

<b>Institution: University of the West of Scotland</b>
<b>Unit of Assessment: 3</b>
<b>Title of case study: Risk assessment in public health</b>
<p><b>1. Summary of the impact</b> (indicative maximum 100 words)</p> <p>Human health risks and population vulnerabilities are easily identifiable globally in communities exposed to the effects of climate change and the legacy of industrial contamination. Research by Dr Gagnon and Professor Hursthouse pioneered decision support frameworks and web tools that have been applied at local and national strategy level to improve environment links to public health. Authoritative Guidebooks developed by UWS researchers facilitated locally grounded adaptation to risks from climate change, while web tools enable robust case evaluation, prioritisation and new resources to be secured for the management of a variety of risks to human health from environmental contamination.</p>
<p><b>2. Underpinning research</b> (indicative maximum 500 words)</p> <p>The legacy of land contamination, the impact of climate change on government services and the protection of public health are global issues. They require complex and highly uncertain information to be assessed and policies developed to allow robust decision making. Implementation at the local level must be transparent and effective in its use of resources to meet statutory obligations in adapting to risks posed by the wider environment. Major challenges for local and national government are to continually adopt best practice and integrate new knowledge. Building on over a decade of research, UWS researchers generated integrated tools and frameworks to help these decision makers develop their plans. Engaging local stakeholders is essential because of differences in local circumstances and priorities and the UWS tools allow for risk assessment and a range of criteria to be incorporated in decision making actively adopted by local authority, government and community groups. The publication (3.1) of an online, computer-mediated decision making framework resulted in a tool to integrate spatial environmental data (GIS) with consultation methods (e-Delphi). Within an EU project [3.a] this tool was used to identify barriers to information exchange, collaboration and consultation in soil quality management, providing methods to efficiently collect and present heuristic rules, decision threads and derive transferable indicators.</p> <p>A research project to integrate spatial decision support techniques in land contamination assessment, (Highland Council grant) [3.b], with the British Geological Survey, fully demonstrated the capability of integrated GIS tools to enhance the response to statutory obligations through data decision support. The tool was further refined through extensive engagement with regulatory stakeholders and demonstrated the potential to integrate wide ranging information and practitioner feedback/opinion. Work on risk based land management policy, identified the opportunity to harmonise strategy internationally (3.2) for implementation at the local level [3.c]. This facilitated further application in a local authority, combining socio-economic factors with health risk assessment procedures enabling decision making to be proportionate, transparent and relevant to community and government issues. This approach, integrating environmental science with socioeconomic and public health issues, was extended to address the complexity of micro-nutrition on maternal health in subsistence communities (Malawi) [3.d]. Led by Professor Hursthouse, a multidisciplinary team was funded to develop a community engagement framework and gathered evidence to better understand iron and zinc transfer in the food chain, coupling ethnographic methods with physical science techniques and thus providing direction for bottom-up interventions to community health.</p> <p>The Scottish Alliance for Geoscience, Environment and Society (SAGES) Lectureship in Environmental Decision Support (2007), appointed Dr Gagnon to extend research into climate change adaptation and environmental health (SFC funded [3.e]). Gagnon and Hursthouse collaborated to identify barriers to information exchange between academic institutions and local government stakeholders. The framework developed was adopted to facilitate research in the Hebrides (EU NPP "CoastAdapt") on the perceptions of local authority decision-makers of their vulnerability to climate change (3.3), and introduced a participatory approach in developing</p>

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adaptation strategies (3.4). Dr Gagnon [3.f] critically assessed the conceptual elements to be considered when conducting a vulnerability assessment (3.5), and was subsequently applied in contrasting communities (3.6) [3.g].

### 3. References to the research (indicative maximum of six references)

1. Hossack I., Robertson D., Tucker P., Hursthouse, A.S., Fyfe, C. 2004. A GIS and web-based decision support tool for the management of urban soils. *Cybernetics & Systems* 35: 499-509.
2. Rodrigues S.M., Pereira M.E., da Silva E.F., Hursthouse A.S., Duarte A.C. 2009. A review of regulatory decisions for environmental protection: Part I - challenges in the implementation of national soil policies. *Environment International* 35: 202-213.
3. Gray S.R., Gagnon A.S., Gray S.A., O'Dwyer B., O'Mahony C, Muir D., Devoy R.J.N., Falaleeva M., Gault J. Are coastal managers detecting the problem? Assessing stakeholder perception of climate vulnerability using Fuzzy Cognitive Mapping. *Ocean & Coastal Management* (in press).
4. Muir D., Dawson, A.G., Gagnon, A.S., O'Mahony C. (2013). Vulnerability and adaptation to extreme coastal flooding: An example from the South Ford area, Scottish Outer Hebrides. In *Coasts, Marine Structures and Breakwaters: From Sea to Shore - Meeting the Challenges of the Sea*, Edinburgh, 18-20 September. London: ICE Publishing (in press).
5. Bruno Soares M., Gagnon A.S., Doherty R.M. 2012. Conceptual elements of climate change vulnerability assessments: a review. *International Journal of Climate Change Strategies and Management* 4: 6-35. [Highly Commended Award Winner at the Emerald Literati Network Awards for Excellence 2013].
6. Bruno Soares M. and Gagnon A.S. 2012. Reflecting on the challenges and barriers of performing climate change vulnerability assessments in Scotland. *International Journal of Global Warming* 4: 346-364.

