

National Planning Framework (NPF) 4 (Scotland) – consultation

NPF document: <https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft/documents/>

BGS response focused to Part 3 (National Planning Policy).

Policy 11: Heat and cooling

Q33: Do you agree that this policy will help us achieve zero emissions from heating and cooling our buildings and adapt to changing temperatures?

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Geothermal heat is included within Policy 11 as a zero emissions source. This resource could be a particularly important contributor to developing future strategies for heat networks in parts of central Scotland underlain by flooded abandoned mine workings (Gillespie et al. 2013; Todd et al. 2019). The warm water in these workings form a potentially significant heat source and thermal store, commonly coincident with areas of greatest population density and existing fuel poverty in Scotland. Glasgow is also now home to a unique geothermal infrastructure - the UK Geoenergy Observatory for research and innovation into mine water heat resources, sustainability, technologies, environmental impacts and training (Monaghan et al 2021). This infrastructure is managed by the British Geological Survey and is aimed to support further research and characterisation of this resource in Scotland, as well as in similar environments elsewhere in the UK.

In addition to mine water heat resources, very shallow geothermal or ground source heat forms a growing technology used in Scotland for heating and cooling (Greenspace Scotland 2022), and is part of the number of low or zero emissions sources which could be considered under Policy 11. Deeper geothermal heat may form a further additional, viable heat source in the future in parts of Scotland (Gillespie et al. 2013).

It is likely Local Authorities will require support in understanding how these resources (both individually and collectively) can be most appropriately utilised / appropriately identified when developing local development plans and Local Heat & Energy Efficiency Strategies (LHEES). Geothermal assessments (regional / local) could help inform local development plans. Geological expertise may be required to support Local Authorities in this context and there is a need for continued research to harness these opportunities and inform appropriate regulation.

References:

Gillespie, M.R., Crane, E.J. and Barron, H.F. 2013. Study into the potential for deep geothermal energy in Scotland: Volume 2, British Geological Survey Commissioned Report, CR/12/131. Scottish Government Project Number AEC/001/11. ISBN: 9781782569862
<https://www2.gov.scot/resource/0043/00437996.pdf>

Todd, F., McDermott, C., Harris, A.F., Bond, A & Gilfillan, S. 2019. Coupled hydraulic and mechanical model of surface uplift due to mine water rebound: implications for mine water heating and cooling schemes. Scottish Journal of Geology; 55; 124-133. DOI. 10.1144/SJG2018-028

Monaghan, A. A., Starcher, V, Barron, H.F., Shorter, K., Walker-Verkuil, K., Elsome, J., Kearsey, T., Arkley, S., Hannis, S and Callaghan, E. 2021. Drilling in to mines for heat: geological synthesis of the UK Geoenergy Observatory in Glasgow and implications for mine water heat resources. Quarterly Journal of Engineering Geology and Hydrogeology, DOI.10.1144/QJEGH2021-033

Greenspace Scotland. 2022. Parkpower website accessed March 2022
<https://www.greenspacescotland.org.uk/energy-projects?msclkid=156d6f04a60d11ec8fa271b72bcb0a7a>

Policy 13: Sustainable flood risk and water Management

Q35: Do you agree that this policy will help to ensure places are resilient to future flood risk and make efficient and sustainable use of water resources?

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Scotland's climate has already changed over the last century, and it now has drier summers and wetter winters (Critchlow-Watton et al. 2014). This is driving an increased exposure in flood risk. The latest National Flood Risk Assessment carried out by SEPA in 2018 predicts the number of properties exposed to surface water flooding will increase from 210,000 to 270,000 by 2080 under a 1:200 year event scenario (Scottish Environment Protection Agency 2018, Scottish Government 2021).

Overall, concerted effort across all sectors through the planning process will be required to ensure that new development is appropriately sited and designed in order to create future sustainable places and manage flood risk.

Policy 13 aligns with recommendations from Scotland Infrastructure Commission (2020), which highlighted the potential contributory role of natural flood management (NFM) approaches and blue green infrastructure (e.g. SuDs) within flood management. However, whilst there are over 94 NFM projects in the UK, assessing the effectiveness of NFM approaches, and identifying what NFM design is most appropriate in what setting, remains highly complex (Dadson et al 2017). This is due in part to the large uncertainties in quantifying the impacts of interventions at large scales and how catchments respond under different conditions (Dadson et al. 2017). A range of information and expertise will be required to inform /support local development plans in identifying the most appropriate opportunities to implement natural flood risk management and blue green infrastructure.

