ASSOCIATION OF IRISH RISK MANAGEMENT

FLOOD RISK MANAGEMENT IN IRELAND

Mark Adamson
Office of Public Works

17th November 2010
CARRICK-ON-SHANNON
FLOOD RISK IN IRELAND

• NOVEMBER 2009 EVENT

  – Very Severe Event and Consequences:
    • Widespread (South-West, West, Shannon, North)
    • €’00s million Euro Damage
      – Homes
      – Businesses
      – Infrastructure
FLOOD RISK IN IRELAND

• NOVEMBER 2009 EVENT
  – Very Severe Event and Consequences:
    • Widespread (South-West, West, Shannon, North)
    • €’00s million Euro Damage
  – Rare:
    • Most Areas: Worst on Record (50+ years)
    • Wettest Month in almost 150 yrs - Valentia

• RISK
  – Function of Probability and Consequence
FLOOD RISK IN IRELAND

• PAST MAJOR EVENTS
  – 1954: Shannon
  – 1986: ‘Hurricane Charlie’
  – Mid-1990’s: Events in South / South-East
  – 1995: Groundwater Flooding – South Galway
  – 2000: Dublin, South-East
  – 2002: Coastal Flood – Dublin, Tolka
FLOOD RISK IN IRELAND

• WHAT IS THE RISK?
  – Historic Event & Insurance Records
  – Predictive Risk Assessments

• IS IT GETTING WORSE?
  – Climate Change
    • Sea Level Rise
    • Increased Rain Storm Depths / Intensities
  – Development in Flood-Prone Areas
  – Increased Wealth
MANAGING THE PROBLEM

• ARTERIAL DRAINAGE ACT, 1945
  – Arterial Drainage Schemes, with Ongoing Maintenance
  – Intended for Agricultural Benefit
  – Provide Significant Benefits to Communities
  – Future:
    • Implementation of New Arterial Drainage Schemes Unlikely
    • Maintenance of Existing Schemes is of Very Clear Benefit
MANAGING THE PROBLEM

• FLOOD RELIEF SCHEMES
  – A.D. (Amendment) Act, 1995
  – Local, Urban Flood Protection Schemes
    • Appx. 20 Schemes Built to Date
    • Appx. 20 Schemes in Design / Construction

• Kilkenny, Tolka, Dodder, Mallow, Fermoy, Clonmel, Waterford, Ennis, Carlow, ...

• Details:
  – Contact OPW
“The Flood Relief Scheme in Mallow has proven a success for the second time in three months”

Irish Times, 13/01/10
MANAGING THE PROBLEM

• MINOR SCHEMES PROGRAMME
  – Launched in 2009
  – Local Solutions for Local Problems
    • Scheme Cost: <€500k
    • Faster Implementation
  – 2010: Appx. €10m Schemes Approved for Funding
  – Ongoing
MANAGING THE PROBLEM

• THE FUTURE FOR FRM IN IRELAND

  – Flood Relief Schemes
    • Will Continue to be a Cornerstone of Reduction of Existing Flood Risk into the Future
  – Arterial Drainage Maintenance
  – OPW Minor Schemes Programme
    • Ongoing Programme
MANAGING THE PROBLEM

• THE FUTURE FOR FRM IN IRELAND
  – Flood Policy Review, 2004
    • Proactive, Catchment-based Approach
    • Flood Mapping
    • Catchment Flood Risk Management Plans
    • Greater emphasis on non-structural measures
  – Establishment of Range of New Programmes
WORK PROGRAMMES

- FLOOD STUDIES UPDATE / R&D
- HYDRO-METEOROLOGICAL MONITORING REVIEW
- RESEARCH & DEVELOPMENT PROGRAMME
- FLOOD HAZARD MAPPING
- CATCHMENT FLOOD RISK MANAGEMENT PLANNING
- FLOOD FORECASTING AND WARNING
- EMERGENCY RESPONSE DEVELOPMENT
- PUBLIC AWARENESS AND PREPAREDNESS
- PLANNING AND DEVELOPMENT CONTROL
- HIGH-RISK CHANNEL DESIGNATION
- PRIORITISATION
- DEFENCE ASSET MANAGEMENT
- REVIEW OF LEGISLATION
- COMMUNICATIONS
- OPW FLOOD RESPONSE
PROGRAMMES 1, 2 & 3

• 1: FLOOD STUDIES UPDATE
  – Update of Flood Studies Report
  – Well underway: Completion 2011

• 2: STRATEGIC HYDRO-METEOROLOGICAL MONITORING REVIEW
  – Strategic plan for monitoring networks
  – Completed – Moving to implementation

• 3: R&D PROGRAMME
  – Structured flood risk management R&D programme
4: FLOOD MAPPING WEBSITE

