



**Workshop Report:
Pharmaceuticals and priority chemicals
in the Highlands and Islands environment**

Wednesday, 21st of June 2017, Inverness

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1 Background

Why this is important for the Highlands and Islands

The Highlands and Islands region covers 50% of the Scottish landmass, (same size as Belgium) and includes 90 inhabited islands. The region faces challenges of being remote and peripheral with inhospitable terrain and climate; water crossings; sparse population (less than 10% of the Scottish population); fragile rural economies; low incomes; high cost of living - all of which contribute to a very challenging environment in which to provide sustainable public services, operate businesses and deliver education and skills.

By viewing the above challenges as opportunities, the region can unashamedly take a lead in developing innovative and novel rural solutions appropriate to the Highlands and Islands, and export and share this learning with other rural regions across the globe. It is often forgotten that many major economies also have to deliver products and services to meet the needs of their rural populations e.g. India – over 85% live in rural areas, China – 50%; Brazil; over 50%.

The Scottish Government has just completed a far-reaching review of its enterprise and skills agencies and is directing them to work more collaboratively in order to deliver transformational change. A Consultation is also underway for a new Climate Change Bill, to build on the existing world-leading, Scottish legislation for carbon reduction.

This resulting new Act should provide the further support and act as a driver to help Scotland to take advantage of the global growth in the low carbon and environmental goods and services sector, and the opportunities presented by a circular economy approach. Indeed, Scotland has already been recognised for its leadership, and was voted Top Circular Economy in the World at the World Economic Forum in Davos 2017.

The Scottish Government's existing and cornerstone legislation on climate change, and water resources (known as, *Scotland: A Hydro Nation*), together with its portfolio of strategies which support the

delivery of a low carbon and circular economy, are some of the key drivers underpinning the **potential success of a regional partnership initiative to deliver a “Greener, healthier and climate-ready Highlands and Islands”**.

The economic environment is now set to facilitate a new way of working to help make the right decisions for the good of region, society, and create new links and ‘safe places’ to innovate across a broader range of Scottish Government organisations, civil society, the private sector and academia.

The need to create new ways of thinking about living within environmental limits is at the heart of this work, and through creative collaborations, we will create tangible projects, test innovative solutions, with the region's public sector's supply chain, SME's and start-ups, involve academia and seek to understand how best to use policy, regulation and new business models to accelerate adoption of innovative practice, behaviour change and technology.

It is a given that the ‘environment is our economy’, and this roundtable workshop held on the 21st of June 2017 was the first in a series of planned events, where sustainability is the lens through which to view and consider how we might best collaborate to develop new approaches and alliances appropriate for the Highlands and Islands region.

10 Priority Goals

In June and August 2016, Highlands and Islands Enterprise and NHS Highland, facilitated a number of other workshops from which **10 priority goals** emerged for delivering a low carbon and circular economy.

These 10 focus or goal areas included: Leadership, Green Procurement, Water, Energy, Chemicals, Pharmaceuticals, Waste, Construction, Food and Transport and align with many other low carbon and circular economy initiatives in Scotland, but are differentiated by the addition of water, chemicals and pharmaceuticals. These are useful additions given the significant public sector spend and associated carbon footprint of delivering and treating water and healthcare. For the region, our pristine aquatic environment is also of critical importance for our food and drink sector.

These priorities, coupled with the region's fast growing digital economy presents, provides a creative framework to explore and understand the big opportunities which link sectors in a new way and help agencies align to address issues hitherto deemed to be 'too difficult' or not on their agendas. There is an opportunity for smart resource use, integrated environmental management, and collaboration to help Scotland's organisations deliver beyond compliance, future-proof services, and identify opportunities for enterprise, innovation and genuine sustainable growth.

Introduction to the Roundtable Workshop

Building on the uniqueness of the 10 priorities set for this collaborative approach, Highlands and Islands Enterprise (HIE), the Environmental Research Institute of the University of the Highlands & Islands, together with Health Care Without Harm Europe (HCWH) organised a roundtable workshop, held in Inverness. The workshop was designed to explore the big challenges and opportunities from the potential threat posed by 'Pharmaceuticals and Priority chemicals in the Highlands and Islands Environment'

Experts and sector stakeholders from across Europe, Scotland and the Highlands and Islands region came together to learn, share and develop ideas for solutions to address the emerging and related issues and challenges which will need to be faced by the public sector and wider society as a result of pharmaceuticals and priority chemicals entering the environment.

3 objectives for the event were as follows:

- To provide participants with the opportunity to come together to hear first hand about the importance of this agenda for the region;
- To learn about initiatives and tools already being employed or developed in other regions across Europe;
- To discuss the most appropriate course of action and steps for the Highlands and Islands region.

Structure of the Speakers Pre-Meet and Workshop

In advance of the workshop, some background reading was shared with delegates and this is attached as **Appendix A**.

The pre-workshop evening was held on 20th June 2017 with some of the speakers and stakeholders. At this pre-workshop session, some early ideas emerged on how the Highlands and Islands region might move more quickly towards a low carbon and circular economy. These ideas were recorded in a low carbon and circular economy 'monopoly' style format and form part of the report as **Appendix B**. They have also been used to support the proposed 'big opportunities' that a collaborative group could action.

The roundtable workshop on the 21st of June 2017 was split into 5 distinct sessions.

- i. **An introduction** from the workshop organisers: Highlands and Islands to highlight the economy and social enterprise opportunities; and Health Care Without Harm Europe to introduce the work being undertaken globally to address this growing area of concern. NHS Highland Chief Executive reaffirmed the need for partnership working and how there may be new or better ways to use resource These are included in **Appendix C**.

- ii. **Setting the scene** and sharing the local context with time to consider the information and what it might mean for the region. These are also included in **Appendix C**.
- iii. **Six highly practical case studies (See Page 7)** from across different sectors and geographies were presented. Armed with these practical examples, delegates then took time to reflect and discuss what could be done in the region and what positive or negative factors might be at play to accelerate or block change. Eight 'action areas' of interest emerged.
- iv. **Public sector specialists** from across Scotland and from **Health Care Without Harm Europe**, presented some of the issues being faced at a national and European level. Delegates were asked to work on one of the eight action areas where they were keen to apply their energy, and scope out the actions that would be required to move forward. These are included in **Appendix D**.
- v. **A final information mining** session finished the day, with the Director for Public Health, NHS Highland, distributing postcards where the key piece of learning and associated action were recorded. These are included in **Appendix E**. (This was to be mailed to the delegates in 4 weeks time as a reminder).

Presentations from across the day highlighted and confirmed some of the really big challenges emerging for different stakeholders and it became clear collective action could make all the difference and that the different agencies and sectors could help each other by being aware of the implications of, for example, their daily operation and procurement actions.

Just some of the examples given on the day include:

- i. We have an ageing population that uses pharmaceuticals heavily. 30 – 90% of ingested pharmaceuticals are excreted and discharged into sewers or septic tanks. Improper disposal and inadequate collection systems of unused pharmaceuticals (50% in the EU) are a complex and costly challenge and contribute significantly to the issue estimated to cost £300 million in the UK alone. Opportunities exist to look at prescribing from a sustainability perspective, which is good for long-term health of the environment and the people living in it, and good for NHS business where over-prescribing is an issue.
- ii. Existing water treatment plants were never designed to treat new, highly resistant molecules and drug cocktails. The resilient, highly bioactive nature of these chemicals results in bio-accumulation in organisms of all sizes from phytoplankton to livestock, fish and humans, and, in turn, this is causing negative, unmeasured health outcomes for human and animal health, the eco-system and our food chain.
- iii. The European Water Framework Directive ban on priority chemicals presents the water sector with significant technical and financial challenges on how to treat priority chemicals, those chemicals/pharmaceuticals considered to be the most carcinogenic, mutagenic, neurologically damaging and endocrine disrupting, found in everyday household cleaning and personal care products.

