Track #1 - Published Abstract

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Industry Adoption of Emergent Technologies for Forest Road Planning, Design, and Monitoring in New Zealand

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Abstract

A targeted survey of active forest roading managers was completed in April 2018 to better understand the characteristics of the forest industry's current road construction programme, practices used in forest road planning and management, and uptake of emergent technologies applied to forest roading problems. The 18 survey responses represented an annual harvest volume and length of new road construction of 10.2 million m^3 and 426 km, respectively. About 180 km (42%) will be built on highly erodible terrain as defined by the Erosion Susceptibility Classification (ESC) system within the new National Environmental Standards for Plantation Forestry (NES-PF). On average, spur and secondary roads cost $72,000 and $90,000 per kilometre, respectively, with gravel and excavation representing the greatest cost components. Spur roads represent about two-thirds of the new road length. In terms of road pavement design, vibratory rollers were the most commonly used machines for compaction and total aggregate thickness (i.e. basecourse plus topcourse) averaged about 300 mm. Managers indicated that few roads required a full geometric design and that marking of the road centreline was often sufficient for roading contractors to build the road. Full geometric designs were associated with particularly difficult road sections (i.e. steep and/or unstable slopes and switchbacks) and managers emphasized the utility of LiDAR data and geometric design software for these situations.

Respondents identified major challenges in managing their roading programmes, including planning, designing, and constructing infrastructure well in advance (e.g. 6 months) of harvesting crews and controlling construction cost in steep terrain. Emergent technology, such as the integration of LiDAR-based digital terrain models (DTMs) and geometric design software is playing a key role in addressing these challenges. For example, managers have been able to test the feasibility of multiple road routes in the office with a high level of detail. They can perform complete geometric designs, estimate earthwork volumes (a requirement under the NES-PF), and costs. While the office-based design still requires field validation, the benefits include more targeted field surveys and improved road design.

This study demonstrates that New Zealand's roading managers are utilising emergent technologies. For example, forty-four percent of roading managers frequently use LiDAR-based digital terrain models (DTMs) to plan and design forest roads. Sixty-one percent of roading managers use a software package to aid in road location planning and design. Softree RoadEng was the most commonly used program. The most common applications of unmanned aerial vehicles (UAVs) included monitoring stockpile volumes at in-forest quarries (39% of managers) and road impacts on waterways (17% of managers).