• PHASE I PROJECT
  – Website / Data management system development
  – Historic data collection / verification
  – Launched: October 2006
4: FLOOD MAPPING WEBSITE

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  – Website / Data management system development
  – Historic data collection / verification
  – Launched: October 2006

• ONGOING MAINTENANCE / UPDATE
Shannon – Athlone
30th November 2009
4: FLOOD MAPPING WEBSITE

• PHASE I PROJECT
  – Website / Data management system development
  – Historic data collection / verification
  – Launched: October 2006

• ONGOING MAINTENANCE / UPDATE

• PRESENTATION OF PREDICTIVE MAPS

• 2011-12: MOVE TO ‘ENTERPRISE GIS’ & WEB-SERVICES
5: CFRAM STUDIES

• FLOOD RISK MGT. PLANNING PROG.
  – Comprehensive, Catchment-Based Flood Risk Assessment and Management (CFRAM) Studies

• EU FLOODS DIRECTIVE

• AFTER THE BREAK!
6: FLOOD FORECASTING

- FLOOD FORECASTING
  - Fluvial Flood Forecasting
    - Detailed: Mallow, Fermoy, Clonmel
Run 2561: 12/01/2010 20:00 15 Minutes Alerts [2 MallowR, 2 Casteloland, 2 Heavy_Rain, 9 MissingD]

Water level

Rainfall (gauged)
6: FLOOD FORECASTING

• FLOOD FORECASTING
  – Fluvial Flood Forecasting
    • Detailed: Mallow, Fermoy, Clonmel
    • EFAS: Broad-Scale EU System
  – Coastal Surge Forecasting
    • National: Under Trial
Figure 5: Detailed section of Wexford Harbour and Slaney river with mesh and bathymetry
6: FLOOD FORECASTING

- FLOOD FORECASTING
  - Fluvial Flood Forecasting
    - Detailed: Mallow, Fermoy, Clonmel
    - EFAS: Broad-Scale EU System
  - Coastal Surge Forecasting
    - National: Under Trial
    - Dublin: Operational
  - National Service?
    - Strategic FFWS Review
    - Completion Early 2011
7: EMERGENCY RESPONSE

- EMERGENCY RESPONSE DEVELOPMENT
  - Flood Event Response Plans: Guidelines and Template Plan
  - DoEHLG (Protocol)
8: AWARENESS & PREPAREDNESS

- AWARENESS AND PREPAREDNESS
  - General campaign launched (www.flooding.ie)
8: WWW.FLOODING.IE
8: AWARENESS & PREPAREDNESS

• AWARENESS AND PREPAREDNESS
  – General campaign launched (www.flooding.ie)
  – Local campaigns
    • Dependent on flood map availability
    • CFRAM Studies
9: PLANNING & DEVELOPMENT MGT

• MANAGING POTENTIAL FUTURE RISK
  – Flood risk impacts of development
    • Development being at risk itself
    • Increasing flood flows downstream
    • Increasing flood levels upstream
    • Increased runoff volumes / rates
  – Critical to effective management of future risk
9: PLANNING & DEVELOPMENT MGT

• GUIDELINES: NOVEMBER 2009

• OVERVIEW OF GUIDELINES
  – Sequential Approach
  – ‘Appropriate Devt’
9: PLANNING & DEVELOPMENT MGT

• APPROPRIATE DEVELOPMENT
  – Flood Zones (Undefended – Fluvial / Tidal)
    • A: High Probability (>1% / 0.5% AEP)
    • B: Moderate Probability (>0.1% AEP)
    • C: Low Probability (<0.1% AEP – All areas not in Zones A or B)
  – Land Use Vulnerability
    • High: Hospitals, Housing, Critical Infrastructure, etc.
    • Less: Shops, Offices, General Industry, etc.
    • Water-Compatible: Navigation, FRS, Amenity, etc.
9: PLANNING & DEVELOPMENT MGT

- APPROPRIATE DEVELOPMENT
  - Flood Zone A: Appropriate Development
    - Water Compatible Development
  - Flood Zone B: Appropriate Development
    - Water Compatible Development
    - Less Vulnerable Development
  - Flood Zone C: Appropriate Development
    - All (BUT – see below)
  - ALL of Above Subject to FRA of Other Sources, e.g., Groundwater
9: PLANNING & DEVELOPMENT MGT

• GUIDELINES: NOVEMBER 2009

• OVERVIEW OF GUIDELINES
  – Sequential Approach
  – ‘Appropriate Devt’
  – Justification Test:
    • Town Centres / Urban Core
  – Flood Risk Assessments
EU ‘FLOODS’ DIRECTIVE

