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Determining Priorities for Sustainability Research on New Zealand Forestry

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EXECUTIVE SUMMARY

The research programme “Protecting and Enhancing the Environment through Forestry” (PEEF) aims at increasing the sustainability and global competitiveness of the New Zealand forestry sector, thereby benefiting society, the environment and the forest industry. An important driver for demonstrating excellent environmental stewardship is to develop, in collaboration with stakeholders, a New Zealand-based vision of sustainable forestry that is locally and internationally defensible. Demonstrating sustainability requires the views and values of stakeholders to be addressed.

Aspirations and concerns for sustainable forestry had been identified for a range of stakeholder groups

- Forestry industry and land management authorities, assessed by means of a national series of workshops
- Forest users, also assessed by means of a national series of workshops
- Authors and contributors to an international forest report for New Zealand, assessed by a survey on risks associated with key components of the report
- Territorial local authorities (TLAs), assessed through an analysis of district plans
- International stakeholders, as understood by participants at a research-prioritisation workshop held in Wellington

Each stakeholder group had its own priorities and important issues. Three of these assessments (above) had used the international reporting framework, the Montréal Process Criteria and Indicators, as part of the process for determining the group’s values and views. For the other two, the forest users and the TLAs, this report described how they were mapped to the Montréal Process Criteria and Indicators. Any additional processing performed for an individual group’s results is also described.

With all group values and views mapped to a common framework, the combined values indicated that the overall important issues were:

- water
- soil
- biodiversity
- access and value (to the public)
- economics and employment
- health

The first four of these issues were presented as priorities for sustainability research at the FFR Environment and Social Members’ Meeting in Rotorua on 18th March 2010 (the others are components in or the focus of other research programmes). The new research priorities focused on:

- Water and forestry: the “water story” (How is it currently told; What is not being told; How it could be told?)
- Soil: new approach to erosion models and datasets to develop national erosion risk
- Biodiversity: LiDAR for quantifying sub-canopy biodiversity
- Access – less a research direction than implementing industry support of the initiatives of the Public Access Commission

Additional research on understanding the above diversity of views was also proposed. This includes exploring which groups consider the same indicators important, and if they mean different things to different groups. Understanding this will enhance the industries’ and government’s efforts toward demonstrating sustainable forestry, both in New Zealand and internationally.

INTRODUCTION

The research programme “Protecting and Enhancing the Environment through Forestry” (PEEF) aims at increasing the sustainability and global competitiveness of the New Zealand forestry sector, thereby benefiting society, the environment and the forest industry. An important driver for demonstrating environmental stewardship is to develop, in collaboration with stakeholders, a New Zealand-based vision of sustainable forestry that is to international standards and acceptability, and that is locally and internationally defensible.

The aspirations and concerns for sustainable forestry were identified for a range of stakeholders.

- A series of seven workshops was undertaken across New Zealand with representatives of the forestry industry and land management authorities from May to June, 2009 (Barnard et al, 2010b; Hock and Barnard, 2010b). Attendees included forestry companies, associated businesses and organisations, farm foresters, councils and government agencies. The facilitated workshops included participants working through the Montréal Process Criteria and Indicators and their relevance.
- Concurrent with the forestry industry and land management authorities’ workshops, a similar series of seven workshops was undertaken with representatives of community forest user groups (Barnard et al, 2010a; Hock and Barnard, 2010a). The aim was to develop an understanding of the values that forest users hold for sustainable forest management, and to develop community-focused indicators for sustainable forestry.
- Reporting on sustainability is based on the measurement of a range of complex ecological and socio-economic functions. In order to explore the risks associated with the variable quality of information on which New Zealand’s international sustainability reporting is based, an indicative survey (Hock, 2009; Hock and Payn, 2009) was held of key contributors to the country’s second Montréal Process report (MAF, 2010). The aim of the survey was to determine the likelihood of error in each of the report’s indicators, and the potential seriousness of such an error.
- The district plans of twelve Territorial Local Authorities with large land areas in exotic forestry were analysed for the ways that the sustainable management of exotic forests is interpreted (Brown, 2009; Brown and Swaffield, 2009).
- An open workshop held in Wellington on February 2010 investigated what participants considered sustainable forestry means to different types of international stakeholders. (Swaffield and Hock, 2010). Participants were from the forest industry, local and national government, Crown Research Institutes, and two international presenters.

