Sixth Bulgarian – Austrian Seminar

THE EU ‘FLOODS’ DIRECTIVE:
EUROPEAN PRACTICE AND RESEARCH IN FLOOD RISK MANAGEMENT

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7th November, 2013
PRESENTATION SUMMARY

• OVERVIEW OF EU ‘FLOODS’ DIRECTIVE & WG F

• STEPS OF EU ‘FLOODS’ DIRECTIVE
  – CHALLENGES FOR EACH STEP
  – REFERENCE TO APPLICATION IN IRELAND
EU ‘FLOODS’ DIRECTIVE

• KEY REQUIREMENTS
  – Transposition (Nov 2009)
  – 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
WORKING GROUP ‘F’

• EVOLVED SINCE 2005 (‘Expert Group’)

• STATUS
  – Working Group within CIS established for WFD

• MEMBERSHIP
  – EU Member States + EEA States
  – International Inter-Governmental Bodies
    • River Commissions, WMO, UN Organisations, etc.
  – Stakeholder Organisations (Under CIS Rules)
    • WWF, EWA, EUREAU, etc.
WORKING GROUP ‘F’

• OBJECTIVE
  – Forum to Support Implementation of FD
    • Information exchange
    • Feedback on Implementation and Reporting
    • Links with Other CIS / COM Areas

• ACTIVITIES
  – 6-Monthly Meetings
  – Preparation of Reporting Sheets / Schema
  – Other Activities / Resource Documents
    • Economics, WFD-FD Links, Research Needs
  – Thematic Workshops
WORKING GROUP ‘F’

• WORKSHOPS – TOPICS:
  – Land Use Planning
  – PFRA
  – Flood Mapping
  – Climate Change
  – Natural Flood Risk Management
  – FRMPs
  – Flash Floods & Pluvial Events
  – Economics
  – Stakeholder Involvement
  – Decision-Making under Uncertainty
  – Objectives, Measures and Prioritisation
IMPLEMENTATION – STATUS

• TRANSPOSITION: NOV 2009
  – All MS have transposed
  – Three ‘non-conformity’ infringement cases open

• REPORTING OF COMPETENT AUTHORITIES & UNITS OF MANAGEMENT: MAY 2010
  – All MS have communicated information

• COMPLETION OF PFRA: DEC 2011
  – Reporting to Commission: March 2012
    • 26 MS had reported as of 17th October
  – Compliance checking ongoing
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IMPLEMENTATION – PFRA

• OBJECTIVE
  – Identify Areas for Further Assessment (AFAs)
    • Focus of the CFRAM Studies
    • Detailed Flood Maps
    • Measures in Flood Risk Management Plan (FRMP)
  – Based on ‘Available & Readily-Derivable’ Information
    • High-Level Screening of Flood Risk
IMPLEMENTATION – PFRA

• CHALLENGES:
  – Broad-Scale (vs. local / detailed) Risk Assessment
  – Assessment of Risk for Certain Sectors, e.g., Environment, Cultural heritage
  – Definition of ‘Significant Risk’, based on Multi-Sectoral Assessment of Risk
  – Provision for Climate Change (Uncertainty)
  – Risk Assessment for Sources of Flood Water other than Rivers and the Sea
IMPLEMENTATION – PFRA

• OVERALL APPROACH
  – Widely Different between MS
    • E.G., Definition of APSFRs (Area, River Reach, Point)
  – Fairly Similar Overall Approach in IE, UK, SE, FI
    • Based on sharing of information
  – IE:
    • Past floods: Historic floods database (No floods & No. properties flooded in the past
    • Future floods: DTM-based predictive mapping, and GIS-based risk assessment tool
    • Local Knowledge
HISTORIC PFRA

- WWW.FLOODMAPS.IE (http://www.floodmaps.ie/)
  - National Flood Data Archive (>5,000 Events)
  - Records of Past Damage / Properties Flooded
  - Records of No. of Past Floods in Communities

HISTORIC RISK CATEGORY
PREDICTIVE PFRA

• FLOOD RISK – FUNCTION OF:
  – Probability of a Flood Event (Hazard)
  – Consequences (Damage in Event of a Flood)

• SPATIAL PROBABILITY -> FLOOD MAPS
  – National predictive flood mapping not available in Ireland at start of PFRA
PREDICTIVE PFRA

