Natural Resource Management

The Glastir Monitoring and Evaluation Programme (GMEP) team have been involved in the conversion of data produced by the GMEP project into practical metrics, maps and tools. These can be used by the Welsh Government (WG), Natural Resources Wales (NRW) and partners as they develop new policies and initiative to deliver a more integrated approach to managing our natural resources. A major ambition of the Environment (Wales) Act and Well-being of Future Generations (Wales) Act. We describe these below under the following headings:

- Resilience
- Natural Capital Accounts
- Using modelling to look into the future
- Ecosystem Service supply

Resilience

GMEP provides data which cover all four ecosystem characteristics (extent, condition, diversity and connectivity) which are considered to help ecosystems become more resilient to pressures such as climate change. Increasing resilience of our ecosystems is a major ambition of the Environment (Wales) Act and Well-being of Future Generations (Wales) Act. We are exploring how to combine GMEP with other data to help track improvements in resilience from a local to national scale.

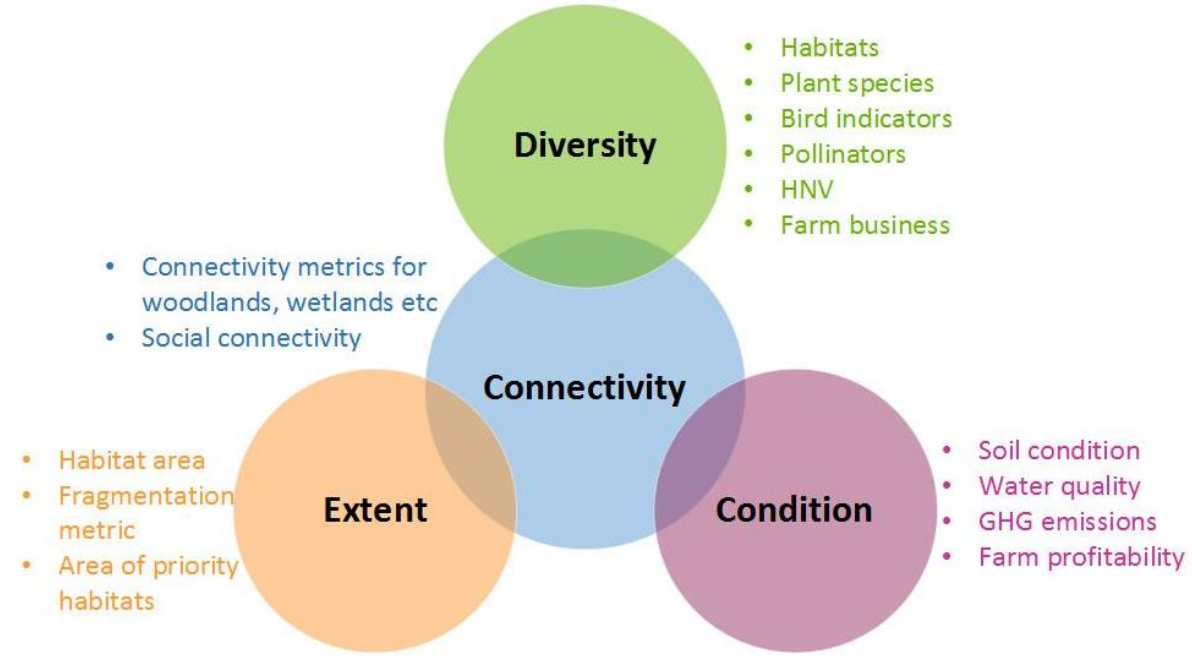

FIGURE-GMEP-NRM-A-1:

Natural Capital Accounts

Wales has been used as a case study to help draft a step-by-step manual to help governments create National Species Accounts following the internationally accepted System of Environmental-Economic Accounting (SEEA). Members of the GMEP team were responsible for drafting this case study which used GMEP data extensively. This work is led by the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP- WCMC), and the project is part of the Advancing Natural Capital Accounting project coordinated by the United Nations Environment Programme – The Economics of Ecosystems and Biodiversity (UNEP- TEEB) Office, UN Statistical Division and The

Convention on Biological Diversity. GMEP soils data is also being used to explore approaches for developing National Soil Accounts.