While several of the above efforts addressed all New Zealand forests, the focus was on exotic plantations.

These diverse views and values needed to be combined to develop a New Zealand vision of sustainable forestry within an international context.

New Zealand is a member of the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, or more commonly known as the Montréal Process (MP). The Montréal Process provides an internationally accepted set of indicators that can be used by the 12 member countries for the conservation and sustainable management of their temperate and boreal forests, which currently constitute 90% of the world’s temperate and boreal forests, 60% of total forests, and 45% of world trade in forest products (Ministry of Agriculture and Forestry, 2006). The Montréal Process Criteria and Indicators provide a constructive and internationally acceptable framework for bringing the different stakeholder views and values together.

This report summarises the results from the individual stakeholder groups and, where necessary, maps the groups’ issues and values onto the Montréal Process Criteria and Indicators. The methods used to combine the individual priorities are described, the combined priorities, and the next steps resulting from this research are discussed.

PRIORITIES OF INDIVIDUAL STAKEHOLDER GROUPS

The PEEF Programme from late 2008 to early 2010 consulted across a broad spectrum of stakeholders in New Zealand forestry. This section provides a summary overview for each stakeholder group consulted or analysed.

The Forestry Industry and Land Management Authorities' Workshops

This workshop series was specifically structured around the Montréal Process Criteria and Indicators (Barnard et al, 2010b). Key observations include:

- The Criteria and Indicators of the Montréal Process, whilst developed at the international level, were generally considered relevant to New Zealand forestry with some issues considered more relevant at the national rather than local level or more relevant to New Zealand's indigenous forests
- Indicators that account for regional differences were considered desirable, i.e. New Zealand-specific measures
- Whilst there was recognition that communities need to view forests as important, actively facilitating management approaches that enhance social benefits was considered difficult
- Sustainability criteria highlight the need for cross-sectoral policy and programme coordination. For example, tensions exist between forestry and dairy farming regarding the consideration of environmental impacts and the regulatory environment
- Forest managers are wary of the potential costs of implementing indicators
- Indicators need to be described in terminology meaningful to the industry

The Forest Users' Workshops

This workshop focused on developing community-generated indicators for sustainable forest management (Barnard et al, 2010a). Issues raised included:

- Access to forests for recreation is a high priority
- Management of soil and water resources, including requiring evidence of waterway protection
- Commitment by forest managers to maintain or create healthy forest ecology and indigenous biological diversity
- Forests as part of local communities manifest, for example, in the protection of specific sites important to the community
- Involvement in managing local forests through being involved on specific issues rather than overall forest management
- Forests continue to grow wood of economic value
- Forests form part of the carbon accounting policies
- Landscape views are affected by wilding pines, and by tree felling

The issues raised by the forest users were mapped to the MP Criteria and Indicators as described in the next section.

The Risk Survey on International Reporting

A risk assessment was performed on the indicators reported on in the Montréal Process report by surveying selected staff within MAF (Hock, 2009; Hock and Payn, 2009). Respondents suggested ranges for the likely error level of each indicator, and the potential seriousness should an error of such a magnitude be determined (the impact). The error levels considered were 1%, 10%, 25%, 50% and 100%, while the potential impact was categorised as negligible, small, substantial, serious or very serious.

Issues that affected the risk levels of the indicators included:

- Monitoring of native forest-associated species is not extensive and exhaustive
- Much is unknown regarding the genetics of native vegetation

- Knowledge of the harvesting of non-wood forest products is sporadic with a diverse range of stakeholders involved
- Some Montréal Process definitions may not be formal definitions in NZ and hence are subject to interpretation
- Indicators, particularly for soil are still under development within NZ
- No systematic inventory is made for issues such as significant soil degradation
- Reference conditions may not be known, hence reporting is subject to interpretation and knowledge development
- Little or no data may be known

The Analysis of District Plans

District plans for twelve TLAs with significant land areas in plantation forestry were surveyed (Brown, 2009; Brown and Swaffield, 2009). Significant differences were found in the way that the different plans interpreted the values of plantation forestry with regard to the Resource Management Act. They included:

- A focus on negative effects, with few or no positive outcomes identified
- Differences in regarding forestry as a permitted versus a controlled land use
- Different levels of sensitivity to similar effects or issues, for example, regarding the effects of forestry on water yield from catchments

The results of the analysis needed to be mapped to the MP Criteria and Indicators which is described in the next section.

