

Cultural Ecosystem Services and Water Quality Improvement provided by Forest Landscapes in New Zealand

Short Term Scientific Mission (STSM)

Government Programmes and Woodland-for-Water PES Schemes Encouraging Afforestation in New Zealand

Scientific Report

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Introduction

The *One Billion Trees Programme* adopted by the New Zealand Government in 2018 aims at increasing current rates of tree planting, with the ambition to reach at least one billion trees over the next decade (Ministry for Primary Industries, 2018). This programme is funded by the *Provincial Growth Fund (PGF)* and led by *Te Uru Rākau – Forestry New Zealand* within the *Ministry for Primary Industries (MPI)*. It aims at supporting landowners to grow both native and exotic trees to create employment and workforce development, optimise land use, mitigate climate change, support Māori values and aspirations, protect the environment and support New Zealand's transition to a low emissions economy. There is an intention to improve incentives to support the *right trees, in the right place, for the right purpose* (Scion, 2018) and create wider social, environmental and economic benefits across New Zealand. The programme will harness and build on the afforestation and land management work already underway with landowners, Māori, regional councils, researchers, community organisations, and local communities. It foresees also the integration of trees into farming landscapes, where it can help address erosion, reduce flood risks and improve biodiversity through afforestation, managed land retirement, riparian retirement, gully planting or wetland establishment.

The *One Billion Trees Programme* aims at delivering improved social, environmental and economic outcomes for New Zealand and playing a significant role in moving towards a low emissions economy. The programme has eight main objectives: to improve land productivity; to tackle environmental issues like erosion; to reduce the effects of climate change by absorbing CO₂, to improve water quality; to provide important habitats for a range of native species; to enhance natural landscapes; to provide another source of income from timber, honey and carbon credits; and to support wellbeing and create jobs and careers for New Zealanders. It is important to highlight the fact that improving water quality is raised as one of the eight main objectives of the programme, thus it highlights the relation between planting trees and forests on one hand and water quality enhancement on the other hand, which is strongly in line with the aims and goals of the *COST Action CA15206 Payments for Ecosystem Services (Forests for Water)*.

Other Payments for Ecosystem Services that currently exist in New Zealand are *Matariki Tu Rākau* that has supported native planting initiatives throughout New Zealand since the end of World War I; the *Crown Forestry Joint Ventures* that provide payments for afforestation in cooperation with landowners, the *Emissions Trading Scheme (ETS)* for forests to earn Carbon Credits for storing carbon; *Assistance from regional councils* with funding available for planting projects to control erosion, establish riparian margins and enhance biodiversity; the *Ngā Whenua Rāhui Fund* that aims at protecting indigenous ecosystems on Māori-owned land through the use of 25 year renewable kawenata (covenants); the *DOC Community Fund – Pūtea Tautiaki Hapori* – funding projects which maintain and restore the diversity of New Zealand's natural heritage and enable more people to participate in recreation, engage with conservation and value its benefits; the *Afforestation Grants Scheme* which has been replaced by the *One Billion Trees Fund*; the *Erosion Control Funding Programme* that helps reduce wide-scale erosion problems, The *Nutrients Trading Scheme (NTS)* and the *Māori Agribusiness – Pathway to Increased Productivity (MAPIP) Programme* that builds partnerships with Maori to sustainably increase the productivity of their primary sector assets.

Most of the above mentioned programmes are multifunctional in their character and aims. They are aimed to contribute to native biodiversity enhancement; climate change mitigation; water quality improvement, flood and erosion control and other critical environmental and social aspects. Health and well-being as well as recreation are highlighted for instance in the *One Billion Trees Programme* or the *DOC Community Fund* as all the environmental goals can only be achieved if there is a strong understanding, valuation and support from the society and the general public.

In this study, we have focused on ecosystem services provided by forest landscapes and their perception, understanding and valuation by different stakeholder groups – public administration (public sector at district level), forest management companies (private sector, local level) and forest users represented mainly by recreationists (user perspective, local level). We focused mainly on cultural ecosystem services from users' perspective and on water quality improvement by forests as a major environmental goal of forest management companies, PES schemes and public authorities. We envision this Scientific Report to contribute to achieving the COST Action PESFOR-W's objective of increasing the awareness on the importance of trees and forests for water quality enhancement.

Scientific Report

PURPOSE OF THE STSM:

200 words summary

The general aim of this Short Term Scientific Mission (STSM) was to generate knowledge on ecosystem services provided by forest landscapes in New Zealand, with a particular focus on ecosystem services related to water quality improvement and recreation. We investigated existing woodland-for-water government programmes and PES (Payments for Ecosystem Services) schemes that encourage afforestation and/or ecosystem service provision by New Zealand forests.

