Beyond the Horizon

Managing Natural Capital for Future Prosperity

26 June 2013

Harbour Commissioner's Office

Conference Report

Northern Ireland environment link

Terry A'Hearn (Chief Executive, NIEA) – *An Environment for Your Future*

- The 21st Century is 'payback time' for the planet – in the coming century we will live with the consequences of our actions in the last century.
- Radical change will dominate the 21st Century – it must, if we are to prosper.
- How do we fundamentally change our economy and society without changing our quality of life?
- If we advocate radical change we need to be clear on the law but flexible on how people meet it – what are we trying to achieve and how do we get there in innovative ways?
- Building trust between EPAs and companies, highlighting financial benefits of efficiency and environmental awareness. Solid case studies of success – we have examples of companies coming round to environmental initiatives because they save money.
- This kind of approach is being adopted at NIEA. New vision at NIEA – creating prosperity through environment and heritage excellence.
- For example, how will the agri-food industry grow by 40% in NI? This could be very negative for the environment if is done in the wrong way. NIEA will work will the agri-food industry to make sure that it is done in the right way – facilitating growth whilst also winning for the environment.
- New strategic approach for NIEA essentially comes down to this – how can we win for the environment and the economy?

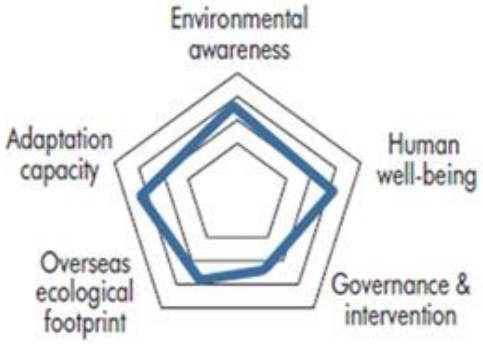
Prof. Roy Haines-Young (Centre for Environmental Management, Department of Geography, University of Nottingham) **-** The Role of Scenarios

- Scenarios are about challenging assumptions.
- How do we cope with rapid change?
- If we think about what the future might be like it can help us to think about today more critically.
- What is 'futures thinking'? We all use scenarios implicitly every day – what will happen if I do this or that? Three possibilities as to what 'futures thinking' could be – prediction, decision-making, social learning.
- Scenarios are not about predicting the future! We can all try to do this, but we be wrong. Scenarios are simply stories about how the world will look if certain trends dominate
- Scenarios are particularly a social learning tool – what new questions arise because of scenarios? How does 'futures thinking' help us to understand today? In this context, scenarios are learning devices.
- Can we use scenarios to inform / design policy? How can we build science into a socially-grounded process (science / policy interface)? Through lots of stakeholder engagement, focal questions about the future that can become 'storylines' that feed into the scenarios.
- Scenarios are not a means for choosing the 'best' future, but they can be helpful in devising goals and strategies.

Summary of Scenarios

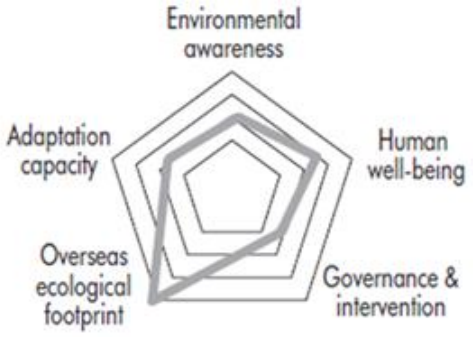
Local Stewardship

There is a conscious acceptance that a reduction in the intensity of economic activity, and the high levels of consumption that have characterised the early 21st century, is needed. There is a focus on sustainability within local areas, although people are still connected and display solidarity with communities in other countries. People travel less and depend more on local resources – food production and leisure take place in their immediate surroundings. Biodiversity increases and ecosystems are managed more sustainably.



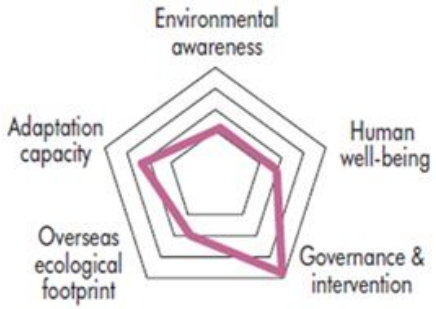
World Markets

The fundamental characteristic is high economic growth driven by short-term profit, with a focus on removing impediments to trade (liberalised markets where international trade barriers have effectively dissolved). The UK's agri-food sector becomes more industrial and large scale. There is a similar approach to food supply from the seas, with a decline in fish stocks around the UK and most fish being imported from Asia. There is very little legislation or incentive geared towards ecosystem service delivery in the UK. Only ecosystem services with obvious monetary value are protected.



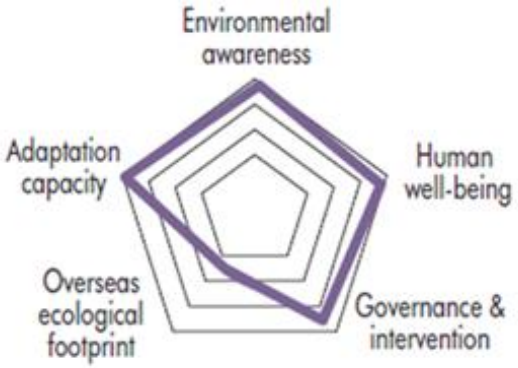
National Security

Climate change, resulting in increasing global energy prices, forces many countries to attempt greater self-sufficiency and efficiency in many of their core industries. The UK follows suit, with agriculture and other key industries intensifying. Sustainable resource management is seen as desirable, but more related to the necessity of food production than environmental concern. Food and energy production, to provide for the UK population, are the main priorities – often at an environmental cost.



Nature at Work

Society focusses on delivering a multifunctional landscape. People have a utilitarian attitude toward nature – it is valued because of what it does for them. Habitat conservation and restoration are seen as important, but the explicit conservation of species can be overruled by a greater ecosystem service benefit. This can result in habitat conversion (for example, semi-natural grassland to woodland). Education has been a major contributor to the shift towards sustainability and the environment is a central part of the curricula in all schools. There is a strong central government which can be authoritarian and nature is seen as a servant to people and is exploited for people's purposes.



'This is my world'

As a way to take the scenarios forward to a larger stakeholder group in an easy to digest package, we devised a portrayal of a mock TV interview, where fictitious individuals living under the different scenarios in 2060 could discuss what the scenarios meant for individuals 'on the ground'. These four roles were played by Eoin O'Liathain, Jonny Elliott, Lisa Critchley, Colleen Lynch and Jonathan Bell, University of Belfast Masters studens. This method was designed to help stakeholders enter into the process more fully (i.e. to think about the scenarios as a 2060 reality rather than abstractly). It focused on four of the NEA scenarios – *Nature at Work, Local Stewardship, National Security and World Markets*.

The below table summaries their interpretation of some aspects of what the different scenarios might mean 'on the ground'.

Scenario	National Security	World Markets	Nature at Work	Local Stewardship
Main Feature – good	Self-sufficiency (attempted) in energy and food.	Economic growth (familiar, we understand this world).	Nature valued for what is does for people.	Small, caring population. Emphasis on local sustainability.
Main feature – bad	Insularity and fear. Environment devoted to food and energy.	Increased polarisation between rich and poor. Extreme climate change impacts – displacement of large populations; Western Europe becomes a 'lifeboat' for developing world.	Utilitarian. Strong government regulation.	Society not as wealthy. Lifestyle change.
How did we get here?	Climate change social impacts drive need for self-sufficiency and forces international barriers up.	Concentrated on producing meat and milk products for global market. 'Business as usual'.	Climate change and habitat destruction raise awareness of need to protect ecosystem service delivery. Embracing of science.	Population crash (or conscious effort to reduce population growth) leads to reduced economic activity general retrenching.
Energy and Science	Local production and use, geared toward meeting national demand and defence.	Climate change unchecked at first, leading to huge technological investment later in an attempt to deal with impacts. Huge investment in 'techno-fixes'. Medical technological advance.	Early drive for renewables; fossil fuels non-existent. Climate change managed proactively. Science recognised as critical to meeting Climate change and energy issues. Carbon sequestration valued.	Lower investment in science (by necessity). Science concentrated on providing for local needs. Diverse energy sources, local supply.
Economy	Investment in national demand and defence.	Unconstrained growth and private profit lead to huge disparity between rich and poor (between and within nations).	Financial value placed on Natural Capital. Strong growth driven by green economy, technology.	Low growth, but stable. Local Exchange Trading Systems (LETS).
Major land use/impact	National food and energy production.	Expanded beef and dairy. Housing / suburban spread.	Multifunctional land management.	At community level, food and energy production.
Attitude to/impact on/profile of ecosystem services	Ecosystems services are essential to deliver what the people require. Emphasis on provisioning.	Nature exploited for financial gain driven by private profit not public benefit.	High recognition that ecosystems are necessary to provide what people need, but that is their primary function; public benefit recognised.	Ecosystem services recognised and utilised at local community level.

