Canadian Journal of Forest Research
Revue canadienne de recherche forestière

Exploring the linkages between multi-functional forestry goals and the legacy of spruce plantations in Scotland

Journal:	<i>Canadian Journal of Forest Research</i>
Manuscript ID	cjfr-2015-0399.R1
Manuscript Type:	Article
Date Submitted by the Author:	11-Jan-2016
Complete List of Authors:	Nijnik, Maria; The James Hutton Institute, Social, Economic and Geographical Sciences Group Nijnik, Anatoliy; Environmental Network limited Brown, Iain; The James Hutton Institute
Keyword:	ecosystem services, woodlands, stakeholders, attitudinal diversity, Q-method

Exploring the linkages between multi-functional forestry goals and the legacy of spruce plantations in Scotland

Maria Nijnik¹

The James Hutton Institute, Craigiebuckler, Aberdeen, AB15 8QH, UK, phone: +44 (0)1224 395305, fax: +44 (0) 844 928 5429, E-mail: maria.nijnik@hutton.ac.uk

Albert Nijnik

Environmental Network Ltd, Aboyne, UK,

E-mail: albertnijnik@yahoo.com

Iain Brown

The James Hutton Institute, Craigiebuckler, Aberdeen, AB15 8QH, UK,

E-mail: iain.brown@hutton.ac.uk

¹ Corresponding author

Exploring the linkages between multi-functional forestry goals and the legacy of spruce plantations in Scotland

Abstract

This paper explores the ecosystem services associated with woodlands, as these are viewed by individuals in Scotland, with the idea to reconcile objectives for multi-functionality with the legacy of past forestry systems which were not designed with multi-functionality in mind. Research follows a semi-qualitative route and applies the Q-method to identify and explain a range of attitudes, among the general public and forestry associated stakeholders regarding functional future of forestry in Scotland. Four distinctive groups of attitudes were identified and key factors influencing the attitudinal diversity explained. Despite the uncovered attitudinal heterogeneity, all groups of attitudes have strong emphasis on native woodland regeneration and on improvement of aesthetic values of woodlands, but differ concerning afforestation. An improved understanding of what people think provided indication of their recognition of ecosystem services types and the trade-offs between these, as well as of opportunities available and of factors that can hamper forestry development (e.g. concerning the aspiration of increasing Scotland's forest cover to 25%). Findings suggest that the *Productivists* position (for which the economic objectives are important) remains strong in Scotland. Results (compared with those in several other countries) demonstrate comparability between public and stakeholder perspectives in support of the multi-functional forestry, and this has distinct policy relevance and implications for decision-making.

Keywords: ecosystem services, woodlands, stakeholders, attitudinal diversity, Q-method

1. Introduction

Policy objectives for sustainable forestry have changed in recent decades to emphasize its multiple benefits. These benefits are often established by comparison and as complements to other land use systems, notably agriculture (Slee et al., 2015). However, the forestry sector generally has relatively long time horizons associated with the time that trees take to become established or reach maturity. Hence, the landscapes of today are still strongly influenced by legacy decisions from the past and policy objectives still remain to be fully realized on the ground. The forestry sector in many countries is therefore typically undergoing a process of change, and a diversity of stakeholder attitudes may not always be consistent with policy objectives. In this contribution, the dichotomy between the legacy of the past and objectives for a sustainable future are investigated with regard to land use in Scotland and this may then be used to identify implications for transition pathways towards genuine multi-functional forestry.

1.1 Forestry in Scotland

Scottish landscapes were deforested early and extensively (Fowler, 2002). The substantial area of largely unbroken dense forests progressively disappeared under anthropogenic influence, with only 4.5% of the land covered with trees at the lowest point (Smout *et al.*, 2005). Deforestation had occurred as a result of the forces related to economic growth and of a scant attention paid to the environment (Nijnik and Mather, 2008). Deforestation was followed by tree-planting initiatives especially in the 19th century, when private planting of exotic species was widespread; and in the 20th century, by further planting of monoculture conifers by the state forestry authority, with the primary policy objective to produce commercial timber (Nijnik and Slee, 2008). The former policy of the creation of commercial plantations was justified for the reasons that: conifer monocultures are more productive and easily managed; straight-edged plantations minimise

fencing costs, which often make up half the establishment costs; large areas bring economies of scale; and hardy pioneer species, such as Sitka spruce (*Picea sitchensis*), were a necessity for establishing forest ecosystems on poorer quality lands (Warren, 2002).

In terms of the actual political and economic achievement, the afforestation programme has been remarkably successful. The forest area in Scotland trebled during the 20th century. However, by 2000, 70% of the forest area was coniferous, with 47% of Sitka spruce. Much of wooded cover in Scotland was established under political circumstances that no longer exist and for purposes that are no longer relevant (Mather, 2003). In forestry, however, “the sins of the fathers...live for a long time and the recent forest enlightenment will not bear visual fruit for many years to come” (Lister-Kaye, 1995, p.61). Today’s forests are a product of the past. Their share in percentage of the land area in Scotland is ca. 17% (FC, 2010); and conifer plantations largely of exotic species (primarily of Sitka spruce) still dominate many landscapes, Figure 1 (Nijnik and Slee, 2008).