Specifically, the objectives of the STSM were: 1) To identify and study existing programmes and schemes targeted at encouraging forest ecosystem services, including or focussing on water quality improvement; and 2) To study the understanding and perception of forest ecosystem services by three main stakeholder groups at different levels – public administration (district level), forest-management companies (local level, management perspective –private companies), and forest users (local level, user perspective - mainly recreationists), in order to better understand the public-private and management-user relationships and interfaces.

We wanted to find out motivations and barriers on the demand side of PES schemes, such as the One Billion Trees Programme, the Nutrients Trading Scheme, or the Emissions Trading Scheme, that represents a potential linkage between carbon markets and water quality improvement.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM:

500 words summary

The work carried out during the STSM included office work and field visits with interviews. The first part of the STSM was dedicated mainly to office work that consisted of literature review and questionnaire development. The literature review focused mainly on contextual documents, in order to understand the overall situation and context in New Zealand (Dean et al., 2019; RDC, 2014; RLC, 2018), as well as on existing Payments for Ecosystem Services schemes with a particular focus on the most recent – One Billion Trees Programme and other PES schemes, such as the Afforestation Grant Scheme, Matariki Tu Rākau, Crown Forestry Joint Ventures, the ETS - NZ Emissions Trading Scheme (Carbon Credits), NTS – Nutrients Trading Scheme, Trees That Count, DOC Community Fund – Pūtea Tautiaki Hapori, Ngā Whenua Rāhui Fund, Māori Agribusiness – Pathway to Productivity (MAPIP), and the Erosion Control Funding Programme (Ministry for Primary Industries, 2018). The One Billion Trees Programme is scientifically supported by the strategy of Right Tree, Right Place, Right Purpose issued by Scion (2018). Another important part of the office work consisted of the development of questionnaires to three different target groups. This was accompanied by several discussions and consultations with the STSM mentor and other colleagues specialised in Social Sciences, until the final versions of the questionnaires were developed. The aim was to cover three different stakeholder groups at three different levels and scales – 1) public authorities, 2) forest management companies, 3) forest users.

The questionnaire for public authorities included questions on strategic landscape planning; environmental and social goals; ecosystem services and existing PES schemes with a particular focus on forests, water and recreation. The questionnaire for forest management companies included questions on the accessibility of the forests; existing policies; existing PES Schemes and the experience of forest management companies with their implementation; motivations and obstacles for application and implementation of PES Schemes; currently undertaken forest management practices for water quality improvement and the public or societal recognition of forest landscapes in general and forestry in particular. The third questionnaire was targeted to forest users and aimed for pre-testing the questionnaire for its structure and contents before developing a more robust online questionnaire for a wider target group across New Zealand. The questionnaire was pre-tested on 13 respondents – recreationist users of the Redwoods – the Whakarewarewa Forest in Rotorua. The questionnaire includes 22 main questions, including aspects such as forest user's motivation and behaviour, forest accessibility and infrastructure, perception and valuation of ecosystem services and benefits provided by forest landscapes including water quality and also the understanding of the monetary value and willingness to monetarily or non-monetarily compensate these services.

The field visits and interviews included two physical visits and interviews in forest management companies – Timberlands Ltd and Hancock Forest Management NZ Ltd, one physical visit and interview in the Rotorua Lakes Council (public authority at the district level) and two telephone interviews with representatives of two forest management companies – City Forests Dunedin and Lake Taupo Forest Management Ltd.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

500 words summary

The main results and outcomes of the STSM can be summed up in five categories as follows:

- 1) literature review on forests, water, ecosystem services and existing PES schemes;
- 2) questionnaires for stakeholder groups at three different levels and scales – public authority, forest management companies, and forest users;
- 3) field visits and interviews – Timberlands Ltd; Hancock Forest Management NZ Ltd; Rotorua Lakes Council; City Forests Dunedin; and Lake Taupo Forest Management Ltd.;
- 4) peer-reviewed scientific report with ISBN, DOI and forewords from specialists in forest, water quality and recreation, and promoting COST and COST Action PESFOR-W;
- 5) establishing a small interdisciplinary research team between Scion – Enabling Environments and SUA Nitra – Department of Landscape Architecture with a focus on landscape and human dimensions of forests;

Additional results of the STSM) During my stay, I have had the opportunity to give a Seminar on Ecosystem Services and Landscape “*Landscape Architecture: Enabling Environments & Landscapes*” that focused on current research questions in Landscape Architecture and cross-cutting themes with Enabling Environments, including potential funding opportunities for research cooperation and exchange between Europe and New Zealand; Another enriching outcome was the possibility to participate in a meeting with representatives of Te Uru Rākau | Forestry New Zealand, where the One Billion Trees Programme was discussed in an interdisciplinary panel. An additional interview with Daniel G Neary from US Forest Service (Rocky Mountain Research Station), an experienced soil scientist, provided me with many additional references and insights into the application of agro-forestry measures for water quality improvement in the landscape.

