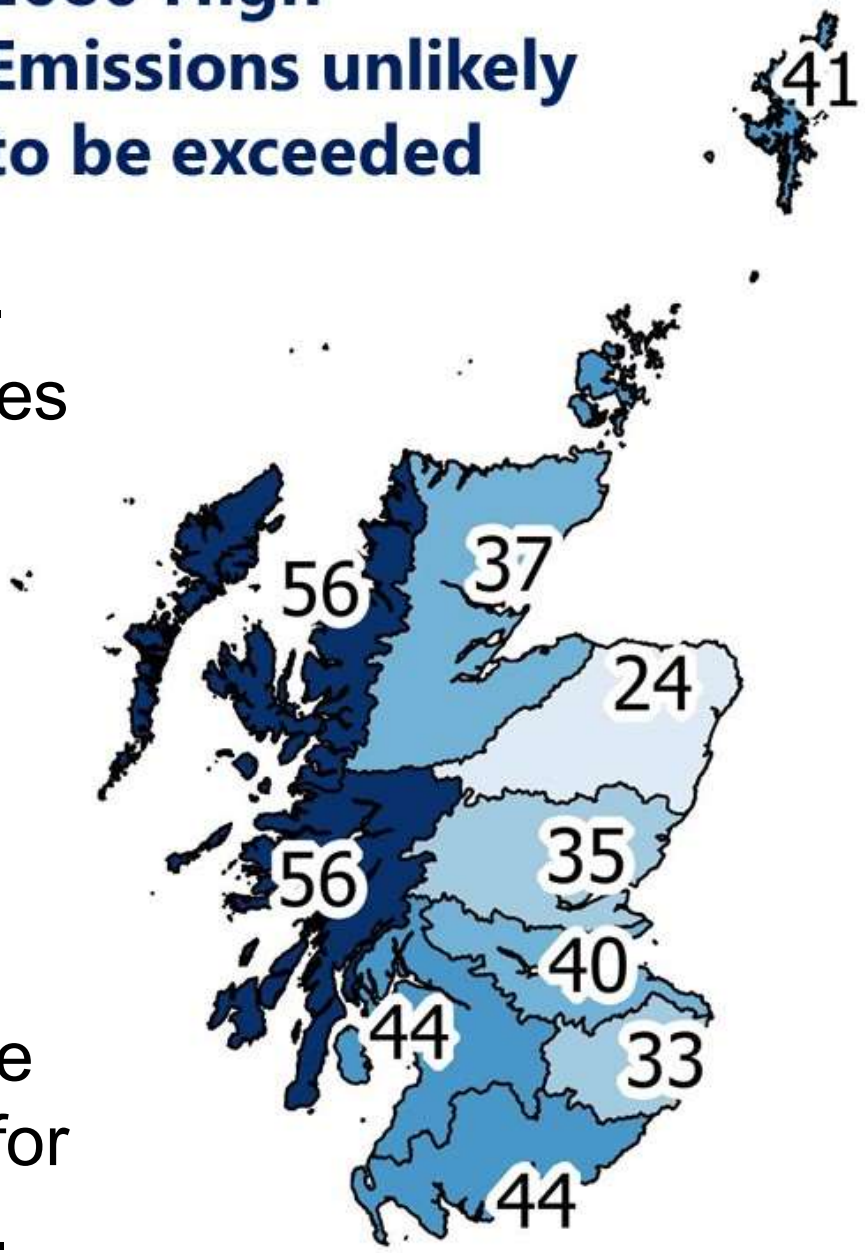
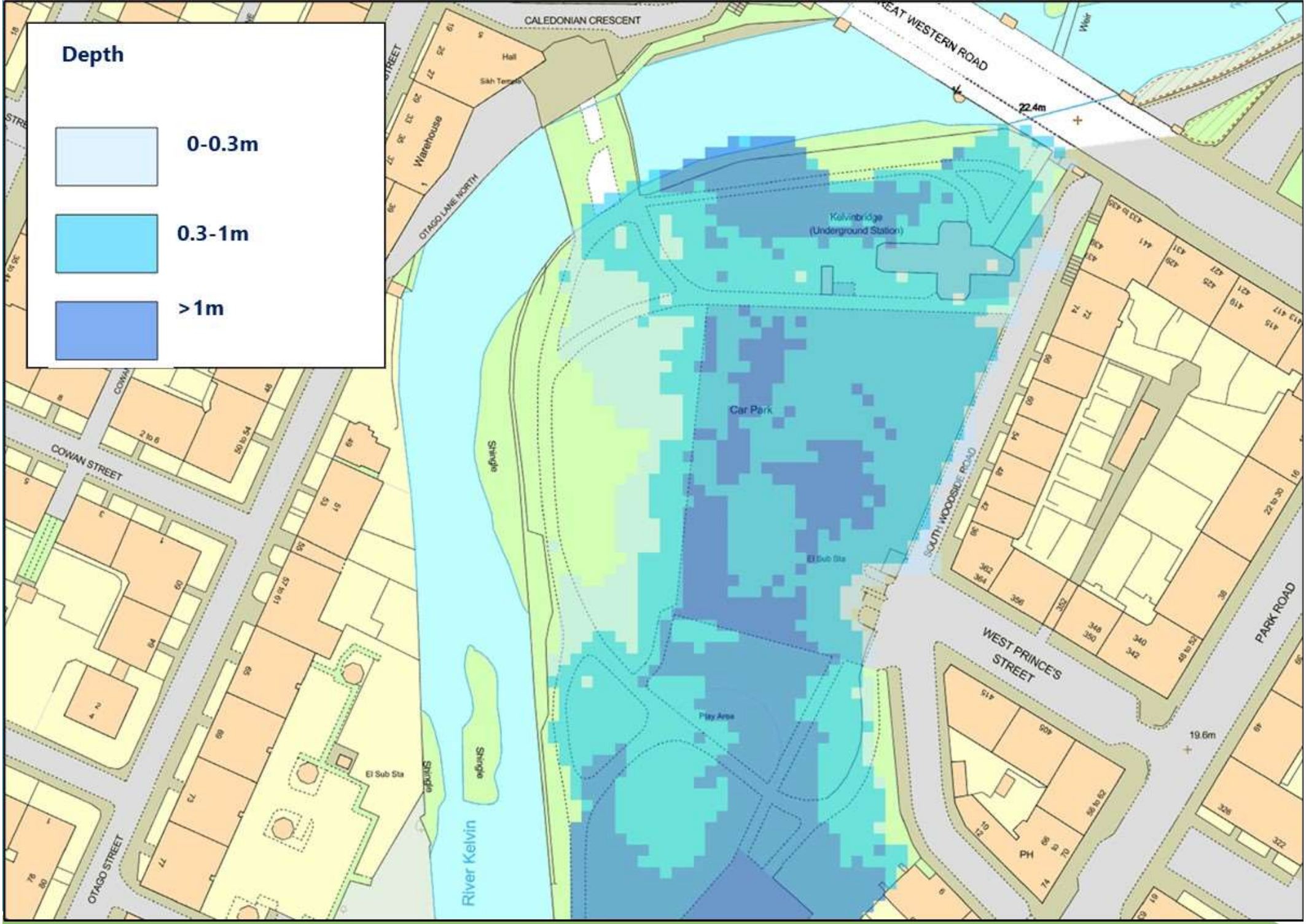
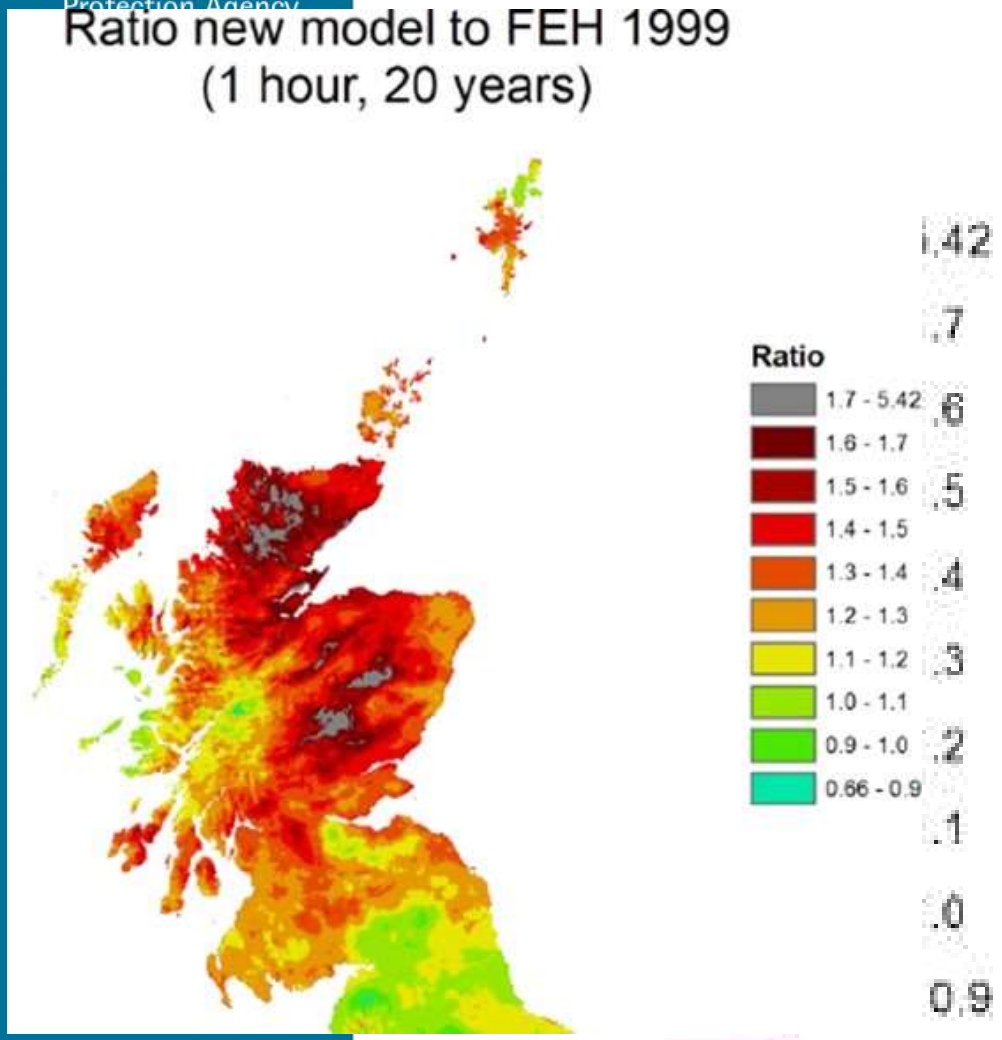
Fluvial

- UKCP09 rainfall and temperature projections.
- CEH 2011study Estimates of the impact of climate change on flood flows
  - 2050s and 2080s
  - Probability range
  - River basin regions
- EA, SEPA and CEH project to provide relative changes in flood peaks for all catchments in Britain. due 2018.




Depth
0-0.3m
0.3-1m
>1m
CALEDONIAN CRESCENT
GREAT WESTERN ROAD
22.4m
Hall
Sikh Temple
Warehouse
OTAGO LANE NORTH
Kelvinbridge
(Underground Station)
Car Park
COWAN STREET
SOUTH WOODSIDE ROAD
WEST PRINCE'S STREET
PARK ROAD
19.6m
Play Area
El Sub Sta
Shingle
River Kelvin
OTAGO STREET
PH

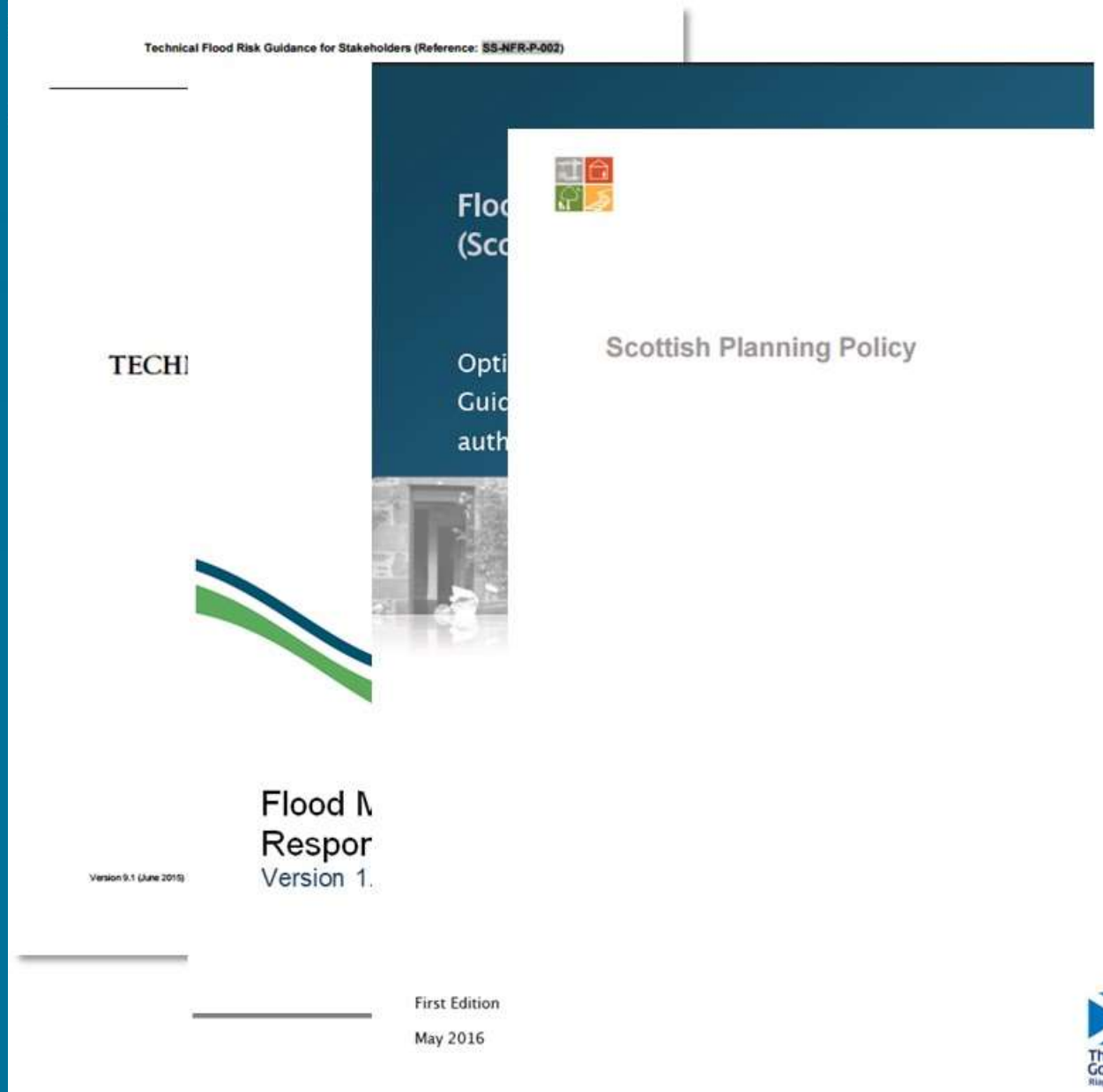
Surface Water



From: The new FEH rainfall DDF model: results, comparisons and implications , Stewart et. al, CEH.

- Sub-daily rainfall not a UKCP09 output.
- UKWIR, Rainfall Intensity for Sewer Design, 2015
- Increases generally higher than 20%
- New DDF model
- UKCP18 sub daily rainfall (very exciting!!!)

Existing Guidance and Policy



UP
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authorities –
H 201.1 – river flows
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WIR 2015 – for
for river flow
?

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

Where next?

- Consistent, workable, guidance and information all based on best available science.
- Flood Risk and Climate Change Working Group
  - SEPA, Scottish Water, Aberdeenshire Council, Adaptation Scotland
  - Links to Land Use Planning Working group
- NFRA, Hazard map updates, FRM strategies
- **What information and guidance do you need from SEPA to make decisions on climate change and flood risk…..**

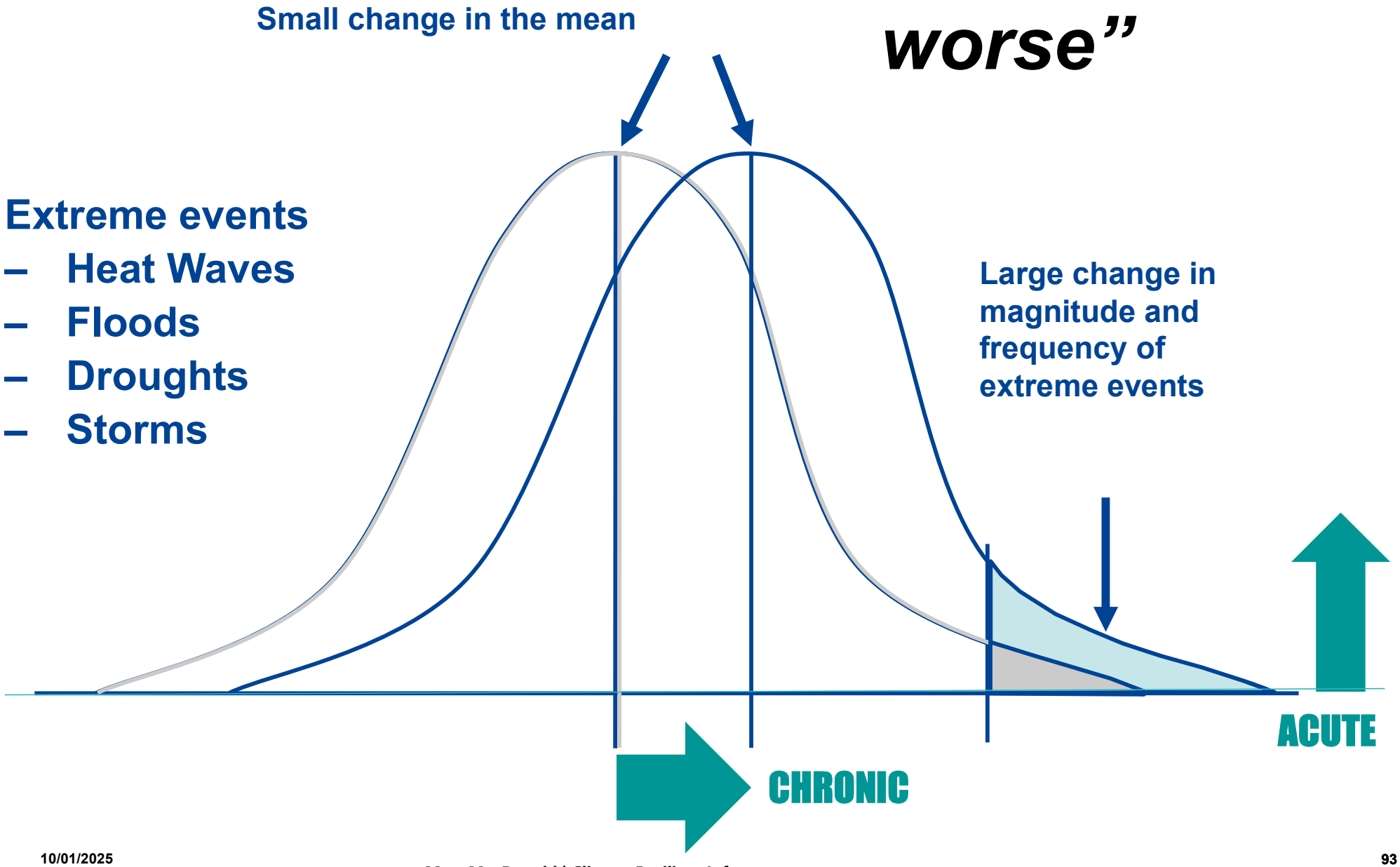
Climate Resilient Infrastructure

Kiki Pattenden, Senior Consultant Climate Resilience

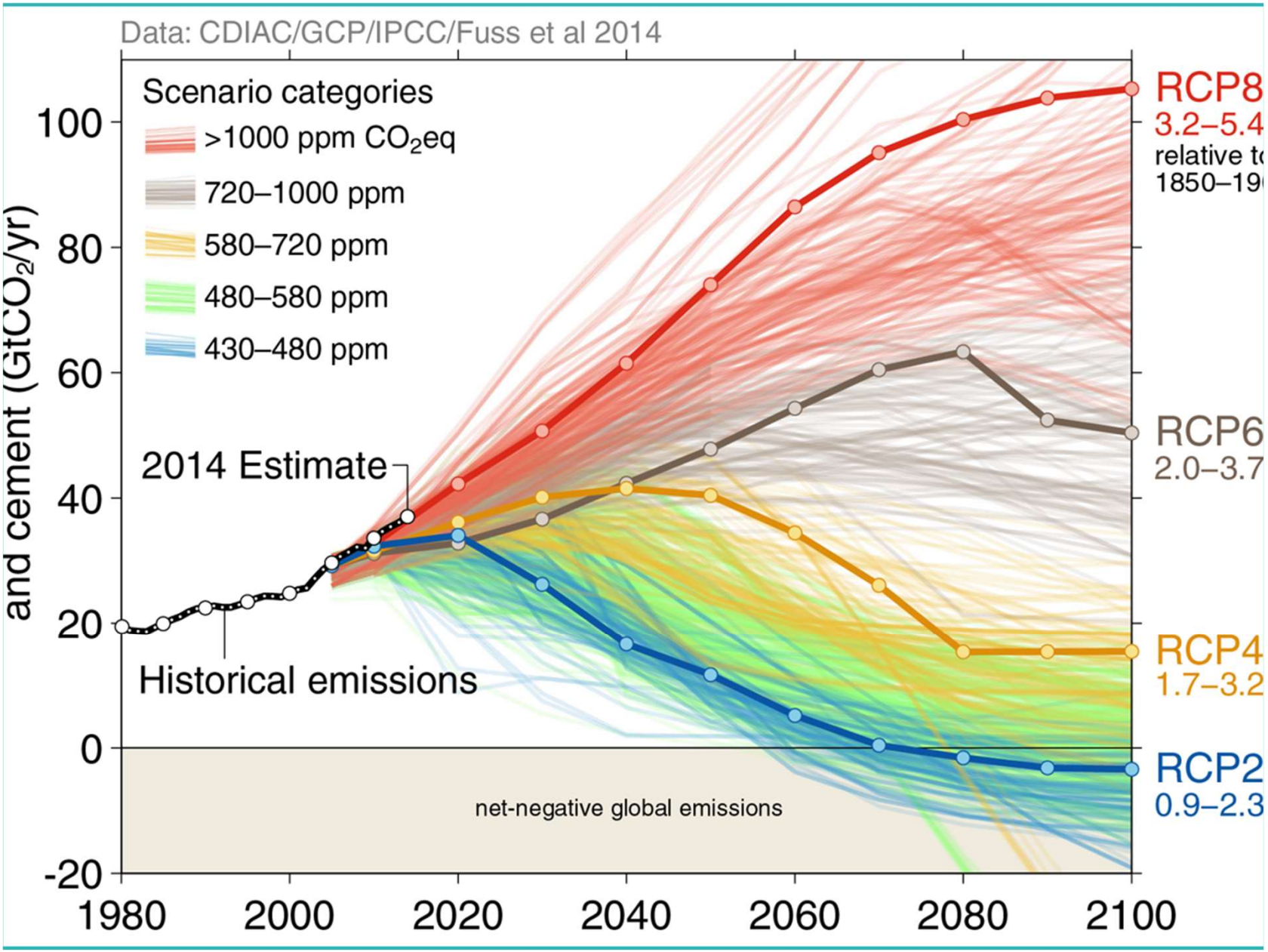
Mott MacDonald

Shifting the “Norm”