- iv. Scottish Water has 9 out of 10 of their water treatment plants based in the Highlands and Islands region. The region also has many thousands of private water supplies, known to be a risk to human health, especially in periods of inclement weather (not unusual for the region) and many tens of thousands of septic tanks which, over time, discharge into the environment, water courses, sediments and coastal waters. Scottish Water is developing a new strategy to find new ways to deliver sustainable rural water by 2040 that takes a low carbon and circular economy approach.

- v. A national approach on prescribing more environmentally friendly pharmaceuticals or green personal care and educating the public sector and citizens on “what’s really in my cleaning and personal products”, might go some way to being part of a regional sustainable approach.

2 Solution Case Studies



Dr. Tim aus der Beek, Department Manager, Water Resource Management, IWW Water Centre, told the story of how the UN would not agree to fund work to reduce pharmaceuticals in the environment because it was not viewed as a global problem. He compiled research from 1016 publications indicating that pharmaceuticals have been found in the environment in 71 countries, covering all 5 UN regional groups. In 2015, the UN agreed unanimously that it is a global issue and needs to be funded. Population collapse due to the feminization of the male fathead minnow was a particularly compelling case study.



MSc Pharm Siv Martini and PhD Helena Ramstrom, Healthcare Administration, Stockholm County Council, explained the Wise List concept whereby a Drug and Therapeutic Committee (DRC) formulate treatment recommendations and publish them on a list, one for prescribers, and another version for consumers. Environmental concerns have been part of the Wise List since 2005. Environmental toxicity is rated on a scale from 0 to 9. Every clinic in Sweden must have an environmental goal, for example a typical goal is, '80% of prescribers must receive information about the environmental impact of pharmaceuticals'. Today, more than 80% of prescribed pharmaceuticals in Stockholm are in accordance with the recommendations in the Wise List.



Data Analyses

In which countries have pharmaceuticals been found in the environment?

- **In 71 countries (covering all 5 UN regional groups), pharmaceuticals have been detected in the environment.** (concentration of at least one MEC in one matrix > detection limit)



Research from Dr. Tim aus der Beek

The Wise List





Prof. Dr. Alistair Boxall, Environment Department, University of York, explained that agriculture consumes around 290 tonnes of antibiotics in veterinary medicine each year in the UK, plus large amounts of parasiticides. Some are highly persistent and still detectable months after application. A range of impacts are possible on soil organisms and associated aquatic systems. Uptake into and effects on plants is also possible. Tiny amounts of pharmaceuticals disrupt the reproduction of aquatic invertebrates. Agriculture has received much less attention than the aquatic environment, so there are still many open questions.



Sonia Roschnik, former Deputy Director, Sustainable Development Unit, England, stated that we need to adjust the carbon footprint so that it is reflected in the country where the consumer is located, not in the country where the product is manufactured. The UK has committed to a ski jump drop in its carbon footprint by 2050 (figured at right), which means that we need to turn the business model inside out. She built a coalition with pharmaceutical companies to get better data on their carbon footprint because they complained about the data, but did not have any better data themselves. It is really important to think through what we want to change, and for the NHS to tell pharmaceutical companies what they really want.

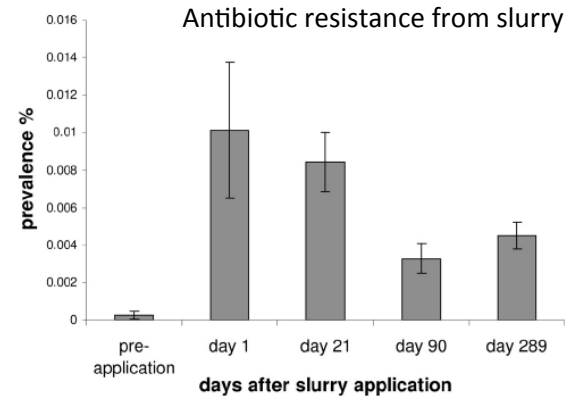
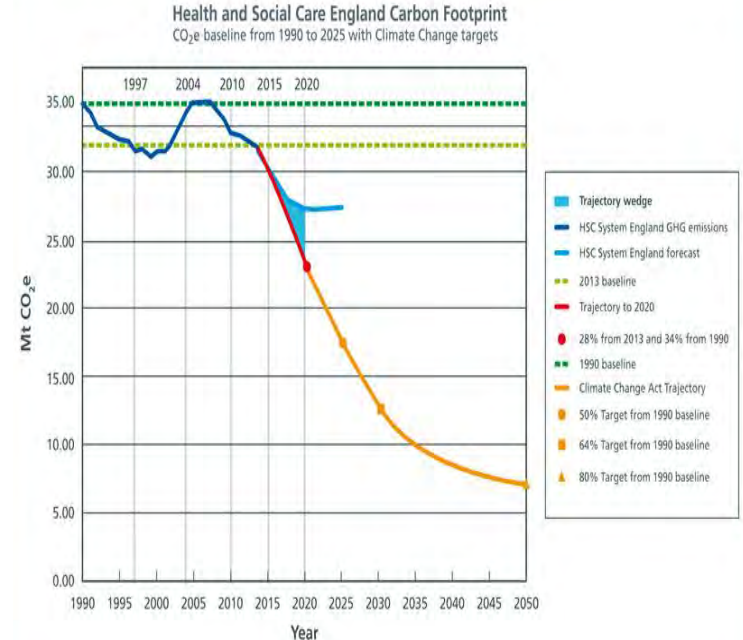


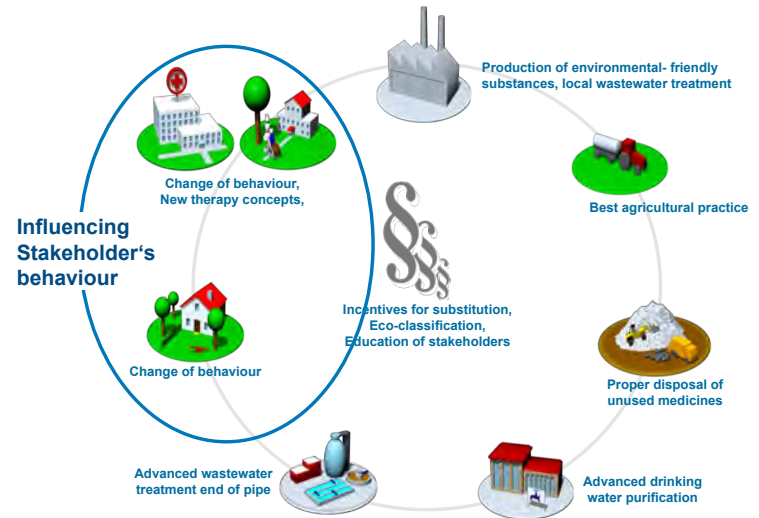
FIG. 1. Molecular prevalence of *int11* in soil amended with pig slurry. Error bars represent standard errors of the results for three replicate samples (four in preapplication soil); the prevalences are statistically significantly different from one another at all time points (chi-square test, $P < 0.0001$).