The Wellington Workshop on International Stakeholders

A 1-day workshop was held in Wellington on 15 February 2010 (Swaffield and Hock, 2010). The workshop used a role play exercise based on international stakeholders to determine drivers and priorities of the respective roles, which were then aligned with the Criteria and Indicators of the Montréal Process and with the Forest Stewardship Council's Principles and Criteria. Key questions identified included:

- How can the New Zealand relevance and credibility of Montréal Process indicators be enhanced?
- How can the specification of indicators be improved?
- How can the communication of indicators to a non science audience be made more compelling?
- How can indicators apply across different types of forestry practices and different land use contexts?

STAKEHOLDER PRIORITIES MAPPED TO MONTREAL PROCESS CRITERIA AND INDICATORS

The Montréal Process provides an international acceptable set of seven criteria and 54 indicators for sustainable forestry. While this is not the only sustainability framework available for New Zealand's forests, three of the groups covered in this report were already mapped in some form to these indicators. This section describes the process whereby the other two groups, the forest users' workshop results and the analysis of district plans, were mapped to the MP Criteria and Indicators. Any additional processing performed for an individual group's results is described, and all the mappings onto the MP indicators are referenced or included if not documented elsewhere.

The Forestry Industry and Land Management Authorities' Workshops

The nationwide overview of the workshop series results (Barnard et al 2010b) were used to categorise each MP indicator as "not relevant", "less relevant", "relevant", "definitely relevant" and "highly relevant" (Barnard and Hock, 2010b).

The Forest Users' Workshops

The match between the MP indicators and the forest users' values was presented at the Wellington Workshop (Barnard and Hock, 2010a). It was based on the values and the indicators (hereafter called measures to avoid confusion with the MP indicators) of the Barnard et al (2010a) report. Each of eight values (access; soil and water resources; biological diversity; forests as part of local communities; involvement in managing local forests; forest productivity; forests as carbon sinks; forests as landscape features) was described with measures listed for all except the last two values. Each value and measure was matched to the indicator or indicators most relevant to them. The fit was described according to whether the MP indicator was "relevant", had "some relevance", or was of "indirect relevance only". The matrix of MP indicators and forest users' values was summarised to a single result per indicator (Table 3 in Hock and Barnard, 2010a). For each indicator, the frequency and type of relevance was combined to give an overall relevancy rating. If no match occurred for an indicator it was labelled "not raised by users"; if only indirect or some relevance was listed against the indicator then it was rated as having "some relevance"; while a minimum of one "relevant" for an indicator meant it was deemed to be that for the forest users (relevance of indicator set to "yes").

The Risk Survey on International Reporting

The MP indicators found to have the highest likelihood of being in error as well as the potential for the highest impact should such an error occur are listed in Hock and Payn (2009) and Hock (2009). Improving the knowledge about these indicators is considered to be highly important because of their high risk.

The Analysis of District Plans

The values expressed in the selected district plans, as reported in Brown and Swaffield (2009), were matched with the relevant indicator or indicators. The eight value categories (soil, water, vegetation, landscape, culture, recreation, economy, hazard) with each of their indicators (again called measures) were assigned to one or more indicator according to how their fit, ranging from "perfect fit" to "reasonable fit/occurs within" to "maybe/slightly" (Appendix 1).

The Wellington Workshop on International Stakeholders

The role play exercise at the Wellington conference determined drivers and priorities for each role, which were then aligned with the MP indicators by the participants. They were combined across the roles, with the top priorities listed in Swaffield and Hock (2010).

COMBINING STAKEHOLDER PRIORITIES

A number of approaches were used to synthesise the importance of the MP indicators across all of the stakeholder groups. Two approaches were used: firstly all indicators were treated independently, and then they were grouped according to their respective criterion.