“Things can only get… worse”



Emissions Pathways



Some numbers for Scotland

1.0 - 1.6 ºC

27%

7.5 days

45%

51%

4%

> 60%

Timing

While COP21 Agreement being discussed

The Event

Storm Desmond - North England suffered 300mm rainfall in 24 hours?

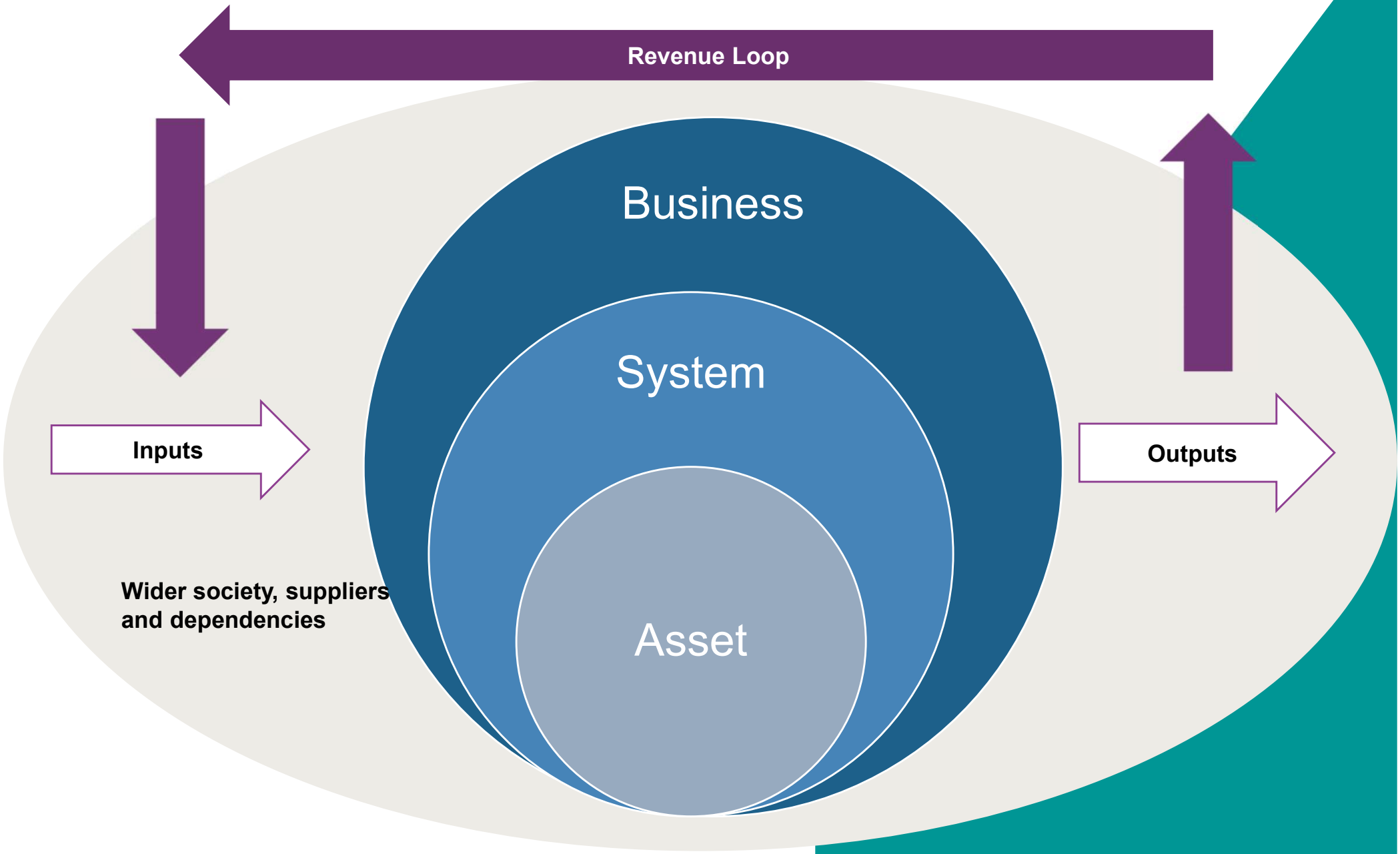
Outcome

Newly completed 1 in 250yr flood barriers were overtopped and severe flooding in the cities of Carlisle, Leeds, York & Lancaster

Consequence

Limited fatalities, but severe disruption, losses and damage of the order of £1.5 to £2.3 bn

Service System Risks



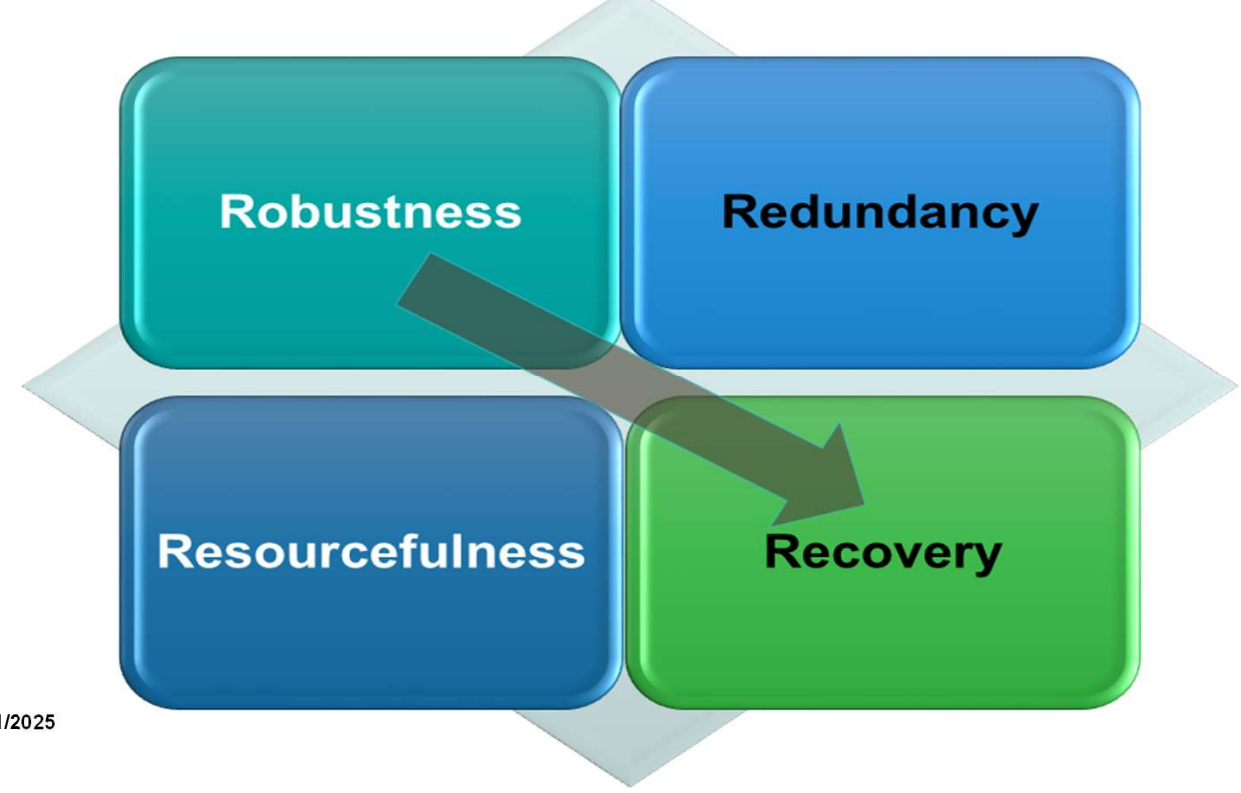
Pathways

Not an academic question

Infrastructure

Part of the commitment to a low C society

Bears the brunt of the effects of climate change



Risk

The complacency of over-reliance on defence

The solution

The 4 ‘Rs’ of *Adaptive Capacity’*

The approach

To incorporate and integrate climate response into city infrastructure

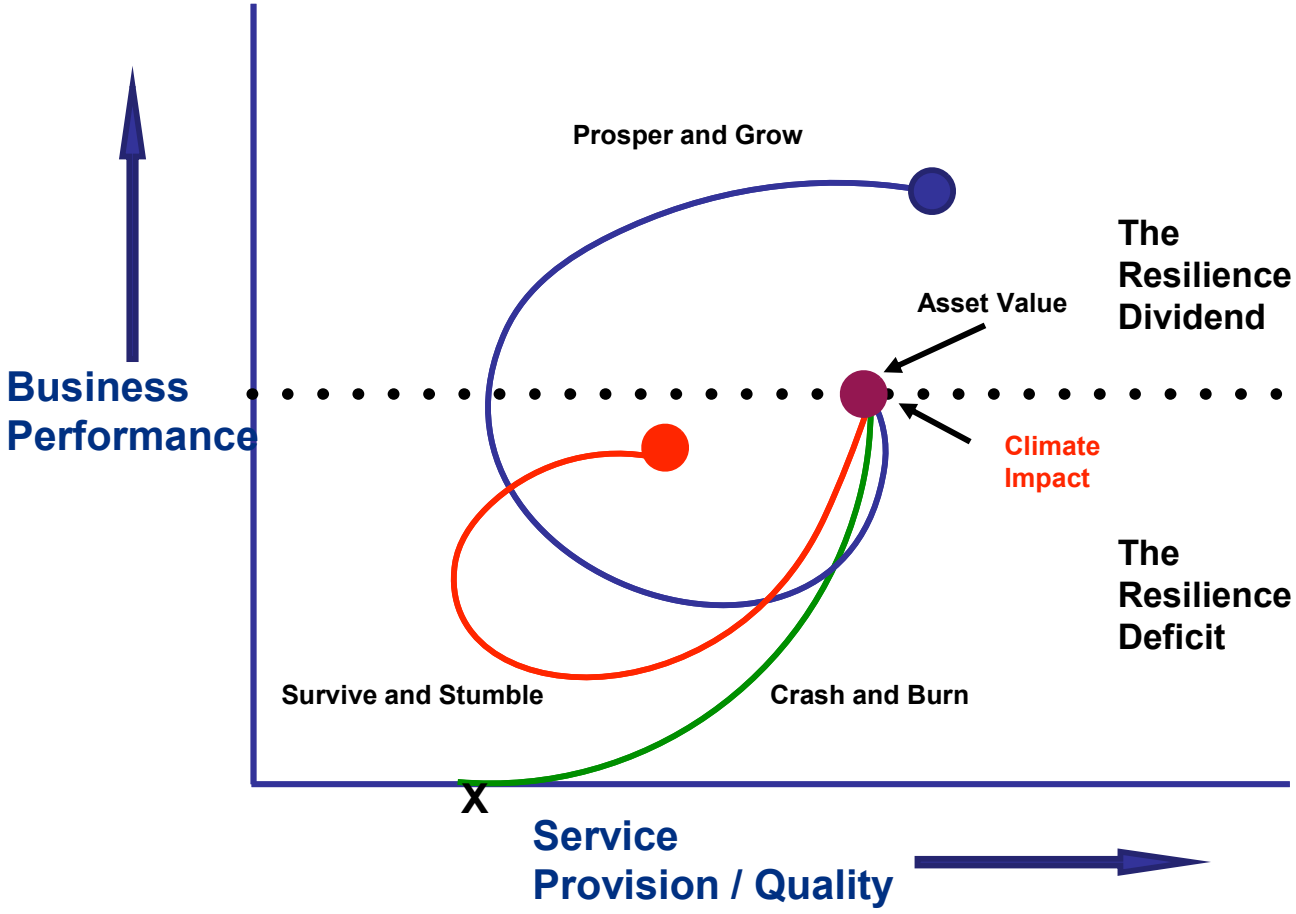
The response

KL's dual-purpose stormwater management and road tunnel (SMART). A 9.5km tunnel diverts floodwaters away from the confluence of the two major rivers while its central 3km section doubles up as a two-deck motorway. In extreme floods the road decks are flooded to increase stormwater capacity

The Outcome

Integrated transport and flood relief infrastructure

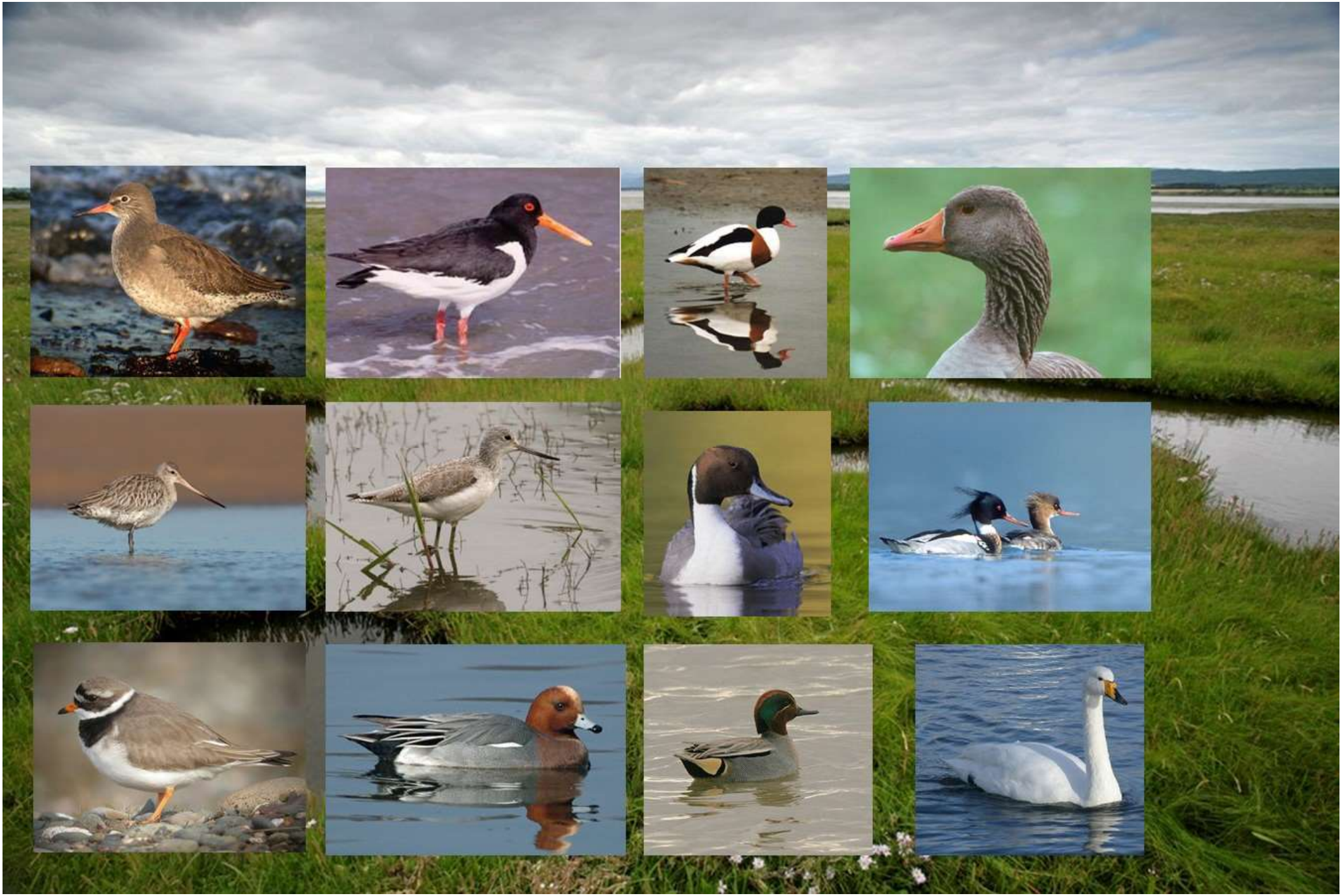
Promoting the Resilience Dividend



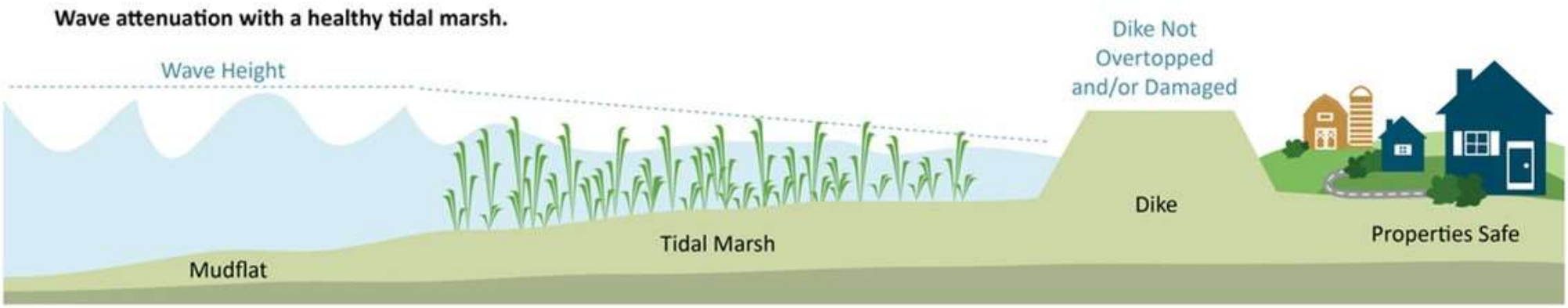
Managed coastal realignment: vital for a future Scotland