Our findings in a nutshell: The Rotorua Lakes Council considers water quality and forests as main priorities of the Council since both have a strong positive impact on recreation, tourism and well-being. All the four interviewed forest management companies have implemented measures that integrate native trees, shrubs and herbaceous plants along water bodies for native biodiversity enhancement and water quality improvement. The main measure applied is monitoring combined with land retirement along watercourses and enhancement of native plants. The most implemented PES scheme by forest management companies in New Zealand is the Emissions Trading Scheme (ETS). Some companies have also been involved in biodiversity-related PES schemes for preserving important bird species and their habitats. Thus the main focus of existing PES schemes in forestry is Carbon Credits and Biodiversity. Water quality enhancement is done in line with National Environmental Standards, as a best-practice approach, while most of the companies do more than required. The questionnaires with users showed that clean water is among the 5 most valued ecosystem services provided by forests, thus water quality has an important impact on tourism and recreation. A great potential is represented by the new One Billion Trees Programme that has listed Water Quality Improvement among the eight main objectives of the programme. Therefore, future tree plantings and afforestation within this programme could provide multiple benefits, if waterbodies in forests and farmlands will be prioritised.

FUTURE COLLABORATIONS

200 words summary

The conducted STSM has contributed and will further contribute to research actions and interests on both sides. At Scion, the outcomes of the STSM are relevant and useful for research action within the “*Growing Confidence in Forestry’s Future*” Research Programme. At SUA Nitra, the outcomes will be utilised in the national research project on *Ecosystem Services of Green Infrastructure* and within other forthcoming research projects. During the research stay in general and within the seminar on Ecosystem Services and Landscape in particular, further research cooperation and funding opportunities were discussed. There is an interest on both sides to cooperate on future project bids and scientific publications.

The main direct follow-up of this STSM is the Scientific Report, which will be further edited into the form of a peer-reviewed scientific publication with ISBN, DOI and forewords by recognised experts from the field, in order to raise the scientific value and impact of the STSM output, as well as the dissemination of COST Action PESFOR-W, which is in line with the aims and objectives of WG4. The research initiative started by this STSM will further continue in the form of additional thematic reviews, interviews and questionnaire-based surveys, as well as a geo-spatial data processing, in order to come up with a research paper for a peer-reviewed scientific journal indexed in Web of Science.

Forest Management Timberlands Limited

Interview with
Colin Mauger
Forest Risk Manager

Rotorua, February 4 2019

TIMBERLANDS Limited is a highly focused and experienced forest management company who acts on behalf of the Kaingaroa Timberlands Partnership, owner of New Zealand's largest crown jewel plantation forest, the 189,000 ha Kaingaroa Forest estate, situated in the centre of the North Island, New Zealand (<https://www.tll.co.nz/>).



Most of the privately managed Kaingaroa Forest provides walking right to the public. There is a school camp on the forest ground and hunting is regulated through a recreational permit system. The main perceived benefits from making the forest accessible to the public is Certification (e.g. FSC - *Forest Stewardship Council* and PEFC - *Programme for the Endorsement of Forest Certification*), more acceptance by the general public, as well as staff attraction and retention. The main risks of public access include health and safety risks and a higher fire risk.



Timberlands Ltd does not currently receive any Payments for Ecosystem Services. Most of the schemes are targeted to land owners and not forest management companies. Further barriers for applying are administrative load and bureaucracy, as well as creating additional liability (ETS and NTS schemes). Furthermore, the payment provided through PES programmes and schemes is relatively low to be of interest to a large forest management company, which makes its main profit from producing and selling timber.

Timberlands Ltd has implemented several actions and management practices on the managed land, in order to improve water quality. In cooperation with the Regional Council, they have planted trees next to streams, where no further forestry interventions are undertaken. These 5 to 50 metre-wide permanent buffer strips along watercourses are part of the company's best practice guide and are being done voluntarily. The perceived recognition of forestry by the public is not very high. There is a need for more lobbying and cooperation with science, especially social science to raise the awareness of the public on ecosystem services provided by forests.

Forest Management

Hancock Forest Management NZ Limited

Interview with
Sally Strang
Environmental Manager

& **Nathan Baird**
& **Sarah Jane Luoni**
Hancock FM Staff

Field visit

Tokoroa, February 8 2019

Hancock Forest Management NZ Ltd (HFM NZ) was established in 2004 to manage forests on behalf of Hancock Natural Resource Group's clients. They currently manage approximately 235,000 ha of plantation forests that are located in Northland, Auckland, Waikato, Bay of Plenty, Horizons (Manawatu Wanganui) and Hawkes Bay regions. HFM NZ is strongly committed to being good stewards of the environment (<http://hfm.nz/about-us/>).