Dr. Ing. Issa Nafu, Head of Department, Emscher Genossenschaft (German water cooperative), told the story of how the biggest waste water treatment plant in Germany faced the challenge of many substances that could not be removed economically, by focusing on changing stakeholder behaviour. They began by conducting a survey to assess attitudes and behaviours in order to see changes from the education project. A key message of the campaign was that everyone can participate in preventing water pollution from medicine. Every Spring pharmacists organise a Spring cleaning of the medicine chest with fliers issued with every prescription. Students wrote a thriller on the topic of medicines in the environment. 20% of the population now knows the proper disposal of medicines, and 34% say they changed their behaviour.

SOME OPTIONS TO REDUCE PHARMACEUTICALS IN WATERS



Adrian Sym, CEO, The Alliance for Water Stewardship, reported there is either too little or too much water in many places today, and water is on the list of ten global risks that CEO's focus on, both in terms of likelihood and impact. The economic impact of closing cotton dyeing plants in India, or the flood in Thailand is huge with many jobs were permanently lost. A water stewardship standard is essential to move the private sector into compliance with global policy. We need a single global standard for all sectors, all nations.

The Global Risks 2015 Report

The Ten Global Risks in Terms of Likelihood and Impact

Top 10 risks in terms of Likelihood	Top 10 risks in terms of Impact	Categories
<ul style="list-style-type: none"> Interstate conflict Extreme weather events Failure of national governance State collapse or crisis Unemployment or underemployment Natural catastrophes Failure of climate-change adaptation Cyber attacks 	<ul style="list-style-type: none"> Water Crisis Weapons of mass destruction Interstate conflict Failure of climate-change adaptation Energy price shock Critical information infrastructure breakdown Fiscal crisis Unemployment or underemployment Biodiversity loss and ecosystem collapse 	<ul style="list-style-type: none"> Economic Environmental Geopolitical Societal Technological

Source: Global Risks 2015 report, World Economic Forum

Learn more at <http://wef.ch/grr2015> Get in touch: GlobalRisksReport@weforum.org or call +41 (0)22 869 1212

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3 The vision, opportunities and actions

Attendees considered a number of questions in order to identify the main areas of interest in the room. They were asked to focus their thoughts on the Highlands and Islands region and consider what they would like to aim for in order to benefit the region. Attendees then took time to consider the main factors, good and bad which would have a bearing on the issue/situation, and which factor was most critical to enabling their aims for the region.

The Consolidated Workshop Results from the above work are included in **Appendix F**. The following summary also takes account the final mining of ideas by Hug o Van Woerden, Director of Public Health at NHS Highland, where individuals highlighted their one piece of learning and what they would do differently.

A number of key aims or themes emerged from the working groups with most highlighting the need for strong leadership, better communication and education for all sections of society – from school children to our political leaders to business to public sector agency procurement teams. There was a strong wish to see the region take a leadership role and engage with national networks and share information as a matter of urgency, with many undertaking to ‘tell’ others about these issues in their current role and escalate for further debate and consideration. There was also strong agreement that Scotland is a small country and should be able to take action, but that their could be real impact for citizens almost immediately at a regional level.

The following workshop findings presented here take into account and integrate the outcomes of the speakers pre-meet; public health director’s data-mining exercise, and are translated into 5 practical and achievable opportunities for action.

① **Work towards prudent use of pharmaceuticals – robust and shared data.**

- Collectively build on excellent nascent research work on chemicals in H₂O and identify what is in the environment.

- Explore with the Regulator – the sustainable technology for surveillance and removal from waste water streams. (Where are the risks e.g. hospitals? Should any unregulated pharmaceuticals be used on estates? Should we consider water treatment on farms for contained, medicated animals?)
- Sharing data across sectors – environment and health.
- Learn from others e.g. Stockholm WISE list and SEPA international board.
- Putting sustainability into the decision making for formulary – consider pathways for pharmaceutical assessment.
- Consider ‘social prescriptions’.
- Build a case study around one medicine.
- Develop a central PowerPoint for partners to agree and use for dissemination and build awareness.

② **Collectively undertake an Innovation Call for more technologies for this space, building awareness and taking existing/new technologies and approaches that result in behaviour change. Pilot and test in genuine partnership with public sector.**

- Develop a programme of market opportunity for industry and academia.
- Focus now on practical solutions for behaviour change Apps?
- Include ‘take back’ schemes to be explored with pharmaceutical companies.

- Learn by doing, e.g. Caithness Alliance for Water Stewardship work.
- Review other tests and trials from other similar geographies.
- Consider ‘No Pills’ approaches and translate to NHS Highlands.

③ Commit to collaborate. Collectively work together to explore the right messaging to communicate the need for appropriate prescribing, disposal, and use of products that have priority chemicals in them across different groups from healthcare professionals to patients.

- Prudent use of pharmaceuticals, etc. and a change of procurement on care or cleaning products which contain priority chemicals.
- NHS Highland could set a stretch goal of reducing emissions of chemicals to sewer by 2025 with a ban on personal care products being brought into hospitals which have chemicals known to cause a problem to the environment.
- NHS National to check chemical and materials in line with Water Framework Directive and international treaties.
- Engage with local MSP’s, health economists, 2050 Group or Highland Youth Parliament to highlight issues, disseminate information and encourage action.
- Policy should be similar to zero waste and integrated into the manufacturing and production in all sectors – design pollution out.

④ Establish a Sustainable Healthcare Coalition/Highland Quality Institute around a common goal. Apply robust research and circular economy principles from the start and design out waste and pollution.

- Incorporate into planning applications for new build and refurbishment pharmaceutical treatment – RICS and RIAS present and communicate to members.
- Work to overcome 1 year capital models and IFRS rulings.
- Identify key areas of academic research, e.g. embryos and oestrogen, human exposure effects to population and health economics.
- Build on the desire to work together that already exists, and establish a new group, interested in ‘healthcare for the environment’ and reducing carbon footprints from chemicals and pharmaceuticals (low carbon etc.) highly connected to the local community, prepared to look at the Green, healthy and Climate Ready Highlands and Islands in a different light (circular economy) and worldview (collectively).
- Create regional targets for biodegradable chemicals and pharmaceuticals.
- Identify highest priority chemicals and sources for research and regulation by taking a holistic approach and by providing objective information to tell the story and educate and empower people and practitioners to make good decisions for greater society.
- Develop apps and games to support behaviour change, as well as other materials such as leaflets for doctors surgeries, posters, point of sale and stickers.

- Develop new business models for healthcare which embrace circular approach.
- Promote non-incineration technology or approaches.

⑤ **Develop a programme of debates and public engagement to reduce anthropogenic pollution resulting from the use of pharmaceuticals and chemicals. Reduce, recycle or remove harmful substances from the waste stream. Develop a campaign – ONE HEALTH/NO HARM.**

- Face-to-face debates supported by social media with use of existing materials and videos.
- Develop a media plan which considers issues like ‘going beyond compliance’ with messaging on packaging.

There was a consensus around the need for collaborative action on the part of all the stakeholders in the room, and there was a resonance with delegates about Albert Einstein’s comment, “*We cannot solve our problems with the same thinking we used when we created them*”. Refer to **Appendix E** for further information about worldview transitions.

NEXT STEPS

Further workshops are planned, and the ideas and comments provided by delegates on the Low Carbon and Circular Economy Monopoly Boards will form the basis of these next events.