Using modelling to look into the future

GMEP uses models to forecast the changes Glastir management may deliver in the future. GMEP has modelled 6 Glastir interventions and shown there is potential to deliver the following at a national scale:

- Reduction in flood-generating land of 1-9%
- Reduction of diffuse pollution and soil erosion of 1-15%
- Increased national carbon storage by 0 - 6%
- Reductions in greenhouse gas emissions nitrous oxide and methane emissions of 0.1 - 7%
- Positive changes in habitat suitability projected for 75% of the 21 plant species modelled.

These are all described more fully elsewhere in the GMEP portal (see GMEP data and findings tab and click on GMEP findings) and in the Year 1 GMEP report (see Resources tab).

Ecosystem services

GMEP has used the Land Utilization and Capability Indicator model (LUCI) (http://www.lucitools.org/) to map the current supply of ecosystem services at a national level, and identify where there are opportunities for improvements to the supply of these services. LUCI produces national scale maps showing where a particular service (e.g. carbon storage or broadleaved woodland) may be improved, without adversely impacting the other services. Working in partnership with local communities/farmers, the LUCI model can then be used to target management at a local level down to 5 metres scale (e.g. where to target riparian tree planting). This multi-scale capability of the LUCI model is one of the main reasons it was selected to be part of the GMEP modelling framework.

The services we explored with the LUCI model are:

Climate change mitigation

- carbon stock in soil and vegetation
- change in carbon stock which depends on the land use / soil combination
- carbon status which indicates where there are opportunities to improve without damaging other services

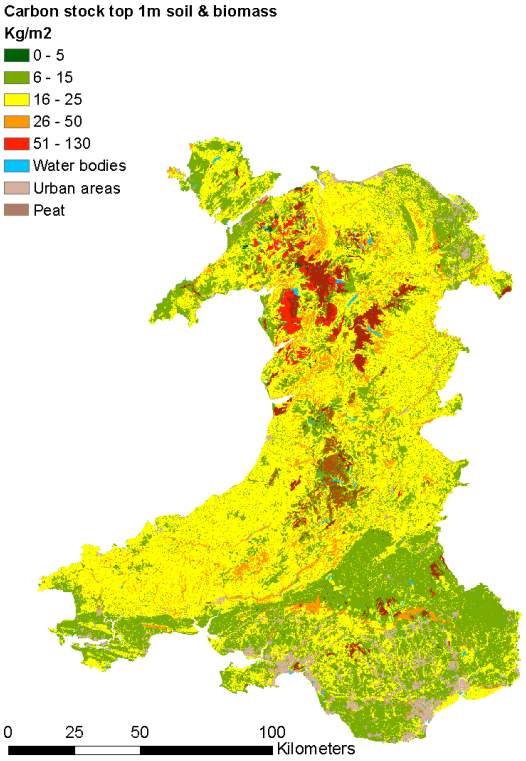

FIGURE-GMEP-NRM-B-1: Amount of carbon (kg/m^2) in the plant biomass and top 1 metre of soil

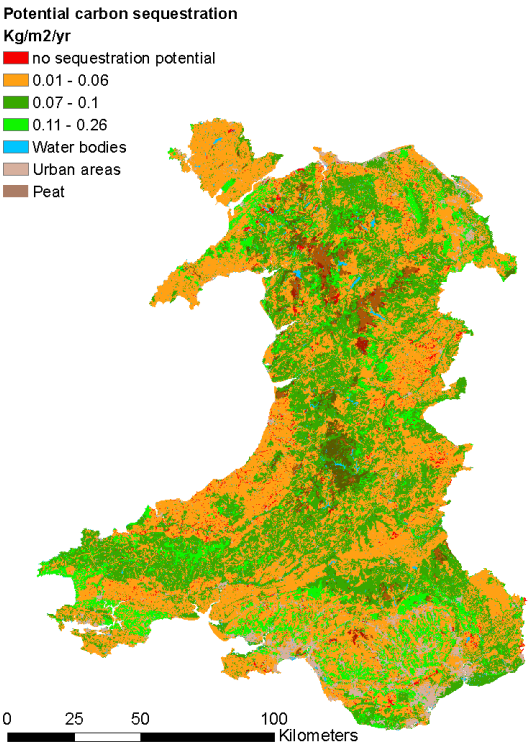

FIGURE-GMEP-NRM-C-1 Potential carbon sequestration (kg/m^2/yr) in the plant biomass and top 1 metre of soil