HFM NZ actively manages its responsibilities in the areas of biodiversity, soil and waterways protection, reserve management, recreation and public access and protection of historically significant sites within the forest estate (HFM NZ, 2017).

One of their stewardship objectives is to manage their forests sustainably and minimise adverse effects of forest operations on soil and water values and their forest activities are targeted towards enhancing water quality, among others through shading waterways keeping water cool for enhanced fish and macroinvertebrate life, as well as through erosion control (HFM NZ, 2017).

The Hancock Forest Management company has implemented biodiversity restoration projects funded by the Waikato Catchment Ecological Enhancement Trust. 90 percent of their forest riparian zones have been retired, i.e. forestry was stopped and the natural regeneration of non-native pines is being controlled, while native endogenous wetland species (e.g. cabbage tree, flax, toetoe and others) are being promoted. This approach not only enhances biodiversity by providing important habitats for native flora and fauna, but at the same time it significantly improves water quality in forest landscapes. They have received Payments for Ecosystem Services on biodiversity restoration projects (Waikato Catchment Trust) and on climate change mitigation (Carbon Credits) within ETS (New Zealand Emissions Trading Scheme).



Forest Management

Lake Taupō Forest Management Limited

Interview with
Geoff Thorp
Director of LTFM Ltd

Rotorua (telephone interview),
February 15 2019

The Lake Taupō Forest Trust controls an area of 33,733 hectares of land on the eastern shores of Lake Taupō for the benefit of owners. The land comprises 68 Māori land blocks and 15 blocks owned freehold by the Trust. Of this area, 24,207 hectares (71 per cent) are planted in forest. Around 98 per cent of the forest is planted in *Pinus radiata*, and the remaining 2 per cent is mainly *Douglas Fir*, *Eucalyptus*, *Cypress* and *Larch*. The Lake Taupō Forest Trust participates in a blue duck / whio (*endangered bird species, one of only three ducks world-wide that exclusively live on fast flowing rivers*) protection project on the Waimarino River funded through a PES scheme based on public-private partnership, while involving several trusts and funds (<https://www.lfft.co.nz/>).



The forests are accessible to land owners, which is managed and regulated by an *Owner Access Policy* (LTFT and LRFT, 2018). Owners' access is for recreational purposes only, i.e. pig and deer hunting, fishing and food gathering. The Lake Taupo Forest Trust has received Payments for Ecosystem Services on climate change mitigation (ETS – New Zealand Emissions Trading Scheme) and on water quality improvement (NTS – Nutrients Trading Scheme) on a few smaller lands (after-1990 forestry). The after 1990 forest land (approximately 600 ha) is a carbon-market-linked PES scheme, however it is only a small portion of the overall land. Before-1990 forests represent approximately 95 % of forests. Existing PES schemes are not of a significant interest for the trust, since the managed land is large enough and produces sufficient income from timber. Water quality in managed forest landscapes is enhanced through stopping forestry interventions close to water bodies. There are wide areas of natural forests along waterways with water-quality-related regulations. Riparian land has to be maintained, although the trust did more than required by official regulations. Approximately 30 % of the managed land is unplanted. There are riparian strips of land that achieve up to 100 metres width, all following the general aim – to protect Lake Taupo which is widely considered as national treasure and is highly valued by the iwi. Regarding public recognition of the positive contribution of forestry to the society and provision of a wide range of ecosystem services by forest landscapes, more cooperation among forest management companies would be beneficial, in order to develop a positive image in the society.