Use this link to access the presentations online:
<https://noharm-europe.org/issues/europe/pharmaceuticals-and-priority-chemicals-highlands-and-islands-environment-workshop>

Appendix A – Background Reading

Below are links to items given as pre-reading to the workshop.

www.hie.co.uk

<http://thelancet.com/infographics/what-is-planetary-health>

<https://www.theguardian.com/environment/2017/may/02/uk-killer-whale-died-extreme-levels-toxic-pollutants>

<https://www.theguardian.com/lifeandstyle/2017/feb/14/sea-to-plate-plastic-got-into-fish>

<http://www.government.se/articles/2015/08/strategy-for-a-non-toxic-environment/>

<http://www.nhshighland.scot.nhs.uk/AboutUs/HQA/Pages/TheBasics.aspx>

<https://noharm-europe.org/issues/europe/pharmaceuticals-environment>

<https://noharm-global.org/content/global/about>

<http://www.greenhospitals.net/>

<http://saferpharma.org/>

<http://a4ws.org/>

<http://who.int/ceh/capacity/chemicals.pdf>



Appendix B – Monopoly Board Brainstorm

Ideas generated during the speakers' dinner, 20th of June

Energy	Transport	Chemicals	Waste
<p>Reduce fuel poverty in the community by providing cheaper, greener energy created on hospital and government sites.</p> <p>Operation T.L.C. Opportunities to scale-up simple, low-cost solutions.</p> <p>Promote 'wear a fleece' in winter months rather than turn the heating up.</p> <p>Improve energy efficiency of building infrastructure and increase sustainable bio-mass installations.</p>	<p>Can health service lead the way in cycling to work schemes?</p> <p>Sustainability depends upon behavioural change. Investigate how the existing skills of psychology (NHS) colleagues can support!</p> <p>Global corporate network – promote minimum of 10,000 steps per day. Costs just a pedometer.</p> <p>Introduce new NHS Highland transport manager to green transport ethos.</p>	<p>What is the effect of oestrogen compounds on the developing embryo?</p> <p>Research on the nature, levels and distribution of organic micro-pollutants being spread on land in Scotland.</p> <p>Trialling behavioural change with patients – variety of approaches (app games, etc.) Managing my meds.</p> <p>Phase out all lead ammunition products by 2020 (for environmental, human, animal health)</p>	<p>We need a joined-up approach to the management of waste in the community. Each Health Board / Local Authority does something different.</p> <p>Let's promote non-incineration technologies to dispose of healthcare waste to reduce air pollution.</p> <p>How do septic tanks work?</p> <p>Sustainable food grown on hospital sites from warm water and food waste.</p> <p>Risk assessment on new products / services to be used in NHS, e.g. PILLCAM</p> <p>Why is there variation in recycling collection across councils in Scotland?</p> <p>Understand the relationship between land use and the dissemination of 'AMR'.</p> <p>Collaborative working with SMEs to develop cross-disciplinary products (water/waste/health).</p>



Appendix B – Monopoly Board Brainstorm

Ideas generated during the speakers' dinner, 20th of June

Pharma	Water	Leadership
<p>Are the pharmaceuticals found in the environment toxic to the environment / humans?</p> <p>Are we responsible for environmental harms in third world countries where “our” pharmaceuticals are produced?</p> <p>How can HCWH help NHS Scotland realise the benefits of considering environmental impact of prescribing medicines in the Scottish National Formulary?</p> <p>Risk-based proportionate action on pharmaceuticals.</p> <p>Implement in Scotland by 2018, a programme of surveillance of antimicrobial resistance (AMR) in the environment (focus on clinically important antibiotics.)</p> <p>Write-up poly-pharmacy project from NHS Highland and communicate more widely.</p> <p>How can we increase public expectations / education about the benefits and harms of medicines? They are not a magic bullet. NNT / NNH</p>	<p>Water stewardship as financial risk reduction mechanism.</p> <p>Small-scale / rural wastewater treatment for resource recovery and pharmaceutical / trace.</p> <p>Contaminant treatment recovery.</p> <p>Partnership between St. Andrews University and two schools with UHI and AWS project at Caithness.</p> <p>To obtain to alliance water stewardship certification at Caithness General.</p> <p>Phosphorus and ? Extraction.</p>	<p>What about preventative medicine or encouraging healthier lifestyle choices to prevent illness or worsening conditions, thereby reducing pharmaceutical use, time in hospital, etc.?</p> <p>Who should cover the costs for the upgrade of waste water treatment plants in order to eliminate pharmaceuticals more effectively?</p> <p>Changing behaviours with regard to consumption and disposal of unused medicines by the public are important component.</p> <p>Mapping impacts and opportunities – not hospitals but future challenge is community healthcare.</p> <p>We need more SMEs doing Circular Economy projects.</p> <p>Value-based organisation – Highland Quality Approval (Elaine).</p> <p>Leadership award in sustainability (Brian).</p> <p>Leadership: network through own organisation too.</p> <p>17 SDGs as reporting tools for sustainable development – tools, setting goals, reporting.</p> <p>Healthcare for the Environment interest group.</p> <p>Highlands and Islands Improvement Institute – using learning methods to improve processes.</p> <p>Project justification and process for planning application incorporating pharmaceutical treatment processes as part of new build / refurbishment of hospitals and operating practices. (Brian Swanson and Elise Cartmel)</p> <p>Encourage ‘mobile free’ zones in hospital public areas and meeting to encourage ‘real’ conversation.</p> <p>Webinar on integrated health system (social and healthcare).</p> <p>Leadership. Lead by example. True leader will inspire through action. (Brian)</p> <p>Asset sharing among public / private sector.</p> <p>Shifting balance of care to community.</p> <p>5% reduction in non-clinical floor space by end of 2018.</p>

Appendix B – Monopoly Board Brainstorm

Ideas generated during the speakers' dinner, 20th of June

Procurement	Construction	Food	Ideas in the middle of the board
<p>How does a small country like Scotland influence multinational companies and supply chains? Priority projects? Partners?</p> <p>Integrated public sector decision to reduce unsustainable food such as pork from the menu.</p> <p>Locally sourced and procured healthy and nutritious foods.</p> <p>Are we destroying somewhere else when we purchase XYZ?</p> <p>Can we reduce pharmaceutical use by improving nutrition?</p> <p>Opportunities for increasing reverse logistics and increasing Circular Economy opportunities.</p> <ul style="list-style-type: none"> • New business • Economic development <p>Increase req of Scottish Procurement regulations to include care pathway assessment (social, environmental, financial implications.)</p> <p>Procurement. Look outside NHS and health for inspiration.</p> <p>Procurement – how can we reduce the carbon footprint for pharmaceutical procurement in NHS Scotland?</p> <p>Set targets to procure bio-degradable chemicals / pharmaceuticals at regional level.</p> <p>Workshop on green solutions for necessary construction.</p>	<p>Present to RICS Scotland on more efficient property usage especially healthcare.</p> <p>Improve collaborative working to build better buildings.</p> <p>Promotion of eco-friendly traditional building methods and repairs in partnership with Scottish Lime Centre.</p> <p>Agile working NHS Highlands.</p>	<p>Multi-centre international clinical studies to develop evidence for nutritional food, exercise and other lifestyle choices using the model of drug studies to mitigate the prescription of drugs.</p> <p>Smaller livestock herds leads to less usage of pharmaceuticals leads to still enough food products to feed the world?</p> <p>Promote sustainable food and food waste reduction among Scottish hospitals and healthcare centres.</p> <p>Promote the procurement of antibiotic-free meat at hospital level in Scotland.</p> <p>Soft services facilities management – set a target with Dave McKay to reduce food waste.</p> <p>Better linkages with agriculture to include pharmaceutical / trace contaminants as part of soil management.</p>	<p>Advocacy for promoting healthy eating / drinking e.g. healthy loss leaders at supermarkets.</p> <p>Link hospitals in Europe with those in developing countries to exchange knowledge and practice.</p>