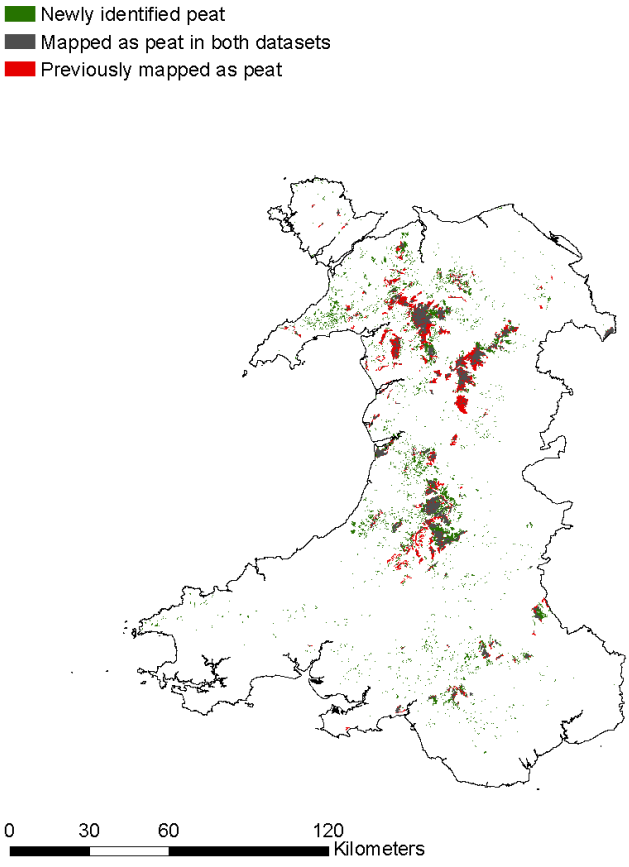

FIGURE-GMEP-NRM-D-1 Changes in peat distribution across Wales based on the revised peat map (GMEP 2015; Year 2 Report)

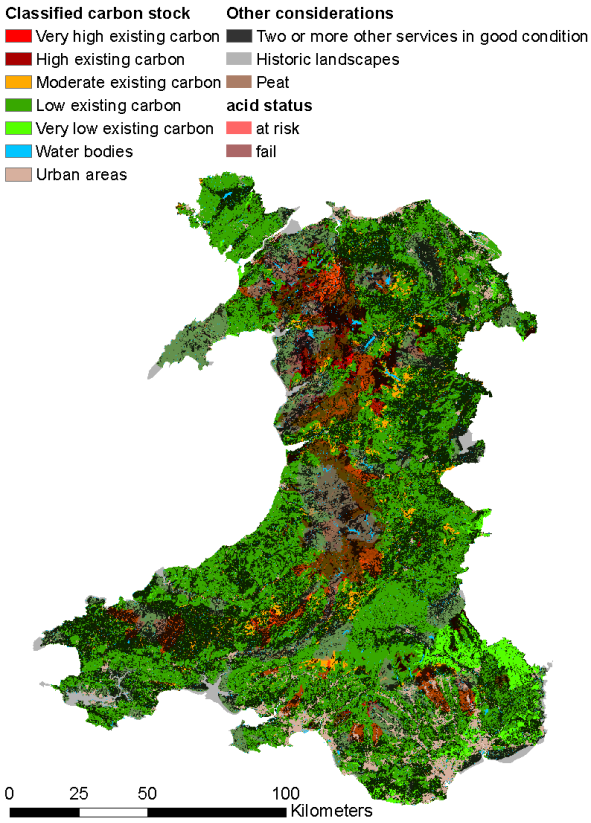

FIGURE-GMEP-NRM-E-1: Opportunity map showing where carbon stock is low and could perhaps be improved without major damage to other services including historic landscape. Total area is 34% of Wales / 713,387 hectares. The most recent updated peat extent is also shown and has been included in these calculations as these areas should be protected as are areas at risk of acidification should trees be considered as the management option.

Regulation of water quality and flow

- land which slows rainfall runoff which is a factor in mitigating flood risk
- current nitrogen and phosphorus levels in streams and rivers

