# River Management and Flooding

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Catchment Management

Content **Introduction** Water cycle and use Flooding Reducing impact Flood warnings Uncertainty Flood defences

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## Home for wildlife

#### Salmon

![](_page_5_Picture_2.jpeg)

#### Freshwater pearl mussel

![](_page_5_Picture_4.jpeg)

![](_page_5_Picture_5.jpeg)

#### Otter

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#### Water Use

How much water every day does someone from

- Europe use
- Africa use
- How much do each of these use:
  - Flush the loo make a pair of jeans
  - > Brush teeth 1 kg of w
  - Washing machine
  - > Bath

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- 1 kg of wheat
- 1 kg of beef

### **Scottish Rivers**

#### **Spey River**

- 107 km long
- drains 3008 km<sup>2</sup> of land
- flow =  $64 \text{ m}^3 \text{ s}^{-1}$

#### Deveron

- 98 km long
- drains 955km<sup>2</sup> of land
- flow = 16 m<sup>3</sup> s<sup>-1</sup> approx. 16 baths a second

![](_page_7_Picture_9.jpeg)

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## Why does flooding occur?

- Natural process- in many situations
   beneficial
- Development pressures
  - Food
  - Housing (1200 ha per annum)
- Climate Change

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![](_page_8_Picture_6.jpeg)

![](_page_8_Picture_7.jpeg)

![](_page_9_Picture_0.jpeg)

## **Climate Change**

![](_page_10_Picture_1.jpeg)

![](_page_11_Figure_0.jpeg)

![](_page_11_Figure_1.jpeg)

Flow duration curves for spring: A significant increase in flows between all three 25 year periods

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![](_page_12_Figure_0.jpeg)

## **Consequences: Extreme Events**

![](_page_13_Picture_1.jpeg)

![](_page_13_Picture_2.jpeg)

![](_page_13_Picture_3.jpeg)

![](_page_14_Picture_0.jpeg)

![](_page_14_Picture_1.jpeg)

![](_page_14_Picture_2.jpeg)

![](_page_14_Picture_3.jpeg)

![](_page_14_Picture_4.jpeg)

## **Types of Flooding**

- Coastal
  - High tide
  - Low pressure
  - Wind
  - Hurricane, Tsunami
- Pluvial
  - Drains/ sewers
- Fluvial

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• Rain/ snow

![](_page_15_Picture_10.jpeg)

![](_page_15_Picture_11.jpeg)

![](_page_15_Picture_12.jpeg)

#### **Scottish Context**

- Rivers 50, 000 km
  - Fluvial flood zone is 3,425 km<sup>2</sup> (4.3%) of Scotland
  - Approximately 73,300 properties (2.9%)
- Coast 12, 000 km
  - Coastal flood zone
     566 km<sup>2</sup> (0.7%)
  - Approx. 26,200

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![](_page_16_Picture_7.jpeg)

![](_page_16_Picture_8.jpeg)

![](_page_17_Figure_0.jpeg)

![](_page_17_Figure_1.jpeg)

#### **Reducing the impact of Flooding**

There is a need for:

Defences

Surface water management

Better warning and communication

However risks are never eliminated

![](_page_18_Picture_6.jpeg)

#### **Flood Warning**

•What is the message?

•How should it be communicated?

•What should people do?

•What are the risks and uncertainties?

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![](_page_19_Picture_5.jpeg)

![](_page_20_Picture_0.jpeg)

#### What does the message mean?

Flood Watch = Flooding possible. Be aware! Be prepared! Watch out!

Flood Warning = Flooding expected, affecting homes, businesses and main roads. Act now!

Severe Flood Warning = Severe flooding expected, with imminent danger to life and property. Act now!

**All Clear** 

![](_page_21_Picture_5.jpeg)

### Is it Working? Uncertainty and Risk in Flood Communication- UR-Flood

- Work with communities in case studies
- Flooded and at risk of flooding
- Use questionnaire and discussion groups
- Questions focus on:
  - Flooding situation
  - Awareness of flood warning
  - Uncertainty and reliability
  - Responses to warnings

![](_page_22_Picture_9.jpeg)

![](_page_22_Picture_10.jpeg)

#### **Case Studies**

![](_page_23_Figure_1.jpeg)

Case Studies	Туре
Huntly	F
Glasgow	F
<b>Newton Stewart</b>	F
Moffat	F
Newburgh	С
Dalbeattie	F
Clonmel	F
Ballinasloe	F
Dublin	<b>P</b> , <b>F</b> , <b>C</b>
Wexford Town	С
Rome	Р
Venice	С
Finland	F

#### www.macaulay.ac.uk/urflood

![](_page_23_Picture_4.jpeg)

![](_page_24_Figure_0.jpeg)

![](_page_25_Figure_0.jpeg)

## Is it working and can it be improved?

![](_page_26_Picture_1.jpeg)

**Research into Flood Warnings** 

This is a survey that aims to explore how people understand and react to flood warnings, to help us prepare before flooding events happen. We hope that you will be able to fill it in.

Huntly, August 2010

![](_page_26_Picture_5.jpeg)

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 Responses still being collated
 Full response later in year to be discussed with a focus group for proposed improvements

Details will go on web site

Provisional interim summary results from Huntly

## Summary Responses (1)

#### About warnings

- Authorities largely considered trustworthy, particularly SEPA and emergency services
- Message considered reliable from a range of sources ranging moderate to high
- About communication
  - All respondents: more or better targetted information
- On uncertainty

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 Understanding of probability low to moderate, possible difference between flooded and not flooded

## Summary Responses (2)

#### Future

- Split between OK and call for more information in both warning and action to take
- Preferred method of communication
  - Phone call
  - Text message (particularly flooded area)
  - Non flooded residents also included radio and TV
  - Not website, e-mail, in person visit

![](_page_28_Picture_8.jpeg)

## **Uncertainty in measurement**

![](_page_29_Picture_1.jpeg)

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![](_page_29_Picture_3.jpeg)

![](_page_30_Picture_0.jpeg)

#### Real Time Data to Evaluate and Inform

![](_page_30_Figure_2.jpeg)

www.macaulay.ac.uk/tarland/data

# Traditional response to flooding is to install flood defences

84 Flood 'prevention' schemes completed in Scotland between 1961 to 2009

**Current view is to supplement these with natural flood management techniques** 

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![](_page_33_Picture_0.jpeg)

![](_page_34_Picture_0.jpeg)

![](_page_35_Picture_0.jpeg)

![](_page_36_Picture_0.jpeg)

### Importance of education and awareness

![](_page_37_Picture_1.jpeg)

#### **Be Prepared**

- Insurance
- Useful numbers
- Flood kit
- Storage
- Gas, electricity and water
- Home protection
- Transport

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Evacuation plans

![](_page_38_Picture_9.jpeg)

![](_page_38_Picture_10.jpeg)

# Water quiz- Answers

How much water every day

does someone from:

- Europe use 150 litres
- Africa use 25-50 litres
- How much do each of these use:
  - Flush the loo 6 litres
  - Brush teeth 1-3 litres
  - Washing machine 60 litres
  - Bath 150 litres

![](_page_39_Picture_10.jpeg)

make a pair of jeans 10,850 litres
1 kg of wheat 1300 litres
1 kg of beef 15,500 litres

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![](_page_40_Picture_0.jpeg)