Figure 1

Much of the new Scottish woodland has been developed in remote locations, and forest culture, as manifested in folklore, literature and art, has been relatively modest (Mather, 2003). Also, in the past, people were not encouraged to visit woodlands, which were usually viewed as the domain of private landowners, and there was a social as well as a geographical gulf between people and forests (Mather *et al.*, 2006).

It was only in the early 1990s that non-material values emerged as an important issue on the policy arena (Wiersum, 1995). The Non-Binding Principle that forests should be sustainably managed to meet social, economic, ecological, cultural and spiritual human needs of present and future generations, has been influential (UNCED, 1992). Since then the objective of forestry in Scotland has been shifting from its predominantly material (commodity) production towards

multi-functionality (Nijnik and Mather, 2008). The relative societal weight of forestry and its contribution to livelihoods have changed. Conifer tree-planting has also decreased (Figure 2).

Figure 2

There is an increasing interest by decision-makers in ecosystem management, small scale forestry and adaptive forest management (Nijnik *et al.*, 2008; Sarkki *et al.*, 2015). Forestry policy actors, uses and activities have changed. Multi-functionality is reflected in policies, both national (Scottish Government, 2011) and international (MEA, 2005), with attention in research agendas in Scotland given lately to multiple ecosystem services (Thomas *et al.*, 2015). Existence of forestry multi-functionality in Scotland is backed up by empirical evidence from institutional analysis and public opinion surveys (Nijnik and Mather, 2006), and it is expressed in real terms on the ground (Mather *et al.*, 2006). Multi-functionality is seen as a strategy capable to meet increasing private and public demand in modern societies (Schmithusen, 2007). In Scotland, the concept of multi-functionality is seen as central to the national Land Use Strategy (Scottish Government, 2011) which aims to deliver a more integrated approach linking land and people and having ‘the right tree in the right place’ (Munoz-Rojas *et al.*, 2015). An essential pillar of the Strategy is woodland expansion with an aspiration to reach 25% cover by 2050.

1.2 Models of multi-functionality

Significant characteristics of multi-functionality are: (i) *multiple commodity and non-commodity outputs that are jointly produced*; (ii) poorly functioning markets for *public goods* which constitute some of the non-commodity outputs (Maier and Shobayashi, 2001). ‘Joint’, however, gives rise to questions of scale, time and space. Should multi-functionality apply in the *vertical* sense, with each field or forest stand fulfilling two or more functions (e.g. with reconciling multiple benefits at landscape scale and designing forestry to deliver this), or can it be used to

93 describe a pattern of diversity in which different units of land are dedicated to different
94 functions? The debate began in mid-20th century (e.g. Dana, 1943; Pearson, 1994), became
95 polarized, and was never resolved. Dana implied a ‘vertical’ interpretation of multi-functionality
96 while Pearson’s view was of its ‘horizontality’, i.e. of effective multiple use of forest on the basis
97 on merely organized and coordinated specialization (Sedjo, 2004). The former view was
98 dominant in the last part of the 20th century, arguably the origins of forest ecosystem
99 management. However, the latter also has its advocates (Vincent and Binkley, 1993).

100 Another challenge of multi-functionality in forestry originates from the fact that the joint
101 production (and consumption) of multiple ecosystem services (*supporting, provisioning,*
102 *regulating and cultural/social*, MAE, 2005) may result in conflicts between stakeholder interests.
103 Stakeholder interests are diverse in number, as is the range of forestry related stakeholders.
104 Therefore, a better understanding of stakeholder attitudes and perspectives is important for
105 informing the design of policies of various levels on the delivery of ecosystem services, and for
106 identifying future opportunities and management practices pertaining to forest multi-
107 functionality. It is also necessary to understand current forestry changes in practice and the extent
108 to which they manifest policy objectives, including goals for woodland expansion.

109 While the demand and supply of *marketable forest commodities* (e.g. timber) can be analysed by
110 economic models, with choices and resource allocation mediated by markets, social expectations,
111 preferences and needs for *public goods* require novel, and more pluralistic valuation methods, or
112 their combination (e.g. of analytical and participatory techniques by Nijnik and Mather, 2008;
113 participatory techniques and visualization tools by Miller *et al.*, 2009, or Q-method combined
114 with aggregated ecological indexes, c.f. Nijnik *et al.*, 2008). The literature provides strong

arguments that stakeholder preferences for the social states of public goods should be determined through non-market-oriented postulates, or revealed through mechanisms other than the market (Kant, 2003). Thus, application of Q-method to understand the variety of subjective viewpoints on an issue (briefly explained in Section 2) which avoids the challenge of questionable attributions of pseudo-market values, is particularly useful in identifying potential conflicts (e.g. between stakeholder interests) to avoid and manage them, or for assisting decision-makers with a proper incorporation of public perceptions into the policy design.

Thus, the objective of this paper is to examine the heterogeneity of stakeholder attitudes towards the services that forest ecosystems can provide and the trade-offs between these services. We used the Q-method and carried out research in three phases. *Phase 1* was on public attitudes towards woodlands expansion in Scotland, with a particular attention given to Sitka spruce forests. *Phase 2* addressed stakeholder priorities for landscape changes and characteristics, and the role of woodlands (both native and exotic, e.g. Sitka spruce) in Scottish countryside. *Phase 3* covered stakeholder evaluation of multi-functional forestry, with analysing of trade-offs between ecosystem services and comparison of the results across several countries in Europe. At each research phase, heterogeneities of perspectives were identified through characterizations of attitudinal groups and concise analyses that follow.

