



General information

Description	This study gauged the severity and permanence of soil compaction associated with mechanized clear felling and site preparation of radiata pine plantations.	
Geographical area	Euskadi	
Group of tree species	Pinus radiata	
Date	December 2018	
Authors (affiliation)	Gartzia-Bengoetxea, N. & Arias-González, A. (NEIKER)	
Contact e-mail	ngartzia@neiker.eus	
Tool type	Report	
Tool format	Text	
Language	English	
Risk management plans to which the tools can be added	Soil degradation risk management plan	
Risk management plans link	https://www.plurifor.efi.int/wp-content/uploads/WP2/plans/Soil-degradation-plan_ES.pdf	
This tool is...	<input checked="" type="checkbox"/> a new tool	<input type="checkbox"/> an improved tool
Original tool of which this one is an improvement		

Topic

Risk	Soil degradation		
Risk component	<input type="checkbox"/> hazard	<input checked="" type="checkbox"/> impact	<input type="checkbox"/> vulnerability
Risk area	Risk management		
Risk phase	Rehabilitation/restoration		
Risk phase (alternative terms)	Recovery		
Level	Regional		
Sendai priorities	<input checked="" type="checkbox"/> Priority 1: Understanding disaster risk <input checked="" type="checkbox"/> Priority 2: Strengthening disaster risk governance to manage disaster risk <input checked="" type="checkbox"/> Priority 3: Investing in disaster risk reduction for resilience <input type="checkbox"/> Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction		
Contribution to Sendai targets	<input type="checkbox"/> Reduce global disaster mortality <input type="checkbox"/> Reduce the number of affected people <input checked="" type="checkbox"/> Reduce the direct disaster economic loss <input type="checkbox"/> Reduce disaster damage to critical infrastructure <input type="checkbox"/> Increase the number of national and local disaster risk reduction strategies <input type="checkbox"/> Enhance international cooperation to developing countries <input checked="" type="checkbox"/> Increase availability of and access to multi-hazard early warning systems and disaster risk information and assessment		



Description and analysis

Summary

At present, the compaction of soil caused by heavy machinery in the extraction of timber from forests during ground-based logging operations appears unavoidable. Soil compaction is the compression of a soil's solid particles which leads to increased bulk density and increased soil strength. These alterations of the soil physical properties, when severe, are detrimental to the growth of plants and increase the rate of seedling mortality. Soil compaction can induce or accelerate other soil degradation processes, such as erosion or landslides.

This case study was conducted in The Basque Country. The impact of mechanized site preparation on soil compaction was evaluated 15 years after logging operations. Site productivity, soil carbon storage and soil hydrological properties were also evaluated as ecosystem services provided by forest soils.

Place in national/regional policy

At this moment, this tool is not considered in any policy in any region.

Goals and achievements

In Communication 2006 [Communication (COM(2006) 231)], the European Commission underlined that little public awareness of the importance of soil protection. Measures to improve knowledge and exchange information and best practices are needed to fill this gap. This tool has been prepared to help forest resource managers plan, to prescribe and implement sound forest practices that comply with sustainable forest management that protect soils.

Stakeholders involved

Provincial Council of Biscay.

Implementation stage

This information will be incorporated in a peer-reviewed paper entitled: "Impacts of forest site preparations on soil compaction and soil ecosystem services 15 years after logging operations" (tentative).

State of technical knowledge

Still more research is needed to avoid soil compaction and other negative effects of ground-based logging operations. Some of the existing solutions to minimize soil compaction consist of selecting lighter machinery, machines with tracks instead of tires and if machinery with tires is used, deflate the tires to the lowest allowable pressure recommended (Wingate-Hill and Jakobsen, 1982). Additional solutions to protect the soil from compaction include the application of a buffer between the skid trail and the machines running gear in the form of branches, brush, bark, woodchips and sawdust (Akay et al., 2007; Ampoorter et al., 2007; Horn et al., 2007). However, these methods need to be adapted to every forestry region.

Regulatory and/or socio-economic contexts

At present little regulatory context but potentially important socio-economic benefits by helping forest planners to avoid unwanted impacts, and support successful and sustainable forest-based sector development.

Impacts of the tool

To date, very little impact because the tool has not been adopted by forest resource managers. Efforts will be made to increase the impact by discussing with forest authorities how the tool can be incorporated in normal operating procedures.



Implementation requirements and durability

Description of the implementation steps

1. Revisit the study site and identify the subplots.
2. Measuring the trees and soil sample collection and analysis.
3. Analysis and interpretation of the results.
4. Tool available to download (not implemented yet).

Governance

The report was developed for research purposes of NEIKER. NEIKER does not accept any liability whatsoever for any error, missing data or omission in the data, or for any loss or damage arising from its use. NEIKER agrees to provide the data free of charge but is not bound to justify the content and values contained in the databases.

Regulatory framework

The tool is advisory only to assist regional planners and all parties involved in risk management in the Basque Country. There is no regulatory framework at present.

Human resources requirements

The report aims to provide knowledge on the impact of mechanized site preparation on soil compaction and other ecosystem services in *Pinus radiata* stands. No special resources are needed to use the report. The target public are the foresters.

Financial requirements

None

Technical requirements

None

Priorities identified for successful implementation of the tool (political, technical, human, financial...)

The priority is to increase public awareness of the need of soil protection. As the protection of forest soil is an issue of increasing concern to Central European forestry (Thees and Olschewski, 2017), South Western plantation forestry should also address this issue.

Soil protection must not be seen as a barrier to forest activity. When forest operations protect soil, the maintenance of productivity is assured, the surrounding ecosystems such as streams and rivers do not receive high loads of sediments and social perception of forest operations is gained. Protecting soils is a win win solution.

Challenges or risk factors (legal, financial, safety...) expected during the implementation and solutions proposed

The main challenge is to incorporate the knowledge generated in the decision making process. To increase public awareness of the need to protect soil, forest authorities might foster the use of this kind of knowledge. The incorporation of this kind of tools in the forest management might be linked to change in the business as usual management and this may rise the price of the harvested wood that need to be compensated.

Additional and non-formal experiences to help the implementation of good practice

None

SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Fill the gap of mid-term (15 years) impact of mechanized site preparation on soil compaction and other ecosystem services. 	<ul style="list-style-type: none"> • A stronger study is needed
Opportunities	Threats



- | | |
|---|---|
| <ul style="list-style-type: none"> Evidences the need for a long-term research programme on “ Effects of harvesting practice on soil sustainability” | <ul style="list-style-type: none"> Difficulties in persuading people to use the results because they add complexity to existing decision making. |
|---|---|

Lessons learnt

Evaluation process, if exists (internal or external)

None

Assessment of results (quantitative and qualitative) and comparison with main goals

The assessment of the results will be carried out by a peer review process.

Negative aspects identified

Difficulties on maintaining long-term experimental trials.

Unexpected consequences (short- / mid- / long-term) and corrective measures implemented

None

Access to complete tool

Files	Soil_compaction_Euskadi.pdf
Web links	Not available yet

Interreg 
Sudoe

Transnational plans for
the management of
forest risks
PLURIFOR

European Regional Development Fund