What did you have for breakfast?	Rationed. Oats, honey, milk.	Full fried breakfast. Orange juice. Columbian coffee.	Toast with blackberry and apple jam. Herbal tea.	Muesli with goats' milk. Seasonal fruit juice.

Workshops

Stakeholders were split into nine different tables dealing with three different topics:

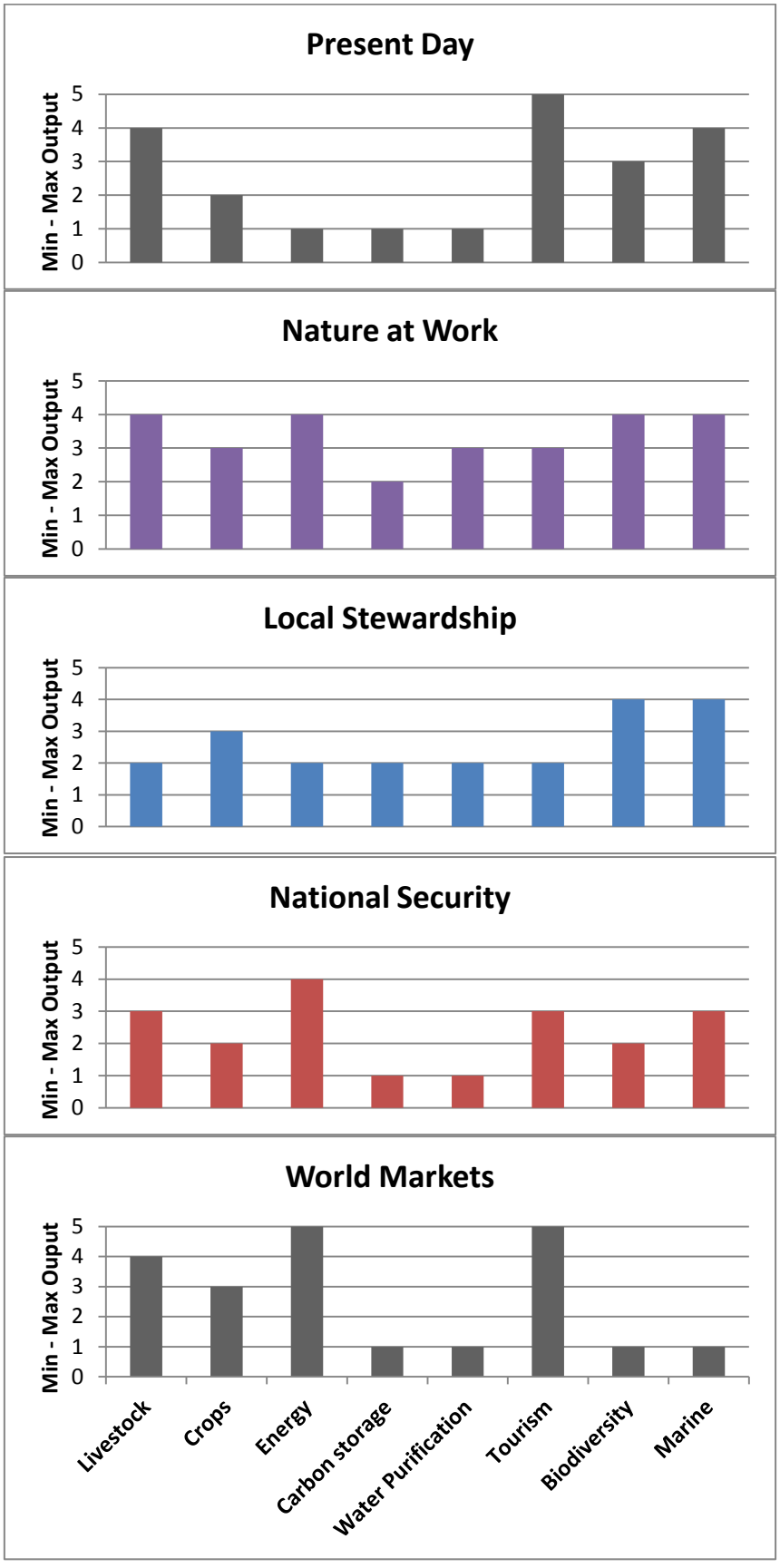
- 3 different specific **sites** (Causeway Coast, Mourne Mountains, Strangford Lough)
- 3 different **habitats** in NI (peatland, woodland, farmland)
- 3 categories of **ecosystem service** for NI as a whole (provisioning, cultural, regulating).

The aim of this exercise was to discuss how ecosystems service delivery might look for the different topics under the different NEA scenarios. During this process, stakeholders were encouraged to think about the follow questions for the different habitats/sites/services they addressed:

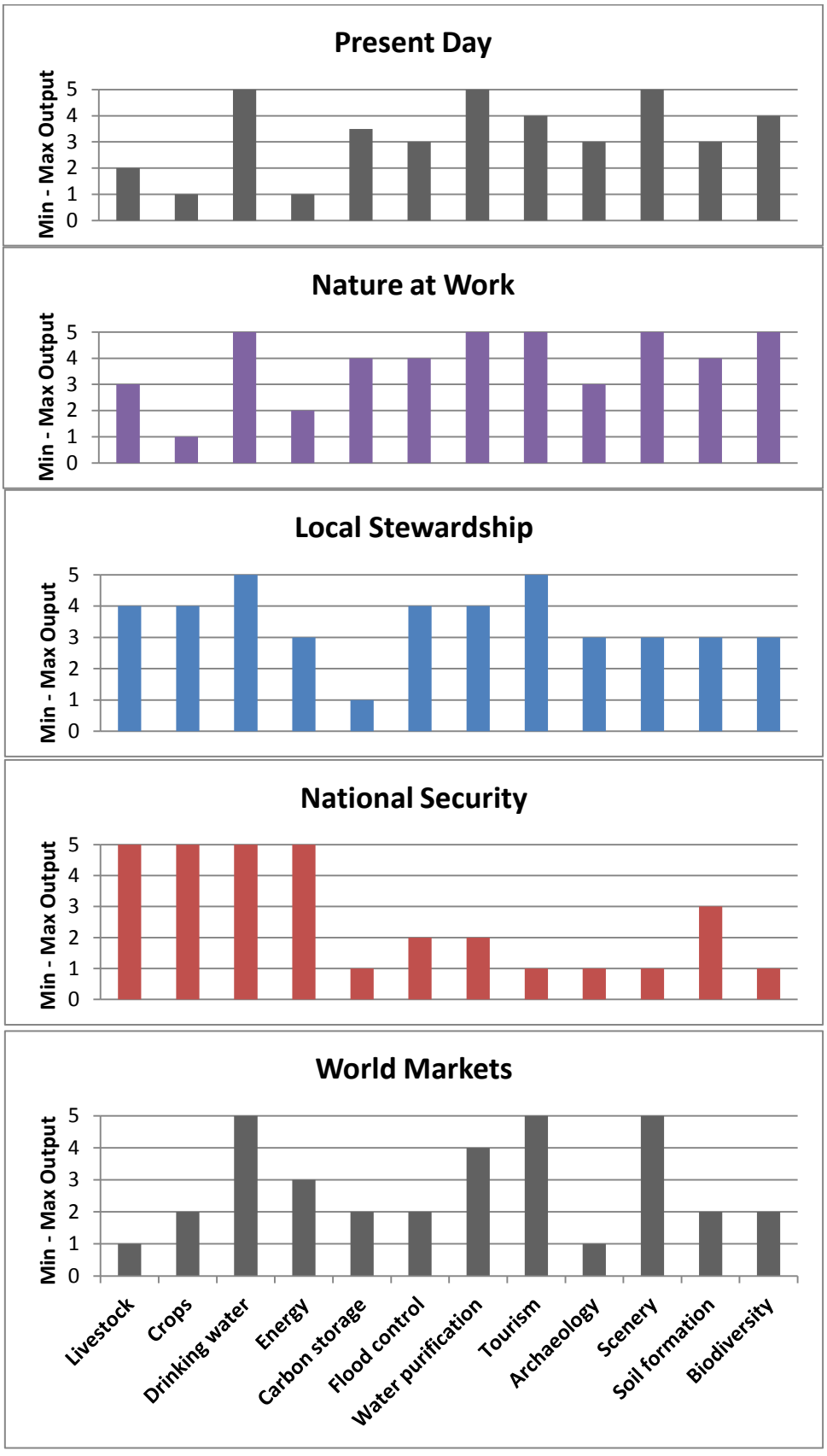
- What are the major ecosystem services currently being delivered?
- What are the future drivers/changes under each scenario? How will that impact on each ecosystem service?
- Which leads to greatest increase/decrease in the various ecosystem services?
- Which scenario leads to greatest benefit (and to whom)?
- Articulate any trade-offs, serious impacts (direct and indirect)
- Who are the key stakeholders and which services might each care about the most?
- Which groups benefit/lose in the different scenarios? How can they be engaged? How to get them to realise the longer term impacts?