Appendix B – Monopoly Board Brainstorm

Ideas generated during the workshop, 21st of June

Energy	Transport	Water	Pharma
<p>Engagement was great, but a similar event with more hands-on showing existing and emerging techs.</p>	<p>Public health and national procurement project, building on the Stockholm 'WISE' approach and SDU Scope 3, linking sustainability info (Environmental, Social, Financial) to prescribing tools such as B.N.F.</p> <p>Can a data platform be used to monitor pharmaceutical prescribing with environmental measurement data?</p>	<p>Explore options around policy response to promote Circular Economy in nutrients – PO₄ + NO₃</p> <ul style="list-style-type: none"> • Emission Tables? • Cap & Trade Markets <p>If all businesses and public sector can excel at governing the health-water-land nexus, what benefits would arise? How could this capability create growth opportunities?</p> <p>Need more understanding of public attitudes to use of wastewater products.</p> <p>NHS Scotland role in public education.</p> <ul style="list-style-type: none"> • Potential partners: Scottish Water? • Posters, information leaflets and stickers are dispensed and OTC products providing disposal info • Opportunity to link to 6 monthly 'amnesty' or return campaigns • NHS Highland trial first, then a national project 	<p>How can you monitor/use waste?</p> <p>How can sensors/software be used to give feedback/awareness?</p> <p>Circular Economy opportunities in the health sector</p> <p>Closer involvement of pharmaceutical industry in debate about facilities / mechanisms to support take-back schemes.</p>

Appendix B – Monopoly Board Brainstorm

Ideas generated during the workshop, 21st of June

Leadership	Procurement	Ideas in the middle of the board
<p>Sustainability at what cost? What impact do changes in health services have on sustainability of communities? Evidence/ leadership, etc. (This one is from Maimie – I will explain further.)</p> <p>Active 2050 Group IW Highland.</p> <p>Could NHS Scotland (the whole) join Global Green and Healthy Hospitals? Alignment with Scottish policy? Alignment with UNSDG's?</p> <p>Using Highland and Islands as demonstration projects for national roll-out. Link/sponsor at Holyrood – Rosanna Cunningham? Follow link with approaches used by food coalition and parliamentary events.</p> <p>Involve Highland Youth Parliament. IW workshops to spread the message to the youth.</p>	<p>Demonstration project – increasing change in prescribing practices?</p> <ul style="list-style-type: none"> • Care pathway assessment uncorp. • Sustainability – NHS Highland • Sustainability team, public health, building on work of Sustainable Healthcare Coalition (Sonya's team) <p>How can NHS Scotland 'access' products and services (CE Approach)?</p> <ul style="list-style-type: none"> • IFRS Ruling – lease on balance sheets? • Over-coming 1 year capital models <p>Using Scottish Procurement Regulations and associated tools (sustainability test) to establish NHS Scotland Sustainability Assessment for all pharmacy product procurement. (One category manager at NHS Scotland National Procurement for <u>all</u> products).</p>	<p>Development of regional re-use/re-manufacturing hubs for Highlands & Islands:</p> <ul style="list-style-type: none"> • Support CE • Increase working in SME & Third Sector (Big Ask – needs good support!) • Cost-effective resource management • Skills and education • Employment <p>Do we need a mapping exercise to identify key stakeholders and identify 'critical actions' across all sectors? (May need individual organisational maps for complex orgs such as NHS.)</p>

Appendix C – Introduction and Setting the Local Context



Diane Duncan, Head of Low Carbon & Clean Technologies, HIE, presented a vision based on inclusive growth, international collaboration, innovation, and investment, and ten low carbon and circular economy priorities: Leadership, Water, Pharmaceuticals, Chemicals, Waste, Procurement, Food, Construction, Transport, and Energy. She spoke about how a circular, low carbon economy presents a great opportunity for economic development for the region and will require collaboration from a number of stakeholders.



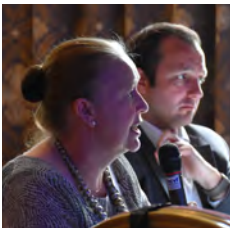
Dr. Ian Rudd, Director of Pharmacy, NHS Highland, explained that most pharmaceutical waste enters sewers either as human waste, or by people flushing pharmaceuticals down the toilet. Another major source is the farming sector who are responsible for introducing pharmaceuticals into waterways through livestock and farmed fish.



Anja Leetz, HCWH Europe Executive Director, gave an overview of HCWH Europe and the organisation's work throughout Europe in bringing the voice of health professionals to the European policy debate and educating the health sector to understand the importance of the environment, encouraging public health and healthcare leaders and professionals to advocate for broader social policies and changes.



Dr. Sharon Pflieger, Consultant in Pharmaceutical Public Health, NHS Highland and National Clinical Lead Area Drug and Therapeutics Committee Collaborative, stated that more than 600 pharmaceuticals have been found in the environment worldwide, and accumulate in fish, vegetables, and livestock. She offered the concept of 'realistic medicine' where physicians ask the patient, 'what matters to you?' and gave the example of a man who was overprovided with a hip replacement rather than a plastic grab rail to navigate the stairs.



Elaine Mead, Chief Executive, NHS Scotland, stated that NHS Highland feels a very strong social, economic and environmental responsibility to the communities they serve, and that progress has already been made by combining healthcare and social care under one banner as integrated teams. She said, 'it is critical that we work in partnership to drive the research, innovation and enterprise agendas', and she offered food for thought, 'we have quite a lot of money, how do we make better use of it?'



Prof. Dr. Stuart Gibb, Director, Environmental Research Institute, University of Highlands and Islands, pharmaceuticals and illicit drugs are even found in rural areas where food and drink are produced, and impact physiology and behaviour of fish. He proposed addressing the issue with an integrated approach that tracks the full stream of pharmaceuticals running through society, with intervention points labelled.

Appendix D – Solutions for Highlands & Islands Enterprise



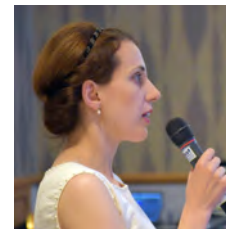
Elise Cartmel, Chief Scientist, Scottish Water, explained that the first approach taken by Scottish Water to deliver outcomes has been to work with SEPA to optimise processes and improve catchment management. Scottish Water sees the opportunity to recover the resources coming in to wastewater treatment works (WWTW). Scottish Water has 2000 WWTW, and examined the river before and after the treatment works at 20 sites in the Central Belt, looking for sources of chemicals and predicted use. They created a decision tree to prioritise chemicals and sites. 14 substances were recommended for process optimisation.



John Redshaw, Principal Specialist Scientist, Scottish Environment Protection Agency, stated that antimicrobial resistance in Scotland is a massive issue. Screening of waters found 23% of E. coli with resistance to cefotaxime, an antibiotic used to treat serious infections in hospitals. SEPA will continue to work in partnership with others to protect and improve Scotland's environment, and in ways where possible, deliver social and economic success. SEPA is keen to support the NHS Highland Sustainable Health Care programme and to explore how it might contribute to it.