• KEY REQUIREMENTS
  – Transposition (SI No. 122 of 2010)
  – Preliminary flood risk assessment (Dec 2011)
  – Flood maps (Dec 2013)
  – Flood risk management plans (Dec 2015)

• OTHER PROVISIONS
  – Co-ordination with WFD implementation
  – Trans-boundary co-operation
  – Public dissemination / engagement
EU ‘FLOODS’ DIRECTIVE

• ARTICLES 4 & 5 – PRELIMINARY FLOOD RISK ASSESSMENT (PFRA)
  – Define ‘APSRs’
    • Based on Available / Readily-Derivable Information
  – For which:
    • Flood Maps are to be prepared
    • Flood Risk Management Plans are to include measures to address flood risk
OVERVIEW OF PFRA

• OBJECTIVE
  – Identify Areas of Potentially Significant flood Risk (APSRs)
    • Focus of CFRAM Studies
    • Detailed Flood Maps
    • Measures in Flood Risk Management Plan (FRMP)
  – Based on ‘Available & Readily-Derivable’ Information
    • High-Level Screening of Flood Risk
OVERVIEW OF PFRA

• OVERALL APPROACH
  – Risk Assessment
    • ‘Historic’ FRA (What has happened)
    • ‘Predictive’ FRA (What could happen)
    • Consultation
  – Define ‘Significant’ Risk
  – Identification of APSRs
    • Identify APSRs (Can be based on justification under any one of the approaches + FRS)
    • Validate, Consult & Finalise
'PREDICTIVE' PFRA

Degree of Consequence in the Event of Flooding
High → Low

Probability of Flooding
High → Low

RISK
‘PREDICTIVE’ PFRA

- FLOOD RISK – FUNCTION OF:
  - Probability of a Flood Event (Hazard)
  - Consequences (Degree of Damage in Event of a Flood)
‘PREDICTIVE’ PFRA

• PROBABILITY OF A FLOOD (HAZARD)

• CONSEQUENCES
  – Different ‘Receptors’
    • People, objects, areas and activities that could suffer harm or damage in the event of a flood
  – Vulnerability Assessment for Receptors
RECEPTORS

• CRITERIA
  – Social
  – Economic
  – Environmental
  – Cultural Heritage
RISK ASSESSMENT

• RISK – (HAZARD, CONSEQUENCES)
  – Hazard
    • Indicative Mapping for range of sources of flooding
    • 3 Probabilities for each source
  – Consequences
    • Standardised Vulnerability Classifications

• FLOOD RISK INDEX (FRI)
  – Consistent Metric
  – Standard Threshold for ‘Significance’
RISK ASSESSMENT

• INDIVIDUAL POINT RECEPTORS
  – Each Receptor represents a certain level of risk
    • Properties, Power stations, airports, hospitals, etc.
  – Calculate FRI for each Receptor
    • Vulnerability Classification
    • Probability of Flooding

• AREAS OF RISK
  – Cumulative risk within an area
    • Collection of houses, businesses, other receptors
  – Sum FRI within a given area
RISK ASSESSMENT
RISK ASSESSMENT
RISK ASSESSMENT
OVERVIEW OF PFRA

• COMPLETION OF PFRA
  – Initial Draft: Mid-Late 2010
    • Identification of APSRs for CFRAM Studies
    • Consultation with:
      – Key Stakeholders / Experts (DoEHLG, EPA, etc.)
      – Local Authorities (Local Knowledge / Perceptions)
  – Final Draft: Mid 2011
    • Formal, Public Consultation Period (SI 122, 2010)
  – Final: December 2011
    • Deadline in ‘Floods’ Directive
EU ‘FLOODS’ DIRECTIVE

• ARTICLE 6 – FLOOD MAPS
  – Only Required for APSRs
  – Flood Hazard Maps
    • Low, medium and (option) high probability events
    • Flood extent
    • Depth or water level
    • (option) velocity or flow
  – Flood Risk Maps
EU ‘FLOODS’ DIRECTIVE

• ARTICLE 7 – FLOOD RISK MANAGEMENT PLANS (FRMPs)
  – At Catchment-Scale, but focused on addressing risk in APSRs
  – Set out flood risk management Objectives
  – Set out prioritised set of Measures for achieving specified Objectives
5: CFRAM STUDIES

• FLOOD RISK MGT. PLANNING PROG.
  – Comprehensive, Catchment-Based Flood Risk Assessment and Management (CFRAM) Studies

• OUTPUTS
  – Flood Maps
  – Catchment Flood Risk Management Plan
    • Long-term plan for cost-effective and sustainable management of flood risk
    • Prioritised set of actions and measures to address flood risk in Areas of Potentially Significant Risk (APSRs)
5: CFRAM STUDIES