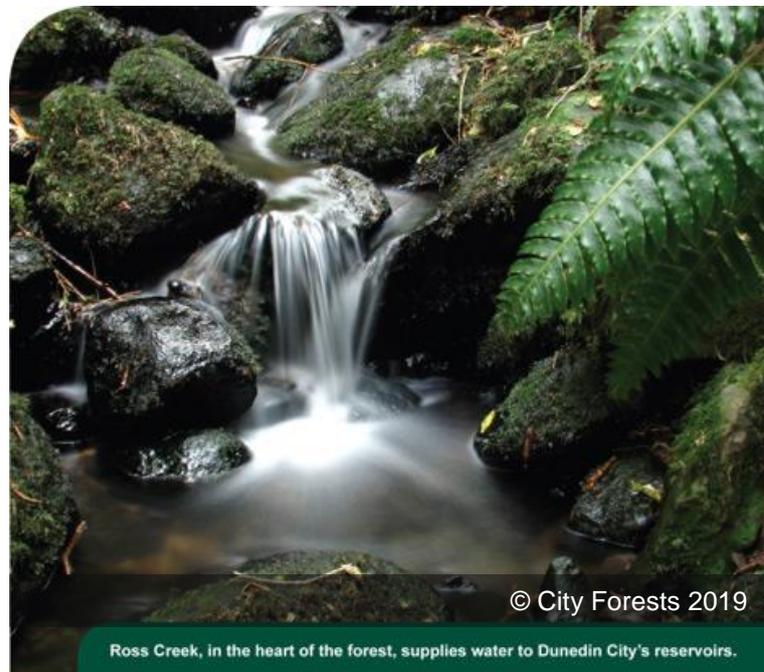
Forest Management

City Forests Limited, Dunedin

Interview with
Peter Oliver
General Manager, Forest Assets

Rotorua (telephone interview),
February 15 2019

City Forests is a Dunedin-owned forest products company based in Otago, New Zealand. Their forests are managed to a high environmental standard and this is certified by the Forest Stewardship Council® (FSC®). Urban forests around Dunedin are considered as an asset for the city. The company is very conscious of resources and values other than the plantation forests. For this reason there is a process to manage non-forest resources, and to protect and enhance their value. As part of the commitment to sound environmental practice, and to the principles FSC certification, there is a number of processes to monitor the condition of the environment and the impact of operations in the forests where there may be a potential threat to important conservation values (<http://www.cityforests.co.nz/>).



The monitoring activities include carbon capture and storage; water quality; soil protection; native forest reserves and other flora; High Conservation Value Forest; wildlife; heritage and archaeological sites. City Forests has worked with the Otago Regional Council to set up an appropriate water and water course monitoring system for key waterways in the company's forests, which is intended to monitor for changes in water quality due to harvesting operations. Attributes assessed are water clarity, temperature and conductivity; substrate sedimentation; invertebrate types and numbers; and condition of riparian vegetation. Evidence of this monitoring consistently shows the benefits of well managed plantation forests to stream water quality, especially when compared to streams which cross farmland (<http://www.cityforests.co.nz/>). City Forests has implemented regeneration processes along watercourses in line with the National Environmental Standards. There are designated permanent set-aside reserves along watercourses, with a minimum setback of 5 metres, which represent a significant proportion of the forest estate's productive and conservation areas which have a combined total of 21 thousand hectares. The ETS is the only PES scheme that City Forests has been involved in. They have sold Carbon Credits worth 31 million NZD since 2010 which helped in the acquisition of new parcels of land for expanding the forest estate. They only trade a safe level of carbon, which is approximately 20 % of the total carbon capital. Other PES schemes are not suitable for the enterprise due to eligibility issues and the company's preference to do their main business - forestry. The NTS scheme is more oriented towards small landowners or the farm-forestry sector.

Public Administration

Rotorua Lakes Council

Interview with
Julianne Wilkinson
Recreation and Open Spaces
Manager

Rotorua, February 15 2019

Rotorua Lakes council is the local and district government authority of Rotorua, managing an area of 261,906 ha (41% forest, 43% agriculture and 8% lakes / 18 lakes, 3 major rivers, 120 wetlands, 100,000 ha of native and exotic forests - with the largest commercial plantation forest in the Southern Hemisphere, and 100,000 ha of farmland). The forests, coupled with extensive trees and gardens in the city, suburbs and parks, support a rich and varied bird life (RDC, 2014; RLC, 2018).

The Redwoods - Whakarewarewa Forest, is an urban forest and one of the district's most spectacular natural assets, famous for the network of superb mountain-biking and walking tracks and the magnificent stand of Californian Coast Redwoods (*Sequoia sempervirens*). These towering trees, along with numerous other species and the fresh forest air, combine to create a unique atmosphere and environment (<https://www.rotorualakescouncil.nz>).



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© Rotorua Lakes Council 2018

The Rotorua Lakes Council currently manages 72 thousand urban reserves providing the opportunity for free close-to-urban recreation, for which the Council has adopted a Recreation Management Policy. Forests and lakes in Rotorua are of crucial importance for recreation and they are considered by the iwi as part of their culture and identity. According to Wilkinson, nature protection and recreation do not necessarily oppose. Quite the opposite, the environment can be best protected, if people are encouraged to be part of it and get to know it. The new governmental PES scheme – the One Billion Trees Programme is not very relevant for the Council's open-space goals, as there is already a huge number of existing urban plantings and not so much available space. However, some reserves could accommodate longer-term native plantings such as Manuka, but this is only of partial importance and relevance.

Forest Users

The Redwoods – Whakarewarewa Forest

Questionnaire Survey

Pre-Tested on
10+ forest users

Rotorua, February 11-20 2019

The Redwoods (Whakarewarewa Forest) is the main urban forest of the city of Rotorua, which is well linked to the city centre through local roads as well as cycle and walking trails.