In evaluating the priorities for each indicator, the importance of each indicator was considered according to (1) its “popularity” across the stakeholder groups, and (2) its importance within each of the groups. The first approach used a “1-group 1-vote” weighting, where the more groups selected an indicator, the higher its tally became. Essentially this is an analysis of the frequency that an indicator was selected. The second approach considered how highly the stakeholder groups ranked an indicator, with higher weights assigned to higher rankings.

Evaluating the indicators at the criterion level took into consideration that there are a different number of indicators to each MP criteria. The frequency counts and rankings were weighted so as to standardise the selections to the criterion level. This was used to explore which criteria were considered important, and which indicators were considered important despite their criterion having fewer indicators to choose from. For example, there are only two indicators that relate to the health of the forests, compared to ten relating to legal aspects for sustainable forestry.

The results of these assessments were compared, and the indicators that occurred most frequently and were consistently highly ranked across all the stakeholder roles, with and without standardisation, were identified. These were considered to reflect the issues most important to all stakeholders.

RESULTS

The indicators considered of highest importance across all stakeholders based on the “1-group 1-vote” weighting are shown in Table 1. Indicators based on weighting the importance to each group are in Table 2. The priorities based on standardising indicators to the criteria level is shown in Table 3. The indicators that occurred most frequently and were consistently highly ranked across all the stakeholder groups, with and without standardisation, were considered to represent the most important issues overall (Table 4). These indicators were grouped according to the themes of forest water, soil, biodiversity, health, economics and employment, and access and value (to the public).

Table 1. Most frequently selected indicators across the stakeholder groups

| Montreal Process Indicators | Number of groups |
|---|------------------|
| 1.2.a Number of native forest-associated species | 5 |
| 1.2.b Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment | 5 |
| 3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions | 5 |
| 4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources | 5 |
| 4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources | 5 |
| 4.2.b Area and percent of forest land with significant soil degradation | 5 |
| 4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources. | 5 |
| 4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions | 5 |
| 1.1.b Area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage | 4 |
| 2.c Area, percent, and growing stock of plantations of native and exotic species | 4 |
| 6.2.a Value of capital investment and annual expenditure in forest management, wood and non-wood forest product industries, forest-based environmental services, recreation and tourism | 4 |
| 6.4.a Area and percent of forests available and/or managed for public recreation and tourism | 4 |
| 6.5.a Area and percent of forests managed primarily to protect the range of cultural, social and spiritual needs and values | 4 |
| 6.5.b The importance of forests to people | 4 |
| 1.1.a Area and percent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure | 3 |
| 2.a Area and percent of forest land and net area of forest land available for wood production | 3 |
| 2.e Annual harvest of non-wood forest products | 3 |
| 3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive species) beyond reference conditions | 3 |
| 6.1.a Value and volume of wood and wood products production, including primary and secondary processing | 3 |
| 6.1.c Revenue from forest based environmental services | 3 |
| 6.1.f Value and volume in round wood equivalents of exports and imports of wood products | 3 |
| 6.2.b Annual investment and expenditure in forest-related research, extension and development, and education | 3 |
| 6.3.b Average wage rates, annual average income and annual injury rates in major forest employment categories | 3 |
| 6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available | 3 |
| 7.5.a Partnerships to promote the sustainable management of forests | 3 |
| 7.5.b Public participation and conflict resolution in forest-related decision making | 3 |

Table 2. Highest ranked indicators across the stakeholder groups, where ranking of importance within each stakeholder group ranged from 0 (not relevant) to 8 (highest priority)

| Montreal Process Indicators | Total ranking |
|---|----------------------|
| 4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions | 34 |
| 4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources | 32 |
| 3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions | 31 |
| 4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources | 28 |
| 4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources. | 28 |
| 4.2.b Area and percent of forest land with significant soil degradation | 26 |
| 6.5.b The importance of forests to people | 25 |
| 1.2.a Number of native forest-associated species | 24 |
| 1.2.b Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment | 23 |
| 6.4.a Area and percent of forests available and/or managed for public recreation and tourism | 23 |
| 6.5.a Area and percent of forests managed primarily to protect the range of cultural, social and spiritual needs and values | 23 |
| 6.1.f Value and volume in round wood equivalents of exports and imports of wood products | 19 |
| 6.2.a Value of capital investment and annual expenditure in forest management, wood and non-wood forest product industries, forest-based environmental services, recreation and tourism | 19 |
| 6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available | 19 |
| 1.1.a Area and percent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure | 18 |
| 2.a Area and percent of forest land and net area of forest land available for wood production | 18 |
| 3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive species) beyond reference conditions | 18 |
| 6.3.a Employment in the forest sector | 18 |

