Northern ToSIA

Assessing sustainability of forest based activities in rural areas of the Northern Periphery

Analysing forest sustainability under various management scenarios: a case study in Inshriach, Northern Scotland

Inshriach Forest lies within the Cairngorms National Park in northern Scotland. The park (some 3,800 km²) is highly important for recreation, tourism, landscape and biodiversity, including the endangered Red squirrel (*Sciurus vulgaris*) and Capercaillie (*Tetrao urogallus*). The forested areas also support many local and regional timber enterprises. Inshriach (3,689 ha) is publicly-owned and is managed by the Forestry Commission. The forested area is mainly coniferous, with Scots pine (*Pinus sylvestris*) as the main species, along with significant areas of riparian and open ground.

Background

Inshriach Forest has traditionally been managed for intensive timber production. Although economic production remains highly important, current forest policy is increasingly prioritising environmental and social objectives: in particular by facilitating outdoor recreation, restoring native woodland cover, and improving habitats for endangered species.

Objectives of the Study

One of the key challenges facing foresters is how to measure and assess all of the relevant aspects of forest sustainability. This case study uses ToSIA (Tool for Sustainability Impact Assessment) to examine the current management strategies and operations and assess their impact on various sustainability indicators. The process is repeated under three additional scenarios, each addressing the potential pressures arising from climate change.

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Forest Management Alternatives

A coherent series of strategies and operations in the forest is defined as a 'Forest Management Alternative', or FMA. The following FMAs are adopted in the wider context of UK forestry. At Inshriach (where *intensive* and *continuous cover* are the main systems currently adopted), each FMA is considered in greater or lesser proportions according to the management objectives of each particular scenario.

FMA 1: Forest Nature Reserve
(Currently 3% of Inshriach, 0.5% of UK forestry)

Tree cover (usually native species) is permanently retained for its biodiversity and recreational value. Management intervention is limited to the removal of non-native species and deer control only.

FMA 2: Continuous Cover Forestry
(Currently 44% of Inshriach, 5% of UK forestry)

Conventional thinning regimes are adopted during early rotation, followed by a partial clearfell to leave seed trees at 80-90 years. Natural regeneration is favoured, promoting species and structural diversity.

FMA 3: Combined Objective Forestry
(Currently 0% of Inshriach, 23% of UK forestry)

Similar to FMA 4, but is thinned to a lower intensity whilst adopting a slightly longer rotation (typically about 75 years for Scots pine). Suits areas of woodland with higher recreational or other biodiversity interests.

FMA 4: Intensive Even-aged Forestry
(Currently 43% of Inshriach, 71% of UK forestry)

Optimising financial return is the primary objective. Rotations are relatively short (typically 60-75 years for Scots pine), with thinning regimes adopted to promote higher volume production and good quality timber.

FMA 5: Wood Biomass Production
(Currently 0% of Inshriach, 0.5% of UK forestry)

Rapid volume production is the primary objective of this FMA. A mixture of Sycamore, Ash and Birch is planted with relatively low inputs in terms of establishment and maintenance. Trees are thinned once at 20 years and are clearfelled at age 40. Whole trees are chipped for use in the woodfuel industry.

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Scenarios

The five current / potential FMAs were considered for adoption in varying proportions to represent potential future changes in management strategy, as may be required in response to either environmental, social, or economic pressures. Four different scenarios (including the current system) were defined in order to measure the impact of management decisions on sustainability indicators. Each scenario was developed in conjunction with forest planners in order to incorporate the different primary objectives of the study area, and was designed to reflect actual or potential changes to its forest design plan. The proportion of FMAs was varied between scenarios to represent these changes. The four scenarios are:

Scenario 1: Environmental Pressure
Due to climate change, there is an increasing intensity of various biotic threats to pines (*e.g*. Red-band needle blight). In addition, there is a corporate policy that conifer plantations are to be restored to broadleaves wherever possible. The combined effect leads to the widespread conversion of Scots pine to other suitable species, such as Birch (*Betula* spp.).

Scenario 2: Social Pressure
Land-use policy requires the return of intensive forested areas to more 'natural'systems in order to increase biodiversity and the potential for tourism. Areas designated for intensive even-aged forestry decrease leading to a rise in the area managed using continuous cover forestry systems.

Scenario 3: Economic Pressure
Responding to climate change mitigation policies, woodfuel industries increase their demand for wood chips and pellets. Areas of intensive even-aged forestry and wood biomass production increase dramatically.

Baseline: 'Business as Usual'
The current management system.