2. Methodology and research framework

2.1. Briefly on the method-in-use

The development of participation as a tool to assess values and attitudes is rooted in planning and decision-making theory that considers public participation as a method, or a set of guidelines and practices, by which there can be greater involvement of participants in specific activities in order to accomplish research objectives or to inform policy (Miller *et al.*, 2006). The range, number

and type of participants are key characteristics of the participation process. These participants are ‘stakeholders’, as is any person, group or institution that has an interest (UKODA, 1995). Awareness raising is important for stakeholder engagement (Scottish Government, 2015) the main objective of which is to improve and facilitate the decision-making process, such as of multi-functional forestry development. Therefore, because of forest policy relevance of this research and the anthropocentric nature of the ecosystem services concept, we started empirical work with identification of stakeholders to be interviewed.

Following van Asselt *et al.* (2001) who distinguish five types of participants considering public decisions: (1) government and decision-makers; (2) citizens; (3) interest groups; (4) business men; and (5) scientific experts, we came up with the list of key stakeholders regarding multi-functional forestry. The participants included (1) forestry related decision-makers, first of all the Forestry Commission, and forest owners and managers; (2) local people, as the primary forest users; (3) forest and environmental NGOs; (4) forest based industries, and (5) scientific experts in forestry and in ecosystem services of trees.

The Q-method allowed for a rather simple data set, because most of the data in this type of analysis derives from how much information is implicit in each participant’s Q-sort, i.e. the formal model of each person understanding of the points of view at issue (Barry and Proops, 1999). Respondents were diverse in their social-economic backgrounds, but the number of actual questionnaire participants was not large, with 86, 30 and 66 respondents at each phase of the research, correspondingly. *Phase 1* (addressing the role of woodlands for the development of countryside) reflected on public attitudes to woodlands, in Scotland. Respondents, therefore, were randomly chosen from the public, and then, the selection was adjusted for background

characteristics of respondents (*gender, age, education, occupation, income, partnership status* etc.) to be almost equally spread among the categories suggested by van Asselt *et al.* (2001).

Phases 2 and 3 addressed the attitudes of forestry stakeholders. Therefore, only forestry related stakeholders, falling under the van Asselt's *et al.* categories, were interviewed. At *Phase 2* (to assess stakeholders' opinions concerning landscape changes and components) 30 land use/forestry stakeholders were approached. At *Phase 3*, we interviewed 66 stakeholders related to forestry and multiple ecosystem services of trees. They included academics and those coming from both the 'demand' or 'supply' sides of forestry. Further, we compared the results for Scotland with those for the Netherlands, Poland, Romania and Sweden where matching research was carried out.

The Q method (Brown, 1996) incorporates elements of behavioural studies into action research. It combines qualitative and quantitative tools and starts with consultation with stakeholders to identify research essentials. Statements are derived through a concourse analysis. Next, to examine individual agreement/disagreement on a specific issue presented in statements, each respondent is asked to rank each statement at a normal distribution sorting chart, i.e. a Likert scale, generating a Q-sort. Then, each Q-sort, i.e. the formal model of each respondent's view (i.e. his/her individual opinion about statements) is correlated with every other Q-sort, and their inter-correlation matrix is factor-analyzed to find attitudinal clusters that exist (Brown, 1996). Because these clusters are associated with respondents, Q factor analysis enables linking these clusters of opinions to individual background characteristics of respondents. Thus, the use of this method leads to identification of prevailing attitudinal typologies. The resulting factors, *i.e.* typical Q-sorts, represent the attitudes people have, allowing us to explain the attitudinal

heterogeneity and to improve understanding of why people have their perceptions. Key steps of a Q-method research are shown in Figure 3.

Figure 3

Comprehensive information about this method and on its comparison with standard R-analysis is now available in the literature (Adams and Proops, 2001; Nijnik *et al.*, 2009).

2.2. Research elements and flow

As mentioned earlier, there were three phases in this Q-study. Three questionnaires (i.e. sets of statements) were therefore designed in line with the research objectives. Statements were designed through concourse analysis (from the Latin ‘concursum’, meaning ‘running together’) of the full breadth of social discussions, surrounding the particular issue examined (Stephenson, 1978). Each of our three questionnaires consisted of 36 statements and 36 boxes in a normal distribution sorting chart.

The following are shortened examples of *Phase 1*: ‘Native woodlands should be preserved whatever the cost’, ‘We should be more self-sufficient in timber and plant fast growing trees’, ‘The rights of people to enjoy the countryside are more important than making profits from the land’, and ‘Planting trees to create jobs is more important than protecting wildlife and nature’. At *Phase 2*, we used, for example, the following statements: ‘New planting must be in tune with the character of the landscape’ and ‘Beautiful landscape that is not being used for recreation is essentially being wasted’. *Phase 3* statements included, as follows: ‘After clear cutting, the ecosystem will never return to its previous state’, ‘Many wild species require an uninterrupted forest for nesting’, ‘Subsequent growth and forest plantation are never as good for ecosystems, as old growth’, ‘Forest is made wealthy through clear cutting’, ‘Hunting is stabilising the population, and is good for forest’, ‘The majority of wildlife species have enough environmental

niches for living'. Each respondent distributed the statements across the Likert chart, on a scale ranging from +5 through -5, based on their agreement/disagreement with the statements (where +5 indicated 'complete agreement', and -5 indicated 'complete disagreement', with zero showing a neutral attitude to the statement).

