

The Definition of Fragile Rural Areas in Highland

Introduction

Highland is a large and diverse region: its communities have differing socio-economic characteristics. As a consequence of the large size, geography and location of the area, many communities are remote from centres of employment and services. The socio-economic profile of a community along with its degree of remoteness can contribute to a community becoming 'fragile', or in danger of decline and an erosion of its facilities and services. Fragile rural areas are taken as those which are socio-economically disadvantaged and/or have suffered economic decline over recent years.

Nothing is static: over the last century there have been great changes to the population size and structure of Highland, and while in the last twenty years or so there has been an overall increase in population this has not been evenly spread across the area. The recent demographic changes that have taken place are well documented, but briefly some areas have seen considerable population decline and a shift in the age structure towards the more elderly groups. These changes have taken their toll on the levels of service provision, both private and public, that can be sustained. Some communities have seen the closure of, for instance, shops, schools, and petrol stations, as well as a reduction in public transport provision. Reductions in service provision such as this can in themselves contribute to further population decline.

The purpose of trying to identify 'fragile' areas is to highlight those communities which are either in this cycle of decline or in danger of becoming so. By identifying the areas and communities which are 'fragile' it then becomes possible to target resources and initiatives at these areas with the intention of stemming the decline. This paper sets out a method of identifying fragile areas, and presents the results of the mapping exercise.

The Indicators Selected

There have been many studies carried out which map areas according to different criteria, for instance in order to identify areas of deprivation, and each one uses a different combination of indicators. There is, therefore, no agreed set of indicators which can be adopted for Highland. In order to develop a suitable measure of fragility for Highland a review of previous studies was carried out and the indicators used in these studies were assessed for their suitability.

Various criteria were set for the type of indicators to be used. Firstly, any system for defining fragility must be as simple and clear as possible. Secondly, where possible the indicators selected should be from sources more recent than the 1991 Census. Thirdly, they must reflect the primary focus of what we mean by fragility, i.e. remoteness and social/economic fragility. Fourthly, the data must be robust and reliable. And fifthly it should be available at a suitable geographic level (the smaller the geography the better). Effective double counting (using two indicators which essentially reflect the same thing) should be excluded.

Four aspects of fragility were to be reflected in the definition of fragility. These were: population sparsity; population decline; level of prosperity; and accessibility/peripherality. It is important to note, however, that fragility is as much about the links between these as it is about the individual factors. Given the criteria for indicator selection detailed above, it was decided that the most appropriate indicators to use would be:

Indicator: Population density (persons per sq.km.), by Highland Council settlement zone

Source: Census 1991

Fragile type: Remote, social

Justification: The Census is the most robust source of population data. Although data relates to 1991, it is unlikely that any changes since then will have had a significant impact on the relative position of settlement zones. Sparsely populated areas are more likely to be fragile than those with greater population densities because a small decline in the population will constitute a large percentage change. A critical level of population is required to make services viable. A low population density suggests that the community could be unsustainable over a long period of time.

Indicator: % population change between 1981 and 1991, by Highland Council settlement zone

Source: Census 1991

Fragile type: Remote, social

Justification: As above, reliable population figures are not currently available after 1991 at the local level. However, population decline over this period is still significant, and a settlement which experienced population decline between 1981 and 1991 is potentially more likely to have experienced a further decline since that time. There are a wide range of factors which can contribute to population decline, although a lack of employment and/or housing opportunities are commonly held as major contributing factors. Further, population decline tends to be concentrated across a number of age groups, namely those of working age, and this has implications for the future sustainability of a community.

Indicator: % change in population aged 0-15 years, between 1981 and 1991, by Highland Council settlement zone

Source: Census 1991

Fragile type: Remote, social

Justification: As above, reliable population figures are not currently available after 1991 at the local level. A decline in the population aged 0-15 is significant in that this age group represents the future workforce and the sustainability of the community. There are clear service implications of a decline in the population of young people, in that the viability of schools in particular is diminished.

Indicator: % people aged over 18 claiming income support, by 1996 Ward

Source: Improvement & Development Agency, August 1996

Fragile type: Economic, Social

Justification: A robust measure of income is not available at the local level, and so it is therefore necessary to use a proxy indicator for income. Income support is a benefit available to those whose income is considered inadequate for their circumstances, and is set at the minimum level the Government considers no individual's income should fall below. Generally speaking, recipients of income support are either the low paid, the unemployed, pensioners, lone parents, or the disabled, provided in each case that the low income criteria is satisfied. Normally, in order to qualify claimants have to be aged over 18, and hence the claimant rate is calculated as a percentage of those aged over 18.

Indicator: % of long term unemployment, by District ward

Source: NOMIS, July 1998

Fragile type: Economic, Social

Justification: As unemployment in Highland is seasonal, long term unemployment (over 6 months) is seen as being a more appropriate indicator of fragility. High levels of long term unemployment indicate a more deep-rooted lack of employment opportunities. Also, there is a relationship between length of unemployment and an individual's ability to manage financially, thus linking closely to the preceding indicator.

Indicator: 10 minute drive time to 5 key services - Post Office; Food shop; GP; Primary school; Petrol facility

Source: Highland Council database, 1998

Fragile type: Social, Remote

Justification: Easy access to services is crucial for most people in a community, but particularly those who are elderly, infirm, disabled, and/or lack their own transport. Five key services are used for this indicator as these services are seen as being the essential for daily needs. Communities which lack easy access to one or more of these services are more vulnerable.