Table 3. Highest standardised rankings of the indicators across the stakeholder groups, where the higher the rank, the more important the indicator is considered

| Montreal Process Criteria and Indicators | Standardised ranking |
|--|-----------------------------|
| 3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions | 7 |
| 3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive species) beyond reference conditions | 6 |
| 4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions | 5 |
| 4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources | 5 |
| 4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources | 4 |
| 4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources. | 4 |
| 4.2.b Area and percent of forest land with significant soil degradation | 4 |
| 2.a Area and percent of forest land and net area of forest land available for wood production | 3 |
| 5.a Total forest ecosystem carbon pools and fluxes | 3 |
| 2.c Area, percent, and growing stock of plantations of native and exotic species | 3 |
| 2.b Total growing stock and annual increment of both merchantable and non-merchantable tree species in forests available for wood production | 3 |
| 1.2.a Number of native forest-associated species | 2 |
| 1.2.b Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment | 2 |

| | |
|--|---|
| 2.e Annual harvest of non-wood forest products | 2 |
| 2.d Annual harvest of wood products by volume and as a percentage of net growth or sustained yield | 2 |
| 1.1.a Area and percent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure | 2 |
| 5.b Total forest product carbon pools and fluxes | 2 |

Table 4. Combined priorities of the stakeholder groups, in order of importance (listed from the most important to those of lesser importance across all groups)

| Montreal Process Indicators | Category |
|---|------------------------|
| 4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources. 4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions | Water |
| 4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources 4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources 4.2.b Area and percent of forest land with significant soil degradation | Soil |
| 1.1.a Area and percent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure 1.2.a Number of native forest-associated species 1.2.b Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment | Biodiversity |
| 6.4.a Area and percent of forests available and/or managed for public recreation and tourism 6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available 6.5.a Area and percent of forests managed primarily to protect the range of cultural, social and spiritual needs and values 6.5.b The importance of forests to people | Access & Value |
| 2.a Area and percent of forest land and net area of forest land available for wood production 6.1.f Value and volume in round wood equivalents of exports and imports of wood products 6.2.a Value of capital investment and annual expenditure in forest management, wood and non-wood forest product industries, forest-based environmental services, recreation and tourism 6.3.a Employment in the forest sector | Economics & Employment |
| 3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive species) beyond reference conditions 3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions | Health of Forest |

DISCUSSION

A number of research initiatives had determined a diversity of views and values on sustainable forestry in New Zealand:

- the forestry industry and land management authorities' workshops
- the forest users' workshops
- the risk survey on international reporting
- the analysis of district plans
- the Wellington workshop on international stakeholders

From this knowledge base, a New Zealand vision of sustainable forestry needed to be developed. A sustainability framework relevant to New Zealand, the Montréal Process Criteria and Indicators, was used as a basis for combining individual stakeholder groups' priorities. Several approaches were used to combine the priorities: "1-group 1-vote" per indicator, weighting the importance of an indicator to a group, and standardising the indicators to the criteria level. These in turn were combined to develop the overall importance of:

- water
- soil
- biodiversity
- access and value (to the public)
- economics and employment
- health

The indicators associated with the priority "economics and employment" are more statistics and policy oriented. Forest health is the focus of the Biosecurity, Protection and Risk research programme. The remaining top four priorities (water, soil, biodiversity and access) were presented at the FFR Environment and Social Members' Meeting in Rotorua on 18th March 2010 (Hock and Clinton, 2010) as a lead in to the discussions on the 2010-2011 Work Programme. The presentation focused on these four themes as priority areas for new research:

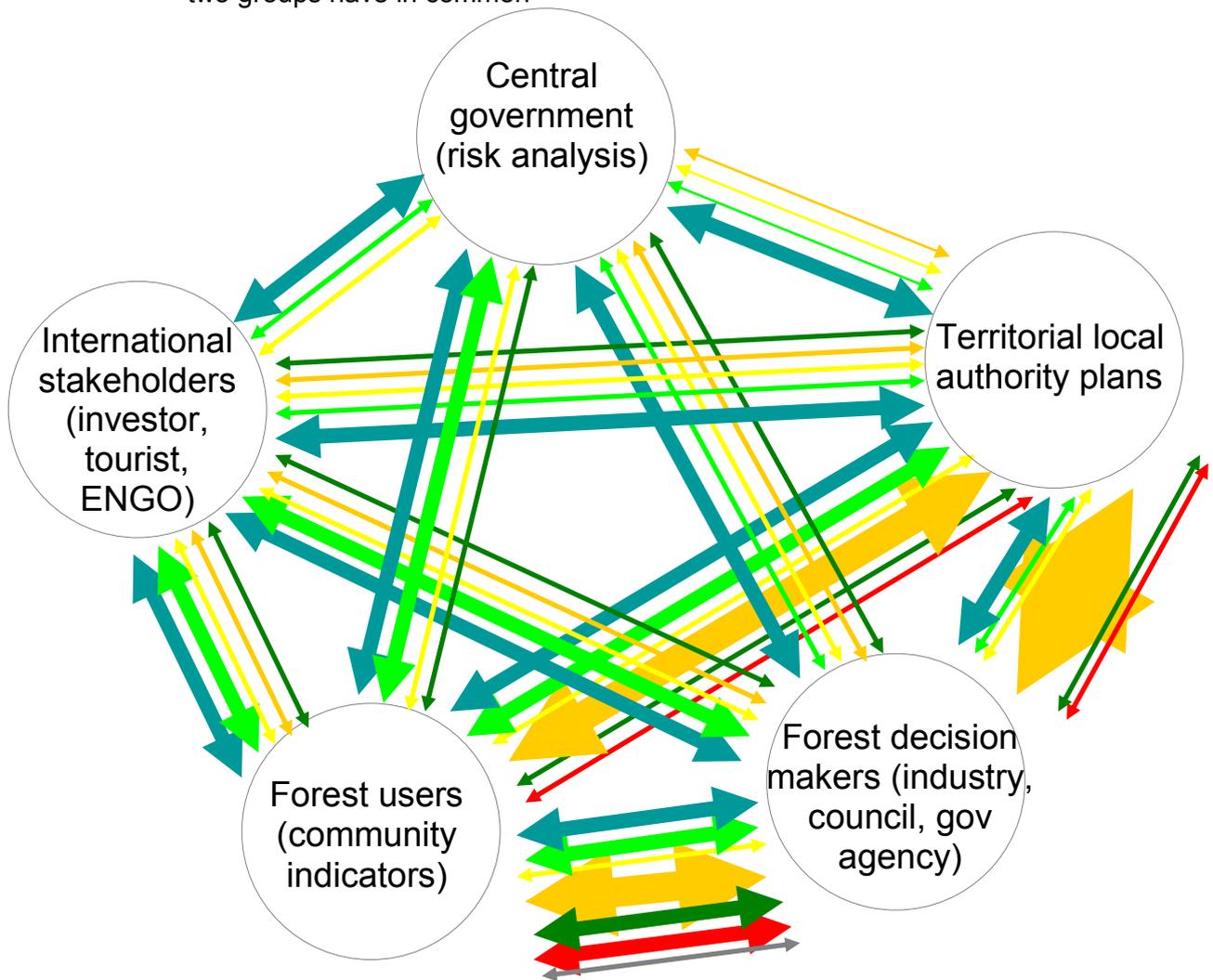
- Water and forestry: the "water story" (How is it currently told; What is not being told; How it could be told)
- Soil: new approach to erosion models and datasets to develop national erosion risk
- Biodiversity: LiDAR for quantifying sub-canopy biodiversity
- Access – less a research direction than implementing industry support of the initiatives of the Public Access Commission

Additional research on understanding the above diversity of views was also proposed. This includes exploring which groups consider the same indicators important (e.g. Figure 1) and if they mean different things to different groups (e.g. Hock et al 2010). Understanding this will enhance the industries' and government's efforts toward demonstrating sustainable forestry, both in New Zealand and internationally.