#### Grant awards:

- [a] URBSOIL: Urban soils as sources and sinks for pollution (EVK4-CT-2001-00053) £199,000
- [b] The integration of earth science data in decision-support for contaminated land inspection strategy in the Highland Council area, (Highland Council/British Geological Survey 2002-2003) £13,000.
- [c] Sustainable Management of Urban Ecosystems: Integration of Environmental Quality Assessment Techniques (British Council, 2005-2006), £1,000
- [d] Bridging the Gap between Environmental Research and Local Decision-Makers; (Scottish Funding Council SPIRIT programme, 2008-2009), £68,804
- [e] Micronutrient deficiency in maternity and child health: scope for agricultural and educational intervention in soil-food-human transfer: (NERC Environment & Human Health Programme, 2007-2009), NE/E00831 3/1 £123,549 (+ £30k extension)
- [f] Performing Climate Change Vulnerability Assessments at the Local Level in Scotland – Challenges, Analytical Trade-offs, and Implications for Local Adaptation; (SAGES, 2008-2012), £40,000.
- [g] Climate Change Impacts and Adaptive Capacity in the Outer Hebrides and Shetland Islands; (Carnegie Trust), £1,595.

### 4. Details of the impact (indicative maximum 750 words)

Our research has directly impacted on the engagement of stakeholders, including the general public, in the development of frameworks and data integration tools. These tools have been applied across local government to improve public engagement, integrate new scientific knowledge to ensure planning decisions are more robust, and thus lead to improvements in the quality of life at the community level. Specifically:

Adoption of a framework The Western Isles, (Scotland) local authority and Hammerfest (Norway) municipality adopted a framework developed by Gagnon to provide a vulnerability assessment of local coastal communities to climate change (4.1, 4.2).

Public engagement: Both Professor Hursthouse and Dr Gagnon have sustained dissemination of research-informed decision-making, contributing to bottom-up community engagement. This forms

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a critical feedback to framework and decision support tool development. Dr Gagnon debated the likely impact of climate change on coastal communities at a series of meetings in October and November 2009 and May 2011 in Benbecula, Stornoway and South Uist, with OXFAM and Local Authority participation (4.1 and 4.2). Hursthouse has sustained long term public engagement with the debate on risk assessment based land management. This has included invited participation community council meetings and national TV interviews (BBC News) along with wider public discussions of land use and soil management through key stakeholder meetings.

[<http://www.brownfieldbriefing.com/news/60-second-interview-professor-andrew-hursthouse>]. The latest example of our engagement involves the innovative options for re use of brownfield sites through a project involving local School groups (Grow wild: Big Lottery/Kew Gardens £100,000 award, First Flagship Project).

### Engaging the Stakeholder Community

a. The decision-support tool developed by Hursthouse and colleagues (3.1) was used by a leading environmental policy NGO (National Society for Clean Air & Environmental Protection/EPUK now EP-S) to gauge regulator opinion on the implementation of the new statutory contaminated land regime. High (>90%) response, identified discrete limitations in policy and guidance and was used to develop a training programme for local authority officers by the NGO (~£20,000 of funded training reaching >100 local authority officers). This activity supported bottom up development of a NGO policy forum (<http://www.ep-scotland.org.uk/policy-focus/land-quality/>) (4.5)

b. Professor Hursthouse and colleagues in an EU expert group evaluated emerging EU soil policy principles for national consideration (3.2) and he was subsequently invited to Chair the group that consolidated the expert review, for the Soil Framework for Scotland 2009 report (4.6) which was used in the formulation of government strategic activities. Work directed by Hursthouse, engaging with 19 other contaminated land regulators, developed support to land developers through the publication of an advisory leaflet (4.7)

### Influence of research in the management of environmental risk

a. Using the integrated vulnerability assessment tool, the Western Isles local authority has changed its approach to risk management and the identification of adaptation strategies (Gagnon) and adopted the outcomes of the community consultations and knowledge exchange activities. It has been followed up by the creation of a guidebook for coastal decision-makers wishing to assess their vulnerability to climate change. This provides a route through the process of adaptation using a participatory approach thereby making the outcomes of this research relevant beyond the geographical region where it was conducted to other coastal communities around the world facing similar threats from climate change and sea level rise. Furthermore, the research (3.3) resulted in the application of a decision-support tool and the formation of coastal resilience groups in the Outer Hebrides and pilot sites in the Republic of Ireland, which bring together various decision-makers from local government and public bodies (e.g. in Scotland: Scottish Environmental Protection Agency (SEPA) and Scottish Natural Heritage (SNH)) to identify bottom-up adaptation ideas to the risks identified as a result of integrated vulnerability assessments (4.8).

b. The Highland Council applied the decision support tool (3.1) to combine spatial environmental information in the evaluation of over 5,000 locations across a region of >26,000 km<sup>2</sup>, allowing the local authority to make a more cost effective assessment of land contamination and resource prioritisation (4.9). The tool was subsequently extended within Inverclyde Council to incorporate multidisciplinary factors in the decision making (4.10). This extension allowed a proportionate response to be developed integrating human health risk assessment and socio-economic considerations where restrictions on funding existed. It sustained community use of an area of land saving the local authority an estimated >£130,000. The tool allowed planning decision makers to balance costs against other factors as well as providing a visual output for clear communication in potentially contentious situations.

## 5. Sources to corroborate the impact (indicative maximum of 10 references)

Identifier \*1

Adoption of the vulnerability assessment framework and its application in the municipality of Hammerfest, Norway. Paper by Stokke, (in press) Ocean & Coastal Management

Public engagement in research

Identifier \*1, Identifier \*2, Identifier 3

**Impact case study (REF3b)**

Engaging the Stakeholder Community

Identifier \*3

Scottish Government working group report:

<http://www.scotland.gov.uk/Publications/2008/06/27092800/3#>

Development & Control Leaflet: <http://www.inverclyde.gov.uk/planning-and-the-environment/environmental-issues/contaminated-land/land-contamination-development-management>

Influence of research in the management of environmental risk

Identifier \*1, Identifier \*4, Identifier 5\*