Cath Preston, Head of Innovation, Scottish Environment Protection Agency, stated today's environmental issues are global, complex, interconnected, and demand immediate attention. She cited massive bleaching of coral reefs in the Great Barrier Reef, and a major Canadian river that vanished in four days due to a change in the pattern of glacial melt. The Scottish lifestyle requires the resources of three planets. Scotland needs to achieve EQS-compliance with 45 priority substances (WFD-PSD) by 2027, and the 'Watch List' is evolving. She recommended organisations learn to grow within planetary constraints by pursuing 'beyond compliance innovation' in the form of greening and minimising inputs and minimising outputs (waste and emissions), whilst maximising products and services.



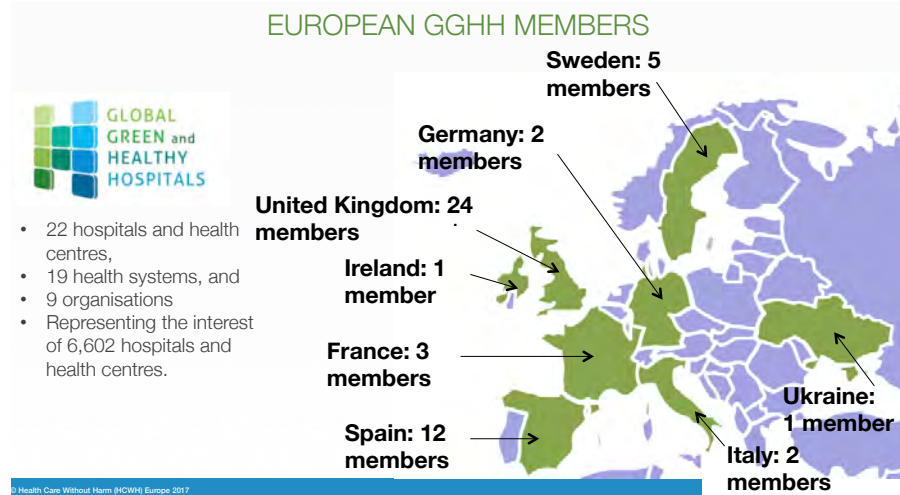
Dr. Adela Maghear, Pharmaceuticals Policy Officer, HCWH Europe, stated that between 30-90% of an oral dose can be excreted as an active substance in urine, and often cannot be screened out by wastewater treatment, which means they can end-up in drinking water. HCWH are waging a 'Safer Pharma Campaign' to educate about the need for policy change.

[The 'Safer Pharma Campaign' video](https://www.youtube.com/watch?v=IAc4qExVGNg)
<https://www.youtube.com/watch?v=IAc4qExVGNg>

There are no guidelines for implementation of pharmaceutical return schemes, and a study of six EU countries, including the UK, revealed radically different outcomes between countries. HCWH is building a database on best practices to address pharmaceutical pollution at the national level.



Aidan Long, Press & Communications Manager, HCWH Europe, discussed the Global Green and Healthy Hospitals (GGHH) initiative of HCWH. There are 805 members from 47 countries, representing 25,600 hospitals and healthcare facilities. There are 24 members in the UK. The GGHH network is mobilising healthcare institutions around the globe to protect public health from climate change by mitigating climate change, building resilience to climate change, and by showing leadership about climate change. Membership is free. Join at www.greenhospitals.net.



Louise McGregor, Head of Circular Economy, Zero Waste Scotland, said Zero Waste Scotland is funded by the Scottish Government and exists to create a society where resources are valued and nothing is wasted. The concept of ‘Circular Economy’ is a solution for addressing root causes of complex environmental problems. It starts with design thinking and carries right through to end of life of a product. Waste is eliminated as a concept. There are four principles:

- ① Design out waste.
- ② Apply systems thinking.
- ③ Rethink products and offer services instead.
- ④ Build resilience by mimicking natural systems.

Example Integrated Multi-Trophic Aquaculture

- Partnership between the Scottish Salmon Company, Loch Fyne Oyster Company and the Scottish Association for Marine Sciences
- Utilising excess nitrogen from salmon farming to grow seaweed & shellfish
- Growing new markets & reducing pollution



Appendix E – Postcards of Learning and Action

	Main point of learning (45 returns)	One thing to be done differently as a result of attending the workshop
1	The damaging nature of some of these substances to the unborn child, adolescents and nursing mothers	Encourage NHS to take a lead by not taking care products into hospitals which have harmful chemicals – add this to patients info
2	Lots of technologies but not applied because innovation difficult in public sector for new tech until it has years of testing	Highlight the issue to industry and run innovation call for sites across region
3	Scotland's environment is not what it seems	Look at it differently
4	There is a huge desire to deliver the aspirations to become a green and healthy and climate ready Highlands and Islands	Seek to work with new partners in NHS Highland and other organisations to help deliver the aspiration, whilst supporting One Planet prosperity
5	AMR is perceived to be akin to climate change in terms of threat to human society	Build a collaboration between a water company and a health group to explore how to achieve a more sustainable health system and safe water.
6	Unregulated pharmaceuticals used on shooting estates. Animals given as standard	Need to ask why if there is a case for now unregulated pharmaceuticals to be used in Highlands and what about water treatment on farms when animals being medicated?
7	More enthusiasm for big picture, radical action than I thought, recognition that the Hippocratic oath extends beyond care for the human body in isolation – it includes care of the environment	Consider collaborative opportunities within procurement using sustainability as a selling point.
8	So much waste that could be reused or recycled – but needs co-ordinated	Get in touch with community groups to explore potential for remanufacturing and recycling
9	The need to share information with health care practitioners – web or applications to help make better decisions on prescribing or buying???	Explore with partners what platforms available to support or disseminate information of this nature
10	We can take the circular economy approach to other subject areas like pharmaceuticals	Take a more multi stakeholder approach to tackling complex environmental issues
11	Mapping projects, collaborations, and the achievable outputs and outcomes	Develop new projects – 5 in total – not different but more of the same

Appendix E – Postcards of Learning and Action

	Main point of learning (45 returns)	One thing to be done differently as a result of attending the workshop
12	That NHS, Scottish Water and others could join up on communicating the issues	Work to bring groups together who can give objective and practical information to patients and consumers
13	Water Framework Directive and other treaties could be used as guidelines for green procurement – health economics of potential load on the NHS from conditions from chemicals not being explored – too difficult	Work with colleagues to consider how green procurement decisions could be implemented
14	Very engaging subject to get girls involved in STEM e.g. personal care products	Highlight this to STEM networks in the region
15	The massive importance of this subject	Try to develop a project on the effects of environmental chemicals on the embryo
16	Animal medicines are not so much discussed about, there is a need for research in the field	Work more to engage pharmaceutical industry in tackling pharmaceutical pollution
17	Now aware of HCWH and SEPA one planet	I will explore engagement in terms of education and drug disposal
18	Design new technology with circular economy and environmental impact in mind	Spread knowledge and raise awareness
19	The lack of knowledge and evidence to inform global response	Look to collaborate more with other GGHH partners
20	Focus on One Health approach	More collaboration
21	Crucial to integrate with various stakeholders	More integrated with other stakeholders and try to establish innovative leadership as a member of the whole community
22	NHS Highland commitment to the programme and close network of those involved	Network and build on this – communicate within SEPA and build learning and networking for my organisation
23	We are all battling the same problems	Collaborate and share more

