Diffuse Pollution: Impacts driving action

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Scope today

1. Quantifying impacts for actions
2. Diffuse pollution c.f. non-point source
3. Conclusions
The value of quantifying Impacts

A pre-requisite for seeking actions

BJ DARCY 18 July 2018
A clear future for our waters
Evidence that this was a major cause of pollution led to establishment of a budget and a capital programme for the Coal Authority to retrofit passive treatment wetlands.

FRPB probably got > fair share of allocation initially... due to good evidence of impact.
Methodology

2 stage process:
- a) identify all reaches exceeding an EQS
- b) identify likely source of those exceedences with local pollution prevention teams and consented discharge records

E.g. river average [Fe] > 2 mg/L – generally associated with abandoned mines if not a known & licenced mine discharge

Similarly if average [BOD] > 3 mg/L – check against known STW discharges
Detailed work judgement includes:

- **Chemical clues**
  e.g. Fe & conductivity, [pH too sometimes] → minewater

- **Sewer maps**
  Separate or combined?

- **Known history of problems**
  e.g. wrong connections
  e.g. pesticides

- **Biological quality assessments**
  It’s poor, & no known cause
  & its urban or farming or other land-use local catchment
FRPB method adopted by SEPA, from 1996 until WFD implementation

Figure 4. Reasons why rivers were classified as polluted in 1996.

- Damage to invertebrates
- Biochemical oxygen demand
- Phosphate
- Ammonia
- Dissolved oxygen
- Acidity
- Iron
- Litter
- Dangerous substances

River length (km)

Methodology refined by Martin Marsden, SEPA

SEPA, 1999 report
International insights, 1998 Diffuse Pollution conference, Edinburgh

At an international conference in UK it was clear that other countries recognised diffuse pollution and had decades of quantification & characterisation … …leading them to programmes of measures & progress…

How to catch up?
The CIWEM diffuse pollution impacts report, 2000

- In 1998, representatives of 16 British organisations agreed to work together –
  - They created a high impact report for governments and agencies
  - Hard evidence of the problem = a pre-requisite for novel (in UK) ideas to address it.

The effect of the CIWEM report

- Scottish Government, Defra EA, SEPA, Northern Ireland, all set up diffuse pollution teams.

- Evidence was clearest and strongest in Scotland:
  - Scottish Government in 2001–2005 funded a diffuse pollution initiative in SEPA
  - C. £0.5M per year in geared up research and implementation projects.
  - Scottish diffuse pollution stakeholder working group → consensus on new legislation

- CEO of English Nature launched the CIWEM report in London, supported by a SEPA Director and the Water Policy lead for the Environment Agency:

- High level buy-in therefore it matters → programmes of work

- Very diverse issues, but a single unified concept driving catchment focused efforts and national (UK-wide) developments in regulatory thinking
Simple regulatory requirements

GBR (10) Discharge of surface water *into the water environment*
- from roads, buildings, yards, construction sites, no oil, sewage, trade effluent etc
- surface water drainage post 2007 must be from a SUD System

GBR(11) Discharge *into a surface water drainage system*
- Sewage into surface water misconnections
- Disposal of oil, chemicals or other potentially polluting materials

- Light touch regulation, not straying from the evidence base
- Supported by sectors in the Scottish Govt. stakeholder group (including NFUS and landowners)

“Our current understanding of the problem”

Figure: Comparing cost effectiveness of addressing non-agricultural diffuse pollution sources

From DEFRA, Tackling water pollution from the urban environment (Nov. 2012)
Scotland had figures for urban runoff impacts, diffuse agriculture impacts etc.,

Scotland has legislation enacted (from 2003) to control diffuse pollution, including the requirement for new developments to use SUDS technology.

**Table 14. Sources of urban drainage pollution and the resultant length of waters classified as polluted.**

<table>
<thead>
<tr>
<th>Source</th>
<th>Length (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban areas</td>
<td>290</td>
</tr>
<tr>
<td>Industrial estates</td>
<td>150</td>
</tr>
<tr>
<td>Airports</td>
<td>47</td>
</tr>
<tr>
<td>Trunk roads</td>
<td>11</td>
</tr>
<tr>
<td>Coastal waters</td>
<td></td>
</tr>
<tr>
<td>Urban areas</td>
<td>4</td>
</tr>
<tr>
<td>Harbours</td>
<td>2</td>
</tr>
</tbody>
</table>

From SEPA (1999) State of the Water Environment
Approx “500km of polluted watercourses due to with urban drainage” in Scotland

WEWS (Scotland) Act 2003

Controlled Activities (Scotland) Regulations 2006 (as amended...)

SUDS, as routine requirements
Research by Heriot Watt University for CREW* found that, for a large industrial estate in Scotland,

- 100% of premises built since the requirement had got SUDS drainage.

*2018, unpublished yet
Impacts must drive actions, (not just income from charges)

No inspections: by policy

- Industrial effluent
- Urban drainage
- IMPACTS in Km

SEPA 1999 water report
If the impacts of many sources are one of the main problems, then → sampling approach to inspection (X% p.a.)