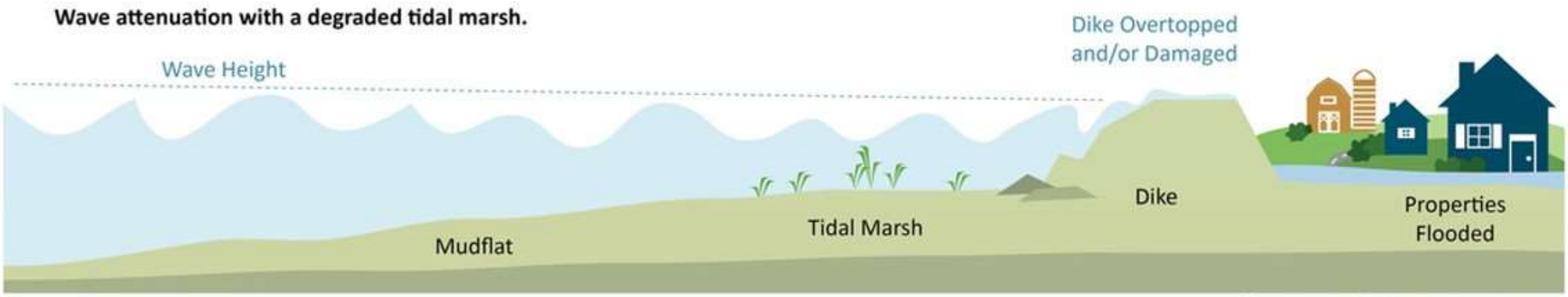
Jim Densham
Senior Land Use Policy Officer
RSPB Scotland

rspb giving nature a home



Coastal Defence





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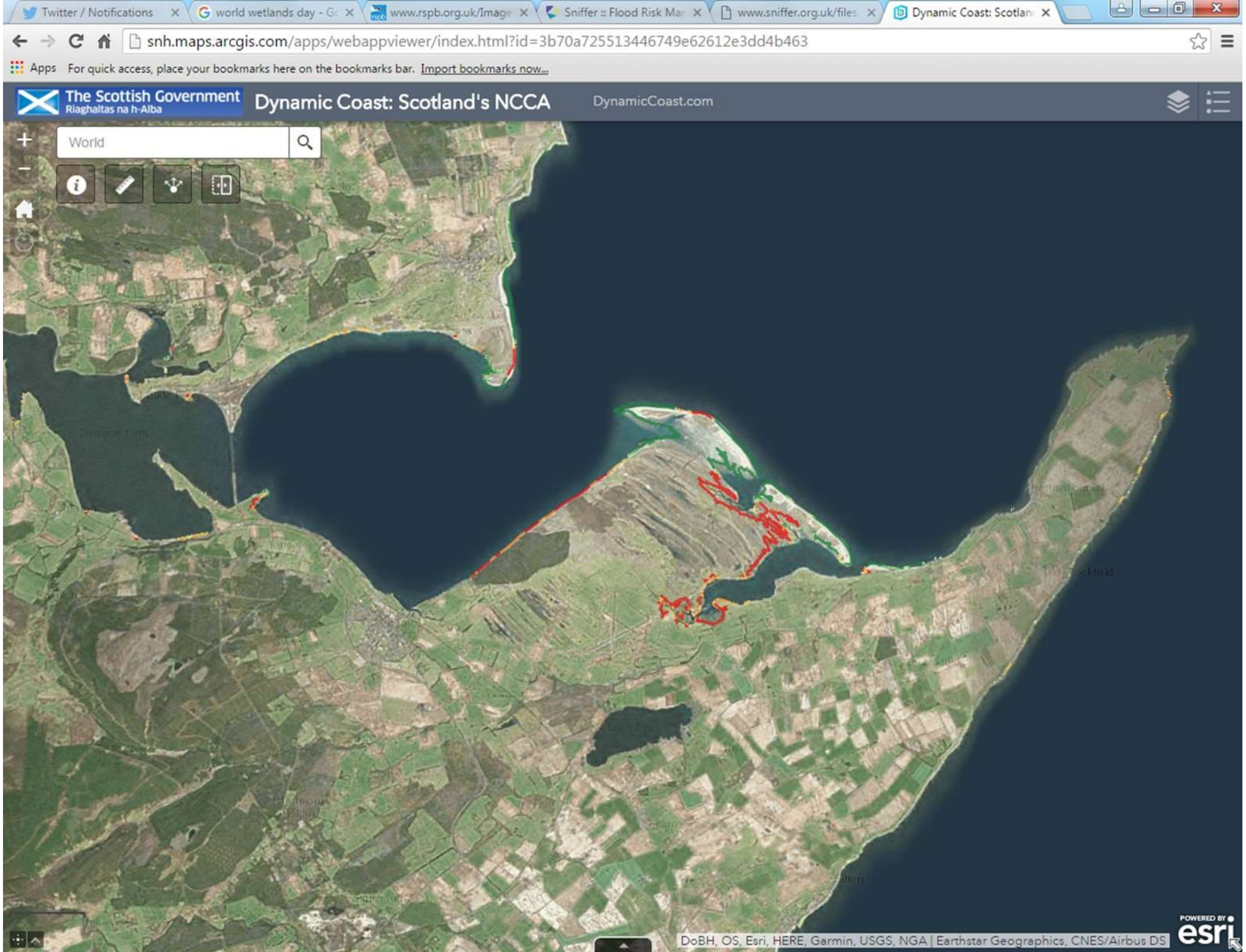
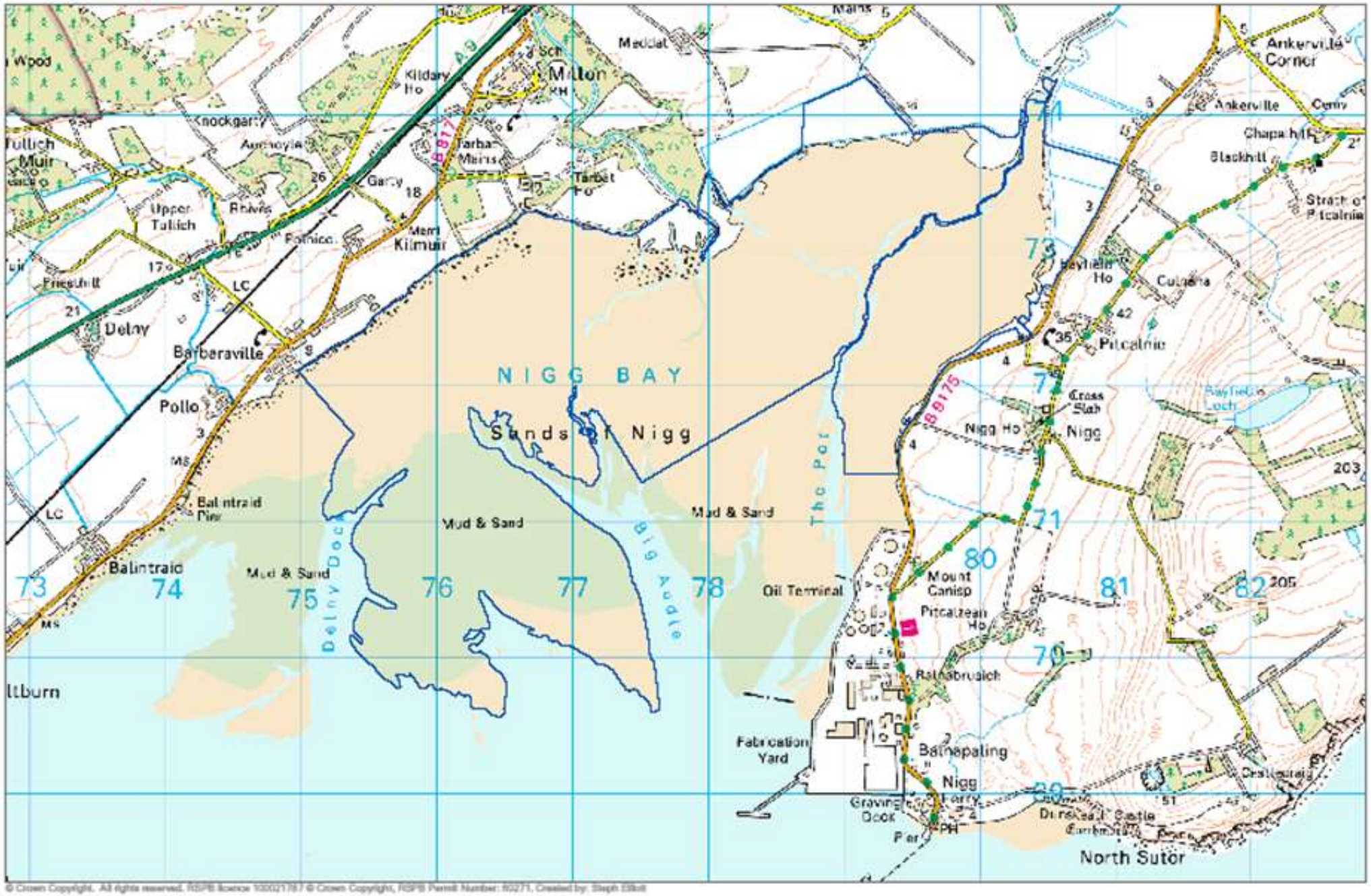

Twitter / Notifications
world wetlands day - G
www.rspb.org.uk/Image
Sniffer :: Flood Risk Mar
www.sniffer.org.uk/files
Dynamic Coast: Scotlan
snh.maps.arcgis.com/apps/webappviewer/index.html?id=3b70a725513446749e62612e3dd4b463
Apps
For quick access, place your bookmarks here on the bookmarks bar.
Import bookmarks now...
The Scottish Government
Riaghaltas na h-Alba
Dynamic Coast: Scotland's NCCA
DynamicCoast.com
World
DoBH, OS, Esri, HERE, Garmin, USGS, NGA | Earthstar Geographics, CNES/Airbus DS
POWERED BY esri

Nigg Bay nature reserve



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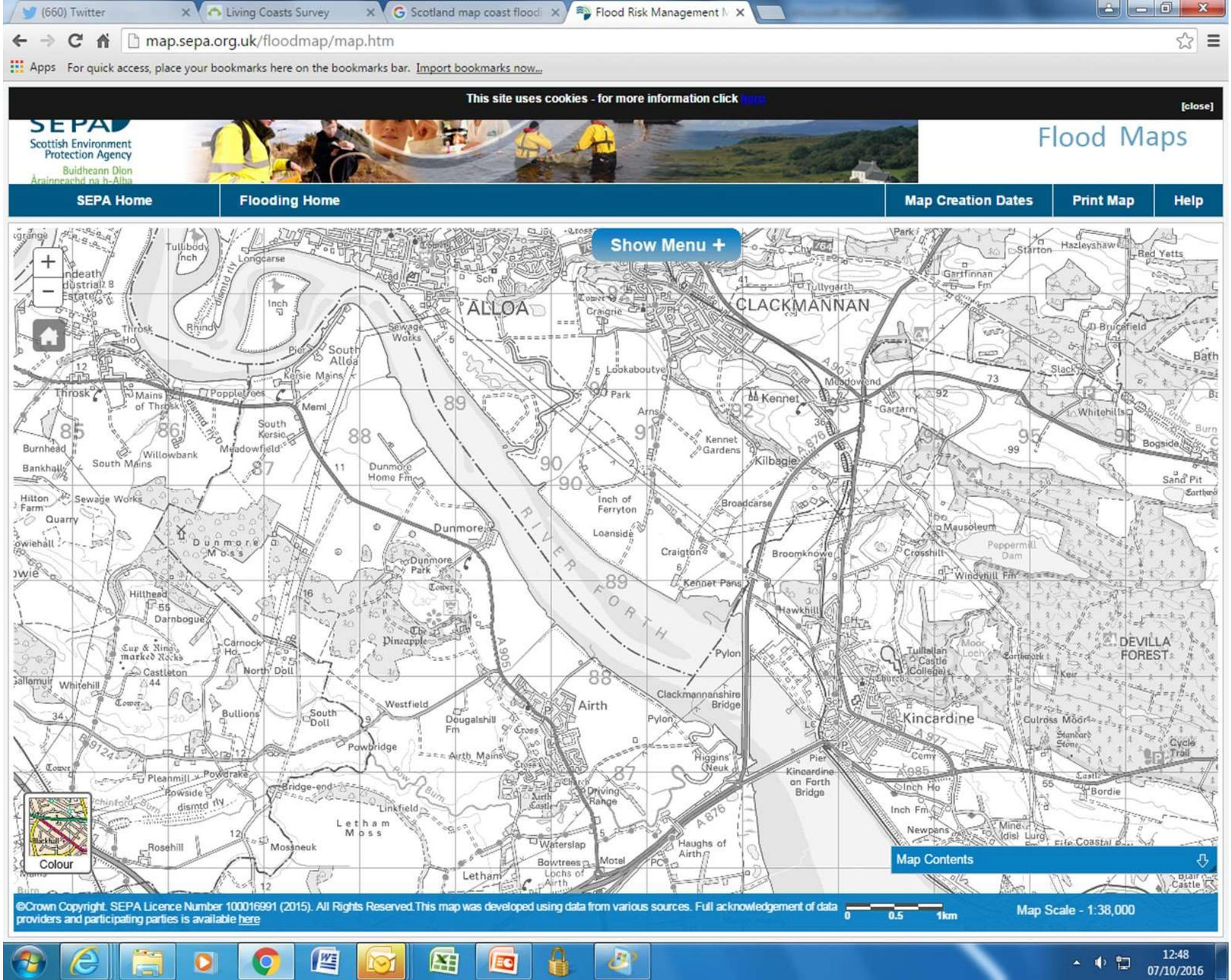
(660) Twitter
Living Coasts Survey
Scotland map coast floodi
Flood Risk Management
map.sepa.org.uk/floodmap/map.htm
Apps For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now...
This site uses cookies - for more information click here
[close]
SEPA
Scottish Environment Protection Agency
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Flood Maps
SEPA Home
Flooding Home
Map Creation Dates
Print Map
Help
Show Menu +
ALLOA
CLACKMANNAN
RIVER FORTH
Dunmore
Airth
Kincardine
DEVILLA FOREST
Kennet
Kilbagie
Colour
Map Contents
©Crown Copyright. SEPA Licence Number 100016991 (2015). All Rights Reserved.This map was developed using data from various sources. Full acknowledgement of data providers and participating parties is available here
0 0.5 1km
Map Scale - 1:38,000
12:48
07/10/2016

(640) Twitter | Living Coasts Survey | Scotland map coast flood | Flood Risk Management

map.sepa.org.uk/floodmap/map.htm

Apps For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now...

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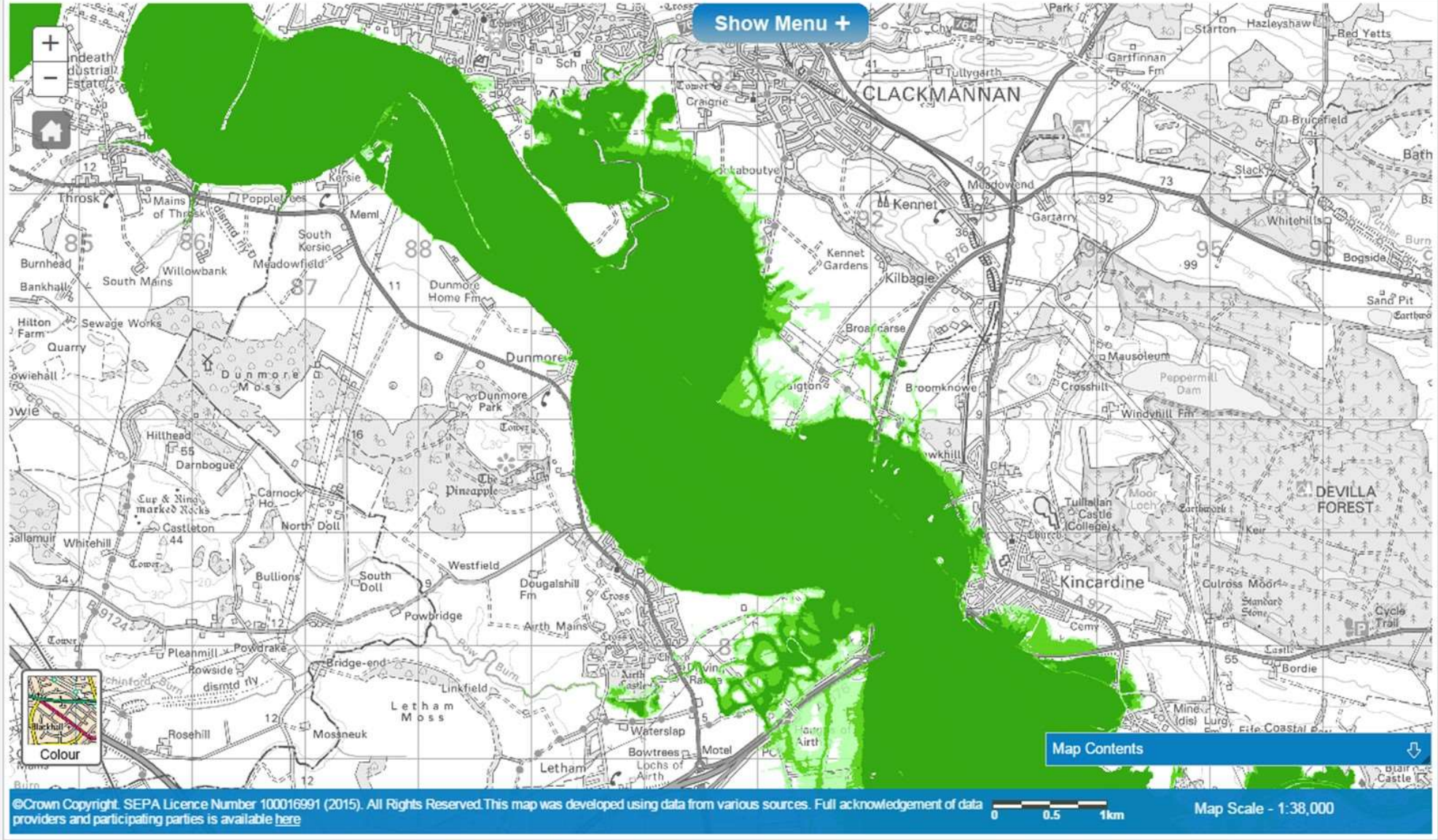
SEPA Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

Flood Maps

SEPA Home | Flooding Home | Map Creation Dates | Print Map | Help



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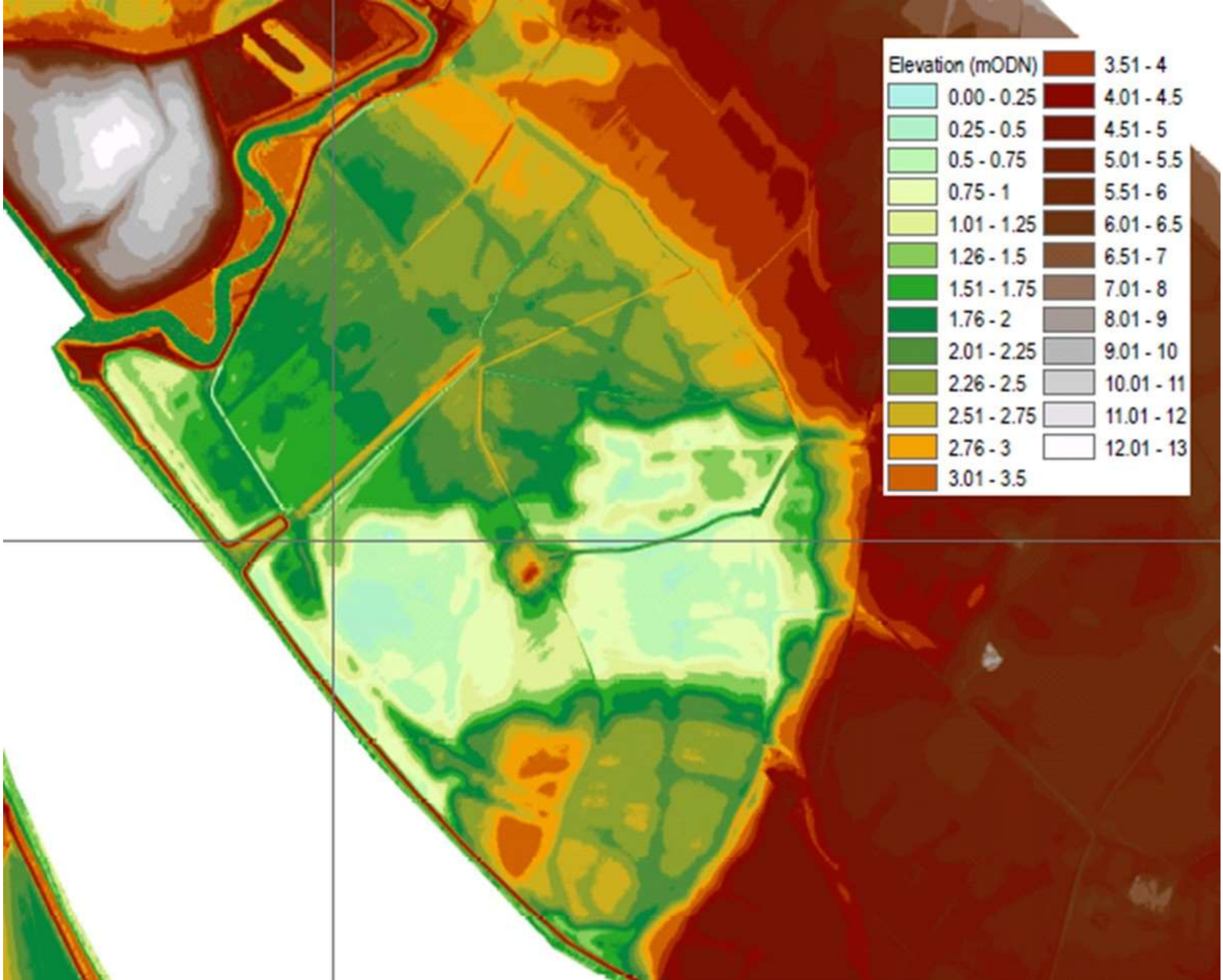
0 0.5 1km