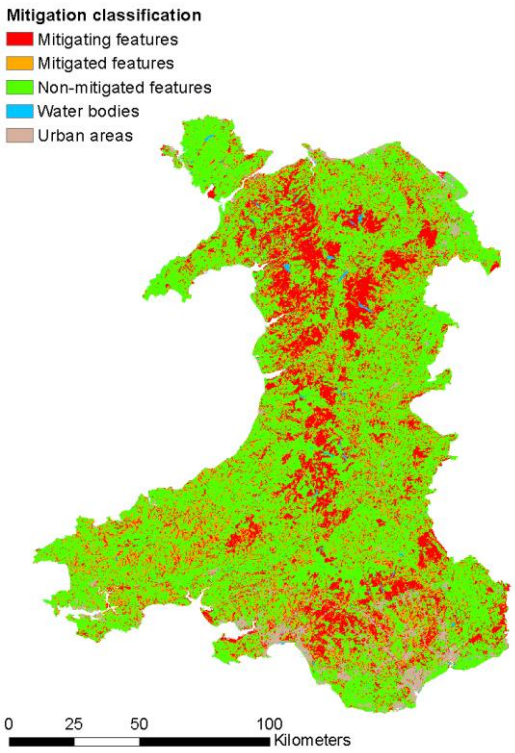

FIGURE-GMEP-NRM-F-1: Distribution of land with and without mitigating features which help slow rainfall runoff and therefore contribute to flood mitigation.

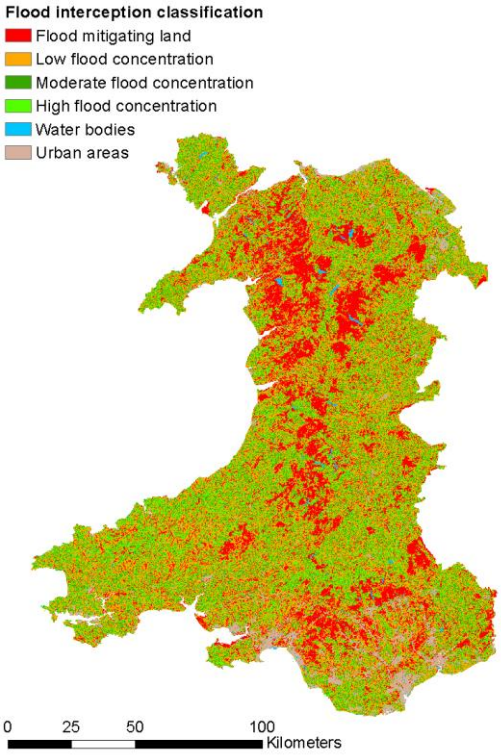

FIGURE-GMEP-NRM-G-1: Land with features which will slow rainfall runoff (red) and land which is unmitigated resulting in high flood concentrations (green)

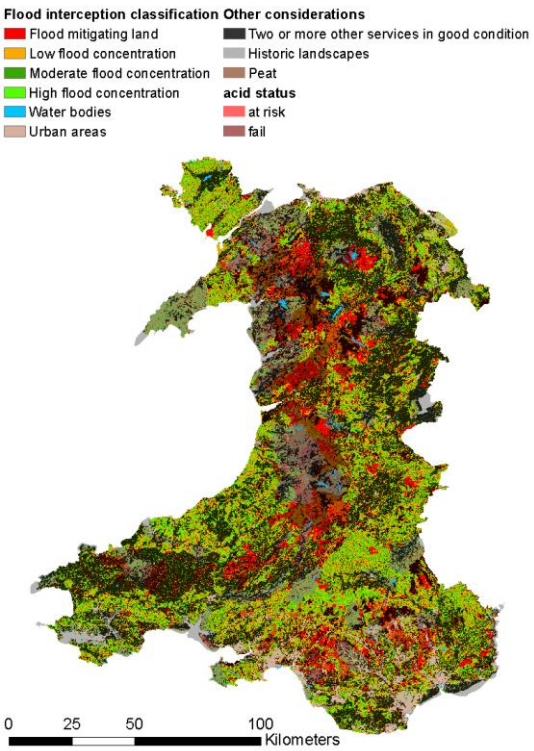

FIGURE-GMEP-NRM-H-1: Potential to improve flood mitigation (green) without major damage to others services (16% of Wales)