Appendix E – Postcards of Learning and Action

	Main point of learning (45 returns)	One thing to be done differently as a result of attending the workshop
24	There is a lack of information about the dangers of pharmaceuticals for the general public	Inform more people and empower them
25	Contrast media damages the environment and does not dissipate	Link with colleagues in Germany on a small scale project
26	Presence of the WISE List in Sweden and environmental impact of specific pharmaceuticals	Explore evidence behind environmental impact of antibiotics on Wise List and introduce the concept at the next Anti-Microbial Management Team
27	There are already practical solutions available today	Tackle the problem broadly including all sectors and relevant stakeholders – the whole product life cycle
28	The use of drugs and how they end up in the water cycle	Prepare a document to inform all our staff on the safe use of drugs
29	This is going to be an enormous challenge for us and a multi-agency approach (globally) is required to avoid enormous problems in the near term.	Take my old medicines to the pharmacy! Spread the word – not enough people know about this issue.
30	Importance of working in a group	Lessen the footprint of buildings within the NHS
31	Ivermectin – do more SEAG – speak to John/Donald (Napier)! SEPA – land spreading regulation!	Maintain and build on the AMR research line`
32	The lack of awareness of the issues (I was not aware)	Continue this learning and continue engagement
33	Potential for anaerobic digestion technology	Think more in terms of the circular economy
34	Potential of H&I to lead the way – communication potential is strong	Focus AWS attention more on health sector
35	The impact of pharmaceuticals on the environment	Look into data sources and how data can give insight into this domain

Appendix E – Postcards of Learning and Action

	Main point of learning (45 returns)	One thing to be done differently as a result of attending the workshop
36	Recognised the opportunity to engage specifically in the project Caithness	Investigate process mapping for catchments and feedback if this can be applied and tailor AWS project – towards Nodes of Control
37	Need to work out priority area of activity and who to engage with over it	Try to increase collaboration and others
38	Pharmaceutical pollution is a big problem from – healthcare and agriculture	Investigate what SEPA can do to promote take-back schemes and think about agricultural sources
39	That sectors of the NHS are engaging in this issue	Put a bit more effort into communicating my research to those end users
40	The significance and complexity of the issue of pharmaceuticals and priority chemicals in the environment	I will not dispose of medicines into the bidet or toilet – I will return old pharmaceuticals to the pharmacy and will tell others about the issues
41	There is lots of evidence out there and many people want to collaborate	Start raising awareness about the ecological footprint of pharmaceuticals
42	New perspective of how other stakeholders see the issue of pharmaceuticals in the environment. How Scottish Water measure waste water	
43	Everyone needs to take responsibility towards reducing pharmaceuticals in the then environment	Get Highland Youth Parliament more involved in reducing the input on the highlands environment
44	That we all have a responsibility to tell people about the diverse range of problem that can emerge if we don't look after our local environment	Try and use biodegradable pharmaceuticals and think about whether they are actually necessary.
45	Changed the mindset – now see how we can apply circular economy to pharmaceutical development, management etc.	Prioritise 2 or 3 actions we can deliver in SEPA

Appendix F -- Consolidated Workshop Results

Part 1 of Participatory Workshop (Blue)

In the morning, at the end of 'Setting the Local Context', participants reflected upon what they heard at their table by discussing the following questions.

- **Aim:** What do we want for Highlands and Islands?
- **Factors:** Given our Aim, what factors, good or bad, have bearing on the situation?
- **Critical Factor:** Looking at our list of Factors, which Critical Factor, if addressed, would most enable the attainment of our Aim?

Part 2 of Participatory Workshop (Green)

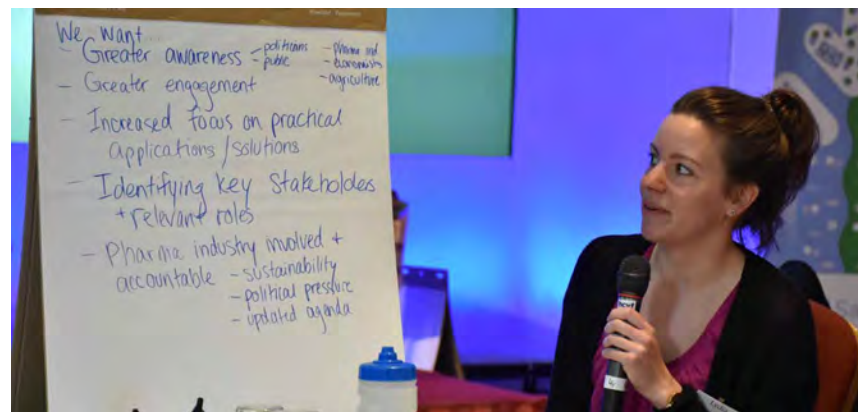
In the afternoon, at the end of 'Solutions for Highlands & Islands Enterprise', participants were asked to brainstorm and choose a course of action. Each table chose one course of action based on the criteria below.

- **Courses of Action:** Which Course of Action do we at this table have the most energy to collaborate on? (Make sure the idea does no harm to people or planet, and addresses our Critical Factor).

Part 3 of Participatory Workshop (Orange)

Next, participants were invited to move to the Course of Action table where they felt they could personally make the best contribution. There, they discussed next steps.

- **Next Steps:** What are the next steps you would wish to take to address the issue?



Appendix F -- Consolidated Workshop Results

Table	Aims	Factors	Critical Factor	Actions	Steps	Prioritising / Member Names
1	<p>We want a Highlands and Islands where there is prudent use of pharmaceuticals based on robust, integrated and shared evidence for the environment and health.</p> <ul style="list-style-type: none"> • Prudent use of pharmaceuticals. • What's in the environment and what effect? Evidence base for action. • Integrated Approach, Contextualised (Rural) Approach. <ul style="list-style-type: none"> - Geographical - Socio-cultural 	<ul style="list-style-type: none"> • Technology • Awareness-raising • Socio-cultural and geographic fabric of region • Partnership approach 	<ul style="list-style-type: none"> • Clearly define the problem that we're aiming to address, and the goal we want to achieve. • Scoring the issue. 	<p>Robust, integrated, and shared evidence...</p> <ul style="list-style-type: none"> • Identify all partners • Sharing info, e.g. between environmental and healthcare sectors. • Ways to communicate "better" e.g. central database, publications aimed at healthcare sector. • Put environmental info into formulary 	<ul style="list-style-type: none"> • Learn from Stockholm: what worked, what didn't, assessment processes. • Identify what we know about chemicals in H2O in Highlands & Islands already. • Stratify the risks. • Identify one medicine we could build a local story around. • Identify stakeholders. • Consider pertinent information and awareness-raising. 	<p>7 Members:</p> <ul style="list-style-type: none"> • John Burnside • Ruth Innes • Alison MacDonald • Cath Preston • Siv Martini • Sharon Pflieger • Elise Cartmell
2	<ul style="list-style-type: none"> • Greater awareness: politicians, public, pharmaceutical industry, economists, agriculture • Greater engagement • Increased focus on practical applications / solutions • Identifying key stakeholders and relevant roles • Pharmaceutical industry involved and accountable <ul style="list-style-type: none"> - Sustainability - Political pressure - Updated agenda 			<ol style="list-style-type: none"> 1. Decide to collaborate 2. Create an agenda: <ul style="list-style-type: none"> - Prioritise list - Social prescribing 3. Production through to disposal <ul style="list-style-type: none"> - Like zero waste - To bring in all sectors - Creates smaller/ pilot projects 		<p>5 Members:</p> <ul style="list-style-type: none"> • James Mowat • Lydia Niemi • Keith Masson • Paul Teedon • Issa Nafo