Map Scale - 1:38,000

12:46
07/10/2016


Elevation (mODN)
0.00 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
1.01 - 1.25
1.26 - 1.5
1.51 - 1.75
1.76 - 2
2.01 - 2.25
2.26 - 2.5
2.51 - 2.75
2.76 - 3
3.01 - 3.5
3.51 - 4
4.01 - 4.5
4.51 - 5
5.01 - 5.5
5.51 - 6
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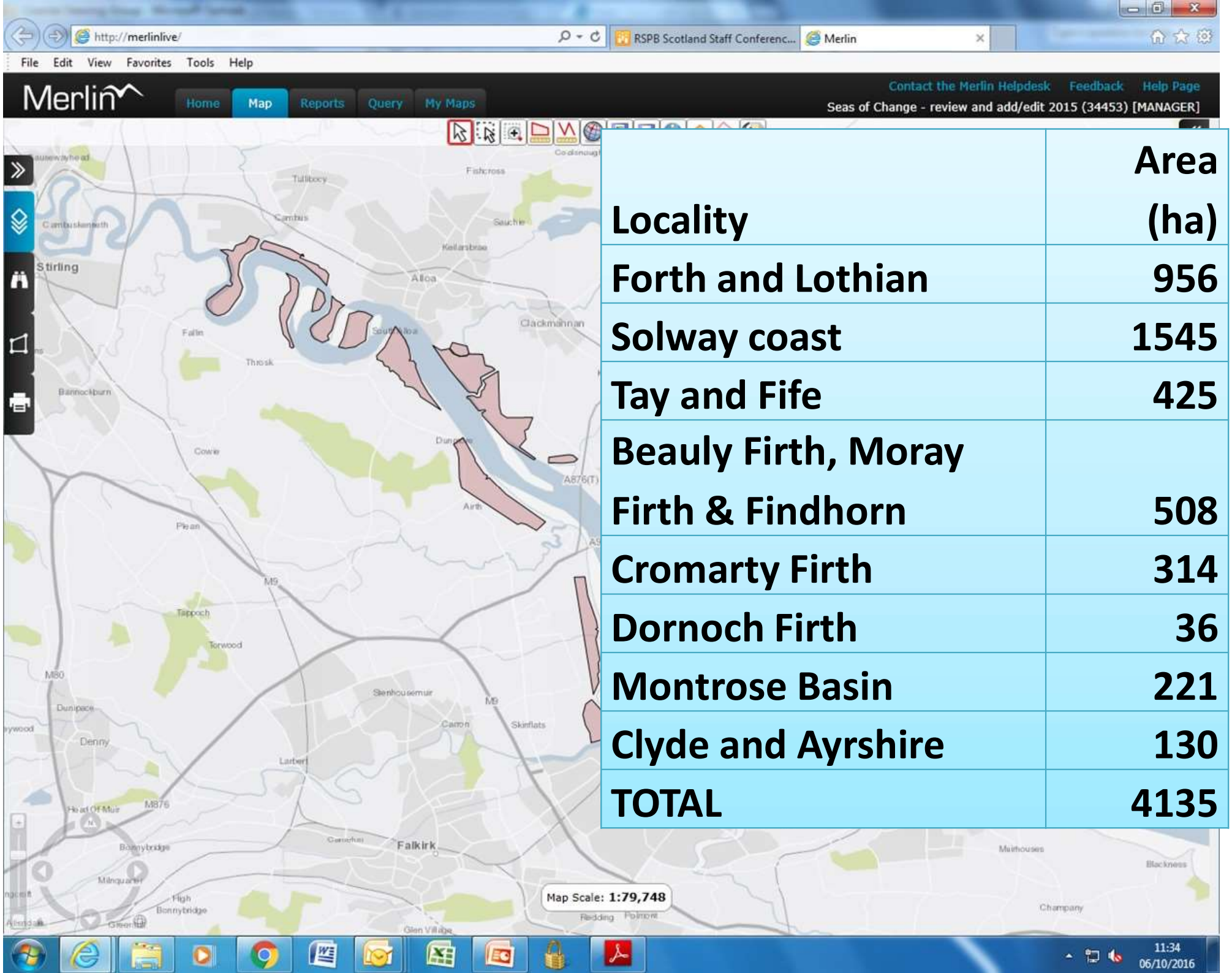
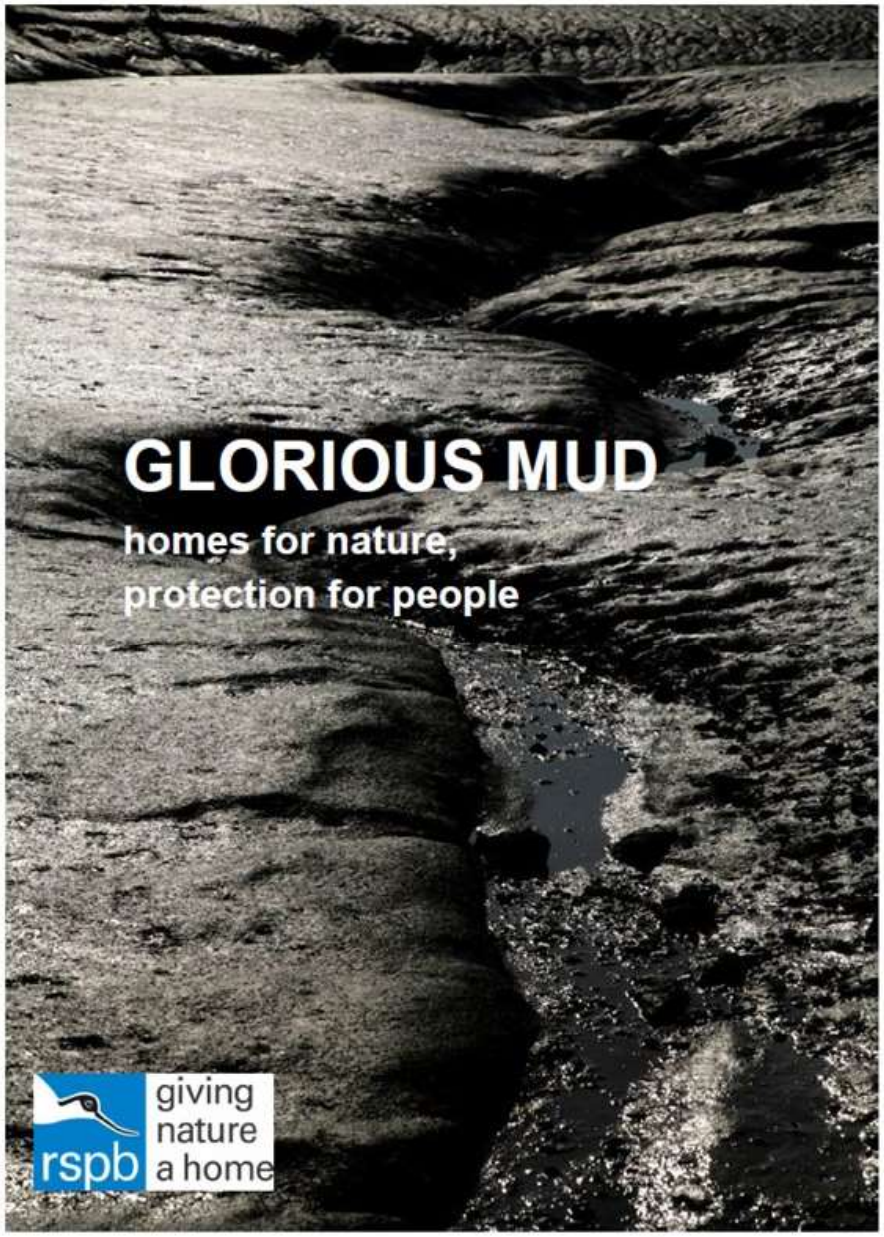


Locality	Area (ha)
Forth and Lothian	956
Solway coast	1545
Tay and Fife	425
Beauly Firth, Moray Firth & Findhorn	508
Cromarty Firth	314
Dornoch Firth	36
Montrose Basin	221
Clyde and Ayrshire	130
TOTAL	4135


GLORIOUS MUD
homes for nature,
protection for people
rspb
giving
nature
a home


http://bit.ly/1QFgS
74

Scotland needs to recreate a swathe of lost intertidal habitats along the coast to protect us from flooding and climate change, as well as providing more homes for wildlife.

To make this happen:

- A blueprint for coastal adaptation and change
- New funding for managed realignment

COUNTING THE COSTS OF CLIMATE CHANGE

Sarah Govan & Ruth Dittrich
(ClimateXChange & SRUC)

climate change

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

The project: adaptation economics and the costs & benefits of a changing climate

How can we record climate change cost data at a Council level, and link those costs to impact?

climate change

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

Visible impacts – with real costs

climate change

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

What we learned – operational & capital costs

Time and materials to

- accommodate tenants made homeless
- fix capital assets
- Support businesses to reopen
- COORDINATE RESPONSE - including costs to the Council

Impacts

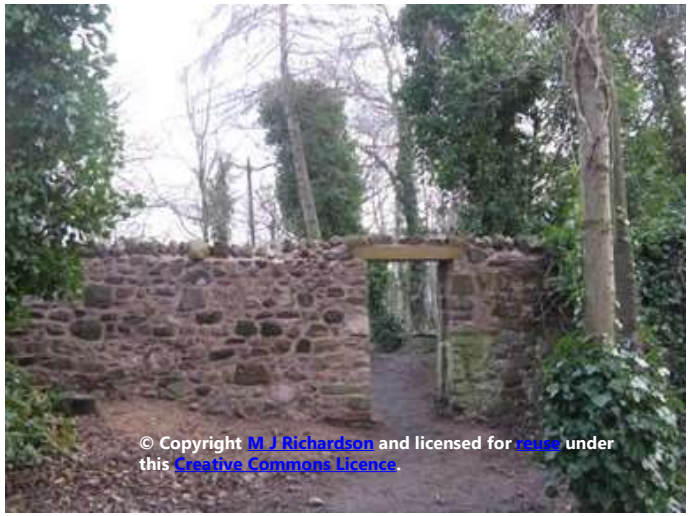
- Insurance – claims increase premiums/ deductibles
- Business planning – costs brought forward
- Building in resilience

What we learned - process

- **work within existing processes** - standard spreadsheet improved recording process
- **Challenges**
  - Calculation of staff time & impact on routine tasks
  - Process impacts – e.g. procurement rules
  - Being helpful within the remit & managing expectations
  - Temporary repairs (e.g. road surface) have high failure rate
  - Urgency – e.g. footpath works for pupils

Conclusion & Next Steps

- ’event-specific’ financial cost centres
- Understanding current costs to frame the scale and extent of future risk – this informs best management options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Next steps?

- Ideally - an economic appraisal of selected adaptation option(s)

Improving Community Flood Resilience in Areas Remaining at Risk

Dan Matthews

RAB Consultants

Resilience and Flood Risk

Resilience and Flood Risk

What?

Why?

How?


rab
Resilience and
Flood Risk

Resilience and
Flood Risk


rab
Resilience and
Flood Risk

RAB Consultants @RABConsultants · 7 Dec 2016

Today we provided an opportunity for the #Army to practice working with the @EnvAgency setting up temporary flood barriers. #floodaware

1 3

Stonehaven's flood defences - WOW that will stop a river!! #idiots #useless

rab

Resilience and
Flood Risk

Paul Reeves @PaulReevesEA · Jan 13

Great to see that #TeamEA are being looked after by the residents of #SouthFerriby 😍

1 8 22

Paul Reeves @PaulReevesEA · Jan 13

The @EnvAgency demountable #flood defences at #SouthFerriby stretch for over a mile.

2 17 20

Resilience and Flood Risk

Summary

- Collaborative planning
- Supported people
- Good practice, good practise
- Resilient communities

How can a similar approach support communities at risk in Scotland?

Resilience and Flood Risk

EMERGENCY PLANNING – EXERCISES – TRAINING

BUSINESS CONTINUITY – FLOOD RISK ASSESSMENTS

FLOOD RISK MANAGEMENT – DRAINAGE DESIGN

PROPERTY LEVEL FLOOD PROTECTION – ASSET INSPECTION

WWW.RABCONSULTANTS.CO.UK

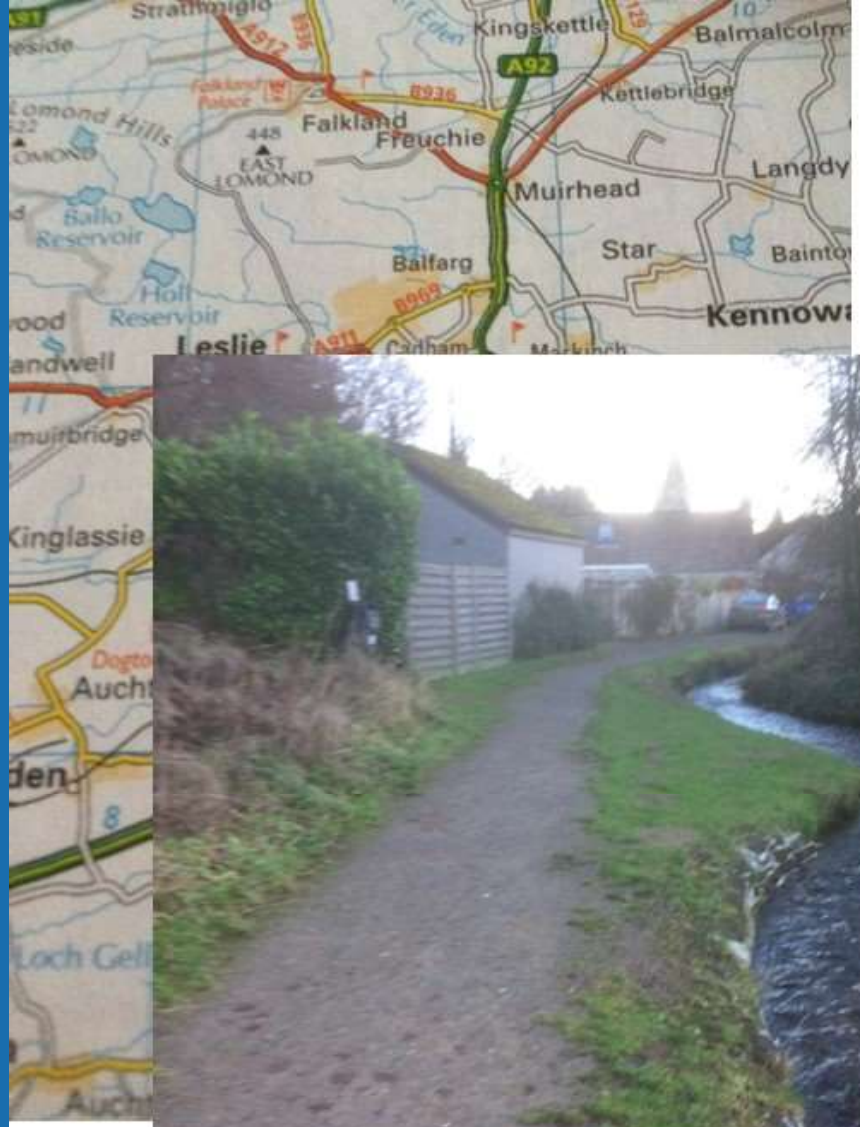
Scottish Flood Forum

supporting flood risk communities

Falkland Flood Action Group – Experience from the Frontline

Kirsty MacRae - SFF Director

John Brown - FFAG Chair and SFF Trustee


Kingskettle
Balmalcolm
A92
Kettlebridge
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Falkland
Freuchie
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EAST LOMOND
Langdy
Muirhead
Star
Bainto
Balfarg
B969
Kennowa
Leslie
A911
Cadham
Markinch
Ballo Reservoir
Holl Reservoir
Kinglassie
Auch
den
Loch Gell

Royal Burgh of Falkland and Newton of Falkland Community Council.

Constitution for Flood Action Group
(a sub-committee of F & N of F C C)

INTRODUCTION

Falkland and Newton of Falkland Community Council currently has responsibility t represent the interests of the whole community equally. Local interest and discussic influence the Local Authority in its decision making and policy development. There is requirement for Falkland and Newton of Falkland Community Council to look after loc issues such as planning, community safety, street lighting, playing fields and oth community specific matters.

The Flood Action Group will be responsible for:-

> Identifying potential flood sites and working with appropriate flood management and transportation officials in order to minimise the risk of flooding.

> Working closely with all Flood Management partners e.g. Fife Council; Falkland Estate Scottish Flood Forum.

> Make recommendations to the Community Council.

> Draw up an action plan with potential timescales.

> Seek potential sources of funding to establish flood control measures identified in the action plan and work with other relevant agencies.

> Manage a specific sub-bank account only for the purpose of Flood Management and prepare an income and expenditure statement to present to the Community Council.

MAKE UP

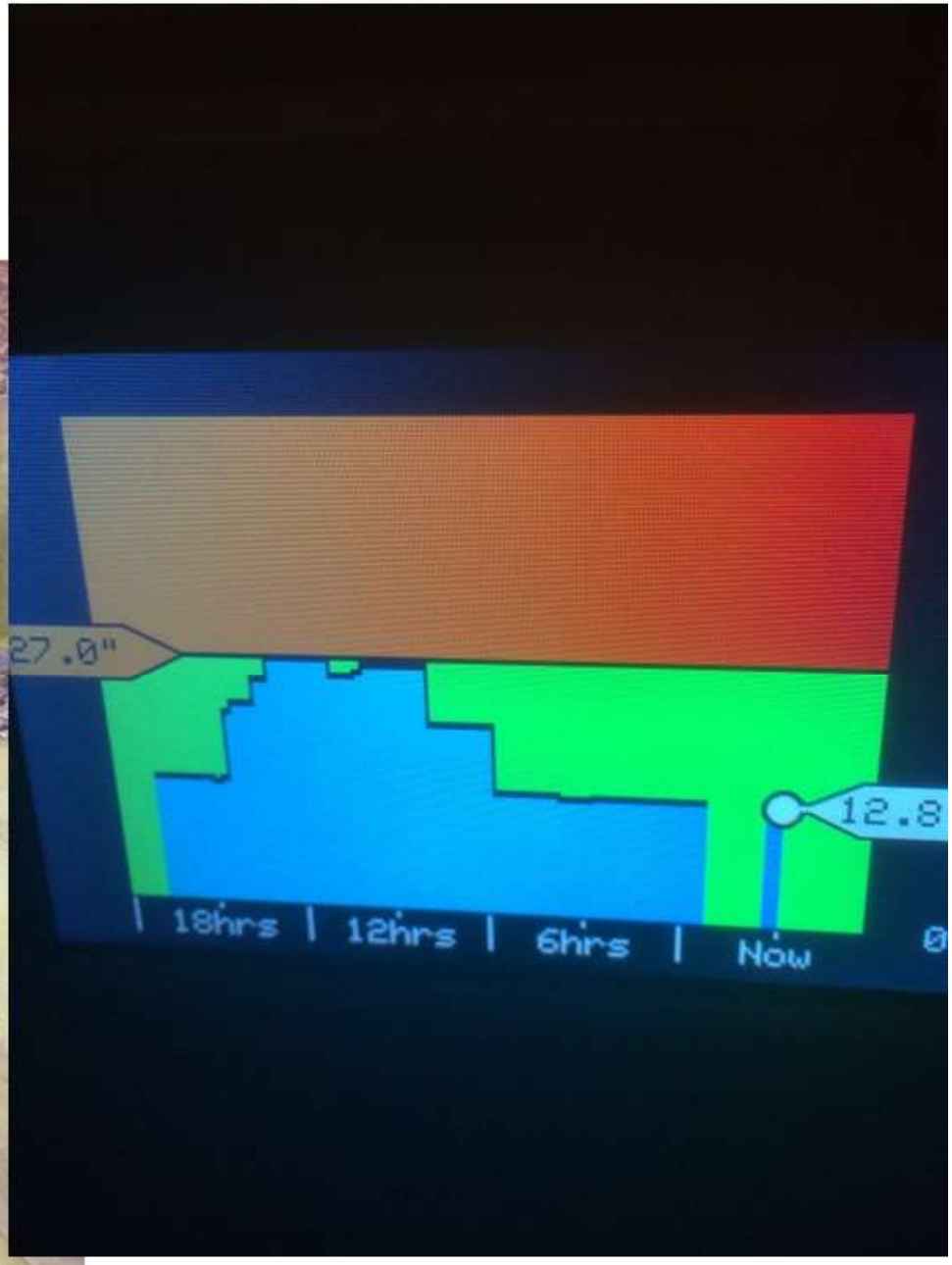
1. The Action Group will comprise of three Community Councillors. They will report bac to the Community Council on a regular basis.