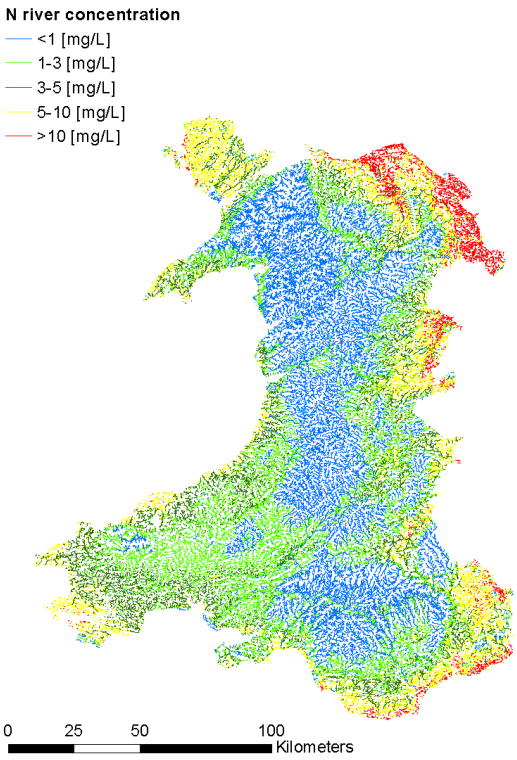

FIGURE-GMEP-NRM-I-1: Current nitrogen concentration (mg/l) in rivers

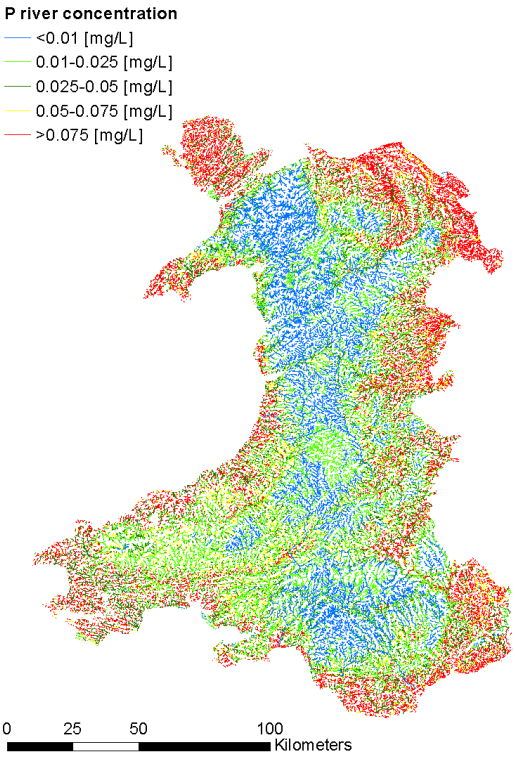

FIGURE-GMEP-NRM-J-1: Current phosphorus concentration (mg/l) in rivers

Biodiversity

- Area of priority habitat and existing woodland
- Land which has the best opportunity to improve the connectivity and area of broadleaved woodland
- Areas of deep peat, areas at risk of acidification and high historic value are also indicated as these are unlikely to be suitable for tree planting. This reduces area of opportunity for woodland planting from 53% of Wales to 36%

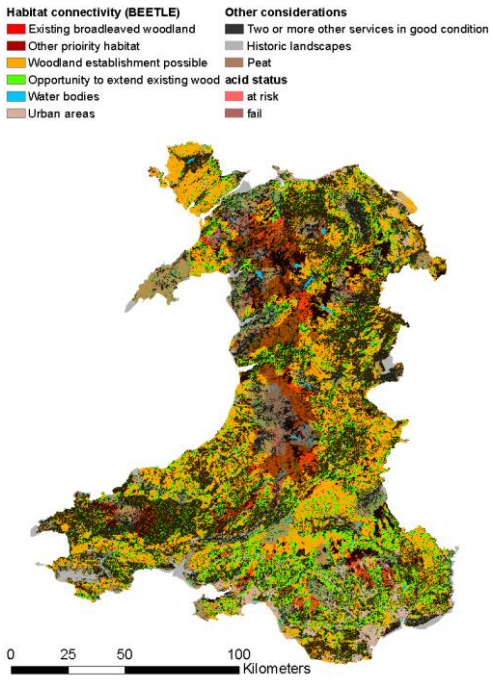

FIGURE-GMEP-NRM-K-1: Extent of current broadleaved woodland and other priority habitat and the opportunity to extend or create new broadleaved woodland without major damage to other services (36% of Wales/ 752,812 hectares)

Agriculture production

- Current agriculture production based on land cover
- An assessment if land is being over or under utilised according to a combination of landcover, soil and slope conditions.