After the respondents had ranked the statements, the output data were assessed, using the sequential application of multiple regression and factor analysis. Factor analysis created a few new uncorrelated choice variables – a set of factors, i.e. groups of attitudes which are called typical Q-sorts – that have captured the common essence of the several individual Q-sorts (Brown, 1996). The resulting 'factors' represent the heterogeneity of attitudes for use in explaining the diversity of opinions expressed, and a basis for interpretation of why people hold their opinions. In our research, each statement in the Q-sample was also scored for each factor, enabling us to analyse the statements' significance to each factor. The final steps comprised interpretation of the social discourses uncovered; contrasting the value outputs with the socio-economic background of respondents (*gender, age, education, occupation, income, partnership status, etc*) and verification, and communication the results with/to stakeholders who contributed to the surveys.

3. Results

3.1 Results of Q-analysis of public attitudes towards woodland expansion

Phase 1 findings show public support to woodlands expansion, as offering a range of benefits to the Scottish people and the environment. Despite evidence of the importance of enlarging the area of wooded cover in this country, the research came up with results showing a diversity of public attitudes towards afforestation. Three predominant attitudinal groups, with two subgroups in each group (six attitudinal groups in total) were distinguished (explaining 73% of the

underlying variation in responses). The first group named as ‘productivists’ is highly distinctive and explains 27% of the variation. It means that part of the public in Scotland considers the creation of new jobs in remote rural areas as a very important policy objective. The legacy of Sitka spruce could be regarded as something quite positive in this setting; and looking at woodlands expansion through the eyes of *Productivists*, we could find some evidence in support of plantation forestry as having its prospering near future in this country. *Productivists* place a clear emphasis on woodland expansion, and consider the social and economic aspects of forestry development as crucial. The attitudinal group consists of two subgroups comprised of respondents with different degrees of support given to productivist forestry. Those belonging to the first subgroup are more extreme and focus primarily on the enlargement of the wealth of rural communities and on the increase of income. In contrast, those belonging to the second subgroup are oriented towards balancing socio-economic objectives of forestry development with environmental considerations.

The second major reason for public support of the policy for expansion of woodlands distinguished in this research was that people recognise the desirability of improving rural landscapes. A number of people, belonging to this attitudinal group (which, in line with the prevailing preferences/perceptions, was called *Recreationists*), were preoccupied with aesthetic values of landscapes and people’s rights to enjoy landscape beauty. Some respondents characterized as *Recreationists*, in addition, were interested in socio-economic aspects of landscape changes, e.g. in attracting of tourists to the remote areas. There is also a distinctive attitudinal group that recognises the intrinsic value of nature and is primarily ecologically oriented. We named this group *Conservationists*. Whilst other groups do not have strong prejudice against the enlargement of wooded area at the expense of non-native species (e.g. Sitka

spruce), *Conservationists* support extensive native woodlands regeneration and biodiversity conservation. There are two subgroups in this group: with more extreme and less extreme attitudes with regard to their appreciation of environmental and cultural values of nature.

Findings allowed us to argue that people consider an increase in the relative level of subsidies to forestry to be important for satisfying the priority objectives of woodlands development. Heterogeneity of public attitudes appeared to be *dependent on age and living conditions and still more on stakeholder competencies, e.g. work experience, occupation and education (and is not dependent, for instance, on gender)*. For example, farmers interviewed during this phase of the research primarily appeared to belong to Group 1 (*Extreme Productivists*), while scientists and researchers could largely be categorised as *Recreationists*.

A general observation from *Phase 1* of our research is that people have diverse opinions about woodlands expansion in Scotland. There is a distinct group of respondents who are in favour of native woodlands regeneration and biodiversity conservation. The other dominant attitudinal group is preoccupied with rural landscapes and/or with opportunities they could provide to local people, to recreationists/tourists and rural economy. Also, socio-economic problems in remote rural areas are of primary concern to those respondents, whom accordingly, we named as *Productivists*. These people consider timber production central, and therefore would not really mind having forests dominated by Sitka spruce. Importantly, despite the diversity of public attitudes identified, there is a general understanding of the desirability of forestry development in Scotland, and of proper integration of woodlands in rural landscapes, i.e. “getting the right trees in the right places for the right reasons” (Warren, 2002; Munoz-Rojas, 2015).

3.2 Results of stakeholder evaluation of landscape characteristics

The results of *Phase 2* of the research shows that the attitudinal diversity of forestry related stakeholders in Scotland falls into four major groups (Table 1)

Table 1

Such heterogeneity of attitudes likely suggests the following priorities for possible directions and of the efforts required for landscape changes, as these are seen by our respondents:

- *Group 1*: policy and management initiatives to address both, socio-economic and ecological objectives of landscape changes in rural areas, with an increase of subsidies to farmers/land owners to support productive forestry but to balance it with improved landscape management.
- *Group 2*: allocation of extra funds for nature protection and biodiversity conservation, for improvement of landscape visual characteristics, and socio-economic development.
- *Group 3*: enhancement of farming and urban-rural industrial activities with the development of infrastructure.
- *Group 4*: promotion of economic and social development, including the development of tourism and recreation in remote rural areas.