- PFRA MAPS – FLUVIAL
  - Automated application of FSU to determine flows
  - Out-of-bank flow: Q(T) – Q(Med)
  - Derivation of Cross-Sections from DTM
  - Application of Normal-Depth Method
    - Flood Level for Cross-Section
    - Flood Extent for Cross-Section: Level vs. DTM
  - Interpolation between 100m Nodes
  - No account of local hydraulics (increased channel conveyance, channel restrictions, etc.)
PREDICTIVE PFRA

- PFRA MAPS – COASTAL
  - ICPSS Maps
    - Extreme Sea Levels using 2-D Coastal modelling
    - Horizontal inland projection of levels
    - No account of flood defences
PREDICTIVE PFRA

• PFRA MAPS – PLUVIAL
  – FSU-based Rainfall Intensities / Durations
  – Application of Rainfall to Rapid Flood Spreading Models, using DTM
  – Allowance for Infiltration / Urban Stormwater Drainage Systems
  – Identify Areas Prone to Ponding
  – No Account of Local Hydraulics
    • E.g., Culverts through Embankments
PREDICTIVE PFRA

• PFRA MAPS – GROUNDWATER
  – Turloughs
  – Single ‘Extreme’ outline
  – Historic observations (aerial, ground-based)
  – Simple predictive method:
    • Typical turlough level variation vs. DTM levels
    • Professional judegement
PREDICTIVE PFRA

• NATIONAL, INDICATIVE PFRA FLOOD MAPS
  – Broadly Indicative of Flood Prone Areas
    • Acceptable Accuracy for PFRA (‘Available & Readily-Derivable’)
  – Not Precise Flood Extent Maps
    • Not Always Locally Accurate
    • Not Suitable for Local / Site-Level Decisions
  – Published for PFRA Consultation
PREDICTIVE PFRA

• CONSEQUENCES
  – Different ‘Receptors’
    • *People, objects, areas and activities that could suffer harm or damage in the event of a flood*
    • Criteria: Social, Economic, Environmental, Cultural
  – Vulnerability Assessment
    • Function of:
      – Receptor Value / Importance
      – Potential degree of damage to Receptor in event of flooding
    • Assign ‘Vulnerability Classification’
## PREDICTIVE PFRA

### VULNERABILITY CLASSIFICATION

<table>
<thead>
<tr>
<th>PROBABLE IMPACT</th>
<th>DEGREE OF RECEPTOR IMPORTANCE / DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>International</td>
</tr>
<tr>
<td>Total Loss</td>
<td>Critical</td>
</tr>
<tr>
<td>Severe Degradation</td>
<td>Critical</td>
</tr>
<tr>
<td>Moderate Damage</td>
<td>Extreme</td>
</tr>
<tr>
<td>Minor Damage</td>
<td>High</td>
</tr>
<tr>
<td>No / Negligible Damage</td>
<td>Low**</td>
</tr>
</tbody>
</table>
PREDICTIVE PFRA

• RISK: FUNCTION OF
  – Probability (Flood Maps)
  – Consequences (Vulnerability Classification)
  – Calculated as ‘Flood Risk Index’

• ‘SIGNIFICANT’ RISK
  – Individual Receptors (Hospitals, Power Stations, Major Airports, etc.)
  – Community Risk (Cities, Towns, Villages)
PREDICTIVE PFRA

• LOCAL KNOWLEDGE
  – Initial Consultation
    • Local Authorities
    • Other Depts. / Authorities
    • Public & All Stakeholders
  – Formal, National Consultation
    • Draft PFRA and APSFR Designations
    • www.cfram.ie/pfra
PREDICTIVE PFRA

- DEFINITION OF ‘SIGNIFICANT’ RISK & APSFRs
  - Need to Capture all Recognised ‘Hot-spots’
  - Cost-Effective Mapping / FRMPs
  - Realistic Expectations
  - Continuity with Minor Schemes Programme

- NATIONAL No. APSFRs: 300
IMPLEMENTATION – FLOOD MAPS

• ARTICLE 6 – FLOOD MAPS
  – Only Required for APSFRs
  – Flood Hazard Maps
    • Flood extent
    • Depth or water level
    • (Option) velocity or flow
    • Low, medium and (option) high probability events
  – Flood Risk Maps
    • Inhabitants potentially affected
    • Type of economic activity
    • IPPC installations and protected areas
    • Other (debris floods, pollution sources, ... )
IMPLEMENTATION – FLOOD MAPS