2. At least, two other interested local residents will be co-opted to serve on the Action Group.

3. The Action Group will meet as often as deemed necessary, will be self-managed and will set its own agenda and record any decisions made.

4. Minutes or notes will be kept and reported to the Community Council.


GLENVALE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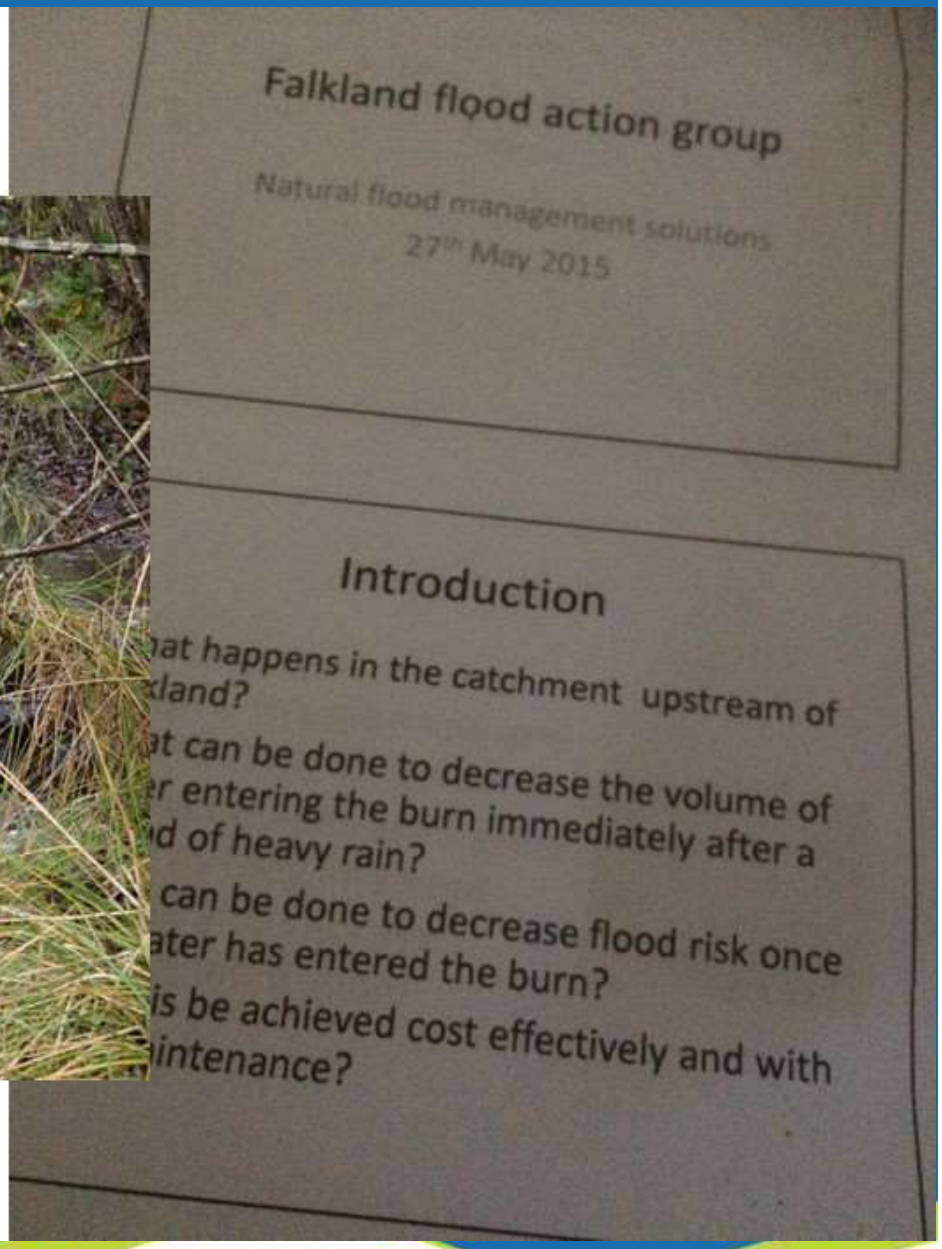
18hrs
12hrs
6hrs
Now


Falkland flood action group
Natural flood management solutions
27th May 2015
Introduction
at happens in the catchment upstream of
kland?
t can be done to decrease the volume of
r entering the burn immediately after a
d of heavy rain?
can be done to decrease flood risk once
ater has entered the burn?
is be achieved cost effectively and with
intenance?

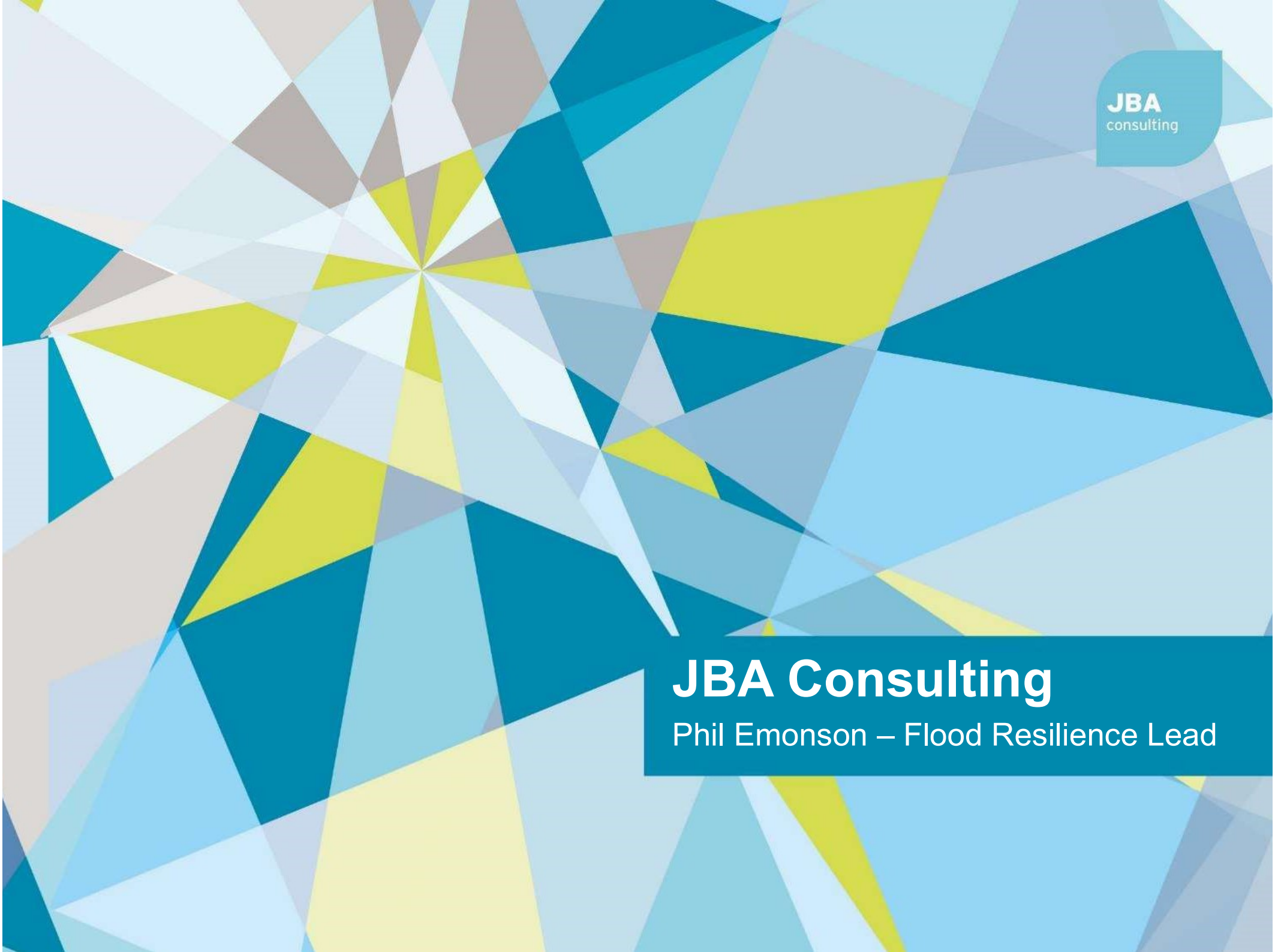
Next Steps

- Play our part in FRM plan implementation
- Creating a community emergency plan
- Succession planning

Contact details

Scottish Flood Forum
supporting flood risk communities

Web: www.scottishfloodforum.org



JBA Consulting

Phil Emonson – Flood Resilience Lead

The role of the individual in flood preparedness

- What is flood resilience and preparedness?
- Personal flood plans and community emergency plans
- Case study – Chew Magna

Damage to property

Stress, anxiety

Long recovery

Mental trauma

What is flood resilience?

- “Capacity to withstand shock and recover quickly”
- Being prepared – a state of mind
- Taking steps to reduce the impact
- Learning lessons from previous events

Personal flood plans

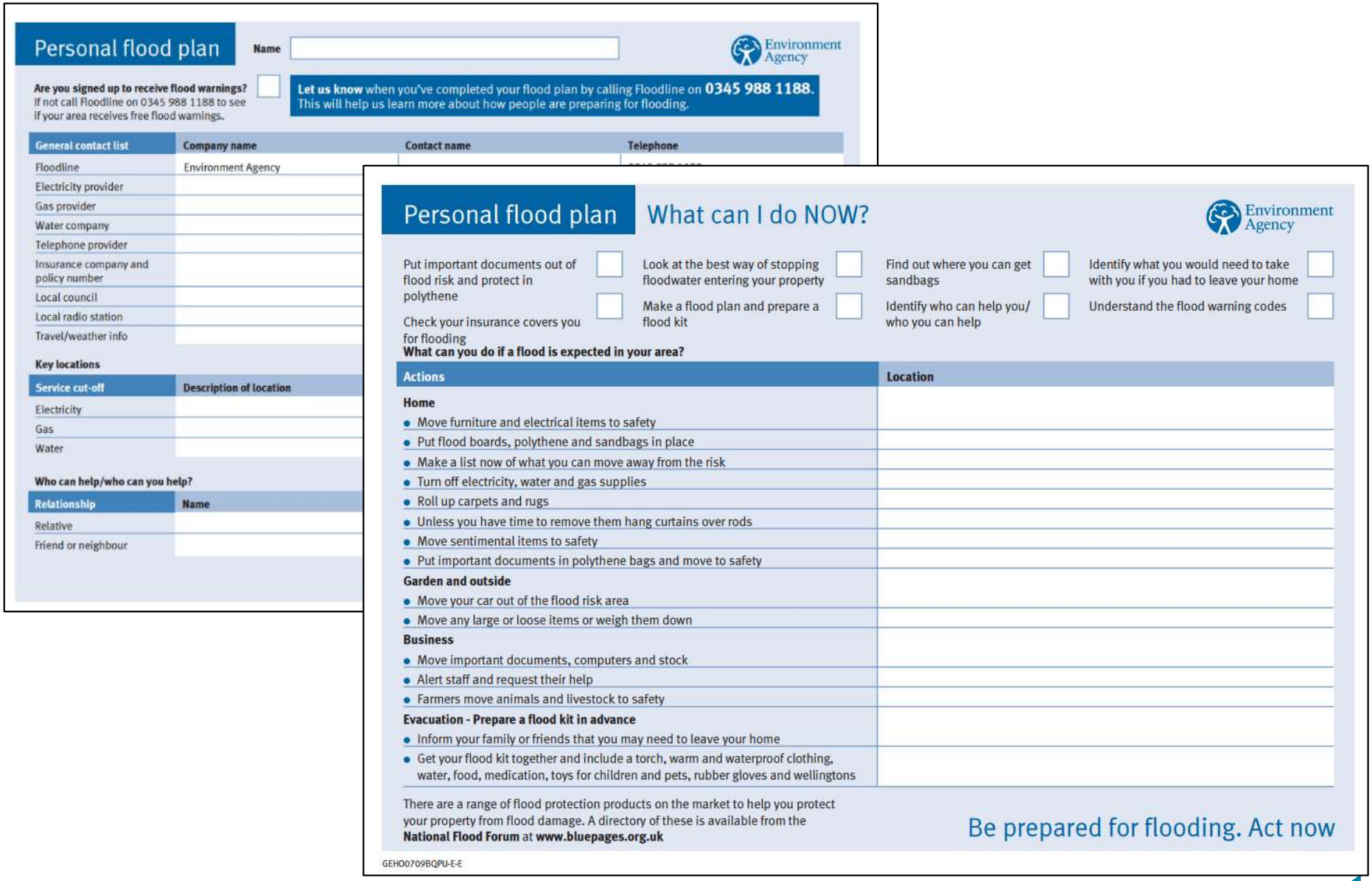
Before a flood….prepare a plan

- Prepare a flood kit (head-torch, hi-vis etc.)
- Discuss with neighbours – set up flood group
- Invest in PLP
- Maintain PLP and regularly rehearse deployment
- Think if help might be needed, and who from

When a flood is forecast…

- Move furniture and sentimental items to safety
- Put important documents in sealed waterproof bag
- Move your car
- Deploy PLP

Personal flood plans



Personal flood plan

Name

Environment Agency

Are you signed up to receive flood warnings?
If not call Floodline on 0345 988 1188 to see if your area receives free flood warnings.

Let us know when you've completed your flood plan by calling Floodline on **0345 988 1188.** This will help us learn more about how people are preparing for flooding.

General contact list	Company name	Contact name	Telephone
Floodline	Environment Agency		
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company and policy number			
Local council			
Local radio station			
Travel/weather info			

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Who can help/who can you help?

Relationship	Name
Relative	
Friend or neighbour	

Personal flood plan — What can I do NOW?

Environment Agency

- Put important documents out of flood risk and protect in polythene
- Look at the best way of stopping floodwater entering your property
- Find out where you can get sandbags
- Identify what you would need to take with you if you had to leave your home
- Check your insurance covers you for flooding
- Make a flood plan and prepare a flood kit
- Identify who can help you/ who you can help
- Understand the flood warning codes

What can you do if a flood is expected in your area?

Actions	Location
Home	
• Move furniture and electrical items to safety	
• Put flood boards, polythene and sandbags in place	
• Make a list now of what you can move away from the risk	
• Turn off electricity, water and gas supplies	
• Roll up carpets and rugs	
• Unless you have time to remove them hang curtains over rods	
• Move sentimental items to safety	
• Put important documents in polythene bags and move to safety	
Garden and outside	
• Move your car out of the flood risk area	
• Move any large or loose items or weigh them down	
Business	
• Move important documents, computers and stock	
• Alert staff and request their help	
• Farmers move animals and livestock to safety	
Evacuation - Prepare a flood kit in advance	
• Inform your family or friends that you may need to leave your home	
• Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons	

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at **www.bluepages.org.uk**

Be prepared for flooding. Act now

GEHO0709BQPU-E-E

Case Study – Chew Magna

- History of flooding, and no cost effective solutions
- PLP provided as part of early pilot
- Sense of resilience?
- **Severe flooding in September and November 2012**

- **Lessons learnt about homeowner preparedness, the need for pumps, appropriate language and community resilience**

Case Study – Chew Magna

- Take time to engage, listen and build trust
- New community flood forum set up
- PLP audits undertaken
- Individuals encouraged to develop personal flood plans
- Importance of updating community emergency plan
- Aim: legacy of personal and community resilience

<u>Storm Angus: November 2016</u>

- Severe rainfall, flooding through village
- Residents prepared. PLP deployed – no internal flood damag

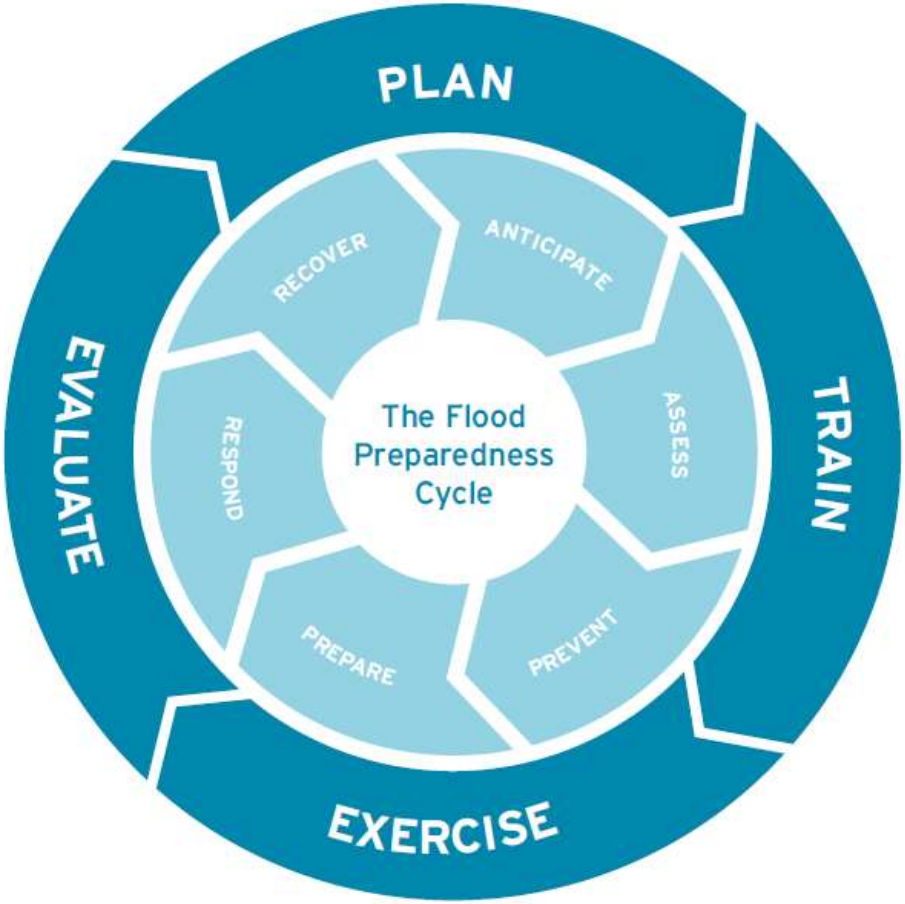
Best Practice

- Language is key. People understand “you can’t stop or prevent flooding”
- Manage expectations
- Tools like PLP and flood plans can help people prepare, reduce damage and stress
- **Research by JBA for Scottish Government (2013) found 75% of residents asked had practiced installing their PLP**





Flood Preparedness Cycle



- Prepared individuals working together to build resilient communities
- Flood wardens and community flood plans