With the aim to better understand the forest users' behaviour, understanding and perception of forest landscape values and ecosystem services provided by forests, including water quality enhancement, a questionnaire has been developed and pre-tested on more than 10 users of Whakarewarewa Forest. The intention was to gain a representative research sample which can be used for developing a more robust online questionnaire for forest users across New Zealand. The questionnaire includes 22 main questions on 1) demographic data such as gender, age, education, and work; 2) the user's motivation to visit the forest, the frequency of their visits, preferred activities; logistics and transportation; the time spent in the forest; the accessibility and infrastructure of the forest; 3) perception and valuation of services and benefits provided by forests and evaluation of its current condition; 4) willingness to support the forest's non-productive services through direct payments, voluntary work, income tax reallocation or any other ways of support. Most of the users state among their main motivation to go to the forest environmental qualities such as fresh air, cooler microclimate; aesthetic values such as beautiful sceneries; mental benefits such as enjoying the quietness and peacefulness of the forest and the contact to nature, doing stress relief and mental hygiene; recreation and sport activities and the spatial proximity and accessibility of the forest to work or home. According to the survey, the most valued ecosystem services provided by forests include clean water, fresh air, climate change mitigation, recreation, sport and tourism; health and well-being; and soundscapes (average value higher than 4.5 out of 5). Most of the survey respondents prefer voluntary work (69 %) to direct payments or tax reallocation (each 31 %).



Further Outcomes & Activities

Scion
Rotorua / Christchurch (online)

February 20 2019

Seminar on Ecosystem Services and Landscape “Landscape Architecture: Enabling Environments and Landscapes”.



Presenting the research methodology and interim results and outcomes; talking about cross-cutting research themes and funding opportunities to Scion colleagues in Rotorua and Christchurch (streamed online).



Scion
Rotorua

February 15 2019

Interview with Daniel G Neary from US Forest Service (Rocky Mountain Research Station) on the application of agro-forestry measures for water quality improvement in the landscape.



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Attila Tóth currently works as Assistant Professor at the Department of Landscape Architecture of the Slovak University of Agriculture in Nitra (Slovakia) and as Visiting Postdoc Researcher of Action Austria-Slovakia at the Institute of Landscape Planning of the University of Natural Resources and Life Sciences in Vienna (Austria). He is chair of LE:NOTRE Institute that aims at linking landscape education, research and innovative practice. His main research focus is Green Infrastructure Planning, Design and Implementation in Urban and Rural Landscapes. He is Secondary Proposer and Management Committee (MC) Member of *COST Action Payments for Ecosystem Services – Forests for Water (PESFOR-W)* and deputy manager of a national research project on *Ecosystem Services of Green Infrastructure*.

Richard T. Yao currently works as a research economist at the Enabling Environments Team at Scion, Rotorua, New Zealand. He does research on assessment of ecosystem services and environmental economics. His current research projects include the spatial economic assessment of ecosystem services (e.g. biodiversity, water supply, water quality, recreation, avoided erosion, flood mitigation) provided by New Zealand's existing and future forests. He recently completed an industry commissioned work on *Analysing ecosystem services in a New Zealand planted forest estate* and a government commissioned project on the *Assessment of freshwater ecosystem assessment of selected Waikato rivers and streams in the Waikato Region*. He is an MC observer in the COST Action PESFOR-W where he represents New Zealand as one of the International Partner Countries.

Scion is a Crown research institute that specialises in research, science and technology development for the forestry, wood product, wood-derived materials, and other biomaterial sectors. For more information visit: <https://www.scionresearch.com/>

The research lab Enabling Environments focuses on the human dimension of forestry. Team members come from economic, social, cultural and forest science backgrounds.

Acknowledgements | About COST

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Special thanks go to all our interviewees – Colin Maunder from Timberlands Limited; Sally Strang, Nathan Baird and Sarah Jane Luoni from Hancock Forest Management NZ Limited; Geoff Thorp from Lake Taupō Forest Management Limited; Peter Oliver from City Forests Limited; Julianne Wilkinson from Rotorua Lakes Council; and Dr. Daniel G. Neary from US Forest Service for dedicating their time, and providing their specialist expertise and valuable experience to contribute to the scientific mission.

Many thanks to the more than 10 forest recreationists who agreed to fill in the pre-testing questionnaire and contributing thereby to initial knowledge generation and questionnaire development for a wider target group using online systems.

Finally, the STSM Grantee, Attila Tóth would like to express his gratitude to all colleagues at Scion, especially the Enabling Environments Research Lab and its Social Scientists Group for providing a kind support and creating a friendly and cosy working atmosphere at the host institution.

What is COST?