- SCOPE OF WORK
  - Survey
  - Data Collection
  - Hydrology
  - Hydraulics / Flood Mapping
5: CFRAM STUDIES

• SCOPE OF WORK
  – Survey
  – Data Collection
  – Hydrology
  – Hydraulics / Flood Mapping
  – Risk Analysis
5: CFRAM STUDIES

• SCOPE OF WORK
  – Survey
  – Data Collection
  – Hydrology
  – Hydraulics / Flood Mapping
  – Risk Analysis
  – Flood Risk Management Options
  – SEA / Habitats Directive Assessment
  – Flood Risk Management Plan
LEE ‘CFRAM’ STUDY

- WWW.LEECFRAMS.IE
- FLOOD MAPS
- FLOOD RISK MANAGEMENT PLAN
## LEE FRMP OUTPUTS - MEASURES

|---------------------|---------------------|---------------------|---------------------|--------------------------|-----|

### NON-STRUCTURAL MEASURES – WHOLE CATCHMENT

<table>
<thead>
<tr>
<th>Measure</th>
<th>Phase</th>
<th>Who</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop Local Awareness and Preparedness Campaign, and Review Flood Event Emergency Response Plans</td>
<td></td>
<td>Local Authorities</td>
</tr>
<tr>
<td>Implement Local Awareness and Preparedness Campaign</td>
<td></td>
<td>Local Authorities</td>
</tr>
<tr>
<td>Maintain, Review, Update and Practice Flood Event Emergency Response Plans</td>
<td></td>
<td>Local Authorities</td>
</tr>
<tr>
<td>Implement the Guidelines on Spatial Planning and Flood Risk Management (2009)</td>
<td></td>
<td>Local Authorities</td>
</tr>
</tbody>
</table>

### CITY X

<table>
<thead>
<tr>
<th>Measure</th>
<th>OPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess Opportunities to Optimise Formal Function of Existing Hydropower Reservoirs for Flood Risk Management</td>
<td></td>
</tr>
<tr>
<td>Implement Formal Function of Existing Hydropower Dams for Flood Risk Management, in conjunction with Further Local Works for Fluvial and / or Tidal Protection</td>
<td>OPW</td>
</tr>
<tr>
<td>OR Detailed Full Scheme Development for Joint Fluvial – Tidal Defences for City X</td>
<td></td>
</tr>
<tr>
<td>OR Maintain Local Works to Provide Fluvial and / or Tidal Protection for City X</td>
<td></td>
</tr>
</tbody>
</table>

### CITY Y

<table>
<thead>
<tr>
<th>Measure</th>
<th>OPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Flood Relief Scheme Development for City Y</td>
<td></td>
</tr>
<tr>
<td>Planning and Procurement Scheme for City Y</td>
<td></td>
</tr>
<tr>
<td>Implement Scheme for City Y</td>
<td></td>
</tr>
<tr>
<td>Maintain Scheme for City Y</td>
<td></td>
</tr>
</tbody>
</table>
5: CFRAM STUDIES

• PROVIDING FOR FUTURE CHANGES
  – Factors in Change
    • Climate Change
    • Land Use Change
  – Future Scenarios (MRFS, HEFS)
  – Hazard and Risk Assessment
  – Influence on Measures
    • Design (Adaptive, Assumptive)
    • Selection (Adaptability Criteria for Appraisal)
5: CFRAM STUDIES

• ENGAGEMENT AND CONSULTATION
  – Partnering
    • Local Authorities, Environmental Authorities, WFD Team, Other Responsible Bodies (ESB, WI)
  – Stakeholder Engagement
    • IFA, Fisheries, An Taisce, Chambers, Coillte, Ports, NRA, RPA, Marine Inst., ...
  – Public Consultation
    • Public Consultation Days, Website, Newsletters, Formal Consultation Processes
  – Coordinated Mgt. of Flood Risk
EU ‘FLOODS’ DIRECTIVE

- NATIONAL IMPLEMENTATION
  - PFRA: Underway
  - Flood Maps and Plans: CFRAM Studies

- PROGRAMME
  - Complete Initial PFRA (2010)
  - Commission CFRAM Contracts (2010 – 2011)
  - Flood Maps (2012 – 2013)
SUMMARY

• THE PROBLEM
  – 2009 Floods were Extreme
  – Climate Change likely to Increase Flood Risk

• THE SOLUTION
  – Ongoing Maintenance of Arterial Drainage Schemes
  – Ongoing Implementation of Flood Relief Schemes
  – Non-Structural Solutions
  – Sustainable Planning and Development
  – CFRAM Studies
    • PFRA, Flood Maps, Flood Risk Mgt. Plans
    • Coordinated Management by all Relevant Parties