Final thought…

Less of this	More of this
	   **Preparedness: empowering people to take action**

Phil Emonson
BSc MSc MCIWEM C.WEM MEPS

Principal Analyst & Flood Resilience Lead

Tel: 07436 814073
Email: philip.emonson@jbaconsulting.com

Community delivered Natural Flood Management at Alwinton, Northumberland

Pete Kerr and Shannon Kerr

8th February 2017

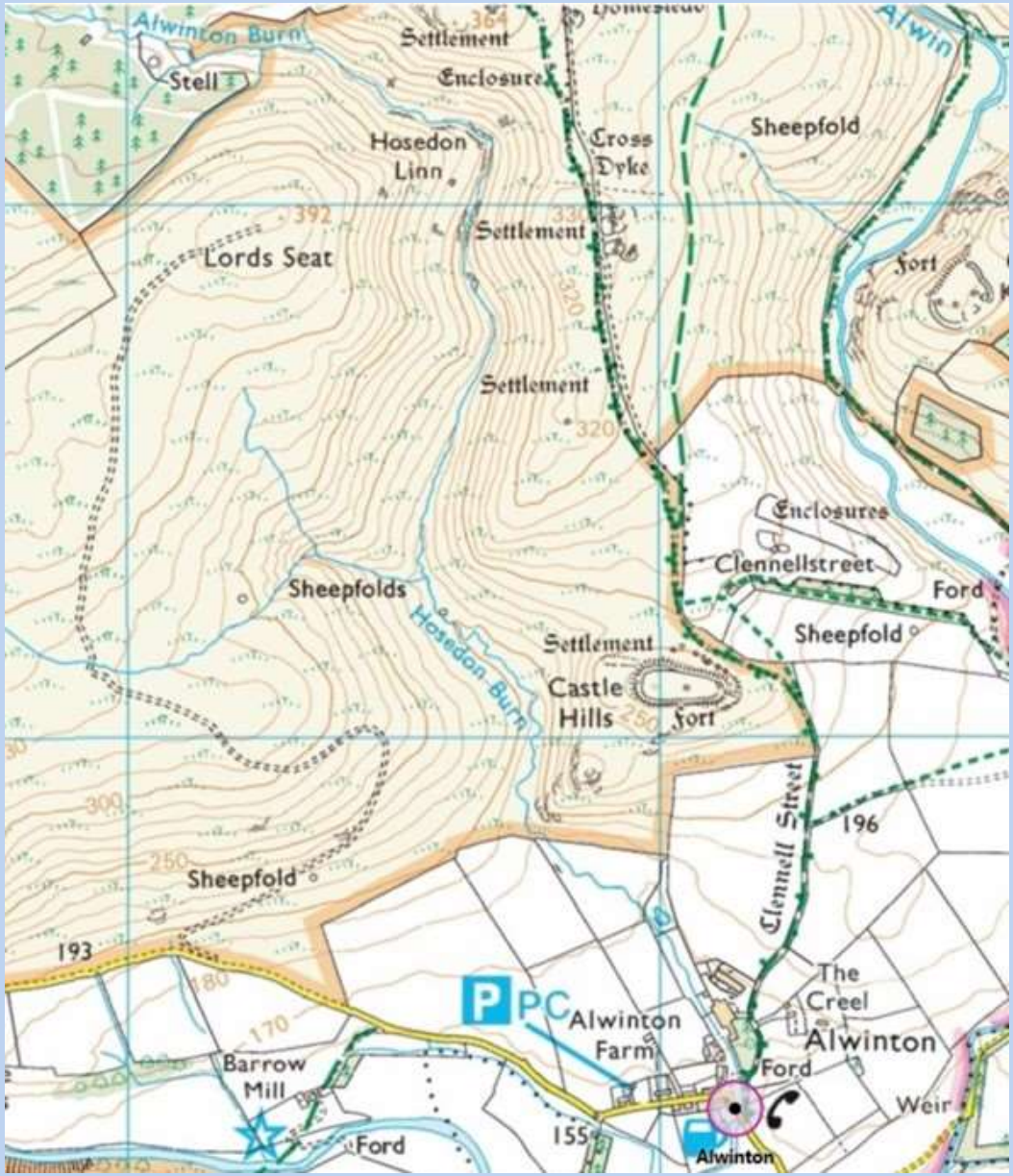
Riverworks

Introduction/background

- funding constraints and an expectation of greater community involvement are common themes.
- Instead of traditional methods of delivering NFM, we will see more schemes being delivered **BY** communities with **support** from traditional ‘deliverers’.

Riverworks

Alwinton, Northumberland



Located in the upper Coquet valley.

Steep, flashy catchment of the Hoseden Burn results in no time for warnings.

Community also becomes cut-off as roads go under water.

Flooding in 1996, 2000, 2005, 2008. Usually 4-6 properties affected.

Two phases of Community led works

- In 2002, the Environment Agency supported £10k of works to the channel, delivered by the community (improved conveyance, earth bunds, gravel management, flood routing away from the village).
- In 2016, Northumberland County Council followed this with £20k of upstream works to ‘slow the flow’.

Riverworks

How is this scheme different?

- Concepts developed by Riverworks were developed by the farmer and contractor.
- Local contractors were very cost effective.
- CDM and procurement challenges to overcome.
- This is a ‘local project’ that was **supported** by others.

Riverworks

Techniques used at Alwinton

Natural flood Management

- Timber barriers slowed the flow, utilised storage on flood plains and increased overland flow.
- Since completion in November 2016, the works have already been effective in Storm Angus in December 2016, apparently preventing flooding.

Riverworks

Insights from those involved

Graham Dixon, Farmer and main Contractor:

"We believed that we could get the best deal from local contractors. Managing the work ourselves meant that we were confident that farm processes would be unaffected."

David Livingstone, delivery of the timber barriers:

"This approach worked for us because we already had a good working relationship with both Graham and Pete. We were able to get a great deal for the larch locally."

Riverworks

Insights from those involved

Dave Green, Project Manager Northumberland County Council:

"This approach removed the need for us to reach agreement with the farmer and the community as the design developed. Health and safety and procurement required a bit more work."

Margaret Ward, Alwinton Parish Council:

"We are delighted that we were able to move quickly from ideas to delivery of our scheme. Using local contractors is extremely important for the rural economy."

Riverworks

Lessons learned

- Having a farmer lead with construction results in health and safety and procurement challenges. These can be overcome!
- It is important to trust the farmer and sub-contractors to do things properly.
- This local approach leads to a far greater sense of ‘ownership’ in final works.
- It can also be far quicker and cheaper.

Riverworks

Riverworks

- Riverworks Ltd is a small family business based in Northumberland. We focus on design and build approaches which are **pragmatic, cost effective and inclusive**.
- We deliver Natural Flood Management projects, river erosion works and fish passes.
- www.riverworksdesignandbuild.co.uk
- Peter Kerr, Director – pkerr3@sky.com

Raising Awareness of Flood Risk Management in Clackmannanshire Council

Stuart R. Cullen
Principal Roads and Flooding Officer

Flood Risk Management (Scotland) Act 2009

- Scottish Ministers,
- & SEPA,
- & All Responsible Authorities have a Duty under the Act - Section 1, (2) (c) iii
- to “act with a view to raising public awareness of flood risk..”
- A generic Action in all 14 Local Flood Risk Management Plans

Resource Issue

- Lack of adequate resources in most Local Authorities to deliver FRM duties
- Efforts to Raise Awareness seen as Low Priority compared to practical Actions.
- Lack of experienced Staff (in this discipline) &
- Lack of Staff Time BUT,
- practical benefits are possible

Initial Efforts

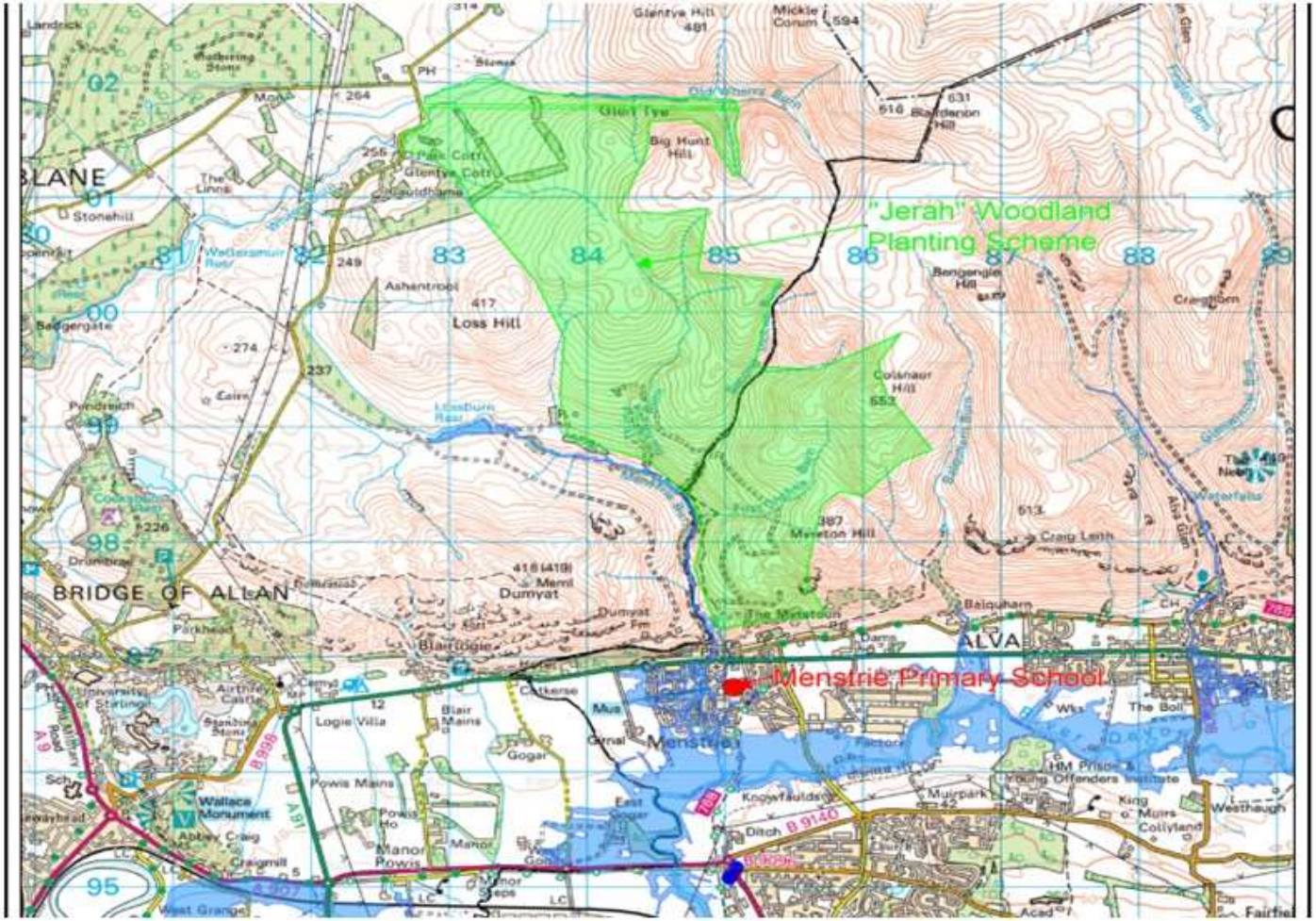
- Engagement events Organised in 2015/16 by Education Scotland's former Community Resilience Officer (Eilidh Soussi)
- Process akin to "Speed Dating"
- What approach will create the biggest "Bang for my Buck"?
- Spread the effort or a focused approach ?

Meeting Menstrie Primary School Teachers

- “Learning for Sustainability” teacher training Event in Stirling – October 2016
- Like Speed Dating again / Council selling it’s wares
- Public Engagement Event organised by Menstrie Primary School
- Nominal Effort led to Public Engagement Event

Previous Informal Chats/Contacts

- “Jerah” Woodland Planting Scheme in Menstrie Burn Catchment – 2014/15
- “Jerah” Consented by Forestry Commission
- Site Operators are Tilhill Forestry
- Heriot Watt University – Academic Study in catchment



Jerah Woodland Planting Scheme in the Menstrie Burn Catchment.

Subsequent Informal Chats / Contacts

- Scottish Flood Forum
- The Conservation Volunteers / Local Groups
- SEPA (ongoing)
- Community Council Liaison Contacts

Some Lessons

- From "I am far too busy for this " to seeing efforts as a useful use of time was rewarding.
- Current position stemmed from an unplanned start
- My approach changed from a “closed” to an “open” mind.
- Establishing one contact can often lead to others.
- The contacts I made also had workload issues but were keen to be involved because I was.
- Effort now to establish & support community groups must have long term benefits.

Some more Lessons

- FRM Community groups need ongoing support to continue to exist.
- Joined up approach from emergency response sectors and responsible authorities is needed.
- Better informed communities will be better prepared, more able to help themselves and others when the time comes and will be more able recover afterwards.

Rosie Walker

The Conservation Volunteers
Senior Project Officer

‘Community River Monitoring Volunteer Project’ - Monitoring Sediment Movement and Blockages on Hillfoots Burns

Projects aim: is to help raise awareness of flood risk in the Council area and to get local communities involved in recording useful information about some of the Hillfoots Burns.

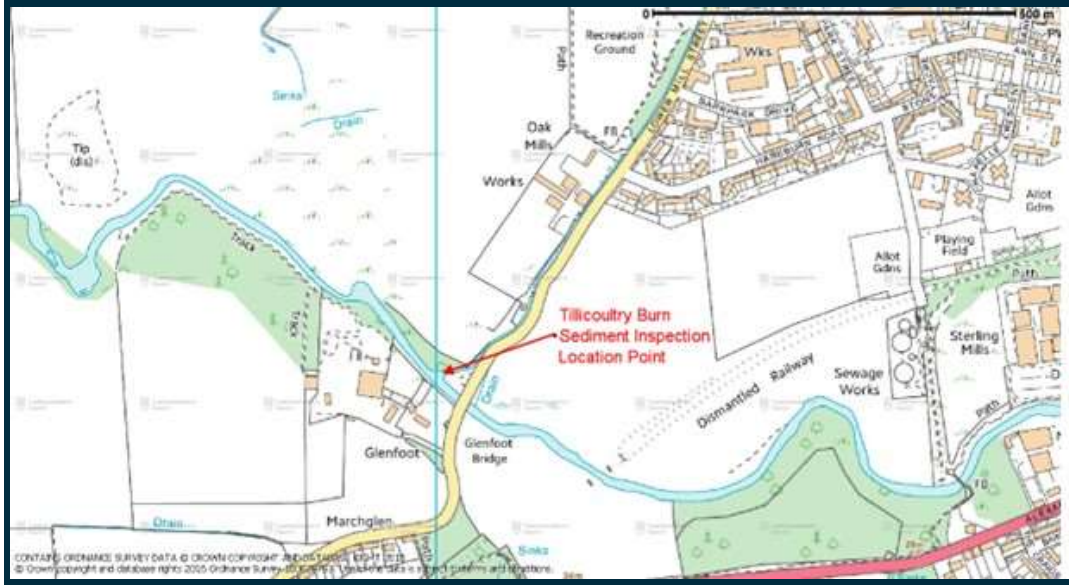
Scotland Counts

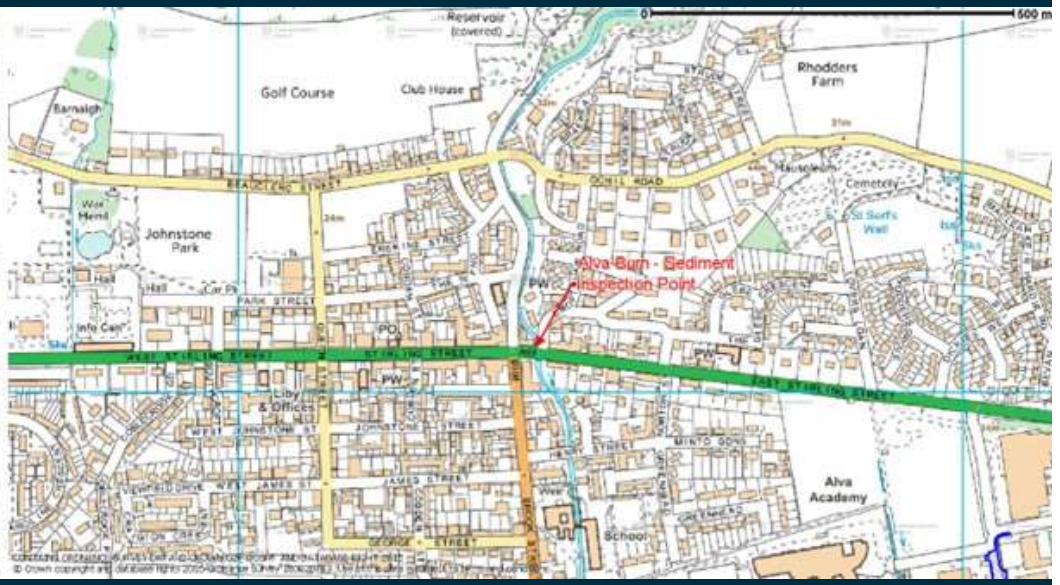
TCV The Conservation Volunteers

Clackmannanshire Council

The Scottish Government
Riaghaltas na h-Alba

Data Collected by Community River Monitoring Volunteers





Data Collected by Community River Monitoring Volunteers

Tillicoultry Burn Confluence with River Devon

Survey details

Date: 15th September 2016

Time: 12pm

Location: Tillicoultry Burn confluence with River Devon

Current weather observed on site: dull, cloudy and mild

Rainfall (mm/hour) for today: 00.8mm

Rainfall (mm/hour) day prior: 02.3mm

Written description of volunteer observations:

- River medium flow of water since recent showers of rain yesterday
- Wooden debris and vegetation (medium branches) build up and boulders exposed. No visible sediment blockages. Noted visible boulders and will note of any changes in movement or new boulders appearing

How Citizen Science helped Clackmannanshire Council

- Data collection at key points on these Hillfoots watercourses
- Generated good contacts with local volunteers in Alva, Tillicoultry and Dollar
- Raised awareness of FRM and Community Resilience
- The Community River Monitoring report contents and data will be included in JBA Consulting Ltd “Flood Risk Options Appraisal in Tillicoultry”

Feedback from Community River Monitoring Volunteers

They have enjoyed taking part in this project and feel that they have made an active contribution to flood management in the local area where flooding is prone to occur and feel as a result of taking part the flood risk benefits of the survey is early intervention to help prevent localised flooding.

The project has increased volunteer knowledge of Flood Risk Management (FRM) issues but also to encourage establishments of links between volunteer groups and the Clackmannanshire Council's FRM staff.

Lessons learned

- Ongoing project development
- Support
- Encouragement and advice
- Further tools to aid data management

Future

- Continue to work with the Community River Monitoring Volunteers
- Explore opportunities to expand the remit of project
- Discuss longer term projects to further train and up skill volunteers and progress them to record more valuable data

10 News

Do your part to prevent flooding

VOLUNTEERS have been asked to keep an eagle eye on water levels in their local burns to help prevent flooding.

Environmental monitoring helpers from The Conservation Volunteers will take photos of Tillicoultry, Alva and Dollar Burns so blockages and sediment movement can be recorded.

The aim of the project is to better understand how sediment moves in the burns and how blockages form. It is also hoped it will help raise awareness of flood risks in the area.

Information gathered will be relayed to the Menstrie Weather website to record rainfall levels.

The monitoring will also allow volunteers to chart climate change, wear and erosion.

The Conservation Volunteers can then pinpoint flooding areas and sediment build up which will allow action to be taken if necessary.

Photos are to be taken at regular intervals from once a week to once a month and volunteers should get pictures after periods of heavy rainfall.

From the vantage point the recorder needs to be able to see the full width of the burn channel and slightly above the river if it is safe and accessible.

To get involved with the project, contact Amanda Malcolm at The Conservation Volunteers on a.malcolm@tcv.org.uk

USING SPATIAL DATA TO GUIDE EFFECTIVE DECISION MAKING

OS MasterMap Water Network Layer

Working with Scottish Environment Protection Agency and Environment Agency, OS created OS MasterMap Water Network Layer.

The most comprehensive GB set of water courses.

OS MasterMap – Water Layer data is a three-dimensional link node network for water features across Great Britain. It contains over 3.5m sections of river network from the River Clyde to the marshland areas and everywhere in-between.