The efficacy of tree planting or other changes in land management to control runoff generation under NFM approaches can, for example, be significantly influenced by soil type and underlying geology, alongside other catchment characteristics (Peskett et al. 2020, 2021). Selection of appropriate and effective Sustainable Drainage Systems (SuDS) is also informed by the underlying geology (British Geological Survey 2015). Infiltration SuDS, provide an overall advantage of reducing the amount of surface water to be managed, but knowledge of ground conditions is required to ensure these systems are implemented only where the ground conditions are appropriate, and do not inadvertently lead to an increased risk of groundwater flooding, negatively impact water quality, or incur ground instability issues.

References:

Scotland's Infrastructure Commission. 2020. A Blueprint for Scotland: Phase 1 key findings report. pp 137.

Critchlow-Watton, N., Dobbie, K.E. et al. (eds) 2014. Scotland's State of the Environment Report. Scotland's Environment Web.

Scottish Environment Protection Agency (SEPA). 2018. National Flood Risk Assessment 2018

Scottish Government 2021. Water-Resilient Places: A Policy Framework for Surface Water Management and Blue-Green Infrastructure. February 2021, pp25.

Dadson, S., Hall, J. et al. 2017. A restatement of the natural science evidence concerning catchment-based 'natural' flood management in the UK. *Proceedings of the Royal Society, A* **473**, 20160706. <https://doi.org/10.1098/rspa.2016.0706>

Peskett, L., MacDonald, A. et al. 2020. The impact of across-slope forest strips on hillslope subsurface hydrological dynamics. *Journal of Hydrology*, **581**, 124427,

Peskett, L.M., Heal, K.V., MacDonald, A.M., Black, A.R. and McDonnell, J.J. 2021. Tracers reveal limited influence of plantation forests on surface runoff in a UK natural flood management catchment. *Journal of Hydrology. Regional Studies*, **36**, 100834,

British Geological Survey (BGS). 2015. *Infiltration Sustainable Drainage Systems (SuDS) Map*.

Q36: Do you agree that this policy will ensure places support health, wellbeing and safety, and strengthen the resilience of communities?

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Policies 14 and 15 are written explicit to specific types of development (e.g. major accident hazards), and certain aspects of development impact (e.g. noise, air pollution) relating to health, well-being and safety. Additional safety aspects are also be significant considerations in the planning process, in ensuring development creates lifelong health, wellbeing and safety. From a geological perspective, these include: the impact of development on environmental quality (soil, water and ground quality; and the potential for ground gas (including radon), or mine gas in development and building design.

‘Mine gas’ is used specifically to refer to methane, hydrogen sulphide, carbon dioxide and carbon monoxide gases released from coal seams and the surrounding bedrock. Abandoned mines can continue to release mine gases such as methane until the workings are completely flooded or the gas reserve is depleted (Department of Energy and Climate Change 2011). These gases can be harmful to human health in specific circumstances if they reach the ground surface and accumulate to certain concentrations in insufficiently ventilated or protected buildings. This was evidenced in the Gorebridge incident in Midlothian within central Scotland in 2013-14, where gas ingress from mine workings occurred to residential buildings and caused a demonstratable health risk (NHS Lothian 2017; RSK-Scottish Government 2019; BSI 8485:2015+A1:2019). Historical mining and quarrying activities across the Midland Valley from the 18th and 19th century have left a network of abandoned underground features, and the potential for ground and mine gas is a key component of ground investigation and building design considerations in central Scotland, as well as in some other areas.

Radon is a radioactive gas which occurs naturally from the ground; different geology has different propensity for the release of this gas. Prolonged exposure to elevated levels of Radon increases the risk of lung cancer, and in some areas it is necessary to apply preventative measures in new buildings and extensions. Indoor radon is the biggest source of human exposure over a long period to ionising radiation in the UK. The UK Health Security Agency (UKHSA) and BGS radon potential dataset is the definitive map of radon-affected areas in Great Britain and Northern Ireland.

References:

Department for Energy and Climate Change (DECC). 2011. *Update of Estimated Methane Emissions from UK Abandoned Coal Mines*. Commissioned research report, written by WSP Environment & Energy, published by DECC, 2011, pp 37.