COST (European Cooperation in Science and Technology) is a funding organisation for research and innovation networks. COST Actions help connect research initiatives across Europe and beyond and enable researchers and innovators to grow their ideas in any science and technology field by sharing them with their peers.



COST Actions are bottom-up networks with a duration of four years that boost research, innovation and careers. COST provides networking opportunities for researchers and innovators in order to strengthen Europe's capacity to address scientific, technological and societal challenges. There are three strategic priorities: Promoting and spreading excellence, fostering interdisciplinary research for breakthrough science and empowering and retaining young researchers and innovators. COST implements its mission by funding bottom-up, excellence-driven, open and inclusive networks for peaceful purposes in all areas of science and technology.

For more information visit: <https://www.cost.eu/>

COST Action CA15206 PESFOR-W

Payments for Ecosystem Services (Forests for Water)

The PESFOR-W COST Action aims at consolidating learning from existing woodlands for water PES schemes in Europe and helping standardise approaches to evaluating the environmental effectiveness and cost-effectiveness of woodland measures. One of its objectives is to create a European network through which PES schemes can be facilitated, extended and improved, for example by incorporating other ecosystem services linking with aims of the wider forests-carbon policy nexus.



For more information visit: <https://www.forestresearch.gov.uk/research/pesforw/>

References

- Barry, L. E., Yao, R., Harrison, D. R., Paragahawewa, U. H., & Pannell, D. (2014). Enhancing ecosystem services through afforestation: How policy can help. *Land Use Policy*, 39, 135-145. doi:10.1016/j.landusepol.2014.03.012.
- Dean F. Meason, Brenda R. Baillie, Barbara Höck, Priscilla Land and Tim Payn. 2019. Planted Forests and Water Yield in New Zealand's Hydrological Landscape – Current and Future Challenges. *New Zealand Journal of Forestry*. 2019. Vol. 63, No. 4, pp. 29-35.
- Forestry New Zealand. 2018. The One Billion Trees Programme – Our future, our billion trees. Wellington: Te Uru Rākau. 16 p. ISBN 978-1-98-857131-7.
- HFM NZ (Hancock Forest Management NZ Ltd). (2017). Forest Management Plan – Public Summary. [online] Available at: <<http://hfm.nz/wp-content/uploads/sites/6/2017/08/HFM-NZ-Public-Summary-2018.pdf>> [Accessed 2 April 2019]. Version July 2018. 71 p.
- LTFT (Lake Taupo Forest Trust) and LRFT (Lake Rotoaira Forest Trust). (2018). Lake Taupo & Lake Rotoaira Forest Trusts: Owner Access Policy. [online] Available at: <<https://www.ltft.co.nz/app/uploads/Trust-Access-Policy-Final-2.pdf>> [Accessed 2 April 2019]. Version September 2018. 10 p.
- Ministry for Primary Industries. (2018). Planting one billion trees. [online] Available at: <<https://www.mpi.govt.nz/funding-and-programmes/forestry/planting-one-billion-trees/>> [Accessed 21 October 2018].
- RDC (Rotorua District Council). (2014). Local Governance Statement. [online] Available at: <<http://geo.rdc.govt.nz/BOPLASS/Tiny/TRIM.aspx?recNum=RDC-432485>> [Accessed 2 April 2019]. RDC-432485, 01-67-001, April 2014. 70 p.
- RLC (Rotorua Lakes Council). (2018). Planning for the Future of Rotorua: 2018 Spatial Plan. [online] Available at: <<https://indd.adobe.com/view/0ce325ac-9274-4cc2-bc9b-6d9188478e1c>> [Accessed 2 April 2019]. 19 p.
- Scion. (2017). Forest Investment Framework. [online] Available at: <<https://www.scionresearch.com/science/sustainable-forest-and-land-management/valuing-the-forest-ecosystem/forest-investment-framework>> [Accessed 21 October 2018].
- Scion. (2018). Right Tree, Right Place, Right Purpose: Scion Strategy to 2030 incorporating Statement of Corporate Intent 2018-2023. Rotorua: Scion. 50 p. ISBN 978-0-473-44204-0.
- Yao, R. T., Harrison, D. R., & Harnett, M. (2017). The broader benefits provided by New Zealand's planted forests. *New Zealand Journal of Forestry*, 61(7), 7-15.
- Yao, R. T., Harrison, D. R., Velarde, S. J., & Barry, L. E. (2016). Validation and enhancement of a spatial economic tool for assessing ecosystem services provided by planted forests. *Forest Policy and Economics*. <https://doi.org/10.1016/j.forpol.2016.06.023>.

Appendix A

Letter of Support of the Home Institution (SUA Nitra)



SLOVAK UNIVERSITY OF AGRICULTURE IN NITRA
FACULTY OF HORTICULTURE
AND LANDSCAPE ENGINEERING

Dean
prof. Ing. Dušan Igaz, PhD.