Comparing the Phase 2 results with the Phase 1 findings, we could argue that the attitudinal stand of Group 2 respondents comes close to the position of *Conservationists* and *Recreationists*. We can also suggest that forestry related stakeholders are likely even more in favour of ‘production’ forestry than is the general public, and that the *Productivists*’ position (for which the economic objectives are crucial, and therefore, Sitka spruce would remain a predominant species) is generally strong.

The results also indicate that stakeholder valuation of landscapes is strongly influenced by the presence of woodlands and landscape characteristics such as landscape capacity; diversity;

resourcefulness of landscape (Valk *et al.*, 2010); visual accessibility; spatial continuity; temporal continuity; environmental health and vitality; diversity of flora and fauna; aesthetic values of landscapes; and profitability of land use management (Nijnik *et al.*, 2009). For example, Group 2 identified the following as important characteristics: open access to the countryside, with properly designed and managed access routes; landscape visual accessibility; spatial continuity; landscape diversity, with high variety of components and their resourcefulness; the diversity of flora and fauna; and high aesthetic values of landscape. Overall, our findings suggest that the most preferred features of landscapes in Scotland are physical accessibility (e.g. availability of access routes), visual accessibility, and spatial continuity of landscapes (Figure 4).

Figure 4

3.3 Results of stakeholder evaluation of ecosystem services and forest multi-functionality

Five groups of attitudes were distinguished on the basis of similarities/differences in participants' responses to the *Phase 3* questionnaire when multi-functional forestry and ecosystem services issues were addressed. Of the five groups, three were major groups (and in concordance with the *Phase 1* results of our study) associated with the *Conservationists*, *Productivists* and *Recreationists* types of attitudes. Those with the *Conservationists* attitudes fell into two groups which were recognised as *Extreme* (Group 1) and *Moderate Conservationists* (Group 4), while *Productivists* comprised of *Extreme* and *Moderate Productivists* (Groups 3 and 5). *Conservationists* (by definition) give their priority to biodiversity conservation over more traditional forestry practices (e.g. of Sitka spruce plantations). *Extreme Conservationists* (Group 1) would rather not allow any disturbance to habitats (e.g. by closing roads and prohibiting logging operations). *Moderate Conservationists* (Group 4) favour multi-functional forestry, and support nature conservation equally with forest provisioning services. The major preference of *Recreationists* (Group 2) is given to the regeneration of forest to provide social and economic

benefits. They support recreation in forest, and suggest that hunting and fishing are necessary to maintain the quality of ecosystems and a wider countryside (Figure 5).

Figure 5

Productivists (Groups 3 and 5) prioritize the *provisioning services* above all others. *Moderate Productivists* are keen to maintain a balance between timber production and other ecosystem services. They support grazing and farming in woodlands, and care for the quality of forest stands, as well as of old growth forests, and of hardwood and native species, whilst maintaining that forests remain a source of timber. They consider forest tourism as socially beneficial. *Extreme Productivists* consider above all the importance of maintaining forest as a source of wood and endorse the associated Sitka spruce plantations. They recognise the need for clear-cutting operations. This group supports the presence of leisure/recreation facilities in forests used for recreation (i.e. kind of ‘horizontal’ multi-functionality), considers forestry and farming as separate businesses, but tends to deny the legitimacy of additional nature conservation measures and their added financial support (arguing that “the majority of wildlife species have enough environmental niches for living”).

An important observation from Phase 3 research is that despite their distinct views, all attitudinal groups support the regeneration of forests and the resilience of ecosystems. Also, *regulating* and *supporting services* are endorsed by all, with the exception of one group which was therefore labelled as *Extreme Productivists*. All groups, except Group 4, named as *Moderate Conservationists*, encourage the development of recreation, and hunting and fishing opportunities in forests, and consider *cultural services* of forest as important. Enhancement of *provisioning services* and the necessity to increase the wealth of local communities is supported by all attitudinal groups, with the exception of *Extreme Conservationists*. Despite the attitudinal

differences, the two groups named as *Moderate Conservationists* and *Moderate Productivists* appeared to be close in their understanding of trade-offs between various ecosystem services and the balancing of often competing objectives of forest multi-functionality.

3.4 Cross-country comparison of stakeholder evaluation of ecosystem services

The results of the Phase 3 survey also provided information on the differences/similarities in opinions of stakeholders coming from Scotland as compared with those in several other countries representing the diversity of natural and socio-economic conditions of forestry development. There is some indication that respondents from *Scotland* and Sweden have a wider outlook on sustainable resource development and forest provisioning services (also observed in Romania). Farming is seen as an integral part of landscapes. There is support for old growth and hardwood forests; and the development of a modern infrastructure is largely encouraged (Figure 6).

