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Assessment of the footprint and carrying capacity of oil and gas well sites: the implications for limiting hydrocarbon resources.

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The rapid growth of shale gas developments within the United States and the possibility of developments within Europe have raised concerns about the impact and potential environmental cost. In this study we estimated the likely physical footprint of well pads if shale gas or oil developments were to go forward in Europe and used these estimates to understand the impact upon existing infrastructure; the carrying capacity of the environment and how this may limit the proportion of resources that are accessible estimates. Conventional well pads in UK, The Netherlands and Poland were examined. For the existing UK conventional well pads the current minimum setback from a building for a currently producing well was measured. To assess the carrying capacity of the land surface, well pads, of the average well pad footprint, with recommended setbacks, were randomly placed into the licensed blocks covering the Bowland Shale, UK, and the extent to which they would interact or disrupt existing infrastructure assessed.

The average conventional well site footprints were: 10800 m2 (1.08 ha) in the UK; 44600 m2 (4.46 ha) in The Netherlands; and 3000 m2 (0.30 ha) in Poland. The average area per well was: 541 m2/well (0.05 ha/well) for the UK; 2870 m2/well (0.29 ha/well) for Poland; and 6370 m2/well (0.64 ha/well) for The Netherlands. Average access road lengths were: 230 m in the UK; 250 m in Poland; and 310 m in The Netherlands. The minimum setback from a building for a currently producing well was 21 m and 46 m from a house, though the mean setback was 329 and 447 m, respectively. When the surface and sub-surface footprints were considered our approach found that the carrying capacity of the sites and the restrictions from infrastructure over the currently licensed blocks covering the Bowland Shale (UK) was between 5 and 42%, with a mean of 26%. Using Cuadrilla's predicted recoverable reserves estimate of 8.5 x 1011 m3 for the Bowland Basin, the carrying capacity of the surface and the likely maximum accessible gas reserves would be limited by the surface carrying capacity to 2.21 x 1011 m3.