This discussion was used to score ecosystem service output in the present day and for each of the future scenarios in 2060 (i.e. thinking about how the different scenarios may lead to increases/decreases in the various ecosystem services). The results of this exercise, essentially collating stakeholder opinion on the potential future of ecosystem service delivery, are presented below in graphical form. Notes from the tables are shown in Sub-Appendix X.A. [some discussion of the implications of these charts, ideally with proper figure descriptions including an explanation of max-min output, would be good]

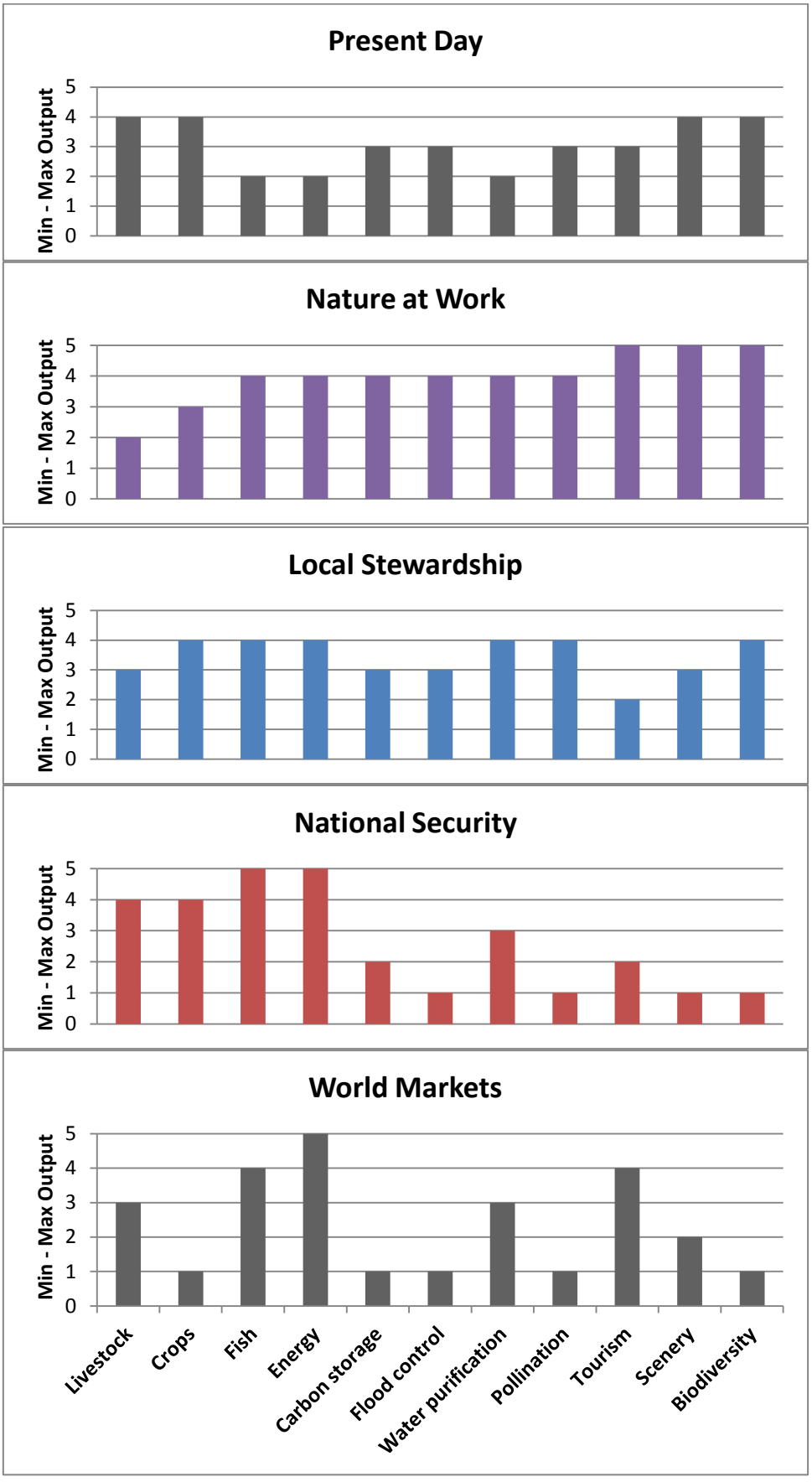
Site: Causeway Coast



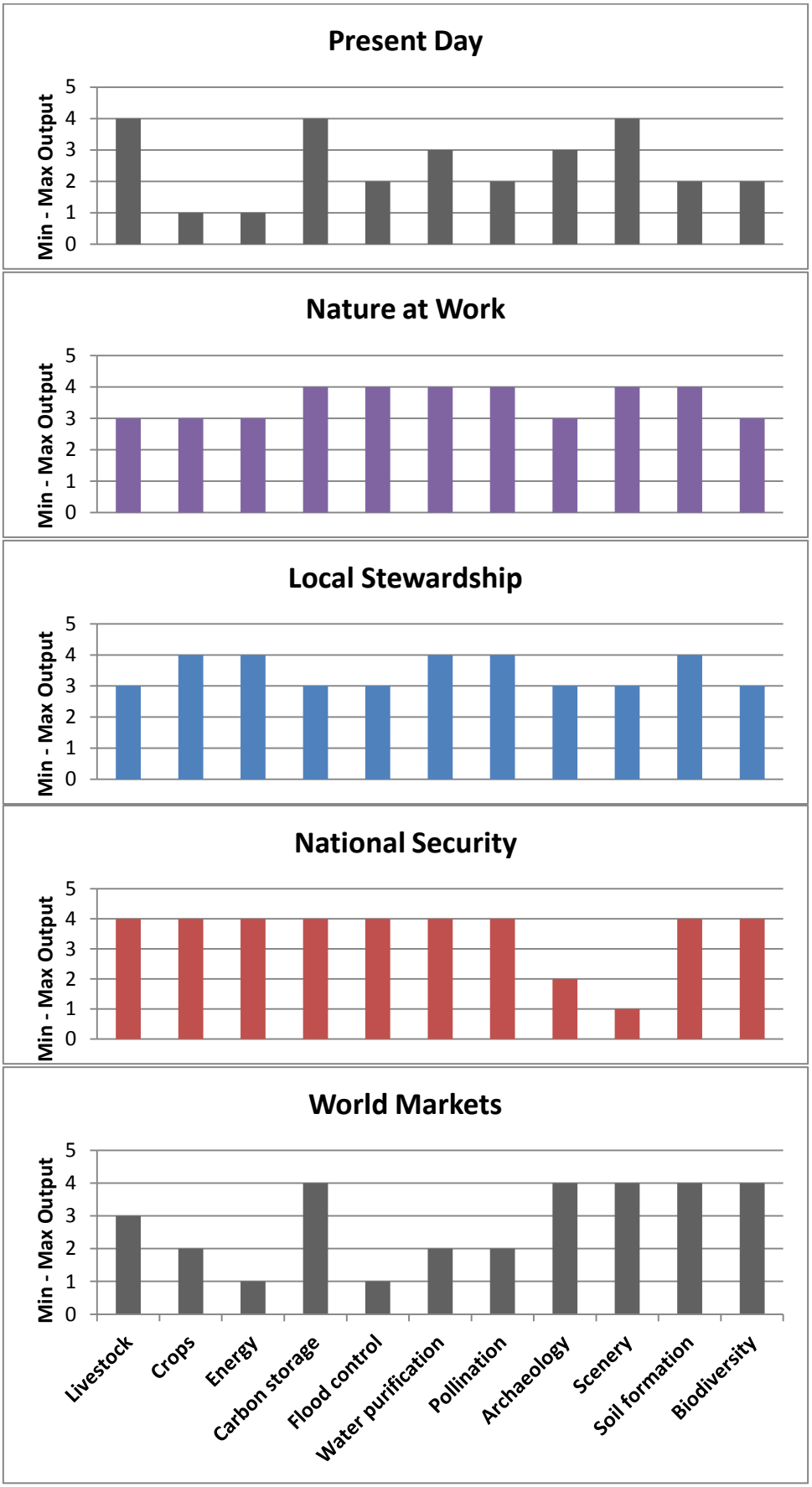
Site: Mournes



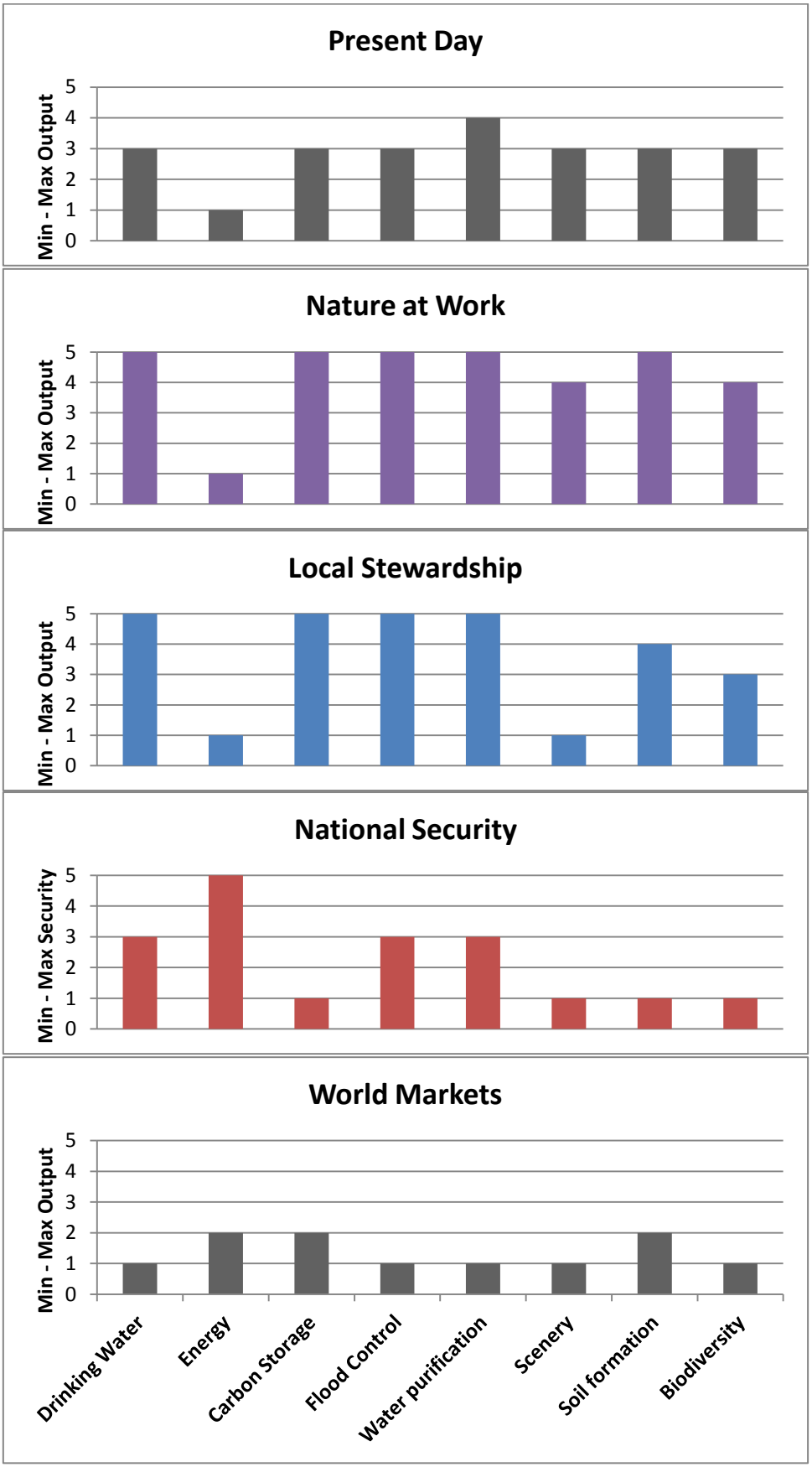
Site: Strangford Lough



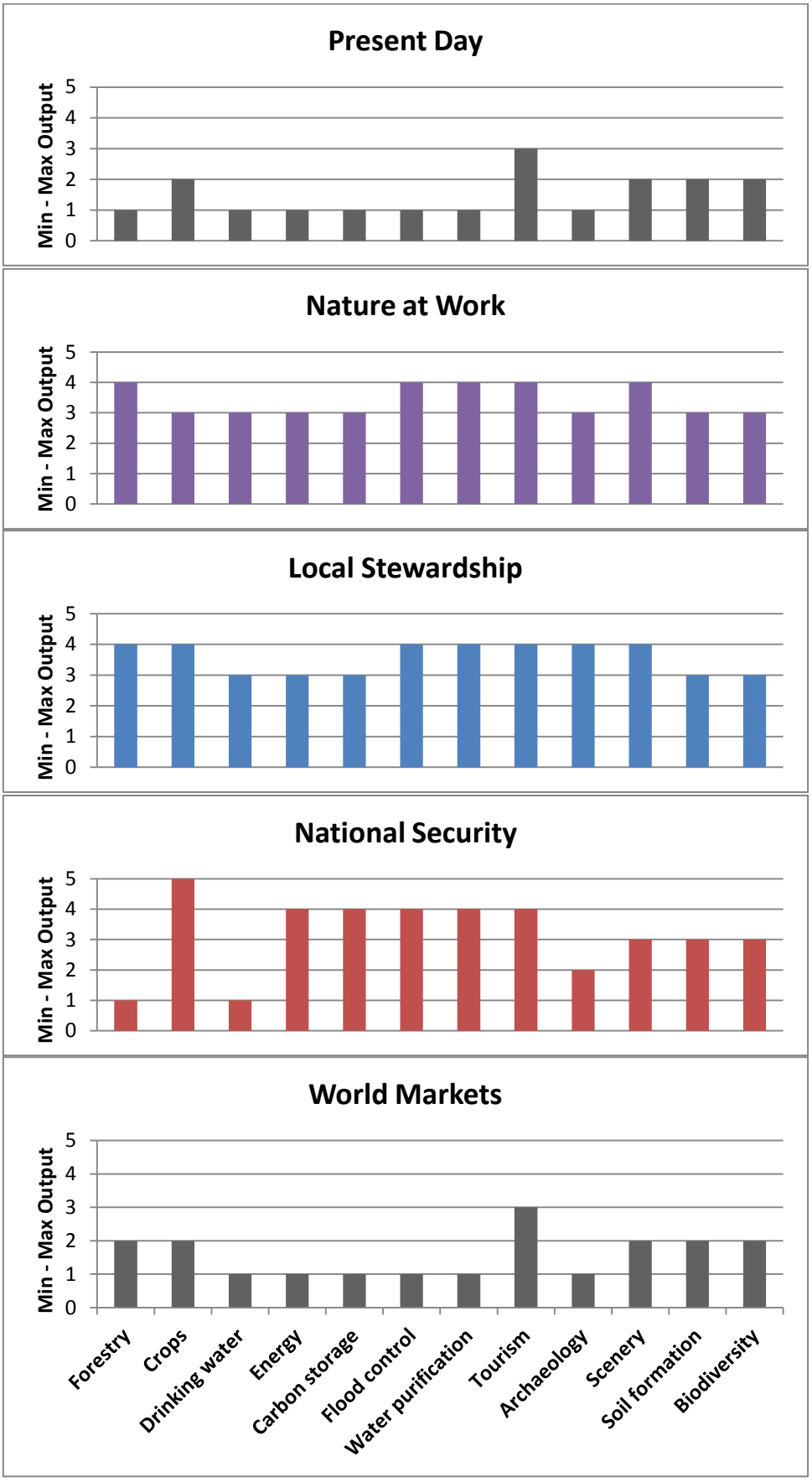
Habitat: Farmland



Habitat: Peatland

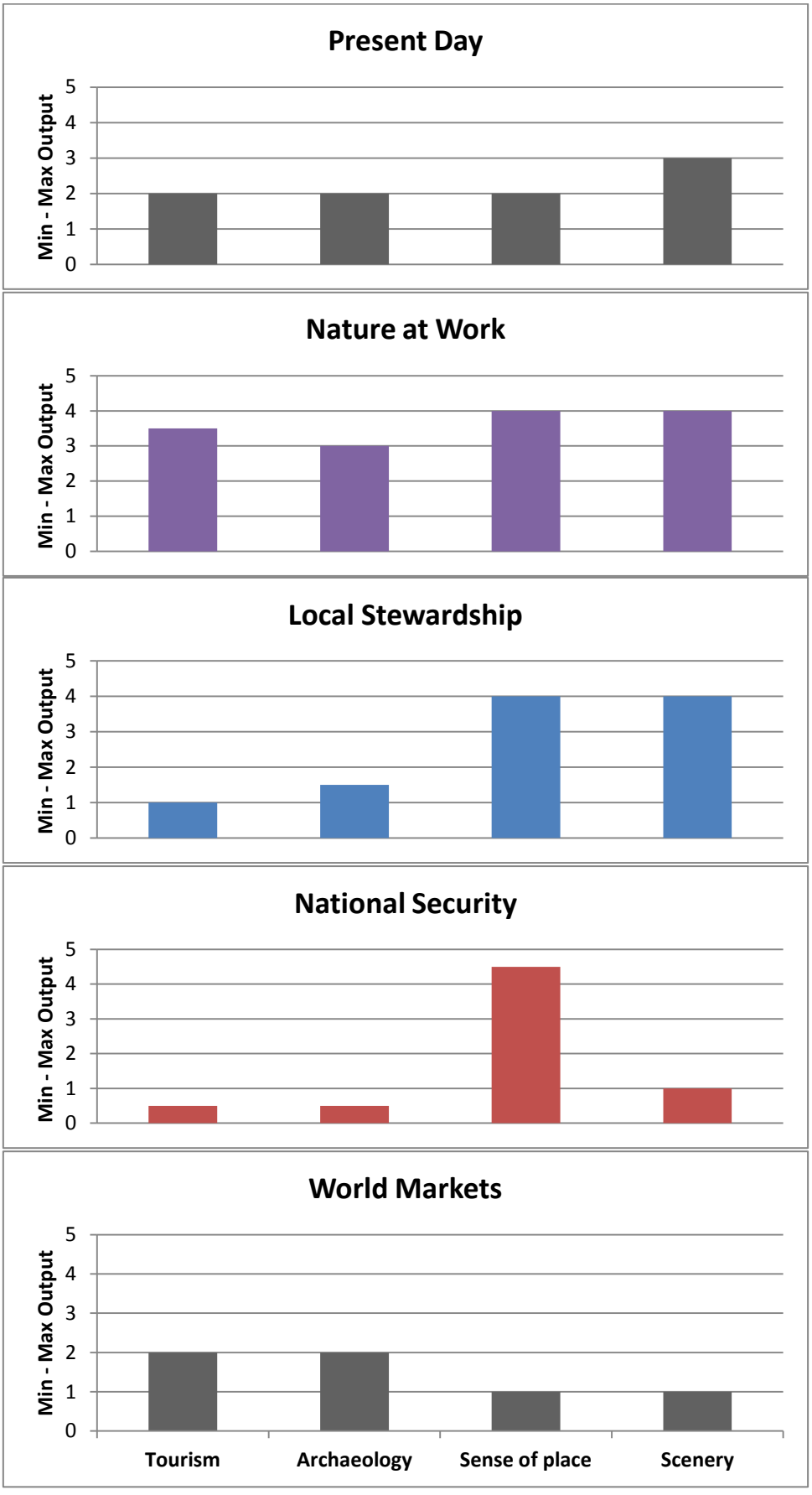


Habitat: Woodland

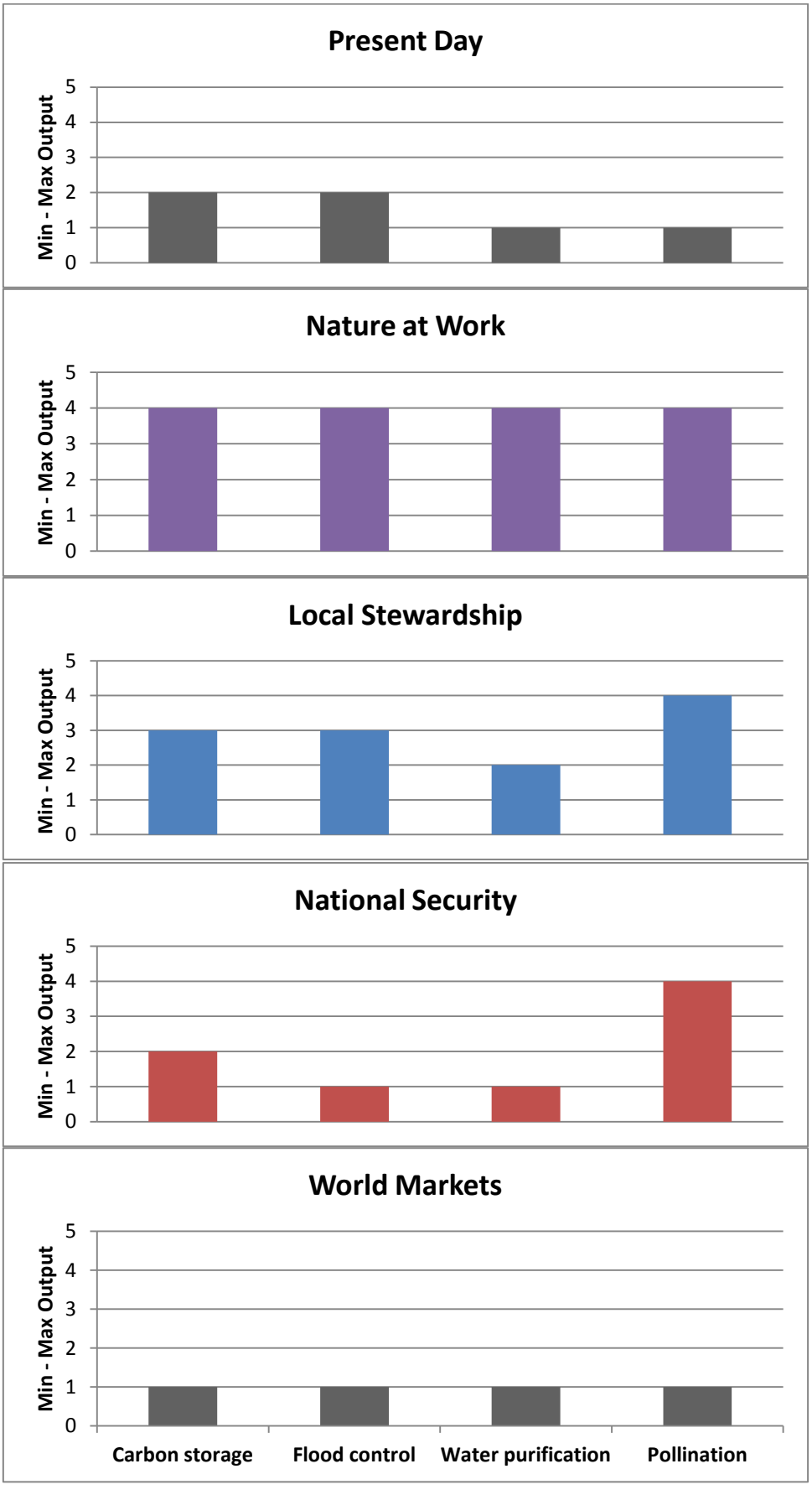


Ecosystem Service: Provisioning

Ecosystem Service: Cultural



Ecosystem Service: Regulating



Open Discussion

The workshop was conclusion with a plenary discussion of the insights brought about by the workshop, and of any omissions or suggested changes to the presentation or elaboration of the scenarios in the Northern Ireland context.

The following is a brief summary of the issues raised and discussed.

- Some delegates felt that the scenarios had been presented in too negative a fashion and that this may have hindered the elaboration of the scenarios.
- The issue of energy security and cost is important. There is a need for recognition of the impacts that this will have on society. This should be a driver for people to think and get policy tools in place.
- Public policy needs to be equality proofed. Different groups will be impacted differently under each scenario, and this should be factored in.
- Issues around the Planning Bill suggest that our politicians are moving backwards in their understanding and valuing of the environment. We need to look at how we are pitching the message to our politicians.
- The opinion was presented that it is pointless to expect political systems to change (in terms of electoral cycles etc.). There is a need to get the message to the voting public and landowners in particular – the workshop may mean very little to politicians in its current form. We need to produce the facts and figures to ground it in reality;