What we focused on

Catchment data

Names of primary watercourses in native languages

Flow and connectivity focus

Gradient

Relative position of water courses over or under each other

Average widths

3D Geometry

Additional information provided by national and local authorities, for example – culverts

What did we create

- More than 3.6m water links
- More than 230,000 lakes
- More than 9000 canals
- Fully topologically structured
- Catchment information
- Maintained in line with topography data
- Designed off of open standards
- Fully extendible specification
- And so much more

Some unexpected findings

- **Sharing data between organisations**
- **Spatial tools to support data analysis**
  - **Where**
  - **What**
  - **Who**
- **Reduction in training**

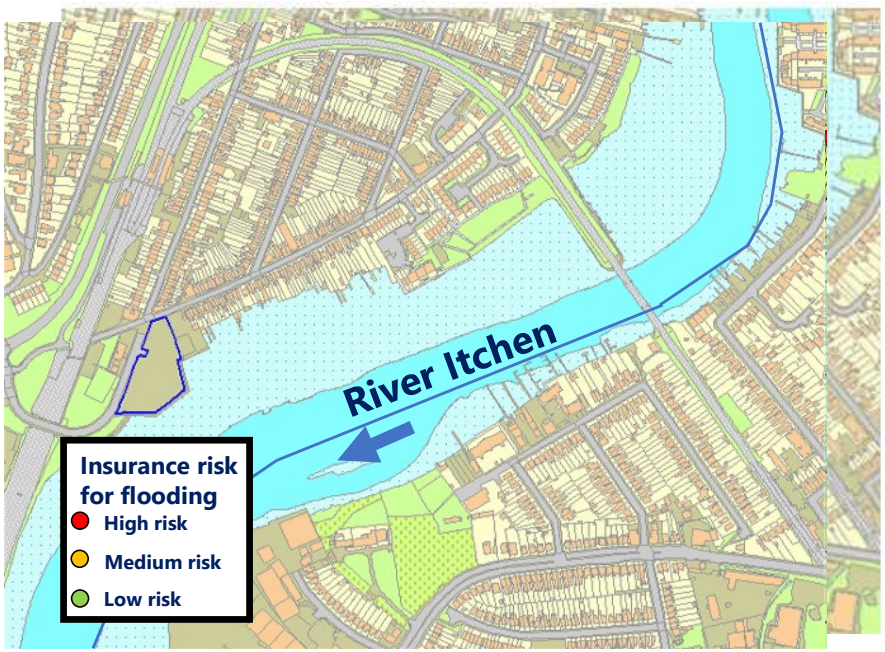
USES

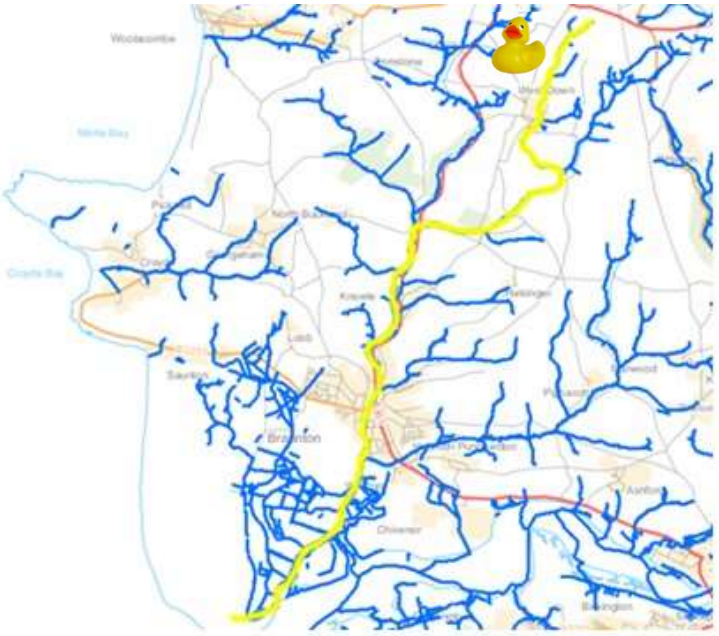
• Intended for use with other datasets to create the answer. Underpinning the following applications:

- Flood risk understanding
- Flood risk mitigation planning
- Flood response planning and execution
- Environmental impact analysis
- Tracing of contamination
- Asset management and protection
- Detailed flood modelling for insurance and land & property

• Base data that requires additional datasets incorporated to enable a full understanding of the risks of flooding. As such it will require input from expert partners especially for the insurance and land and property market

Where did it go?

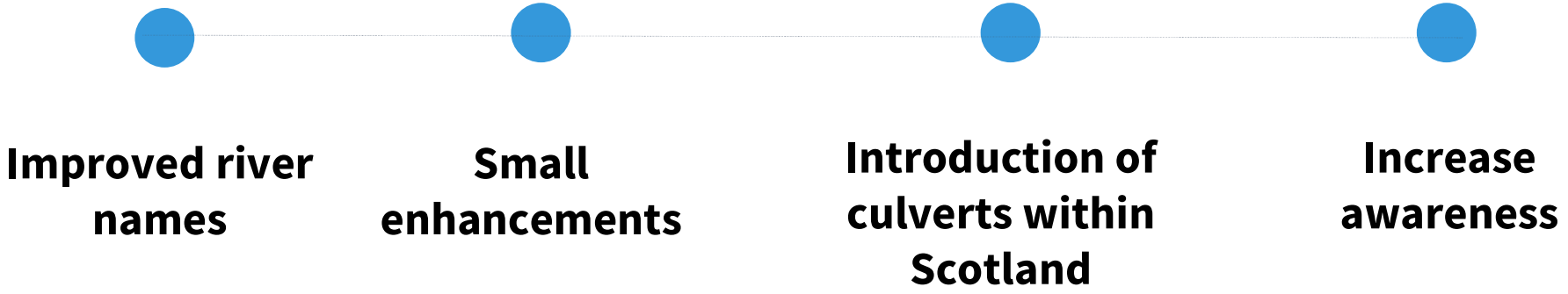




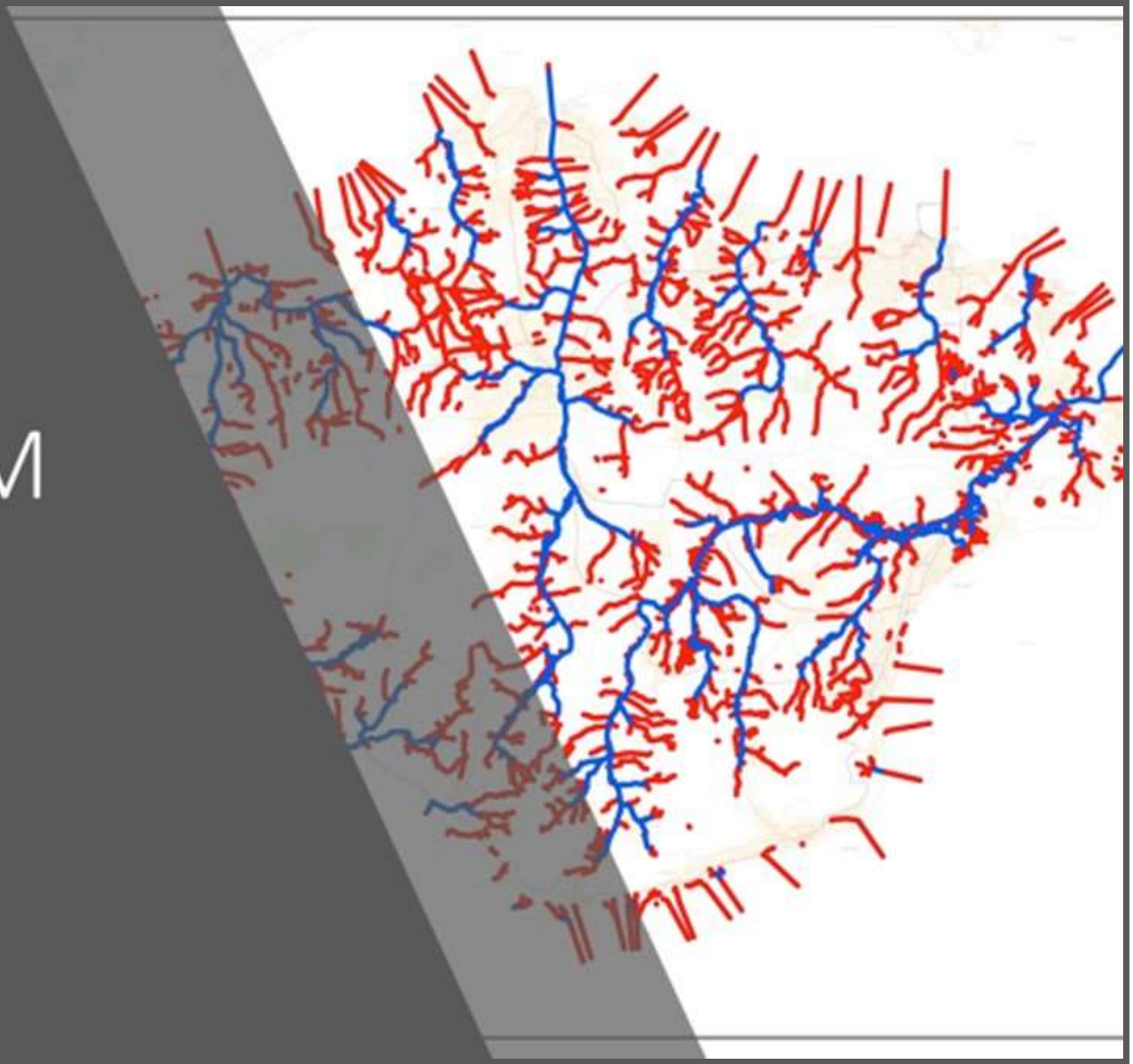
West Down
Knowle
Braunton
Wraften

Understanding the risk to land and properties

What’s next for Water Network Layer



Open vs OSMM



Underpinning decision making in Scotland

The OS MasterMap Water Network dataset will become the definitive dataset used by all Scottish Public Sector organisations in relation to Flood Risk Management Act 2009.

It is also underpinning key policy initiatives such as The Water Framework Directive and the Civil Contingency Act 2004

- **The creation of a definitive Water Layer for Scotland in relation to the Flood Risk Management Act 2009.**
- **Hydrologically and Topologically correct for all watercourses in Scotland, complete connectivity.**
- **Unique identifier in order to identify river stretches**
- **Increased data attribution in terms of flow direction and average channel width.**
- **No restrictive licensing conditions and available for use to all Public Sectors bodies.**

- **Available as an Open Dataset**
- **Contains all Local Authorises and Scottish Water's culverts.**
- **Already demonstrated savings to Local Authorities in terms of Asset Management**
- **Dataset to have continued update cy**
- **INSPIRE compliant**
- **Definitive dataset for Resilience pro**

Thank you for listening

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www.os.uk

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Ordnance Survey

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Managing flood risk on our road networks

Dr. Stephen Thomson

Transport and Flooding Summit 2016

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

‘What took you so long!’

- Barriers, tensions, opportunities
- Communications
- Tangible collaboration
- Perception of flooding resilience

Top 10+

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- Messaging
- Definitions
- Planning / Dev.
- CC mitigation
- Design standards
- OC contract spec.
- Contingency Plans
- Critical networks
- Public perception
- Social Media
- KPI’s
- Conferences

Top 10

Perception of flooding resilience

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Media

Top 10

Communications

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Proactive engagement & forums

Top 10

Barriers, tensions, opportunities

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Long term adaptation

Top 10

Barriers, tensions, opportunities

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Asset Management

Top 10

Barriers, tensions, opportunities

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Long term priorities and interdependencies

Top 10

Tangible collaboration

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Collaboration & knowledge sharing

Top 10

Tangible collaboration

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Resources & equipment

Top 10

Barriers, tensions, opportunities

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Role of the decision maker

Top 10

Barriers, tensions, opportunities

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Funding

Top 10

Barriers, tensions, opportunities

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

People as a resource

Barriers, tensions, opportunities

Communications

Tangible collaboration

Perception of flooding resilience

- People as a resource
- Funding
- Role of decision maker
- Resources – Equipment
- Collaboration – Knowledge sharing
- Long term priorities and interdependencies
- Asset Management
- Long term adaptation
- Proactive engagement & forums
- Media

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MOTT MACDONALD

Ecosystems Services

Appraisal and Flood Risk Management Plans

Presentation to SNIFFER Conference 8 February 2017

Drivers to Use Ecosystem Services

Using a framework to consider the impacts of actions on the environment can help ensure that all significant impacts are identified and brought into the appraisal. The key purpose is to ensure that these impacts are considered as part of decision-making.

One framework is the ecosystem services framework (UK National Ecosystem Assessment (2011, 2014).

Appraisers should decide whether it is proportionate to attempt to put a monetary value on environmental impacts.

Where environmental costs and benefits are valued in monetary terms, these impacts can be brought into a benefit-cost analysis

Guidance to Support SEPA and the Responsible Authorities June 2016.

Sec 8.3 and 8.4

Ecosystem Services and Natural Capital

A Different Approach

This is in contrast to the existing impact-receptor approach which is central to both the SEA and the EIA process and considers “the environment” largely as both an externality and a constraint to development, the Ecosystem Services concept views the economic and social objectives of human society within the wider context of natural capital.

River Medway – Mott MacDonald 2015

Methodologies

Green TEAM

"GreenTEAM" is Mott MacDonald's Green Infrastructure valuation tool which is used to assign an economic value to the Ecosystem Services provided by environmental assets within a defined appraisal area boundary. The tool can be run for multiple scenarios, such as flood risk management interventions and associated land use changes. The tool is compliant with the UK National Ecosystem Assessment (NEA) and the HM Treasury "Green Book" principles and Additionality Guide.

- The tool works by first defining which Ecosystem Services are relevant for the study area based on expert knowledge of the site and stakeholder consultation if applicable
- The percentage of the study area likely to supply each Ecosystem Service is then defined. This is determined for the baseline scenario and then for each option scenario. This uses available information about the site and each scheme, design, strategy option, or other proposed intervention.
- Climate change parameters can also be included

Methodologies

Green TEAM – Monetary Valuation

The values listed in the GreenTEAM Workbook Library are based on an on-going datamining research exercise supplemented by the TEEB database (2010), the Ecosystem Services Valuation Database (ESVD) (2012) and the EVRI database and continuous critical evaluation of relevant research and published literature.

This quality assurance enables us to verify our values at Public Inquiry or Examination in Public.

- Relevant adjustment factors are then applied ~~to each monetary value~~ generated
- A qualitative analysis is also conducted to determine the inter-dependency of values and the situational context
- Monetary values are then reported as £/yr and the baseline and various alternative scenarios can be compared on the basis of individual Ecosystem Services or overall Ecosystem Services benefits

Case Study

Environment Agency, 2016

Mott MacDonald was commissioned to conduct an Ecosystem Services Assessment to compare three potential flood alleviation options.

The results of this comparison were to be used as part of the screening process to develop the “Preferred Scheme” for the catchment and to provide evidence to inform the business case.

Ecosystem Service	Baseline	Scheme 1 – Base Package	Scheme 2 – Intermediate Package	Scheme 3 – Advanced Package
Climate regulation	£280,386	£280,386	£280,386	£336,463
Pollution control	£652,311	£1,001,922	£1,001,922	£1,330,378
Disease and pest control	£2,562	£2,562	£2,562	£2,904
Erosion control	£614,684	£614,684	£768,355	£922,026
Flood control	£193,983	£193,983	£484,957	£678,940
Pollination	£766	£861	£12,297	£13,469
Fuel	£0	£0	£0	£0
Food	£73,772	£73,772	£75,282	£75,282
Wild species diversity	£33,625	£63,826	£77,406	£130,214
Water Supply	£113,780	£113,780	£612,860	£612,860
Carbon sequestration	£8,320	£8,320	£8,320	£24,960
Fibre/raw materials	£0	£0	£0	£0
Aesthetic environment	£73,124	£80,436	£80,436	£91,405
Tourism	£11,947	£11,947	£11,947	£11,947
Recreation	£154,985	£154,985	£154,985	£167,383
Total	£2,214,245	£2,601,465	£3,571,717	£4,398,230

InVest

GIS Based Systems

The Integrated Valuation of Ecosystem Services and Tradeoffs or InVEST suite of models was originally developed by the Natural Capital Project at Stanford University. It consists of a suite of stand-alone spatial computer models. Individual models provide outputs for individual Ecosystem Services.

- Being a spatial tool, InVEST uses maps (usually raster datasets) as data sources and produces maps (usually raster datasets) as outputs
- InVEST outputs are provided in biophysical terms (e.g. tons of carbon sequestered) or economic terms (e.g. net present value of that sequestered carbon).
- The spatial resolution of analyses is also flexible which means that users can model Ecosystem Services at the local, regional or national scales.
- Can be used as a map based qualitative assessment

Benefits

GreenTEAM and InVEST

- Can be used at a landscape or local scale
- Can be used to develop priorities and trade-offs
- Once the library has been developed changes to options can be easily assessed
- Stakeholder priorities can be incorporated and adds to Stakeholder Engagement and is transparent
- Environmental assets cease to be externalities to economic assessment and provide a common currency of value

Projects

- Currently using InVEST outputs in the SEA for the Medway and Swale Estuaries Flood and Coastal Strategy for Environment Agency
- Informing options appraisal for flood risk proposals on a number of schemes in the West Country
- Informing options appraisal for water availability and supply
- Improvement of catchment based plans for water companies and Environment Agency

The Land Use Strategy & NFM target mapping

Achieving multiple benefits using opportunity mapping and the Ecosystem Services approach (2016-2017)

Land Use Strategy for Scotland

- The LUS came out of the Climate Change (Scotland) Act 2009.
- First LUS cycle ran from 2011- 2016, the 2nd cycle of the LUS from 2016-2021.
- There are a large number of policies and proposals in the LUS presented under 3 themes/10 principles for sustainable land use.
- 2 pilots were set up to '*develop a map based tool to help facilitate land management decision making and promote the ecosystem service approach.*'

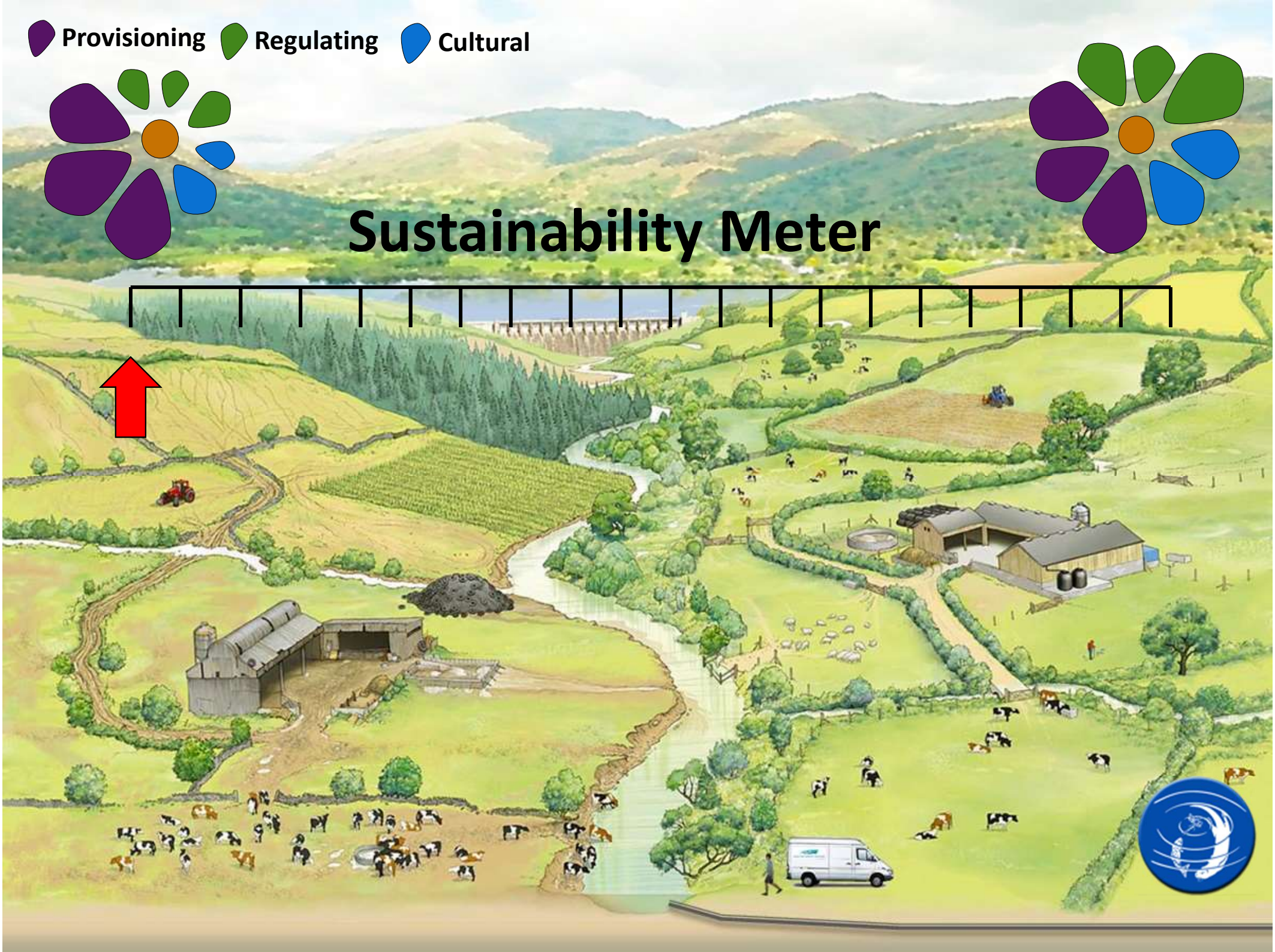
Scottish Borders COUNCIL

TWEED FORUM

A land use opportunity, map based tool, is hosted on Scottish Borders Council website

https://mapping.scotborders.gov.uk/LocalViewExt/Sites/Ext-LUS/

Scottish Borders COUNCIL


Provisioning
Regulating
Cultural
Sustainability Meter

TWEED FORUM

Under the Scottish Borders LUS Pilot: 7 Ecosystem Service Opportunity Maps were generated (reflecting Stakeholder Engagement & Key Policy Drivers)