NHS Lothian. 2017. *Carbon Dioxide Incident in Gorebridge Midlothian, April 2014*. Final Report of the Incident Management Team.

RSK-Scottish Government. 2019. *Research project to investigate prevalence of CO2 from disused mineral mines and the implications for residential buildings*. Scottish Government report, pp 198.

British Standards Institute (BSI). 2015. *BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*. British Standards Institution, 2015.

Policy 22: Minerals

Q43: Do you agree that this policy will support the sustainable management of resources and minimise the impacts of extraction of minerals on communities and the environment?

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The requirement that all types of mineral extraction do not negatively impact on the historic environment is important as noted by Policy 22. However, we note that Policy 22 does not include any explicit reference to building stone extraction. In many parts of Scotland, building stone plays a significant contribution in the sense of place (urban and rural) as well as also supporting Historical Assets and Places (relevant to Policy 28). Building stone and roofing slate extraction can generate

a positive impact on the historic environment, as well as offer other societal benefits. The following points (largely drawn from research published by the British Geological Survey in 2016 - [Scotland's Stone Industry - A Review](#)) are offered to substantiate our position:

- Building stone is a ubiquitous traditional material that has been used widely throughout Scotland in the past. The great diversity of the bedrock geology means that the 'local stone' typically changes over small distances, and so the character of stone structures, and therefore the historic environment, varies considerably in different regions.
- The building stone industry in Scotland is today a fraction of its former size, and an estimated 10% of all stone used annually in Scotland is sourced in Scotland despite the existence of abundance quantities of high-quality building stones. The remaining 90% is imported.
- Poor availability of indigenous traditional building materials poses a risks to long-term health of the historic environment. Efforts to secure the availability of, as well safeguarding sources of traditional building stone materials will in fact be critical to fully enable best-practice compliance with several statements made within the NPF4 Policy 28, which sets out the requirement for development to 'protect and enhance historic environment assets and places' employ the use of 'suitable materials' and preserve 'architectural and historic character' and to 'sensitively repair historic environment assets' (sections 28 [e] & 28 [m])
- Transporting large volumes of imported stone by sea, rail or road comes at a significant environmental cost.
- In addition to providing appropriate stone for building repairs, the building stone industry can generate a variety of economic, social, cultural and environmental benefits including reducing CO₂ emissions, and producing skilled employment, especially in rural areas.

For these reasons, we would welcome the consideration of a local building stone objective within national planning policy, and the forthcoming publication of the NPF4 offers an opportunity for this.

Policy 30: Vacant and derelict land

Q48: Do you agree that this policy will help to proactively enable the reuse of vacant and derelict land and buildings?

Delivering parts of Policy 30 are a complex challenge across planning sector, and there will be continued need for cross-sectoral engagement and collaboration to deliver this policy. The complexity of reuse and re-development of brownfield sites is significant, particularly where land is known or suspected to be unstable or contaminated. For these sites, investment in geo-technical and engineering expertise in remediation is generally required before construction and new development can begin. Early knowledge in local development plans may help identify strategic priorities for this investment.

Policy 32: Natural places

Q50: Do you agree that this policy will protect and restore natural places?

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Scotland's geodiversity (the range of rocks, minerals, landforms, sediments and soils) forms an integral part of the country's natural places and assets. Looking after key parts of geodiversity is a vital part of conserving Scotland's landscapes and nature. As such we propose Policy 32 includes explicit consideration of geodiversity alongside the other natural assets already named and that Geological Conservation Review (GCR) sites are included alongside other names protected sites and landscapes.

Scotland's geodiversity plays a fundamental role in: the physical basis of Scotland's landscapes; development of soils and ecosystems; supporting flora and fauna; it is an important source of raw materials and assets; and has played a founding role in cultural and built heritage. It also provides the means to understanding past and future environmental changes, playing a significant role in delivering nature-based solutions and increasing resilience to climate change. Geodiversity is crucial for developing a more sustainable society as well as our place in, and impact on the natural environment.

There are currently nearly 900 GCR sites in Scotland (NatureScot 2022). These sites contain geological and geomorphological features of national and international importance. Most have

statutory protection through designation as geological features in Sites of Special Scientific Interest (SSSIs). However, more than 200 GCR sites, have no protective SSSI designation status. Local development plans currently consider GCR sites in development proposals and BGS has conducted/produced geodiversity audits for a number of Local Authorities in Scotland to support consideration of natural geodiversity assets in spatial planning