- We need to accept the four year electoral cycle and try to work within the associated restrictions. In addition to trying to encourage longer-term thinking, we should try to become better at selling the environment as a short-term priority.

Reflections on the day.

With no previous exposure, some stakeholders recoiled at the apparent negativity of the four scenarios that the NI process focussed on (though this may been related to the portrayal of the scenarios in the mock TV interviews set in 2060). However, the way in which stakeholders engaged, and subsequent feedback [evidence for this?], showed that the scenarios where plausible and relevant for Northern Ireland, and were a useful framework for discussion – especially when looking at specific sites for Northern Ireland, which was a novel approach (allowing stakeholders to 'ground' the scenarios in familiar places). The 'scenario as process' aspect was useful, including the input of a wide variety of stakeholders (across government departments and agencies, local government, industry, NGO, academic) who were able to exchange views and found the scenarios to be a useful framework in which to conceptualise the challenges facing society over the coming decades. Simply having a diverse group together to talk exclusively about the future in Northern Ireland was novel, and very worthwhile.

Appendix X.1 Notes from tables [brief description of what these tables show?]

CAUSEWAY COAST					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy	Multi-functional land use / multiple outputs Potential for 100% renewable energy from tidal and geothermal (least impact on landscape/seascape)	Local food and energy supply Limited opportunities for 100% food supply given seasonal population (2nd homes)	National food and energy supply – Area important for national energy supply and 'in-state' tourism. Potential for food supply limited.	Economy Provided appropriate and landscape sensitive infrastructure, net exported of energy both renewable and non-renewable. Potential for significant increase in heritage tourism.