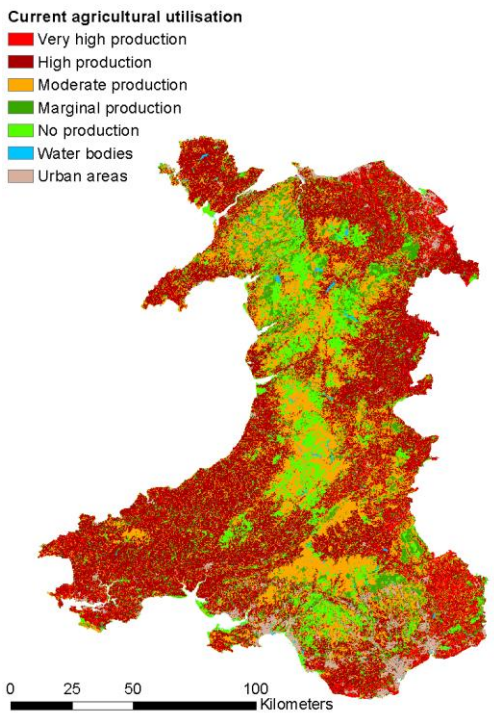

FIGURE-GMEP-NRM-L-1: The current agriculture production based on landcover data

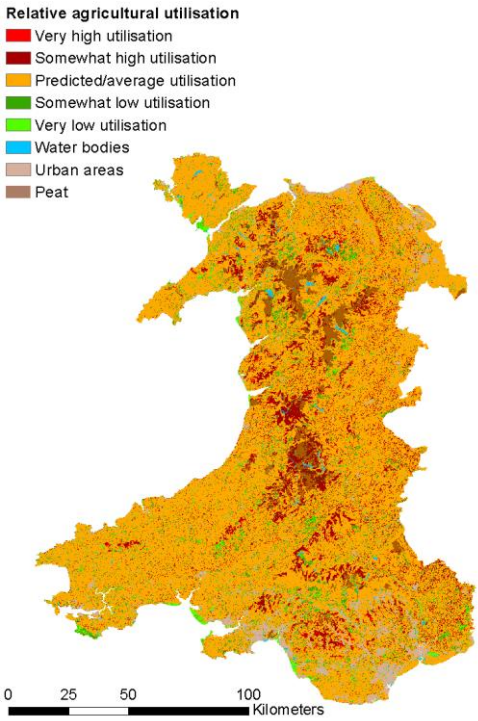

FIGURE-GMEP-NRM-M-1: The utilisation of land for agriculture production relative to its production potential based on landcover, soil and slope condition

Ecosystem services trade-offs and opportunities

- LUCI indicates that in 77% of Wales improving one service may degrade another (a trade-off – indicated in yellow). This emphasises the importance of considering all services before recommending change i.e. will another important service we affected?
- GMEP has enhanced LUCI output by adding in additional issues which need to be considered such as:
    - risk of acidification of waters (important for woodland expansion)
    - areas of deep peat (a new all Wales peatland map was launched by GMEP in 2015)
    - areas of important historic landscape

  We have added these as additional data layers to alert land managers that other services should be considered beyond those currently covered by the LUCI model.

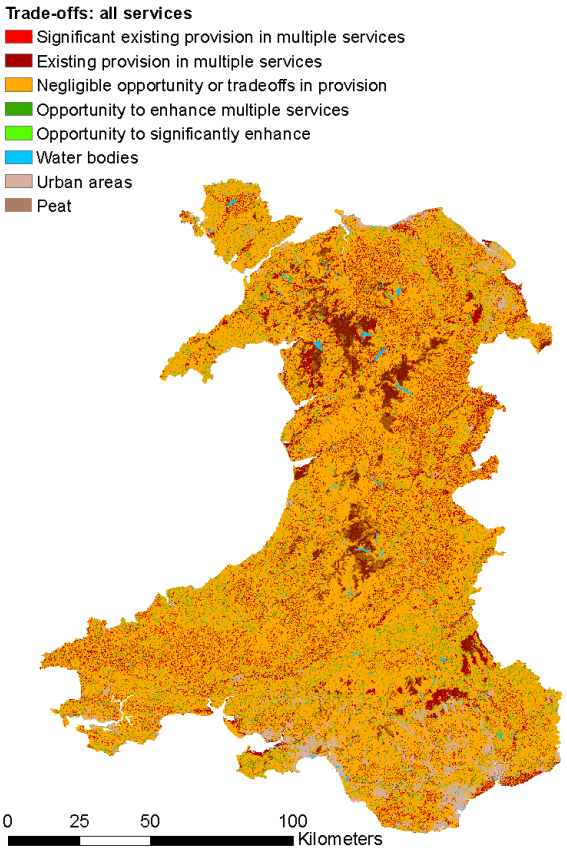

FIGURE-GMEP-NRM-N-1: Map showing the large area of Wales (77%) where extending one service will impact on another. The map emphasises the need to prioritise services locally as trade-offs are inevitable.