Infrastructure management

Presentation to Practitioners Workshop
4th October 2011

Paul Sayers
Lead SWP 4 – Infrastructure Management – FRMRC
Sayers and Partners LLP
England and Wales
• Annual expenditure on maintenance / improvement approx. £450m
• £20 billion of sunk investment

USA
• US Corp of Engineers estimate $2.2 trillion to maintain levees at a “desirable” standard (Steve Stockton)
Where has the science in FRMRC been focused – and can it help practice?
Some difficult questions...

A range of spatial and temporal scales of interest

What are the national...
- Hot spots?
- Investment need?
- How might these change?

How will the system...
- Perform now and in the future?
- Which assets contribute most to risk?

How will an asset...
- Perform under load or on demand?
- Improve or deteriorate with/without action?
1. **Inspection** - Develop new approaches to integrate visual inspection and remote sensed data in the condition assessment process

2. **Individual asset performance** - Improve system risk analysis (RASP/MDSF2) through an improved breach and blockage representation

3. **Asset system performance** - Extend the current system risk analysis models to include coastal assets

4. **Decision support** - Develop new approaches to optimising asset intervention strategies
The uptake challenge
Promoting linkage between researchers and practitioners to help promote practicality and aid future take-up
<table>
<thead>
<tr>
<th>SURNAME</th>
<th>FORENAME</th>
<th>TITLE</th>
<th>ORGANISATION</th>
<th>E-MAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adamson</td>
<td>Mark</td>
<td>Mr.</td>
<td>OPW Dublin</td>
<td><a href="mailto:mark.adamson@opw.ie">mark.adamson@opw.ie</a></td>
</tr>
<tr>
<td>Arthur</td>
<td>Scott</td>
<td>Dr.</td>
<td>Heriot Watt</td>
<td><a href="mailto:s.arthur@hw.ac.uk">s.arthur@hw.ac.uk</a></td>
</tr>
<tr>
<td>Baxter</td>
<td>Geoff</td>
<td>Dr.</td>
<td>EA</td>
<td><a href="mailto:geoff.baxter@environment-agency.wales.gov.uk">geoff.baxter@environment-agency.wales.gov.uk</a></td>
</tr>
<tr>
<td>Bramley</td>
<td>Mervyn</td>
<td>Dr.</td>
<td>EA Advisor</td>
<td><a href="mailto:mervyn.bramley@blueyonder.co.uk">mervyn.bramley@blueyonder.co.uk</a></td>
</tr>
<tr>
<td>Gosden</td>
<td>John</td>
<td>Mr.</td>
<td>Jacobs</td>
<td><a href="mailto:john.gosden@jacobs.com">john.gosden@jacobs.com</a></td>
</tr>
<tr>
<td>Gouldby</td>
<td>Ben</td>
<td>Mr.</td>
<td>HR Wallingford</td>
<td><a href="mailto:b.gouldby@hrwallingford.co.uk">b.gouldby@hrwallingford.co.uk</a></td>
</tr>
<tr>
<td>Hamer</td>
<td>Ben</td>
<td>Mr.</td>
<td>Halcrow</td>
<td><a href="mailto:HamerBA@halcrow.com">HamerBA@halcrow.com</a></td>
</tr>
<tr>
<td>Long</td>
<td>Gavin</td>
<td>Mr.</td>
<td>Nottingham</td>
<td><a href="mailto:gavin.long@nottingham.ac.uk">gavin.long@nottingham.ac.uk</a></td>
</tr>
<tr>
<td>Martin</td>
<td>Jim</td>
<td>Mr.</td>
<td>Rivers Agency NI</td>
<td><a href="mailto:jim.martin@dardni.gov.uk">jim.martin@dardni.gov.uk</a></td>
</tr>
<tr>
<td>Mawdesley</td>
<td>Mick</td>
<td>Dr.</td>
<td>Nottingham</td>
<td><a href="mailto:michael.mawdesley@nottingham.ac.uk">michael.mawdesley@nottingham.ac.uk</a></td>
</tr>
<tr>
<td>Morris</td>
<td>Mark</td>
<td>Mr.</td>
<td>HR Wallingford</td>
<td><a href="mailto:m.morris@hrwallingford.co.uk">m.morris@hrwallingford.co.uk</a></td>
</tr>
<tr>
<td>Ogunyoye</td>
<td>Fola</td>
<td>Mr.</td>
<td>Royal Haskoning</td>
<td><a href="mailto:f.ogunyoye@royalhaskoning.com">f.ogunyoye@royalhaskoning.com</a></td>
</tr>
<tr>
<td>Pontee</td>
<td>Nigel</td>
<td>Dr.</td>
<td>Halcrow</td>
<td><a href="mailto:PonteeNI@halcrow.com">PonteeNI@halcrow.com</a></td>
</tr>
<tr>
<td>Sayers</td>
<td>Paul</td>
<td>Mr.</td>
<td>HR Wallingford</td>
<td><a href="mailto:p.sayers@hrwallingford.co.uk">p.sayers@hrwallingford.co.uk</a></td>
</tr>
<tr>
<td>Simm</td>
<td>Jonathan</td>
<td>Mr.</td>
<td>HR Wallingford</td>
<td><a href="mailto:j.simm@hrwallingford.co.uk">j.simm@hrwallingford.co.uk</a></td>
</tr>
<tr>
<td>Sisinggih</td>
<td>Dian</td>
<td>Dr.</td>
<td>Heriot Watt</td>
<td><a href="mailto:d.sisinggih@hw.ac.uk">d.sisinggih@hw.ac.uk</a></td>
</tr>
<tr>
<td>Smith</td>
<td>Martin</td>
<td>Dr.</td>
<td>Nottingham</td>
<td><a href="mailto:martin.smith@nottingham.ac.uk">martin.smith@nottingham.ac.uk</a></td>
</tr>
<tr>
<td>Stripling</td>
<td>Stuart</td>
<td>Dr.</td>
<td>HR Wallingford</td>
<td><a href="mailto:s.stripling@hrwallingford.co.uk">s.stripling@hrwallingford.co.uk</a></td>
</tr>
<tr>
<td>Taha</td>
<td>Ahmad</td>
<td>Dr.</td>
<td>Nottingham</td>
<td><a href="mailto:ahmad.taha@nottingham.ac.uk">ahmad.taha@nottingham.ac.uk</a></td>
</tr>
<tr>
<td>Thorne</td>
<td>Colin</td>
<td>Prof.</td>
<td>Nottingham</td>
<td><a href="mailto:colin.thorne@nottingham.ac.uk">colin.thorne@nottingham.ac.uk</a></td>
</tr>
<tr>
<td>Wallerstein</td>
<td>Nick</td>
<td>Dr.</td>
<td>Nottingham</td>
<td><a href="mailto:Nicholas.Wallerstein@nottingham.ac.uk">Nicholas.Wallerstein@nottingham.ac.uk</a></td>
</tr>
<tr>
<td>Williamson</td>
<td>Tracey</td>
<td>Mrs.</td>
<td>HR Wallingford</td>
<td><a href="mailto:t.williamson@hrwallingford.co.uk">t.williamson@hrwallingford.co.uk</a></td>
</tr>
</tbody>
</table>
1. **Innovative science** – providing underlying advances (e.g. blockage processes)