1)-Food production (both arable and livestock)

2)-Native woodland expansion

3)-Timber production

4)-Biodiversity enhancement

5)-Soil carbon storage

6)-Improving water quality

7)-Flood water management

Environment SYSTEMS evidence and insight

Scottish Borders COUNCIL

TWEED FORUM

Tweed Forum has been focussing on 2 key challenges:

Diffuse pollution and Flooding

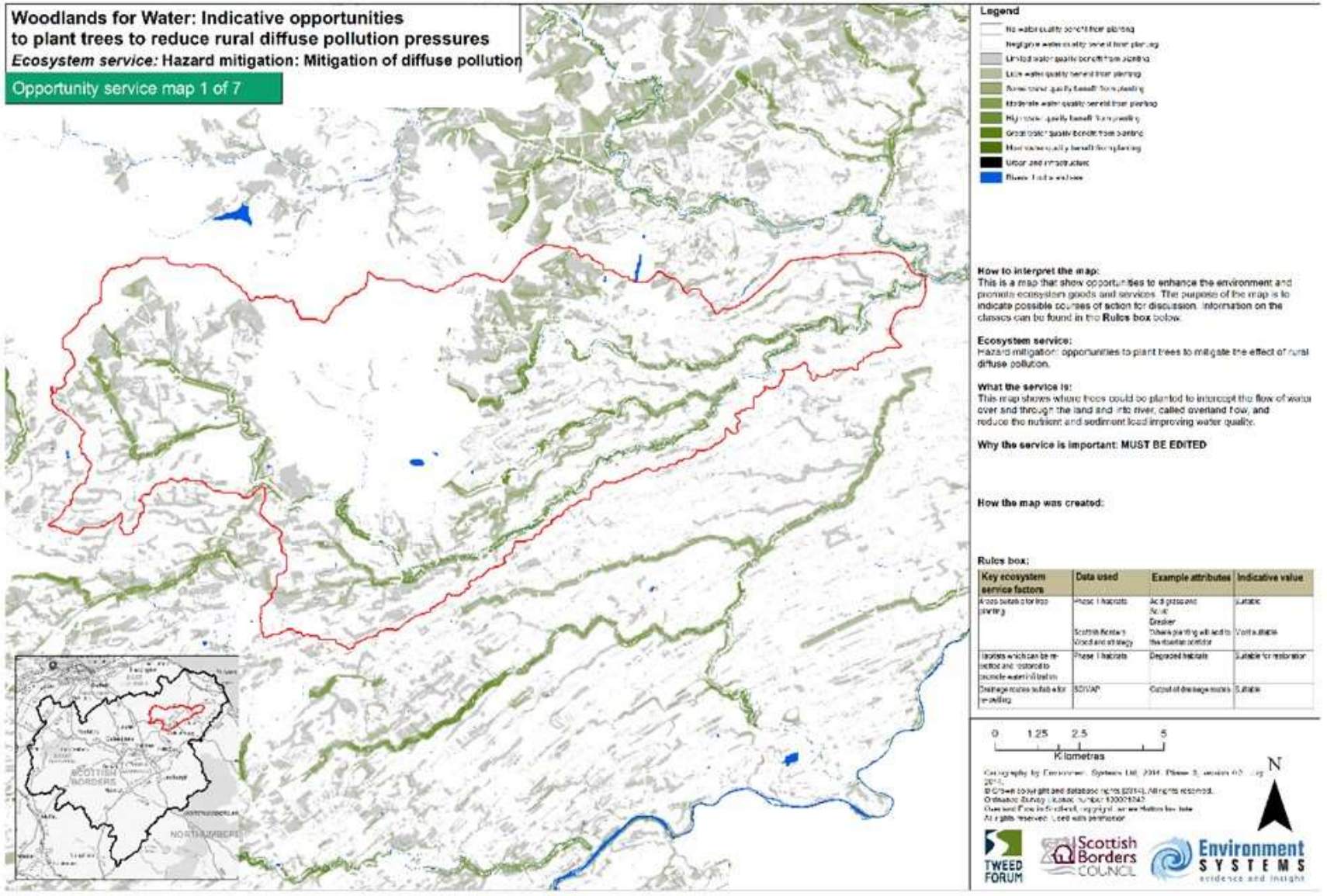
1.Developing a 'woodlands for water' woodland planting target map (for the Borders) that could be used to address 1)- diffuse pollution and another for 2)- natural flood management and also considering how this could be developed nationally.

2.Working with local partnerships to use the LUS Opportunity Maps and the Ecosystem Approach to make landscape scale/catchment scale applications for funding ie Through the Forestry Co-operation Fund in Upper Teviot Catchment.

Environment SYSTEMS evidence and insight

Scottish Borders COUNCIL

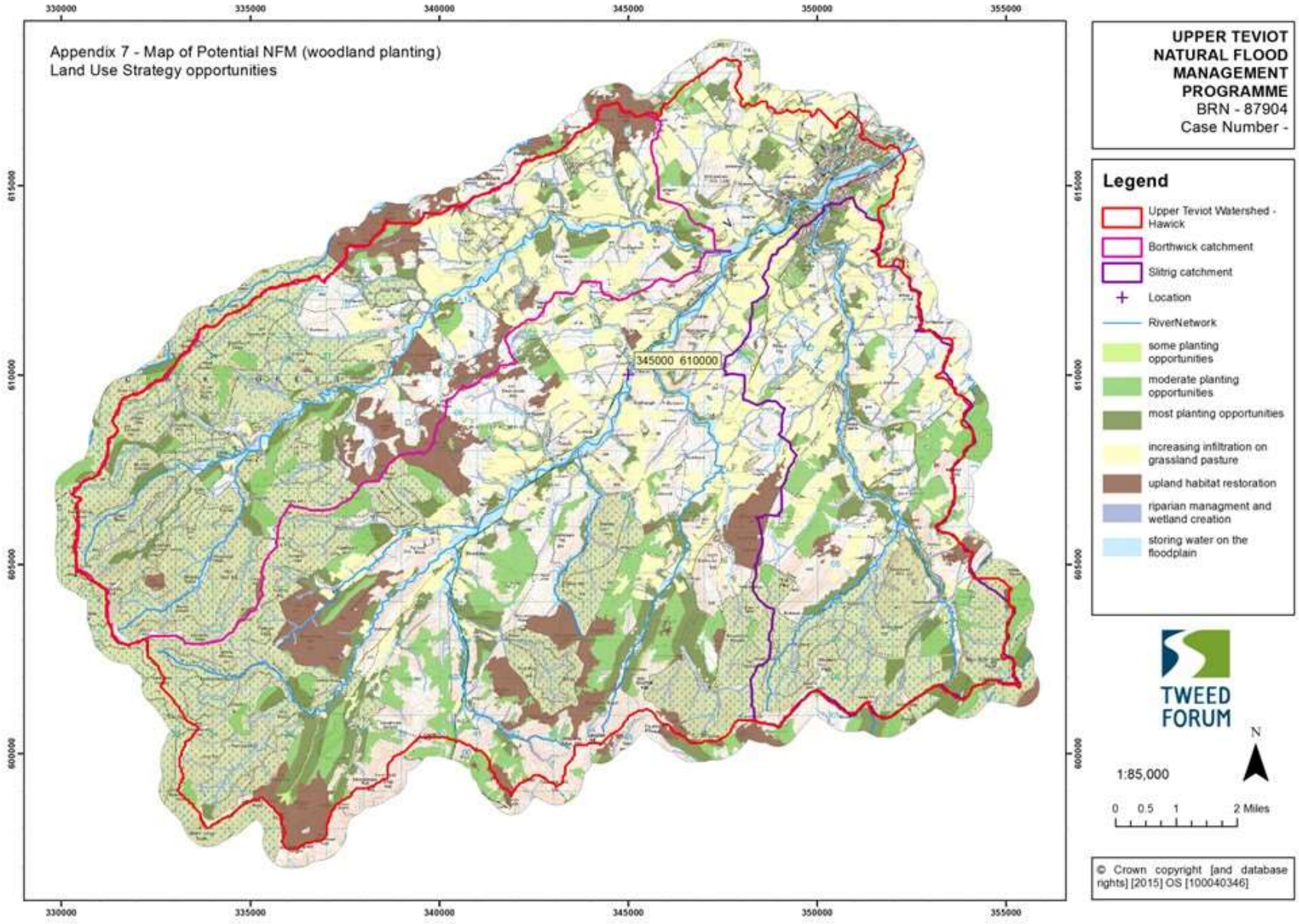
1. Example potential woodland planting map to target diffuse pollution in Berwickshire (ie Blackadder Water



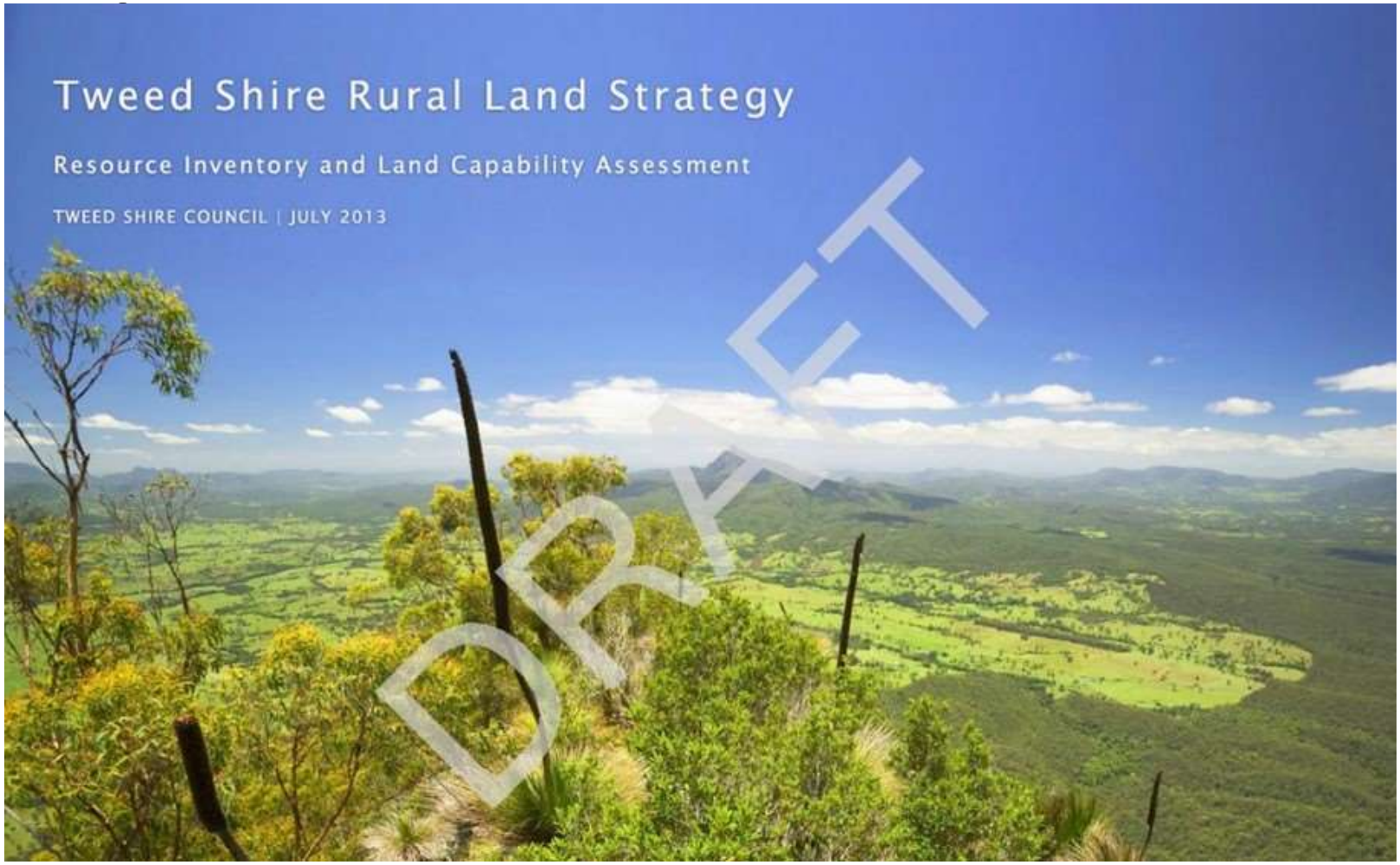
Environment SYSTEMS evidence and insight

Borders COUNCIL

2. Example Upper Teviot - NFM target mapping



Other countries are also looking at similar land use challenges



Benefits of applying the LUS & Ecosystem Approach

- Helps people think at a larger scale ie; the catchment scale
- It's a good educational tool.
- Encourages farmer co-operation.
- Encourages a wider stakeholder group to engage.
- Promotes conservation measures in the right places, at the right scale.
- Approach could be used to incentivise grant funding (important post Brexit & CAP/ Land Use Partnerships)
- Our challenge? …..How do we develop a system that works Scotland wide?

Royal HaskoningDHV
Enhancing Society Together

Rewilding the floodplain

Lessons learned from the delivery of NFM measures in the UK

Ian Dennis
8 February 2017

Rewilding the floodplain

- Changes to land use
  - Natural flood management
  - Take pressure off traditional defences
  - Reduce conveyance and store water in upper catchment

- Examples from three catchments
  - Burn of Mosset (Moray)
  - River Ouse (East Sussex)
  - River Adur (West Sussex)

Case study: Burn of Mosset

- The problem
  - Long history of flooding in Forres
  - Considerable economic damage from repeated flooding

- "Traditional" solution
  - Flood storage dam
  - Channel enlargement
  - BUT large volumes of sediment & LWD
  - Risk of reduced performance

- Upstream basin to capture sediment

Case study: Burn of Mosset

- Floodplain rewilding
  - Breach embankments to create sediment accretion zone
  - Proportion of flow permanently diverted
  - Floodplain wetlands and wet woodland
- Land use implications
  - No summer grazing
  - BUT reduced flood risk elsewhere on estate

Aerial photograph of the burn management works showing the route of the new channel, alluvial fan at the first breach and the wetland habitat created


Alluvial Fan-looking upstream towards the breach

Royal HaskoningDHV

Case study: Rivers Ouse & Adur

- The problem
  - Impermeable geology
  - Rivers modified for navigation and land drainage
    - Channelisation
    - Floodplain disconnection
    - In-channel structures
  - Development on floodplain
  - Flooding in lower catchments (e.g. Lewes)
- Traditional solutions
  - Improve defences at key areas at risk of flooding
  - BUT flooded settlements on natural floodplain

Case study: River Ouse (Spring Meadow)

- Floodplain rewilding
  - Re-meander straightened channel
  - Reconnect floodplain
  - Riparian tree planting
  - Install LWD
  - Raise part of field
- Land use implications
  - Remove part of site from agricultural productivity
  - BUT improved protection to commercial properties

Case study: River Adur (Knepp Castle)

- Floodplain rewilding
  - Remove redundant structures
  - 2km new meandering channel
  - Bank reprofiling
  - Floodplain scrapes
  - Install LWD

- Land use implications
  - Change land use from intensive dairy to free range livestock, sustainable timber and residential lettings

Lessons learned: Pragmatic approach

- NFM measures successfully implemented in all three catchments
- Not always a straightforward process
- Learned lots of lessons!

- Strategic understanding of catchment is vital
- Identify key constraints at outset so they can be accommodated
- Balance NFM gains with other needs
- Attract funding from wide range of sources
  - WFD implementation
  - Agri-environment grants

Lessons learned: Working with landowners

- Engaging with landowners
  - Identify concerns before designs produced
  - Build a case for sacrificing land for wider benefits
  - Input from Third Sector invaluable – more trusted than regulators
- Alternative business model
  - Agri-environment funds
  - New activities could be more profitable than marginal agricultural production
  - Improved production in areas benefitting from flood protection

© Knepp Castle Estate

Concluding remarks

- Rewilding can deliver real benefits
- Be flexible to get schemes implemented - compromise
- Deliver multiple benefits to maximise funding

Dr Ian Dennis

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Royal HaskoningDHV

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Developing a Scottish Natural Flood Management network

Presented by Dr Mark Wilkinson

James Hutton Institute, Aberdeen

SEPA Scottish Environment Protection Agency

crew centre of expertise for waters

The James Hutton Institute *Science connecting land and people*

Scottish Government gov.scot

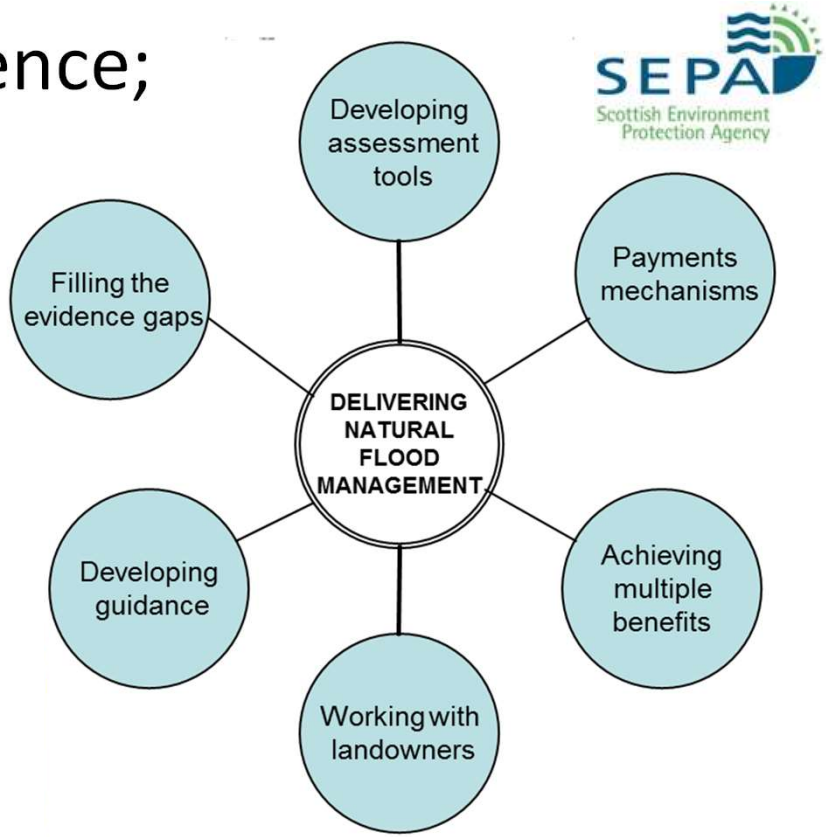
Background

- Desire amongst NFM community to share knowledge and best practice.
  - Significant amount of work taking place > need for knowledge exchange between study sites.
- CREW NFM practitioner's workshop; Edinburgh –2013 and more;
- SAIFF[1] NFM working group

[1]*Scottish Advisory and Implementation Forum for Flooding*

Working aims of the network

- **Share knowledge, research and experience** of the practical aspects of identifying, assessing and implementing NFM measures
- **Connect NFM researchers and practitioners** and enable the better sharing of evidence;
- **Avoid duplication** of effort
- **Identify and discuss NFM** research, monitoring and modelling needs, as well as possible novel solutions.



Proposed key aspects

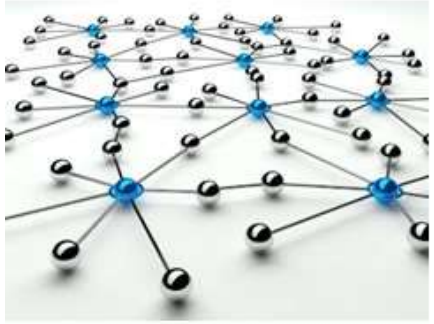
- Website: News items, events, case studies, relevant reports
  - Note: this network will not generate material – it will disseminate existing and new material
- E-bulletin: Short updates; twice a year
- Sign up facility (emailing list)


- *Linking to events*
- *Linking to other groups, centres, societies*

What it will and won't do

- Provide news updates
- Connect projects
- Collate information
- Link to other resources

- **Develop independent material**
- **Answer specific - external content**
- **Give advice (like a society/centre)**



And finally

- To register your interest please visit this link:

http://tinyurl.com/ScotNFMnetwork

Don't worry about writing it down now – you can download this presentation after the conference from the Sniffer website

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