Dr. Zuzana Sarvašová, PESFOR-W STSM Coordinator
Prof. Dr. Kazimierz Banasik, PESFOR-W STSM Vice-Coordinator
Dr. Gregory Valatin, PESFOR-W Action Chair
Prof. Dr. Gebhard Schüler, PESFOR-W Action Vice-Chair
Claire Holmes, PESFOR-W Grant Holder
Dr. Richard T Yao, STSM Mentor

Nitra, October 26 2018

Letter of support of the Short Term Scientific Mission (STSM) proposed by Dr. Attila Tóth

Dear colleagues!

As the dean of the Faculty of Horticulture and Landscape Engineering of the Slovak University of Agriculture in Nitra (Home Institution of Dr. Attila Tóth), I strongly support his proposal to undertake an STSM at Scion (New Zealand Forest Research Institute) from January 28 to February 24 2019 on *Government Programmes and Woodland-for-Water PES Schemes Encouraging Afforestation in New Zealand*.

The proposed research topic is strongly in line with our faculty research interests and I am truly convinced that the proposed STSM would significantly support Dr. Attila Tóth's further professional and personal development.

I hereby express my full support of his application and my agreement with the STSM to be conducted at Scion, New Zealand.

Yours sincerely

SLOVENSKA POLNOHOSPODARSKA
UNIVERZITA V NITRE
FAKULTA ZÁHRADNICTVA
A KRAJINNEHO INŽINIERSTVA
D Ě K A N Á T
Tulipánová 7, 949 01 NITRA



Prof. Ing. Dušan Igaz, PhD.

Dean

Appendix B

Agreement of the Host Institution (Scion, New Zealand)

Te Papa Tipu Innovation Park,
49 Sala Street, Rotorua
Private Bag 3020, Rotorua 3046,
New Zealand

Telephone +64 7 343 5899
Facsimile +64 7 348 0952
Email enquiries@scionresearch.com
www.scionresearch.com



30 October 2018

Dr. Zuzana Sarvašová, PESFOR-W STSM Coordinator
Prof. Dr. Kazimierz Banasik, PESFOR-W STSM Vice-Coordinator
Dr. Gregory Valatin, PESFOR-W Action Chair
Prof. Dr. Gebhard Schüler, PESFOR-W Action Vice-Chair
Claire Holmes, PESFOR-W Grant Holder
Prof. Dr. Dušan Igaz, Dean, FHLE SUA Nitra

Re: **Agreement of the Host Institution (Scion, New Zealand) with the Short Term Scientific Mission (STSM) proposed by Dr. Attila Tóth**

Dear Colleagues,

As the representative of Scion (New Zealand Forest Research Institute) in the COST Action CA15206 Payments for Ecosystem Services (Forests for Water) and the proposed mentor of the STSM applicant, Dr. Attila Tóth, I would like to express my full support of his proposal to undertake a STSM at Scion from January 28 to February 24 2019 on Government Programmes and Woodland-for-Water PES Schemes Encouraging Afforestation in New Zealand.

The proposed research topic is in line with the main research interests of Scion I will be very happy to support Dr. Attila Tóth as his mentor and scientific advisor during his stay at Scion. I hereby express my full support of his application and the agreement of my institution with the STSM. Dr. Attila Tóth will be provided with a working place at Scion and we will help him with consultations, contact facilitation, mentoring and advising.

Please let me know if you need any further information. Thank you.

With very best wishes,



Dr Richard T Yao
Research Economist
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Appendix C

Host Approval of the Scientific Report (Scion, New Zealand)

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25 April 2019

Dr. Zuzana Sarvašová, PESFOR-W STSM Coordinator
Dr. Gregory Valatin, PESFOR-W Action Chair
Claire Holmes, PESFOR-W Grant Holder
Prof. Dr. Dušan Igaz, Dean, FHLE SUA Nitra

Host Approval of the Scientific Report

Dear Colleagues:

As the representative of Scion (New Zealand Forest Research Institute) in COST Action CA15206 *Payments for Ecosystem Services (Forests for Water)* and mentor of Dr. Attila Tóth, I hereby approve the Scientific Report on his Short-Term Scientific Mission (STSM) conducted at Scion from January 28 to February 24, 2019.

The report clearly summarises the purpose of the STSM, describes the work undertaken during the STSM, highlights the main results obtained, discusses future collaborative opportunities, and provides other valuable and interesting information.

It has been a great pleasure to host the STSM visit of Dr. Tóth. Our team very much enjoyed his visit and we thank the COST Action PESFOR-W for the opportunity to host Attila here in New Zealand.

With best regards,



Dr. Richard T. Yao
Scientist – Resource Economist