Sustainability Indicators

The impact of these scenarios was measured against the following sustainability indicators as per the ToSIA protocol (developed under the EFORWOOD project):

Gross Value Added

Calculated from the costs and the value of the timber at each phase of production, extraction and transport.

Greenhouse Gas Emissions

Calculated from the volume of fuel consumed by harvesting machines and vehicles used in transport.

Carbon Sequestration

Calculated from known (entire) tree carbon stocks over the life of the forest.

Employment

Measured in hours / ha. Converted to Full-Time Equivalent (FTE) at a rate of 1584 hours per working year.

Recreation

Scored according to aesthetic impressions related to silvicultural attributes (structure, age, species).

Forest Biodiversity

Scored according to structure, species diversity, composition, naturalness, and connectivity etc.

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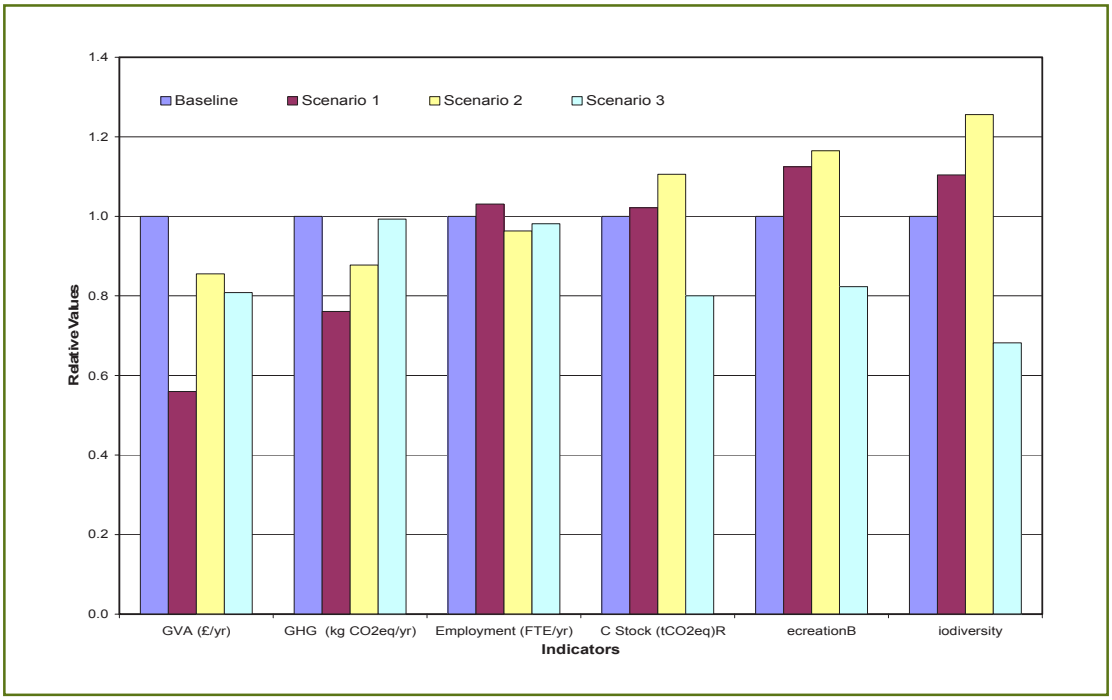
Results and Conclusions

The case study generated a large amount of data which were analysed using ToSIA to determine the impacts each scenario had on the chosen sustainability indicators. For each scenario, the values of all the calculated indicators are shown here, relative to the baseline (i.e. the current management scenario):



In terms of overall sustainability, Scenario 2 seems to offer a good alternative to the current management regime with increased carbon stocks, biodiversity and recreation valuesand reduced greenhouse gas emissions but with little impact on employment and a relatively minor reduction in GVA. However, choice of management options will depend on the preferences of key stakeholders.

This case study illustrates how the ToSIA principles may be applied at stand and forest levels. A major advantage of the methodology is that it allows the user to analyse not only current sustainability impacts but also impacts from potential future scenarios as well. Such analysis allows managers and policy makers to evaluate the advantages and disadvantages of different management optionsand to compare this against the planned objectives for a forest. This information can be valuable in planning and in consultation with stakeholders in order to aid decision making and to ensure local engagement with management plans.

The scenarios detailed here are for illustrative purpose only although effort was made to reflect actual operations and values. Considerations must be given to the assumptions madeand the possible inaccuracies due to unavailability of data. However, the scenarios demonstrate that it is possible to calculate sustainability indicators of value and importance for the forest-based industries.

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