Figure 6

The low representation of *Recreationists* in Scotland can be explained by a legacy of monoculture forest plantations. However, as evident from Phase 2 of our research, stakeholder attention is given to enhancement of the aesthetic component of woodlands in landscapes in support of their potential role in tourism. Respondents from *Sweden* are distributed evenly across the attitudinal groups which may indicate the importance of forestry for both timber production and provision of other ecosystem services. In *the Netherlands*, where the economic role of forestry is insignificant, *Extreme Productivists* are not represented. Respondents from *Poland* have quite radical nature conservation views, which also allow for recreational opportunities. The *Romanians* have moderate nature protection motivations, with support to forest regeneration.

The heterogeneity of attitudes across countries could be explained by the diverse institutional environments, competences, and capacities, influencing stakeholder preoccupation with multiple

opportunities, problems and consequences of forest management and use (Nijnik *et al.*, 2010). Stakeholder attitudes towards multi-functional forests and to the provision of ecosystem services seem to be dependent upon the socio-economic, political and historical preconditions, cultural standards and ethical principles operating in each of the EU states. Nonetheless, respondents from all countries are represented in the group of *Extreme Conservationists*. Overall, results provide a better understanding of the diversity of existing attitudes towards woodlands, with respect to major environmental and visual components of landscapes and in view of implications that forests can have for the environment and people.

4. Conclusions

Q-method has proved through this research to be a useful tool capable of identifying and explaining attitudinal heterogeneity in order to balance stakeholder interests, where possible; to identify potential conflicts in order to assist in avoiding and/or managing them, and likely to assist decision-makers with the incorporation of existing perceptions into policy design. The use of Q-method enabled us to reveal and assess attitudes and perspectives from the standpoint of the persons being observed. It helped us to identify respondents' preferences, to analyse criteria relating to their perspectives and to suggest factors influencing attitudinal diversity.

Research provided empirical evidence of stakeholders' understanding that sustainable multi-functional forestry is the direction in which to go, so as to multiply benefits to society and the environment. Prevailing attitudes identified in this paper, however, appear to be diverse. For example, some people in Scotland (*Extreme Conservationists*) strongly support native woodland regeneration. Others (in particular those classified as *Extreme Productivists*) consider above all the importance of maintaining forest as a source of wood. They would not mind a dominance of Sitka spruce in rural landscapes. The purpose of this research was to show the diversity of

attitudes and perceptions that exist, yet not reconcile the differences. Further research is recommended to show whether attitudes vary over space in Scotland and whether some regions tolerate Sitka spruce more than others.

Despite the heterogeneity of attitudes, public support of proper integration of woodlands in Scottish countryside is noticeable. The thrust of multi-functional forestry is supported by our results, and forest multi-functionality in turn, is aligned with international trends and agreements relating to the role of forests in rural landscapes. The overall conclusion is that although some people in Scotland are in favour of native woodlands conservation and their extensive regeneration, whilst others are more concerned with socio-economic aspects of forestry development, e.g. with new employment opportunities, there is likely an agreement across various categories (attitudinal groups) on the necessity of multi-functional forestry development.

The mix of attitudinal groups implies their recognition of ecosystem services types and the trade-offs between those (Figure 5). Moreover, alongside with the pressures to manage Scottish woodlands multi-functionally and sustainably, there is a need to recognise the very considerable challenges raised by global warming and by the need to develop forestry strategies which confront those challenges. It seems highly probable that the creation of new forests, and particularly of Sitka spruce, will play a significant role in sequestering carbon (cf. Nijnik *et al.*, 2012) and that the mix between native woodlands and exotic species may need to be reconsidered in the light of these compelling new demands on woodland resources (Slee *et al.*, 2012).

Our findings provide additional evidence that in Scotland, the *Productivist* position proves to be rather strong, and a new phase in forest multi-functionality could mean a further shift towards

418 *commercialisation* of forestry, including for carbon and recreation. Also, through the level of
419 importance accorded by the people to the integration of woodlands in Scottish landscapes, the
420 research has demonstrated comparability between public and expert preferences in support of the
421 multi-functional future of forestry. This comparability between public and expert preferences is
422 important for decision-making, and stakeholder attitudes and preferences concerning various
423 ecological, socio-economic and aesthetic aspects of landscape changes have policy relevance in
424 terms of their matter and scale.

Draft

367 **Acknowledgement:**

368 This paper is part of the thematic research of Scottish Government Strategic Research
369 Programme. We are grateful to Professor David Miller and Professor Bill Slee for helpful
370 comments on an earlier draft. Our thanks go to the respondents participating in the survey and to
371 anonymous reviewers of this paper.

372

Draft

References:

- Adams, H. and Proops, J. 2001 Social Discourse and Environmental Policy. An Application of Q Methodology, Cheltenham: Edward Elgar.
- Barry, J. and Proops, J. 1999 Seeking sustainability discourses with Q methodology. *Ecol Econ* 28: 337-345.
- Brown, S. 1996 Q methodology and qualitative research. *J Qualit. Health Research* 6: 561-567.
- Dana, S.T. 1943 Multiple use, biology and economics. *J of Forestry* 41: 625-627.
- Forestry Commission (FC) 2010 *Forestry Facts and Figures*. Edinburgh: Forestry Commission.
- Fowler, F. 2002 *Survey Research Method*. Sage Publications.
- Kant, S. 2003 Extending the boundaries of forest economics. *For Policy & Econ* 5: 39–56.
- Lister-Kaye, J. 1995 Native pinewoods and sustainable development of the Highlands, in: Aldhous, J. R. (eds), *Our Pinewood Heritage*. FC/RSPB/SNH: 60-3.
- Maier, L. and Shobayashi, M. 2001 Multifunctionality: Towards the analytical framework. OECD, Paris, France.
- Mather, A. 2003 The future, in: Smout, T. C. (ed.), *People and woods in Scotland: a history*. Edinburgh Uni Press.
- Mather, A., Hill, G. and Nijnik, M. 2006 Post-productivism and rural land use: cul de sac or challenge for theorization? *J Rural Studies* 22: 441-455.
- MEA 2005 Millennium Ecosystem Assessment Synthesis Report. March 2005. <http://www.millenniumassessment.org/en/index.aspx> [accessed 28 September 2015].
- Miller, D.R., Vogt, N., Nijnik, M., Brondizio, E. and Fiorini, S. 2009 Integrating analytical and participatory techniques for planning the sustainable use of land resources and landscapes. In:

S. Geerteman and J. Stillwell (eds.) Plan Support Systems: Best Practises and New Methods, Springer Publs.

Miller D, Morrice J., Anderson, L., Durozard, E., Fidalgo, B., Fry, G., Gaspar, J., Gibon, A., Hassan, R., Hislop, M., Horne, P., Huet, B., Ladet, S., Lange, E., Leandro, N., Messenger, P., Mottet, A., Nijnik, M., Ode, A., Pascoa, F., Pinto, L., Quine, C., Schroth, O., Schwarz, G., Shepherd, N., Sundli Tveit, M., Vitry, A., Watts, K., Wissen, U. 2006 Visualisation Tools for Public Participation in the Management of Landscape Change. Project Report Visulands, EC.

Munoz-Rojas J, Nijnik M, Puente M G, Garcia F C 2015. The right trees in the right places? Synergies and conflicts in the use of policy and planning instruments for implementing forest and woodland corridors and networks in Scotland, *For Policy & Econ* 57, August: 47–64, [doi:10.1016/j.forpol.2015.05.002](https://doi.org/10.1016/j.forpol.2015.05.002)

Nijnik, M., Nijnik, A., Lundin, L., Staszewski, T. and Postolache, C. 2010 Stakeholder attitudes to multi-functional forests in Europe. *Forests, Trees & Livelihoods* 19: 341-358.

Nijnik, M., Zahvoyska, L., Nijnik, A. and Ode, A. 2008 Public evaluation of landscape content and change. *Land Use Policy* 26: 77-86.

Nijnik, M. and Mather, A. 2009 Analysing public preferences for woodland development in rural landscapes in Scotland. *Landscape and Urban Planning* 86: 267-275.

Nijnik, M. and Mather, A. 2006 *Analysing institutions and public perspectives to identify the future of British forests*. In Reynolds, K.M., US DA Forest Service (eds): Sustainable Forestry in Theory and Practice: From Monitoring and Modelling to Knowledge Management and Policy Science, CABI Publs, pp. 171-188.

Nijnik, M. and Slee, B. 2008 Towards sustainable development of Scottish woodlands. In T.J. Chmielewski (eds): *Nature Conservation Management: from Idea to Practical Results*. PWZN Print, Lublin, Poland. Pp113-132. ISBN: 83-87414-98-0.

- Pearson, P. 1994 Energy, Externalities and Environmental Quality: Will Development Cure the Ills it Creates? *Energy Studies Review* 6(3):199-216.
- Sarkki S, Ficko A, Grunewald K, Nijnik M 2015. Benefits from and threats to European treeline ecosystem services: An exploratory study of stakeholders and governance. *Regional Environmental Change*. Volume 15 (4), <http://dx.doi.org/10.1007/s10113-015-0812-3>
- Schmithüsen, F. 2007 Multifunctional forestry practices as a land use strategy to meet increasing private and public demands in modern societies. *J Forest Science* 53(6): 290-298.
- Scottish Government, 2015. Land Use Strategy Progress Statement <http://www.gov.scot/Resource/0047/00478779.pdf>, - 34 pages [accessed 28 September 2015].
- Sedjo, R. A. 2004 Transgenic trees and trade problems on the horizon. *Resources* 155: 9-13.
- Slee, B., Feliciano, D., Nijnik, M. and Pajot, G. 2012 The scope of the land-based sector to mitigate climate change in North-east Scotland: opportunities and challenges with particular reference to the role of forests. *Int. J. Environ. & Sust Develop* 11(3): 274-292.
- Slee B., Brown I., Donnelly D., Godon I.J., Matthews K., Towers W. 2014. The ‘squeezed middle’: Identifying and addressing conflicting demands on intermediate quality farmland in Scotland. *Land Use Policy* 41 (November): 206–216.
- Smout, T., MacDonald, A. and Watson, F. 2005 *A history of the native woodlands of Scotland*. Edinburgh Univ. Press, pp. 1500-1920.
- Stephenson, W. 1978 Concourse theory of communication. *Communication* 3: 21-40.
- Thomas Haydn J.D., Paterson J.S., Metzger M. J. and Sing L. 2015 [Towards a research agenda for woodland expansion in Scotland](#). *For Ecology & Management* 349(1)August: 149-161
- UKODA 1995 UK Overseas Development Administration, <http://www.globenet.org/preceup/pages/fr/chapitre/etatlieu/acteurs/f/o.htm> [accessed 28 September 2015]
- UNCED 1992 Agenda 21, Chapter 37, par 1, UNCED, Rio, Brazil.