Issues specific to Causeway Coast	Tourism: Moderate – could be better managed (present focus is on key sites and 'signature' projects e.g. Giant's Causeway Visitor Centre) Agriculture: -limited to dairy, beef and sheep farming	Heritage tourism highly valued. Better management Sustainable transport infrastructure developed out of need Agriculture still limited (marginal land). Some limited increase in arable crops	No international tourism. Limited local travel. Sustainable transport infrastructure options under consideration Agriculture still limited (marginal land). Some limited increase in arable crops	No international tourism. Limited local travel Sustainable transport and energy infrastructure developed out of need Focus on area's strength dairy and beef (as during and following WWII)	Increase in heritage tourism. Landscape resource still highly valued and protected with support of energy companies through appropriate legislation More intense dairy and beef farming, based on imported feed and fertilisers
Provisioning services	(min to max output, score 1 to 5)	(min to max output, score 1 to 5)	(min to max output, score 1 to 5)	(min to max output, score 1 to 5)	(min to max output, score 1 to 5)
Livestock	4	4	2	3	4
Crops	2	3	3	2	3
Energy	1	4	2	4	5
Regulating services					
Carbon storage	1	2	2	1	1
Water purification	1	3	2	1	1
Cultural services					
Tourism	5	3	2	3	5
Supporting services					
Biodiversity	3	4	4	2	1
ANY OTHERS?	Marine 4	4	4	3	1
Winners and losers / Key Stakeholders					
Trade-offs and impacts					

MOURNES					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy	Multi-functional land use / multiple outputs	Local food and energy supply	National food and energy supply	Economy
Issues specific to the Mournes	Tourism: Moderate – could be better managed • Land use conflicts • Tourism related pressures • Lack of management resources • Multi-functional landscape • National and local asset • Important role in water provision • Important store for biodiversity • Important pleasuring gorund for the public – health and well-being benefits to society	Heritage tourism highly valued. Better management • Further emphasis on multi-functionality • Micro-zoning of the Mournes – more intensive management • National park designated with a strong top-down model of national park • Biodiversity valued, more site specific designations to reflect this	No international tourism. Limited local travel • Greater emphasis on subsistence farming and self- sufficiency for the Mournes • Greater access provision in the Mournes for recreation • Biodiversity