Appendix F -- Consolidated Workshop Results

Table	Aims	Factors	Critical Factor	Actions	Steps	Prioritising / Member Names
3	<ul style="list-style-type: none"> The Highlands to be a healthy place Be better informed about these issues Joined-up thinking Clean, healthy, climate-ready, low-carbon environment Ability to make decisions Overall: being better informed to encourage joined-up thinking to give a clean environment, etc. 	<ul style="list-style-type: none"> There's an interest in working together already Local context – key drivers Common goal – from different perspectives Focus on what we can do – it's about economics Public engagement – communication, behaviour change Connection with local communities Education Empowering people 	Connection with local communities	<p>Circular economy approach from outset</p> <ul style="list-style-type: none"> New way of looking at these issues Telling a story Creative thinking Holistic approach Focus on one condition but with caution Mapping exercise Intervention: <ul style="list-style-type: none"> A pill An alternative method Personalised medicine Change business model – sell a service Sustainable Healthcare Coalition <ul style="list-style-type: none"> Consider this for new drugs or old (e.g. Ibuprofen, Diclofenac) Apply circular economy approach from the start 		<p>10 Members:</p> <ul style="list-style-type: none"> Dr. Daniel Aklil Dr. Mark Taggart Kateryna McKinnon Ruth Stringer Dr. Karin Helwig Louise McGregor Dr. Rupert Hough Daniel Rice Wendy Rayner Lorna Walker

Appendix F -- Consolidated Workshop Results

Table	Aims	Factors	Critical Factor	Actions	Steps	Prioritising / Member Names
4	We want a Highlands & Islands Region that is free from anthropogenic pollution from pharmaceuticals and priority chemicals.	<p>Good</p> <ul style="list-style-type: none"> • All key sectors are reliant on a healthy environment • Communication and education (ensure people put the right waste in the right waste stream, interdependencies) <p>Bad</p> <ul style="list-style-type: none"> • Community engagement • Public expectations unrealistic 	Education	<ul style="list-style-type: none"> • Educating via face-to-face meetings, supported by public engagement – social media (e.g. HCWH video, pills leaflets). • Wider news reporting. • Thoughts should be focused on the compliance issue. • Messages on packaging. 	<ul style="list-style-type: none"> • Title: One healthy no harm • Vision • Objectives • Players • Business Plan 	<p>4 Members:</p> <ul style="list-style-type: none"> • Brian Swanson • Alan White • Kuan Li • John Redshaw
5	<p>We want...</p> <ul style="list-style-type: none"> • Collaboration • An integrated approach • Realistic healthcare • Protection of the environment • Evidence-based models • Balanced with preventive action • Supported by decision-making • We want to reduce unnecessary and unwanted exposure to pharmaceutical products. 			Early embryo effects of environmental chemicals		<p>7 Members:</p> <ul style="list-style-type: none"> • Lindsey Green • Frances Hines • Duncan Rudd • Hugo Van Woerden • Alex McClure • Fiona Whyte • David Baxter

Appendix F -- Consolidated Workshop Results

Table	Aims	Factors	Critical Factor	Actions	Steps	Prioritising / Member Names
6	We want to engage the community behind healthy and sustainable communities.	Engagement and leadership	Education	<ul style="list-style-type: none"> • Why are there so many pharmaceuticals in the environment? <ul style="list-style-type: none"> - Map the risks - Inclusive approach with stakeholders 		<p>8 Members:</p> <ul style="list-style-type: none"> • Sarah-Anne Muñoz, UHI Rural Health Research • Maimie Thompson • Mark Burton • Helena Ramström • Ian Rudd • Alistair Boxall • Adrian Sym • Duncan Hart
7	We want a significant reduction of all pharmaceuticals and chemical used in the Highlands & Islands (includes waste).	<ul style="list-style-type: none"> • Education – at every level • Responsibility • Discussion and learning from each other 	Education	<ul style="list-style-type: none"> • Course of Action: <ul style="list-style-type: none"> - Involve all stakeholders - Set targets - Education - One Health Approach (+ change disposal behaviour) • Course of Action: <ul style="list-style-type: none"> - Engage with farmers regarding the agricultural use of pharmaceuticals - Encourage organic food through procurement • Engage with the medical profession regarding prescribing • Address advertising of prescription medications 		<p>7 Members:</p> <ul style="list-style-type: none"> • Darroch McNaught • Adela Maghear • Pawel de Sternberg Stojalowski • Highland Youth Parliament • Aidan Long • Alan Whiteside • Sonia Roschnik

Appendix F -- Consolidated Workshop Results

Table	Aims	Factors	Critical Factor	Actions	Steps	Prioritising / Member Names
8	<p>We want...</p> <ul style="list-style-type: none"> • Greater awareness (health professionals and then patients) • Less pharmaceuticals / persistent organic pollutants (POPs) in the environment • 'Greener' pharmaceuticals 	<ul style="list-style-type: none"> • Government agencies need to know • Learn by doing – Caithness • Access best practice • NHS waste programme 	<p>Leadership:</p> <ul style="list-style-type: none"> • Personal • Agency and organisation • All taking responsibility 	<ul style="list-style-type: none"> • Collecting contrast media • 3 ways – healthcare professionals, patients, environment • No pills project • Mühlheim Hospital • Transfer learnings to NHS Highlands & Islands • Stuart (University of the Highlands & Islands) • Measure before • 30,000 bags • 1 year project 		<p>5 Members:</p> <ul style="list-style-type: none"> • Harry Maclean • Anja Leetz • Tim aus der Beek • Elaine Mead • Stuart Gibb

Appendix G – Worldview Transitions

Christopher Cooke, of 5 Deep Ltd., stated that we humans have been successful as a species, adapting and growing through problems. As we adapt and grow, our worldview changes. A worldview refers to the meaning-making capacities within individuals that influence what is important to them (values) and what they believe (beliefs).

Each worldview carries its own innate biases. For example, the Success Driven, or Orange worldview, is a game-playing intelligence, biased toward winning the game. The People Driven, or Green worldview, is an inward-focused journey where the individual is biased toward equality.

It is not until the Yellow, or Flexible-Flow Oriented worldview, which knows how to work with all earlier worldviews, starts to become established that an individual has the capacity to handle wicked problems, such as pharmaceuticals and priority chemicals entering the ecosystem.

An understanding of worldviews can assure effective communications, education, policy-setting and strategy development that lead towards a regenerative culture, one that is inspired by a shared quality of life and overarching purpose, and the ability to manage all resources, social, economic and ecological, in an enduring manner.

5 Deep conducted two polls in the room. The chart at right indicates the group sees a need for the more complex thinking of Yellow (15) and Turquoise (10), and recognises the importance of the Green worldview (28). The second poll assessed readiness for worldview change. The results of this stand-up poll were the following:

- ① Nobody believed current thinking can handle the situation (0).
- ② Many had a strong sense that change is needed (19).
- ③ Nobody felt stuck and in a rut (0).
- ④ Many saw a clear way forward (27).
- ⑤ A few were able to utilise new thinking to solve the problem (6).

Whilst more than half of the group (27) see a clear way forward, nearly as many (19) see that a change in the way of thinking is required in order to solve the wicked problem of pharmaceuticals and priority chemicals entering the ecosystem.

For further information, please refer to:

[Mind The Gap](#), a report from the *Fire Starter Festival*, Edinburgh & Glasgow, January 2017.

[Stepping Through the Worldview Membrane to a Worldview Interested in the Thrival of All Life](#), a white paper by 5 Deep.

“We cannot solve our problems with the same thinking we used when we created them.”
-- Albert Einstein