Indicator: areas outwith 1.5hr drive time of Inverness

Source: Highland Council database, 1998

Fragile type: Social, Remote

Justification: Inverness is a major employment and service centre for the Highlands. It acts as a regional centre, although in itself it can be considered as being remote from the wider UK and European markets. An area which is outwith a certain drive time of Inverness is even more remote from these markets, as well as having more limited access to the business, service and cultural and leisure opportunities that the town offers. The drive time was set at 1.5 hours on the basis that commuting is unlikely to take place beyond an hours drive from Inverness, and in order to access services and facilities a 3 hour round trip is a considerable journey.

Mapping the Indicators

The indicators were treated in a number of different ways before being mapped, as detailed below.

The two accessibility indicators had to be treated differently from the other indicators by their very nature. In order to identify areas outwith a 10-minute drive time of all five key services, the services were first mapped and a 10-minute drive time 'exclusion zone' drawn round it. Drive times were calculated according to the actual road network, with different average driving speeds being allocated to different types of road. Any area which fell outside the 'exclusion zone' was subsequently included within the fragile area analysis. It is important to note that the areas within a 10-minute drive time of the five key services may not necessarily be able to access all five services in one place. That is, the services could be in different locations, and so in order to access all five in one trip could necessitate considerably more than 10 minutes of driving. However, given that services tend to be clustered in areas of population, it is more likely that all services could be accessed in one place.

The second accessibility/peripherality indicator, the area outwith a drive time of 1.5 hours from Inverness, was treated in a similar way. Using set speeds for different types of road, a map was drawn which showed all areas falling outwith the stated travelling time.

Data for the numerical indicators selected was gathered for the stated year and geography, and the settlement zones/wards were ranked in order of the value of the indicator. For the

population change indicator, all rural settlement zones which had experienced a decline between 1981 and 1991 were taken as being fragile, and thus all were included and mapped.

For the remaining numerical indicators (change in population aged 0-15, long term unemployment rate, claimant rate for income support, and population density), it was necessary to establish a cut-off point, above which a value would be taken as being indicative of fragility. A number of possible approaches to this could have been taken (for instance, above the Highland average, or a particular percentage above the average), but it was felt that whatever approach was taken it had to be consistent across the four indicators.

There are drawbacks to using any particular cut-off point, particularly as the number of values for each indicator varies (from 183 settlement zones to 72 wards). To be consistent with the definition of Fragile Areas used by Highlands and Islands Enterprise, the worst third of areas was selected as being the cut-off point. As the purpose of the work, however, was to identify rural areas which are fragile it was necessary to remove any urban areas from the worst third selected and replace them with a rural area. For the purposes of this work, 'urban' was taken as being anywhere with a population of more than 5,000 in the 1991 Census. This led to Inverness, Culloden, Alness, Dingwall, Fort William, Thurso, Wick and Nairn being excluded from the analysis. Where an area was removed on the basis of being urban, it was replaced with the rural area next in the ranking.

The table below gives detail on the number of values for each indicator, its range, average and median, the value at the cut-off point and the number of urban areas replaced. The table shows that for population density, all of the original third worst areas were rural, as there were no replacements. For the income support claimant rate and long term unemployment, however, there were 12 and 10 replacements respectively. A map was then produced for each indicator showing the worst third areas.

Table 1 Indicators used and cut-off points

Indicator	No. of values	Range	Highland average	Median	Value at worst ¹ / ₃ cut-off point (rural)	No. of urban areas replaced
Population density	183 settlement zones	0.06 to 740.66 persons/km ²	7.91	4.78	2.24	0
% population change	183 settlement zones	-63.64% to +147.73%	+4.57%	+3.54%	All with a decline	0
% change in population aged 0-15	183 settlement zones	-14.3% to 11.1%	-3.1%	2.45%	-3.6%	1
Income support claimant rate	72 wards	6% to 35.46%	12.91%	11.66%	11.59	12
Long term unemployment	126 wards	0.28% to 11.23%	2.42%	2.13%	2.43	10

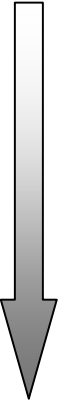
Having produced seven individual maps, it was then necessary to combine these and produce one final map which showed the degrees of fragility across all areas (or where no, one, two, three, four, five, six or seven indicators coincided). Across the seven indicators chosen, four different geographies were used (settlement zone, Highland Council ward, District ward, and a facility based area). Therefore in order to combine these meaningfully, what is known as a

'raster' approach was taken. Raster analysis essentially created a grid across The Highland Council area, with each square of the grid being one kilometre square. For each square of the grid, it was determined how many indicators of fragility were present and this was then mapped. The resulting map of fragility, shown in Figure 1, thus consists of a series of coloured squares which represents the raster grid.

Highland Rural Fragile Areas

When all the indicators are combined, as in Figure 8, it is possible to identify which areas are most fragile. The Highland Council area can be broken down into zones of differing fragility, according to the incidence of the seven indicators. The resulting zones are shown in Table 2 below.

Table 2: Zones of fragility

Most fragile  Least fragile	North east and Central Sutherland South/west Caithness Skye South Wester Ross, extending inland to Dingwall North west Sutherland South west Lochaber and Kyle area Mid Ross and north Easter Ross North Caithness South Nairn/remote Inverness Badenoch & Strathspey and east Lochaber (excluding Fort William and environs) North Wester Ross South east Sutherland Inverness/Inner Moray Firth area Fort William and immediate hinterland
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Conclusions

The work presented above shows how mapping indicators with GIS can be used to assist in the process of identifying fragile areas. Although maps have been developed from a given set of indicators, the methodology is suitably flexible so that the indicators used can be varied over time, as better and/or more up to date data become available. The work is still at the development stage, as a demonstration of how the methodology could be used to inform area policies and resource targeting. While it is believed that the choice of indicators adequately reflects aspects of social and economic fragility as well as possible, given the constraints of data availability, comments from others on the selection of indicators and the application of the methodology would be welcome and are currently being sought.