• DUE FOR COMPLETION: DEC 2013

• CHALLENGES:
  – Significant Experience in MS
IMPLEMENTATION – FLOOD MAPS

• CHALLENGES:
  – Transboundary Mapping
    • Seems to be Variable
    • Good cooperation within International River Commissions, and Bi-laterally between some MS
    • Greater difficulties elsewhere
  – Publication and Communication of Risk
  – Climate Change and Uncertainty
    • Different approaches in different MS
  – Scale of Work Involved
IMPLEMENTATION – FLOOD MAPS

• IMPLEMENTATION IN IRELAND
  – 8 Probabilities (50% AEP – 0.1% AEP)
  – APSFR + ‘MPW’s
  – Defended Areas (Areas protected by defences)
  – Defence Breach Scenarios
    • 2-D Modelling of impact of defence breach
    • Selected defences only (higher risk)
  – Future Scenarios
    • ‘Mid-Range’ and ‘High-End’ Future Scenarios
IMPLEMENTATION – FLOOD MAPS

• IMPLEMENTATION IN IRELAND
  – Uncertainty Mapping
    • Level of Analysis: Broad-scale, simple assessment
    • Presentation:
      – Extent line-type
      – Sensitivity extent lines
      – Fuzzy lines
      – Sliding probability extents
  • Value
    – Who would use the uncertainty information?
    – Important to maintaining clarity
IMPLEMENTATION – FRMPs

• ARTICLES 7, 8 & ANNEX – FLOOD RISK MANAGEMENT PLANS (FRMPs)
  – At Catchment-Scale, but focused on addressing risk in AFAs
  – Set out flood risk management Objectives
  – Set out prioritised set of Measures for achieving specified Objectives
IMPLEMENTATION – FRMPs

• CHALLENGES:
  – Early Stage (Due 2015)
  – Setting Objectives
    • National consistency vs local importance / flexibility
      – WG F Workshop – 16th October 2013
  – Coordination with WFD
    • WG F FD-WFD Synergies Document in Development
    • Key Issues:
      – Information Exchange (Flood maps – SWMIs)
      – Measures (Achieving mutual benefits – Avoiding conflict)
  – Climate Change
    • Uncertainty in future allowances
      – WG F Workshops (Sweden 2009, WG F 12)
IMPLEMENTATION – FRMPs

• CHALLENGES (CONT’D):
  – Land Use Planning
    • Major component of Flood Risk Prevention
      – Essential for long-term, sustainable flood risk management
      – Inappropriate development creates demand for future investment of resources for flood protection
    • Varying approach across EU, but trend towards stronger regulation (WG F Workshops, NO & AT/SL)
      – Need for Balance: Need to keep people safe, but also need to avoid unnecessarily restricting economic growth
  • Flood mapping critical (Defines development zones)
  • Provision for Climate Change? Uncertainty?
IMPLEMENTATION – FRMPs

- **CHALLENGES (CONT’D):**
  - Public & Stakeholder Engagement
    - WG F Workshop (Romania, 2012)
    - Essential for:
      - Raising awareness of resilience against flood risk
      - Building trust and buy-in
      - Improving outputs, e.g., maps, through local knowledge

- **Communication of Risk**
  - Many ‘publics’ and stakeholders
  - Need to be clear in what we’re saying and why
  - Need to adapt message and method to the audience

- **Challenges**
  - Conveying complex concepts simply
  - Managing fears and expectations, e.g., Property devaluation, Communicating Need for Prioritisation
IMPLEMENTATION – FRMPs
New Approach in Ireland

• NEED FOR APPROACH THAT ADDRESSES:
  – Risk to People, Environment, Cultural Heritage and the Economy
  – Links through and links together:
    • Objectives
    • Development and Selection of Measures
    • Prioritisation

• ISSUES:
  – Difficulties in monetarising some risks / benefits
  – Need to reflect societal values and objectives
  – Need for fair, objective and transparent process
IMPLEMENTATION – FRMPs
New Approach in Ireland