valued through zoning of important sites	No international tourism. Limited local travel • Area exploited for water, energy and food production. • Major changes to waterways - new dams for hydro power production. • Blocking of natural drains to facilitate hydro – potential loss of wetland areas • Intensive farming to increase food production, economies of scale, amalgamation of farms • Land back into production, no set aside • Change in landscape to facilitate energy infrastructure - Landscape covered in turbines – NI need to maximise wind potential of high ground	Increase in wealthy tourists • Commodification of the Mournes – new interpretive centres, car parks roads and other tourism related infrastructure • Open access, little restriction on tourists • Either intensification of agriculture to compete on global market or agriculture obliterated because small/hill farms not able to compete with other countries. Potential however, to create a unique brand of Mourne farm produce, building on the cultural significance of Mourne. • Either Mournes is exploited as a global tourism destination or a location for producing and exporting energy. The level of landscape obliteration required to produce sufficient amounts of energy for export would not be compatible with a thriving tourism destination. So Mournes would need to decide its function within global economy.
Provisioning	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Livestock	2	3	4	5	1
Crops	1	1	4	5	2
Drinking water	5	5	5	5	5
Energy	1	2	5	5	3
Regulating					
Carbon storage	3.5	4	1	1	2
Flood control	3	4	4	2	2
Water purify.	5	5	4	2	4
Cultural					
Tourism	4	5	5	1	5
Archaeology	3	3	3	1	1
Scenery	5	5	3	1	5 if tourism and not energy becomes driver
Supporting					
Soil formation	3	4	3	3	2
Biodiversity	4	5	3	1	2
ANY OTHERS?					
Winners and losers / Key stakeholders	Tourists W Recreationalists W Farmers L Quarries L Residents W NIWater W Forestry W/L	Biodiversity W Intensive farming L Energy companies W Tourism providers W	Local People W Biodiversity W Recreationalists W	Farmers W Energy companies W Biodiversity L Tourism industry/service providers L Community breakdown L	Tourists W Some local residents W Businesses W Landowners L Potentially energy companies W Biodiversity L Potentially farming L
Trade-offs and impacts	Economy v environment National v local Public v private				