Enforcement: admin. penalties
For a definition, it is *irrelevant* whether an input is from a pipe or a any other ‘point’

Is this useful? “Pollution from widespread activities with no one discrete source [why not?], e.g. acid rain, pesticides, urban run-off, etc. Source: [http://glossary.eea.europa.eu/EEAGlossary/D/diffuse_pollution](http://glossary.eea.europa.eu/EEAGlossary/D/diffuse_pollution)
International perspectives

- IWA Land Use & Water Quality Task Group
- Aims to raise profile of diffuse pollution, to produce a high impact report for governments, environment agencies, business, and NGOs
- Report: by autumn 2020
IWA questionnaire: how important as defining characteristics are these for diffuse pollution?

<table>
<thead>
<tr>
<th></th>
<th>IRRELEVANT</th>
<th>NOT VERY IMPORTANT</th>
<th>NEITHER IMPORTANT NOR UNIMPORTANT</th>
<th>IMPORTANT</th>
<th>VERY IMPORTANT</th>
<th>TOTAL</th>
<th>WEIGHTED AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Cannot identify a source</td>
<td>18.75%</td>
<td>6.25%</td>
<td>12.50%</td>
<td>35.94%</td>
<td>26.56%</td>
<td>64</td>
<td>3.45</td>
</tr>
<tr>
<td>B. Not from a pipe</td>
<td>6.45%</td>
<td>8.06%</td>
<td>9.68%</td>
<td>38.71%</td>
<td>37.10%</td>
<td>62</td>
<td>3.92</td>
</tr>
<tr>
<td>C. Weather driven</td>
<td>7.81%</td>
<td>15.63%</td>
<td>10.94%</td>
<td>37.50%</td>
<td>28.13%</td>
<td>64</td>
<td>3.63</td>
</tr>
<tr>
<td>D. Cannot be controlled by legislation</td>
<td>27.42%</td>
<td>20.97%</td>
<td>20.97%</td>
<td>20.97%</td>
<td>9.68%</td>
<td>62</td>
<td>2.65</td>
</tr>
<tr>
<td>E. Landscape related</td>
<td>4.69%</td>
<td>1.56%</td>
<td>18.75%</td>
<td>45.31%</td>
<td>29.69%</td>
<td>64</td>
<td>3.94</td>
</tr>
<tr>
<td>F. Stormwater associated</td>
<td>6.25%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>34.38%</td>
<td>34.38%</td>
<td>64</td>
<td>3.78</td>
</tr>
</tbody>
</table>

**OTHER (PLEASE SPECIFY)**

<table>
<thead>
<tr>
<th>#</th>
<th>DATE</th>
<th>OTHER (PLEASE SPECIFY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9/28/2017 7:55 PM</td>
<td>spatially and temporally variable quality and quantity</td>
</tr>
<tr>
<td>2</td>
<td>9/28/2017 12:35 PM</td>
<td>In Greece diffuse pollution is connected mainly to urban activities: road run-off and agriculture</td>
</tr>
<tr>
<td>3</td>
<td>9/27/2017 12:55 PM</td>
<td>I would have thought land management would be better than landscape</td>
</tr>
<tr>
<td>4</td>
<td>9/27/2017 10:12 AM</td>
<td>Several of these alternatives can be misunderstood</td>
</tr>
<tr>
<td>5</td>
<td>9/27/2017 12:12 AM</td>
<td>Note there are non-stormwater associated sources of diffuse pollution</td>
</tr>
</tbody>
</table>
Diffuse pollution is "Landscape or atmospheric contamination mobilised and transported into the water environment by weather conditions" 

(Diffuse Pollution Revisited, Watershed & River basin management Group conference, 2017)
Conclusions (1) Definitions choices:

**Regulatory**

Conventional regulation does not allow for control. Policies define by exclusion: ‘Can’t be controlled’ ‘Can’t find the source/s’

Not specifically identified in ‘core’ business water regulations & meaningful policies

Under-resourced, self-defeating, built-in failure to either monitor properly, or attempt serious control

**Physical processes**

Quality–quantity characteristics
Weather–driven
Pollutants & sectors, land–use
Soils, surface imperviousness, Topography, hydrology

Identification of how pollution occurs: where & why it matters, Which sectors/land–uses for actions & which actions might be effective?

Rational basis for developing:

a) Appropriate monitoring
b) A practical & appropriate regulatory control regime
CONCLUSIONS (2): Key Links

Keep it big picture to drive government actions:

- Weather driven -> high flow pollution from unprotected landscapes

Restrict use of Problem materials
Manage use
Capture and safely remove, reprocess, recycle

Landscape interventions
Manage landscape and land use to minimise loss of contaminants (soil, nutrients, FIOs, as well as toxic substances etc)
SUDS, BMPs

Inspections & enforcement regimes, & ensuring included in development programmes etc.

N.B. Fragmentation destroys the case for control
References

- Novotny & Olem

BJ DARCY 18 July 2018