Warren, C. 2002 Managing Scotland's environment. University Press, Edinburgh.

Wiersum, K. F. 1995 200 years of sustainability in forestry: lessons from history. *Environ Management* 19(3): 321-329.

[Valk, A.J.J. van der](#); [Bloemers, J.H.F.](#); [Kars, H.](#); [Wijnen, M.](#) 2010. The Cultural Landscape and Heritage Paradox. Scientific book or proceedings. Amsterdam University Press, Landscape & Heritage Studies – 744 pp.

van Asselt, B.A., Mellors, J., Rijkens-Klomp, N., Greeuw, S.C., Molendijk, K.G., Beers, P.J., and van Notten, P. 2001 Building blocks for participation in integrated assessment: a review of participatory methods. Maastricht, Intern Centre for Integrated Studies (ICIS).

Vincent, J. R. and Binkley, C. S. 1993 Efficient multiple-use forestry may require land-use specialization. *Land Economics* 69: 370-376.

Table 1: Heterogeneity of stakeholder attitudes, with four attitudinal groups (i.e. factors) identified, as presented in the matrix of factor loadings, with *X* indicating a defining sort.

QSORT	1	2	3	4
1	0.0468	-0.1641	0.8657X	0.0114
2	0.1081	0.8124X	-0.1080	0.0396
3	0.2210	0.6866X	-0.4959X	0.0343
4	-0.0115	0.2001	0.8399X	0.1761
5	-0.0654	0.8121X	-0.1006	0.2682
6	0.0475	0.6876X	0.3566	-0.1492
7	0.1877	0.0489	0.7240X	-0.0206
8	-0.0930	-0.1808	0.7930X	0.3538X
9	0.0915	0.6505X	-0.2551	-0.0338
10	0.1495	0.5868	0.5447	-0.2914
11	-0.0188	0.5023X	-0.6246X	-0.0417
12	-0.2365	0.6560X	0.1259	0.0408
13	0.6671X	0.1888	-0.0104	0.3221
14	0.7053X	0.1480	0.1535	0.1129
15	0.5527X	-0.0384	0.1153	0.3758
16	0.7809X	0.3070	-0.0606	-0.0186
17	0.7182X	0.0808	-0.0317	0.5172X
18	0.7952X	0.0602	0.1948	0.3452X
19	0.7914X	0.1629	0.1668	0.1506
20	0.6900X	-0.0654	0.0105	-0.1270
21	0.6822X	-0.1744	-0.1283	-0.0029
22	0.7750X	0.1379	-0.0103	-0.2648
23	0.2197	-0.0332	0.1939	0.7281X
24	0.3140	0.2122	-0.5270X	0.0166
25	0.6476X	0.3917	-0.1537	0.0146
26	0.7412X	-0.1284	-0.3285	0.0273
27	0.4048	0.6872X	-0.1478	-0.2372
28	0.2448	0.7442	-0.0420	-0.0205
% expl.Var	24	19	16	6

[1] An individual's loading on a factor is a correlation coefficient indicating the extent to which each of the 28 individual Q-sorts (i.e. the formal model of each of the 28 interviewed persons' understanding of the points of view at issue) is similar/dissimilar to each of the four composite factor arrays. A positive loading indicates that the respondent shares subjectivity with others on that factor, whilst negative is a sign of rejection of the factor's perspective.

[2] Dominating indicators are those with factor loadings ≥ 0.5 or ≤ -0.5 .

[3] % explanatory variation means that, when all Q-sorts are considered, the first factor explains 24% of the variation; the second factor explains 19% of the variation and so on.

Figure captions

Figure 1. Conifer woodland in Scotland as seen at

http://www.macaulay.ac.uk/explorescotland/lcs_sc_woodland3.htm

Figure 2. Conifer planting in Scotland

Forestry Commission, 2015 as seen at <http://www.forestry.gov.uk/>

Figure 3. Sequencing of steps in a Q-study

Figure 4. Most preferable characteristics of Scottish landscapes as identified from the Q-analysis of stakeholder attitudes

Figure 5. Heterogeneity of stakeholder preferences with regard to forest ecosystem services and the trade-offs, as identified by the Q-analysis

Figure 6. Distribution of the groups within each country respondents

Figure 1. Conifer woodland in Scotland, as seen at http://www.macaulay.ac.uk/explorescotland/lcs_sc_woodland3.htm

Figure 2. Conifer planting in Scotland
Based on Forestry Commission <http://www.forestry.gov.uk/> 2015 data

Figure 3. Sequencing of steps in a Q-study

Figure 4. Most preferable characteristics of Scottish landscapes as identified from the Q-analysis of stakeholder attitudes

Figure 5. Heterogeneity of stakeholder preferences with regard to forest ecosystem services and the trade-offs, as identified by the Q-analysis

Figure 6. Distribution of the groups within each country respondents

Note: Each column totals to 100%, showing the percentage of respondents which belong to different attitudinal groups in each country.