• NATIONAL POLICY REVIEW, 2004
  – Focus on managing risk to "People, businesses, infrastructure and the environment"

• ‘CFRAM’ PILOT STUDIES (www.cfram.ie)
  – 2008: Indicators, Methods & Datasets Study
  – 2008-09: Development & application of new MCA method to test on Pilot CFRAM Studies
  – Outcomes of MCA Process for Pilot CFRAM Studies:
    • Deemed to be appropriate
  – 2013: Being further developed for use for National CFRAM Programme & ‘Floods’ Directive
IMPLEMENTATION – FRMPs
New Approach in Ireland

- OBJECTIVES & SUB-OBJECTIVES
  - Represent Potential Benefits of Measure / Scheme
    - Economic (4 Objectives):
      - Reduction of economic damages to properties and of risk to transport, utilities and agriculture
    - Social (5 Objectives):
      - Reduction of risk to people, highly vulnerable social properties, social infrastructure, employment and amenity
    - Environmental & Cultural (6 Objectives):
      - WFD, Habitats, Fisheries, Pollution, Landscape & Cultural Heritage
      - Based on avoidance of damage and achievement of benefits
      - Linked closely to SEA / HD AA
    - Technical (3 Objectives):
      - Operational Risk, Climate Change and Health & Safety
      - Used for Option Selection Only
IMPLEMENTATION – FRMPs
New Approach in Ireland

• (DRAFT) GLOBAL WEIGHTINGS PER OBJECTIVE:
  – Risk to Human Health and Life: 40
  – Economic Risk: 30
  – Risk to Community: 15
  – Risk to Utility Infrastructure: 15
  – Risk (or Benefits) to Water Quality / Pollution Sources: 15
  – Risk (or Benefits) to Habitats / Species: 15
  – Risk to Agriculture: 10
  – Risk to Landscape (incl Urban Impacts): 10
  – Others (Excl. Technical): 30

• REPRESENT SOCIETAL VALUE OF OBJECTIVE
  – National Stakeholder and Public Consultation to Validate ‘Societal Value’
IMPLEMENTATION – FRMPs
New Approach in Ireland

- NATIONALLY CONSISTENT INDICATORS FOR EACH OBJECTIVE
  - Measurable, where possible, e.g:
    - (2.a) Economic Risk – AAD (€)
      - UK Flood Hazard Research Centre Methodology, Converted by PPP
      - Based on standardised depth-damage curves
    - (3.a) Risk to people – No. Properties at risk
    - (3.b.ii) Risk to local employment – No. Businesses at risk

- FOR EACH OBJECTIVE / SUB-OBJECTIVE
  - Minimum Requirements
    - Generally, do not make matters worse
  - Aspirational Targets
    - Reduce risk to zero or achieve benefits in other sectors
IMPLEMENTATION – FRMPs
New Approach in Ireland

- MEASURES TO BE SPECIFIC ACTIONS
- MULTI-CRITERIA ASSESSMENT / APPRAISAL
  - Used for Selection of Measures for APSFR / UoM
  - Performance of Measures / Schemes against Minimum Requirements & Aspirational Targets
    - Score: 0-5 on performance
    - Negative scores for not achieving Min. Requirement
    - Detailed guidance on scoring being prepared to help ensure national consistency (Need for equal basis for prioritisation)
  - Global Weightings per Objective / Sub-Objective
  - Local weightings
    - Reflect local relevance / importance of the Objectives
IMPLEMENTATION – FRMPs
New Approach in Ireland

• MCA SCORE
  – For each Sub-Objective, MCA Score calculated as function of:
    • Performance score
    • Global weighting
    • Local weighting
  – Sum MCA Score per Sub-Objective for overall MCA Score per Option (measure)
  – Quantitative, but non-monetarised, metric of benefits of the measure
  – Calculated nationally in a consistent manner
IMPLEMENTATION – FRMPs
New Approach in Ireland

• SELECTION OF MEASURES
  – MCA Score represents overall benefits of the measure
    – No provision for cost
  – MCA Benefit-Cost Ratio
    • Calculate MCA Score per Euro
    • Max. = Greatest overall benefit per Euro spent
  – Economic Benefits
    • Traditional economic ‘BCR’ also calculated
    • Needed for economic efficiency / financial justification
    • Measure / scheme should have Economic BCR > 1
IMPLEMENTATION – FRMPs
New Approach in Ireland