Figure 1. Commonality between stakeholders on sustainable forestry, based on MP indicators
Legend – colours represent topics:

- ↔ Soil & water
- ↔ Biodiversity
- ↔ Health
- ↔ Socio-economic
- ↔ Productivity
- ↔ Legal
- ↔ Carbon

The width of a line represents the number of indicators in the above topics that the two groups have in common



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APPENDICES

Appendix 1. Results of the analysis of district plans for their approach to plantation forestry mapped to the Montréal Process Criteria and Indicators

The district plan approaches to plantation forestry are categorised into eight values (soil, water, vegetation, landscape, culture, recreation, economy, hazards). For each category and each district, the district's approach in the plan is assessed as either one of control or effect, where the former indicates that the council considers this a controlled activity under the RMA and for the latter the council places restrictions on the effects of a forestry activity (Brown and Swaffield, 2009). The categories are matched to the indicators of the Montréal Process where the fit to an indicator ranges from "perfect fit" through "reasonable fit/occurs within" to "maybe/slightly".

Table 1 shows the match ordered by the categories and measures of the district plan analysis, while Table 2 shows the match ordered by the Montréal Process Criteria and Indicators.

Table 1. The values of the district plans (Brown and Swaffield, 2009) matched to the Montréal Process indicators

| Value | | District | | | | | | | | | | | | The focus is on (*1): | Matching MP indicator (Table 2) | | |
|------------|-----------------|------------|-------------|-------------|----------|---------|-----------|-----------|-------|---------------|---------|---------|------------|---|---------------------------------|--|---------------------------|
| Category | Measure | North-land | S. Wai-kato | Wha-ka-tane | Roto-rua | Wai-roa | Gis-borne | Has-tings | Taupo | Marl-bo-rough | Tas-man | Clu-tha | South-land | c = <u>control</u> e = the <u>effect</u> | per- fect fit | reason- able fit/ occurs within | maybe/ slightly |
| Soil (*2) | Erosion | | | | c | c / e | c | e | | e | e | e | | | 4.2.a | 4.2.b | 4.1.a |
| | Ph | | | | | e | | | | | | | | | 4.2.a | | |
| Water (*2) | Quality | | | | e | c | | | | | | e | e | | 4.3.b | | 4.3.a |
| | Yield | | | | | | | | | e | e | | | | 4.3.b | | |
| | Sediment | | | | | | | | | e | | | | | 4.3.b | | |
| | Pollution | | | | | | | | | e | | | | | 4.3.b | | |
| | Debris | | | | e | | | | | | e | | | Incl harvest effects | 4.3.b | | |
| Vegetation | Loss | | | | | | e | | | e | e | e | e | Indigenous habitat | | 1.2.a | 1.2.b, 1.2.c, 1.1.b |
| | Wildings | | | | | | | | | e | | | | | | | 2.c |
| Land-scape | Quality | | | | | | | c | | c | | | c / e | Non specified | | | |
| | Wildness | | | | | | | | | e | | | | | | | |
| | Coastal | | | | | | | | | | e | | | | | | |
| | Rural character | | c | | | | | e | c | c | | | | | | | |
| | Urban | | | | c | | | | | | | | | As a backdrop | | | |
| | Visual | | | e | | | e | | | | | | | Colour, form, scale | | | |
| | Enclosure | | | | | | | e | | | | | | | | | |
| | Landform | | | | | | | e | | e | e | e | | Eg mask or contrast | | | |
| | Surface | | | e | e | | | | | e | e | e | | Eg scar or harvest | | | |
| Culture | Maori | | | | | | | | | e | | | | Significant sites | 6.5.a | 6.5.b, 7.5.b | 7.5.a |

| Value | | District | | | The focus is on (*1): | Matching MP indicator (Table 2) |
|------------|------------|----------|---|---|-----------------------|---|
| Recreation | | c | e | e | | 6.4.a, 6.4.b, 6.5.b, 7.5.b, 6.5.a, 7.5.a |
| Economy | | c | c | c | c / e | 6.1.a, 6.1.f, 6.3.a, 6.3.b, 6.1.b, 6.1.c, 6.1.g, 6.2.a, 6.2.b, 6.3.c, 6.3.e |
| Hazard | Fire | e | e | | | 3.b |
| | Ice | | e | | | 3.b |
| | Flood | | | e | | 3.b |
| | Wind-throw | | e | | | 3.b |
| | Discharge | | | | e | 4.2.a, 4.2.b, 4.3.a, 4.3.b |

(*1) Explanation of codes

c = control: the council's controlled activities under the RMA 1991

e = effect: the council has restrictions on the effects of a forest activity or activities

(*2) Note that while plantation forests and soils, and plantation forests and water were analysed across the district plans, soil and water per se are the primarily focus of regional councils.