STRANGFORD LOUGH					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy Renewable Energy. Health and Wellbeing. Food.	Multi-functional land use / multiple outputs National Park/Tourism. Water. Landscape.	Local food and energy supply Water. Decentralisation - health and education.	National food and energy supply Global energy prices. Water.	Economy Food.
Issues specific to Strangford Lough	<u>Tourism:</u> Moderate – could be better managed How to grow tourism. Access to countryside. Outdoor recreation. <u>Climate change:</u> Threat to biodiversity <u>Infrastructure short termism:</u> <u>Environmental irresponsibility:</u> <u>Conflicting demands:</u> Fishing, nature, maintaining water quality. <u>Landuse:</u> Infrastructure. Urbanisation of seabed. Impact of water from agriculture on water quality. Planning development.	Heritage tourism highly valued. Better management Marine current turbines (Tidal). <u>Zoning for seabed and biofuels:</u> Shellfish. Tourism. Hunt for outdoor recreation. Water quality. Catchment flood control. Biodiversity offsetting. Artisan food production.	No international tourism. Limited local travel <u>Energy:</u> Individual wind turbines/solar panels. Algae for biofuels. <u>Food:</u> Small holdings. Water supply. <u>Enforcement/regulation:</u> Individual wind shoreline resources. Desalination. Shorter supply chain. Skills based education.	No international tourism. Limited local travel Submerged with seawater. Covered in wind/tidal turbines. Water harvesting. Intensive agriculture.	Increase in wealthy tourists Golf courses. <u>Health:</u> Increase in inequality. Consolidation of farming Restricted access to coast. Renewable energy production covering land.
Provisioning	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Livestock	4	2	3	4	3
Crops	4	3	4	4	1
Fish	2	4	4	5	4
Energy	2	4	4	5	5
Regulating					
Carbon storage	3	4	3	2	1
Flood control	3	4	3	1	1
Water purify.	2	4	4	3	3
Pollination	3	4	4	1	1
Cultural					
Tourism	3	5	2	2	4
Scenery	4	5	3	1	2
Supporting					
Biodiversity	4	5	4	1	1
ANY OTHERS?					
Winners and losers / key stakeholders	<u>Winners:</u> Local community. Birdlife. <u>Losers:</u> Marine species.	<u>Winners:</u> Tourist providers. Biodiversity. <u>Losers:</u> Livestock farmers.	<u>Winners:</u> Nature. Biodiversity. Communities. <u>Losers:</u> Tourist Providers.	<u>Winners:</u> Energy producers. Fishermen. <u>Losers:</u> Tourist Providers.	<u>Small number do well!</u> <u>(Economic Elite)</u>
Trade-offs and impacts					

PEATLAND					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver **Issues specific to Peatland**	Economy Land ownership: Climate Change: Growing recognition of sequestration value Land management – implications of grazing Land use change – forestry, agriculture. Implications of drainage for biodiversity & water quality	Multi-functional land use / multiple outputs Positive impact for upland peatlands as carbon sequestration is valued Positive impacts for water quality Multifunctional use of lowland peatlands – carbon market, potential for greater value from lowland carbon – paying for carbon sequestration Conflicts on low land peat, between forestry and peat Potential negative implications for recreational value on peatlands	Local food and energy supply Potential negative implications for peatland Likely to lead to increase in peat-cutting – possibly localised rather than widescale More recognition of ESS, likely to be intensification of some use of peatland. Remainder protected for sequestration value Community focus on peatland activities – commonage	National food and energy supply Energy – drive for self sufficiency –wind farm development in upland areas Agricultural Intensification likely to occur Negative implications for peatland-harvesting of lowland peat for horticulture Negative implications for biodiversity and carbon storage values of peatland Competition between agriculture/food production & energy in this scenario High pressure on upland and lowland peatland	Economy Pressure from influx of population from elsewhere. Increase in demand for everything. Significant decline in peatland – due to change in climate conditions Increase peat harvesting, grazing, planting under this scenario Little incentive for peatland restoration/protection Increase in people pressure on peatland Overall negative impacts on peatland in this scenario
Provisioning	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Drinking water	3	5	5	3	1
Energy	1	1	1	5	2
Regulating services					
Carbon storage	3	5	5	1	2
Flood control	3	5	5	3	1
Water purification	4	5	5	3	1
Cultural services					
Archaeology	n/a	n/a	n/a	n/a	n/a
Scenery	3	4	1	1	1
Supporting services					
Soil formation	3	5	4	1	2
Biodiversity	3	4	3	1	1
ANY OTHERS?					
Winners and losers / Key stakeholders	Energy providers (winners) Landowners/farmers (losers) Water companies (losers)	Water companies (winners) Landowners (winners) Windfarm developers (losers)			
Trade-offs and impacts					

FARMLAND					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy	Multi-functional land use / multiple outputs	Local food and energy supply	National food and energy supply	Economy
Issues specific to farmland	Population: Steadily growing, urbanisation	• Pressure for more food • Pressure re: water quality & increased pesticides • Multi-functional land use • Habitat Fragmentation • Planning = housing & services	• Grow your own/ locally grown • Communal markets • Lower impacts on farming • Better local market due to rising population • Sustainable farming • More CO-OPs • Valuing Nat Cap & Eco Serv	• Bigger demand for food & energy • Loss of green Space • Fracking • Rise in renewables • Rationing? • Rise in food prices • Pressure on H20 quality • New technology – crops/GM • Improved integrated policies	• Protectionism/ Move Eastwards • Opportunities for growth • Maintain Green & Clean Image • Marginalisation due to lack of mineral resources • Population increase = Waste increase • Specialisation locally & globally = rise in transport costs • Impact of Eco Services - Policies
	Climate change: Growing threat to single output farms	• Importing Grass • Habitat Fragmentation • Stocking Densities • HNV Farming Systems • Intensification/ Abandonment • Disease	• Stocking Densities • Changing farming techniques – gone too far return to tradition • HNV farming • Invasive species • Engineering Solutions	• Impact of extreme weather on growing techniques • Food for biofuels • Better use of resources • HNV Farming • Disease	• Land grabbing • Increase in food prices • Increased Droughts/ Flooding • Disease • International Risk MGT Approach • EU Membership? • Engineering solutions (poultry manure)
		←	**Need for more research**	→	
	Food security: Heavily reliant on imports of food and animal feeds	• Land Abandonment • Pressure on land use • Increased opportunities for recreation • Try different types of farming e.g. HNV	• Ethical Production • Impact on Health & Well being • Restructuring of Industry • Move away from subsidised farming	• Food Provenance/ traceability • End of food supply line so have to take what given • Increase in production standards & ethical production	•Food traceability •Decreasing choice? •Decrease in waste •Ethical production Disease Risk
	←		**Greater value placed on Farmers & farming**	→	→
	←		**Education & integration**	→	→
Provisioning	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Livestock	4	3	3	4	3
Crops	1	3	4	4	2
Energy	1	3	4	4	1
Regulating					
Carbon storage	4	4	3	4	4
Flood control	2	4	3	4	1
Water purif.	3	4/5	4	4	2
Pollination	2	4	4	4	2
Cultural					
Archaeology	3	3	3	2	4
Scenery	4	4	3	-	4
Supporting					

Soil formation	2	4	4	4	4
Biodiversity	2	3	3	4	4
ANY OTHERS? *Environmental* *Crime* *Political impact*	 2 4	 3 3	 4 3	 3 3	 2 2
Winners and losers / Key Stakeholders	**Losers:** Environment; Public; NGOs; Farmers; Future Generations	**Winners:** Politicians; Developers; Multinationals			
Trade-offs and impacts	Economy V Environment				