• SELECTION OF MEASURES
  – MCA Process and BCR is for Decision-Support
  – Other Factors in Decision-Making Process:
    • Consultation with responsible bodies
    • Professional judgement
    • Stakeholder views / preferences

• OTHER MEASURES
  – National Policy Measures Applicable Everywhere
    • Planning / Land Use
    • Emergency Response Planning
    • Resilience
  – Further Data Collection / Analysis
IMPLEMENTATION – FRMPs New Approach in Ireland

• PRIORITISATION OF MEASURES
  – Set Nationally / Regionally
    • Major Schemes Funded Nationally
    • Regional Discretion on Priority of Minor Schemes
  – Based on MCA Outcomes:
    • MCA Benefit-Cost Ratio
    • Traditional economic ‘BCR’ also calculated
  – Take into Account Other Factors & Consultation
  – To be Defined by Timelines (i.e., as a Programme)
    • Requires Projection / Estimation on Multi-Annual Budgeting
    • Realistic!
      – Work according to budgets
      – Can not implement all measures in first cycle
# IMPLEMENTATION – FRMPs
## New Approach in Ireland

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<tr>
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</thead>
<tbody>
<tr>
<td>Install additional hydrometric monitoring equipment</td>
<td>Operate additional hydrometric monitoring equipment</td>
<td></td>
<td></td>
<td></td>
<td>OPW</td>
</tr>
<tr>
<td>Coordinate, operate and maintain existing hydrometric network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OPW ESB EPA</td>
</tr>
</tbody>
</table>

## EXISTING FLOOD DEFENCES
- Determine defence asset monitoring and maintenance programme
- Proactive maintenance of existing defence assets at Tower, the Jack Lynch Tunnel, and other Council-owned, identified defences, including road embankments protecting properties

## INDIVIDUAL RISK RECEPTORS
- Operators to pursue detailed risk assessment and management measures (see Table 8-1)

## CORK CITY
- Implementation of local works to provide fluvial and/or tidal protection for Cork City area.
- Further optimisation of the function of Carrigadrohid and Inniscarra dams for flood risk management AND/OR
- Maintenance and further implementation of local works to provide fluvial and/or tidal protection for Cork City area.
- Further optimised operation of Carrigadrohid and Inniscarra dams for flood risk management AND/OR
- Implement full joint fluvial – tidal defence scheme for Cork

| | | | | | |
| | | | | | OPW ESB CCyC CCoC |
| | | | | | OPW ESB CCyC CCoC |
| | | | | | OPW ESB CCyC CCoC |
### BLACKWATER FLOOD FORECASTING SYSTEM

<table>
<thead>
<tr>
<th>Rank</th>
<th>Item</th>
<th>Rank</th>
<th>Current status</th>
<th>Set by</th>
<th>Locked</th>
<th>Locked until</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>SendAlerts</td>
<td>1</td>
<td>Alerts</td>
<td>System run 3...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Run 2551: 12/01/2010 20:00 15 Minutes Alerts [2 MallowR, 2 Castleland, 2 Heavy_Rain, 9 Missing]

**Water level**

**Rainfall (gauged)**
MALLOW FLOOD RELIEF SCHEME
KILKENNY FLOOD RELIEF SCHEME
IMPLEMENTATION

• GOVERNANCE
  – Variable Structures across EU
    • National consistency
    • Federal systems / Regional competence
    • Importance of Local decision-making
  – Structure Adapted to National Legislation
    • No ‘One size fits all’ approach
  – Clarity in Responsibilities and Good Communication between Competent / Responsible Authorities and Stakeholders is Essential
EU ‘FLOODS’ DIRECTIVE

- IMPLEMENTATION IS CHALLENGING
  - Time, Resources, Methodologies, Communication & Governance

- EU ‘FLOODS’ DIRECTIVE IS FLEXIBLE

- WG F: FORUM FOR INFORMATION EXCHANGE
  - Ideas and information
  - Approaches and experience in other MS

- GOOD COMMUNICATIONS IS CRITICAL
Sixth Bulgarian – Austrian Seminar

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EUROPEAN PRACTICE AND RESEARCH IN FLOOD RISK MANAGEMENT

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