Table 2. The Montréal Process Criteria and Indicator matches to the values of the district plans (Brown and Swaffield, 2009)

| Montreal Process Criteria and Indicators | perfect fit | reasonable fit / occurs within | maybe / slightly |
|--|--|---|--|
| <p>Criterion 1: Conservation of biological diversity</p> <p>1.1.a Area and percent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure</p> <p>1.1.b Area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage</p> <p>1.1.c Fragmentation of forests</p> <p>1.2.a Number of native forest-associated species</p> <p>1.2.b Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment</p> <p>1.2.c Status of on site and off site efforts focused on conservation of species diversity</p> <p>1.3.a Number and geographic distribution of forest-associated species at risk of losing genetic variation and locally adapted genotypes</p> <p>1.3.b Population levels of selected representative forest-associated species to describe genetic diversity</p> <p>1.3.c Status of on site and off site efforts focused on conservation of genetic diversity</p> | | <p>Vegetation - Loss</p> <p>Vegetation - Loss</p> | <p>Vegetation - Loss</p> <p>Vegetation - Loss</p> <p>Vegetation - Loss</p> |
| <p>Criterion 2: Maintenance of productive capacity of forest ecosystems</p> <p>2.a Area and percent of forest land and net area of forest land available for wood production</p> <p>2.b Total growing stock and annual increment of both merchantable and non-merchantable tree species in forests available for wood production</p> <p>2.c Area, percent, and growing stock of plantations of native and exotic species</p> <p>2.d Annual harvest of wood products by volume and as a percentage of net growth or sustained yield</p> <p>2.e Annual harvest of non-wood forest products</p> | | | <p>Vegetation - Wildings</p> |
| <p>Criterion 3: Maintenance of forest ecosystem health and vitality</p> <p>3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive species) beyond reference conditions</p> <p>3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions</p> | <p>Hazard - Fire, Hazard - Ice, Hazard - Flood, Hazard - Windthrow</p> | | |
| <p>Criterion 4: Conservation and maintenance of soil and water resources</p> <p>4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources</p> <p>4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources</p> | <p>Soil - Erosion , Soil - Ph</p> | <p>Hazard - Discharge</p> | <p>Soil - Erosion</p> |

| Montreal Process Criteria and Indicators | perfect fit | reasonable fit / occurs within | maybe / slightly |
|--|---|---------------------------------------|--------------------------------|
| 6.4.a Area and percent of forests available and/or managed for public recreation and tourism 6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available 6.5.a Area and percent of forests managed primarily to protect the range of cultural, social and spiritual needs and values 6.5.b The importance of forests to people | Recreation Recreation Culture - Maori | Culture - Maori, Recreation | Recreation |
| Criterion 7: Legal, institutional and economic frameworks for forest conservation and sustainable management 7.1.a Legislation and policies supporting the sustainable management of forests 7.1.b Cross sectoral policy and programme coordination 7.2.a Taxation and other economic strategies that affect sustainable management of forests 7.3.a Clarity and security of land and resource tenure and property rights 7.3.b Enforcement of laws related to forests 7.4.a Programmes, services and other resources supporting the sustainable management of forests 7.4.b Development and application of research and technologies for the sustainable management of forests 7.5.a Partnerships to promote the sustainable management of forests 7.5.b Public participation and conflict resolution in forest-related decision making 7.5.c Monitoring, assessment and reporting on progress towards sustainable management of forests | | Culture - Maori, Recreation | Culture - Maori, Recreation |
| Missing indicator: landscape quality | Landscape - Quality; Landscape - Wildness; Landscape - Coastal; Landscape - Rural character; Landscape - Urban ; Landscape - Visual ; Landscape - Enclosure; Landscape - Landform ; Landscape - Surface | | |