WOODLAND					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key drivers **Issues specific to woodland?**	Economy Woodland management, jobs, fuel, construction Climate change: Diseases and Pests: Invasive species Non-native threat to native species Ash dieback Carbon storage: Sequestration Land management: Agriculture / recreation / forestry Baseline low – more woodland highly beneficial. Need for rigorous approach to ecosystem services to develop multiple uses / benefits from land. Agri-forestry concept, for example, bee-keeping	Multi-functional land use / multiple outputs Climate change – can native stock continue to thrive? Allow ancient woodlands to regrow and regenerate Multi-use – biodiversity and sequestration Recreation Biodiverse as opposed to monoculture	Local food and energy supply Access to woodland limited / reduced Active woodland management strategies Need for incentives Local scale planting Need for sustainable harvesting, coppicing Local enterprise – charcoal production Forest service stakeholder – should drive effective management of forests	National food and energy supply Government stewardship of land Disease – plant and pest diseases Competition for land Native species in decline, non-native growth Self-sufficiency in woodland production and energy put strain on woodland Creation of large plantations for timber Energy – move away from fossil fuels	Economy Economic growth is (without effective management) detrimental to woodland. Increased pressure on wood production. Forestry less valuable than agriculture (NI focus on agriculture)
Provisioning	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Livestock	1	4	4	1	2
Crops	2	3	4	5	2
Drinking water	1	3	3	1	1
Energy	1	3	3	4	1
Regulating					
Carbon storage	1	3	3	4	1
Flood control	1	4	4	4	1
Water Purif.	1	4	4	4	1
Cultural					
Tourism	3	4	4	4	3
Archaeology	1	3	4	2	1
Scenery	2	4	4	3	2
Supporting					
Soil formation	2	3	3		2
Biodiversity	2	3	3		2
Nutrient cycling	1				
ANY OTHERS?					
Winners and losers / key stakeholders					
Trade-offs and impacts					

PROVISIONING SERVICES					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy	Multi-functional land use / multiple outputs	Local food and energy supply	National food and energy supply	Economy
Issues specific to Provisioning Services	Population: Steadily growing 1.5 – 1.6 million in last decade?	Population still growing.	Conscious decision to reduce family size. Rate of population growth slows.	Possible child policy in place?	Growing steadily.
	Climate change: Growing threat to single output farms Eg. Livestock farms	In Nature at Work, people know why land is being used in a particular way. How we use land will be important in tackling climate change. Reduced vulnerability of farms due to multiple outputs. Strategic land-use policy in place.	Climate change still has substantial impacts on provisioning. Less of a driver, but impacts still high?	Climate change impacts still felt. Lack of concerted global effort / policy direction.	Climate change unchecked – market driven. Impacts on provisioning are high – type of crop, disease etc.
	Consumer preferences: Opposing views – value for money or sustainably produced food. Horsemeat scandal shows that people want well sourced food.	Tension over reduction in meat?	Preference not an issue – forced change.	Preference not an issue – forced change.	Market driven. Tension between rich and poor. More cheap food produced, but wealthy people require a minimum standard of quality?
	Food security: Secure at the moment in the sense that we eat comfortably – but heavily reliant on imports.	Still reliant on inputs means a level of vulnerability still present. (How is security defined geographically?).	People growing own – but climate impact? What happens if allotment fails? If producing locally for self, the 'safety net' is removed. Less energy to use.	Land resource used almost exclusively to produce food and energy.	
	EU decides what our outputs are? Debates on-going for public goods. Driven by external markets. Security of the farming industry itself – can individual farms/farmers actually meet demand.	Which crops would work best in which land.		EU break-up.	Big industrial farms, GM. Import and export high. Animal welfare.
	(min to max output, score 1 to 5)	(min to max output, score 1 to 5)	(min to max output,score 1 to 5)	(min to max output,score 1 to 5)	(min to max output,score 1 to 5)
Livestoc	4	2	2	2	5But unsustainable – possibly much less!
Crops	3	4	4	4	3
Fish	2	3	1	1	1
Drinking wate	5	5	4	4 Rationing?	5
Energy	1	5	3	4	2
ANY OTHERS? *Fibre*	1	2	5	2	3
Winners and losers / key stakeholders	Losers: biodiversity, environment	Public goods recognised and paid for – societal win Some individual species lose?		Producers win (within nation) Global losers from trade loss	Rich win, poor lose. Environment loses.
Trade-offs and impacts					

REGULATING SERVICES					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy	Multi-functional land use / multiple outputs Still an economic driver (low carbon!)	Local food and energy supply	National food and energy supply	Economy
Issues specific to Regulating Services? Education Silo Thinking R&D	Climate change: Drive to renewables (+ve) Adaptation – flood storage and land management Carbon sequestration (peatland, etc.) Land ownership: 'Use' rather than 'ownership' Agri (food) sector current under current practices Carbon sequestration (forestry, peatland, etc.) Planning systens, current design guidelines/regs Payment for public goods provision: Non-existent Economic terms of, for example, clean water. Involving agencies such as NI Water.	Agri-environmental schemes (e.g. farmers paid for services) Education is key for scenarios Possibility of there being less food (e.g. more land for flood storage and carbon sequestration) Regulating services will suffer as much as other services – big trade offs Regulating ecosystem services recognised as public good – land owners paid Food crops instead of biofuels Paying for water Look of landscape changes impacting on tourism, loss of cultural heritage	Missing the 'bigger' picture Unable to control all areas – issues of overarching management, for example – flood management, upstream and downsteam areas could be separated Lack of info exchange	Large mono crops – loss of diversity= increased vulnerability Loss of knowledge share	Increased pressure on natural resources Increase in GHG's due to intensive farming practices for larger populations Loss of economy - deprivation Lack of infrastructure and land (increased pressure) - climate refugees Disease spread through increased population - loss of services.
	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Carbon storage					
Flood control					
Water purify.					
Pollination					
ANY OTHERS?					
Winners and losers / key stakeholders	Gov, Farmers, Public – everyone! health and wellbeing big factor	Less democratic - people may lose free will Businesses	Businesses, scientific community, families, Gov	Quality of life - Health and life expectancy (lack of fuel/food) Loss of biodiversity	Arable farmers, environmental sector Animal welfare – losers Multi-national cooperation's – winners
Trade-offs and impacts	Env vs Env? Carbon sequestration, more mixed farming vs provision of grassland for flood water storage	Loss of diversity – impacts Tourism and culture Loss of species and landscape character	Less travel = smaller carbon footprint Sense of charity (i.e. developing world) will be lost Lack of coordinated approach – loss of skills	Carbon footprint	Quality of life – health and wellbeing (food security) Civil ownership SME's/green businesses

CULTURAL SERVICES					
	Present day	**2060: Nature at Work**	**2060: Local Stewardship**	**2060: National Security**	**2060: World Markets**
Key driver	Economy	Multi-functional land use / multiple outputs	Local food and energy supply	National food and energy supply	Economy
Issues specific to Cultural Services	not getting full economic value from cultural services, issues for this include, unwieldy inflexible regulation, access issues and troubles legacy	good focus	Reduced	economy down	Economy winners rich in society, rich countries and big business, losers everyone else
	Education: Lack of understanding of the importance of heritage potential particularly from an economic perspective	Strong	Increased	Education down – cultural heritage not important	Down
	Tourism: See economy above	Properly valued	down	down	Down limited to the very rich
	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)	(min to max output, 1 to 5)
Tourism	2	3.5	1.5		
Archaeology	2	4	3		
Sense of place	2	4	4		
Scenery	2.5	4	2		
ANY OTHERS?					
Winners and losers / Key Stakeholders	Society loses as a whole due to lack of strategy especially economically	Society loses as a whole due to lack of strategy esp.	Economy down bust sense of place up	Economy down but sense of place up	Winners rich in society, rich countries and big business, losers everyone else
Trade-offs and impacts	To improve the situation increased access to land reduced sense of land ownership rights. Trade offs in regulation must be easier and compromises made (e.g. wind turbines vs historical landscapes)	To improve the situation increased access to land reduced sense of land ownership rights. Trade off in regulation must be easier and comprises made (e.g. wind turbines vs historic landscapes)	Economy down bust sense of place up	Economy down bust sense of place up	Environment over exploited