2. **Enabling technologies** – extending system analysis frameworks (building RASP to promote take-up into MDSF2 /NaFRA)

3. **Pilot** – proving the utility of the science and technology through prototype pilot application (Dodder, Thames, Holderness)

4. **Guidance** – providing user relevant guidance (two CIRIA technical notes – (i) inspection, and (ii) blockage)

5. **Linkage** – nationally and international rojects and data:
   - CDOG (Heriot Watt)
   - FACET tools scoping (Haskoning / Sayers)
   - Floodprobe/UrbanFlood (HRW)
   - ILH (CIRIA/HRW)
   - DSIG data (Oxford/Morris)
   - Workshops Australia (Sayers/HW), China (SWP leaders), Practitioner (today) and Science (9th Dec) workshops in the UK)
A clear road map to uptake...
Next generation of asset management tools (supporting future developments of PAMS, MDSF2/NaFRa/LTIS and other assessment tools)

- Probabilistic prediction of blockage at structures (WP 4.1)
- Condition assessment, linking visual inspection and quantitative survey data (WP 4.2)
- Whole life costing methods
- Linear asset condition
- Next generation methods to support the identification of preferred asset management strategies
- Improved representation of breach within system risk models (e.g., RASP)
- Improved representation of asset performance and enhanced visual inspection
- Application of HR BREACH model and literature review
- Optimisation of structural intervention options (WP 4.5)
- Linked RASP and coastal process models
- Improved ability to assess coastal erosion and flood risks
- Integrated assessment of coastal erosion and flood risk (WP 4.3)
- Rapid simulation of defence breach formation (WP 4.4)
- Future climate uncertainty
- Asset performance (now and future)

A clear role in practice.....
Look to use the outputs....

Papers
   Many journal papers and conference papers

Books
   In press - Thomas Telford Book – Infrastructure management and design
           (edited Sayers)

CIRIA TN
   Notes on inspection and blockage in press

Tools
   Breach codes, complied tools (now as much open source as ideal)

Data
   Base datasets in blockage (plus various model runs).
Some key outputs

Papers
   Many journal papers and conference papers

Books
   In press - Thomas Telford Book – Infrastructure management and design
      (edited Sayers)

CIRIA TN
   Notes on inspection and blockage in press

Tools
   Breach codes, complied tools (now as much open source as ideal)

Data
   Base datasets in blockage (plus various model runs).
Acknowledgement

The research reported in this presentation was conducted as part of the Flood Risk Management Research Consortium with support from the:

- Engineering and Physical Sciences Research Council
- Department of Environment, Food and Rural Affairs/Environment Agency Joint Research Programme
- United Kingdom Water Industry Research
- Office of Public Works Dublin
- Northern Ireland Rivers Agency

Data were provided by the EA and the Ordnance Survey.