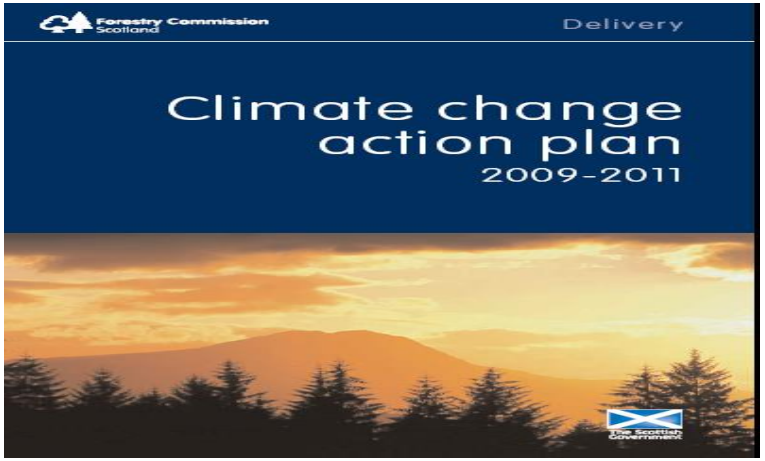
Forest Research

TTF Conference March 2014

Brief discussion on the FC Technical Note:
‘Reducing Greenhouse Gas Emissions from Forest Civil Engineering’

Alan Dickerson



Forestry Commission Scotland – Climate Change Action Plan 2009-2011

It took a long time but finally in 2013 -
A Technical Note was produced

Basic principle:
Sustainable, low carbon, construction is also safe, economic construction

- Key message:
- If peat is disturbed
- Then irreversible -
- Water loss 75%
- Carbon loss 60%

Forestry Commission

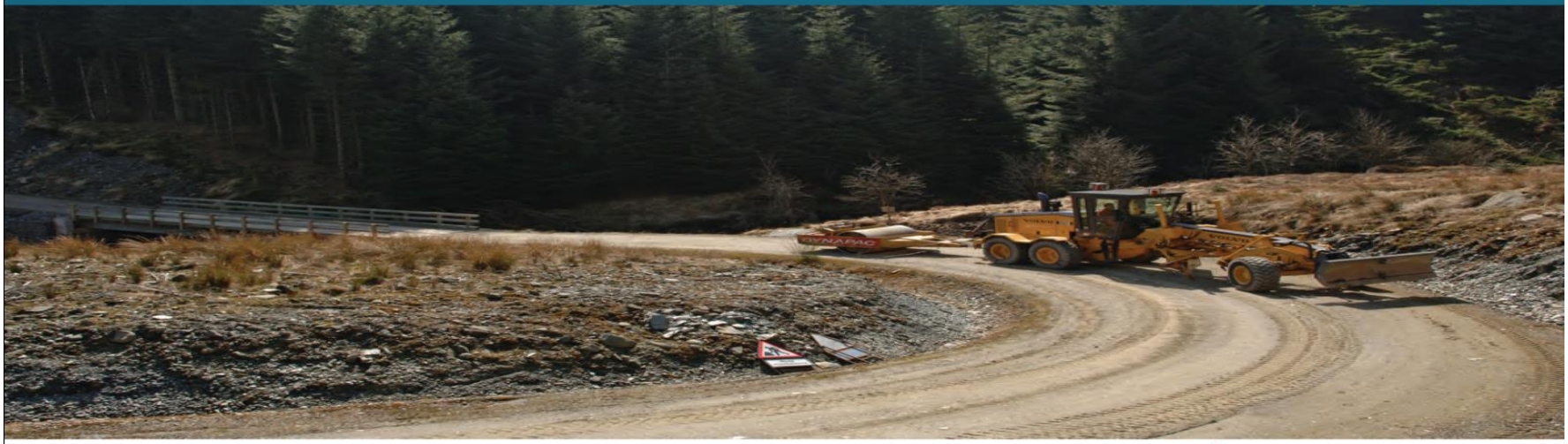
Reducing greenhouse gas emissions from forest civil engineering

The management of forests and woodlands requires an effective road network to provide access for the machinery required to plant and harvest trees and extract timber and wood products. Roads are also used by visitors for access and activities such as cycling and mountain biking. Forest roads and bridges must be constructed so that they are fit for purpose and robust enough to cope with intensive forest operations. However, building and maintaining road networks uses energy and releases carbon dioxide and other greenhouse gases – from the disturbance of soil for new roads and the quarrying of materials to the emissions from construction vehicles. It is important that these emissions are reduced wherever possible by following good practice in construction and by minimising soil disturbance, especially on sites with peaty soils. This Technical Note describes how the greenhouse gas release from forest civil engineering operations can be controlled and reduced, while still ensuring the development and maintenance of a robust forest road network. It is aimed at forest civil engineers, planners, managers and owners.

Alan Dickerson, Bruce Nicoll and Mike Perks

December 2013

Technical Note



Consider opportunities for reducing greenhouse gas emissions from forest civil engineering by using the 'Reduce, Reuse and Recycle' approach

Reduce

- Reduce the need for materials and construction by designing and constructing roads using the minimum structure necessary to ensure they are robust enough for their intended use and so that they require the minimum of maintenance.
- Reduce greenhouse gas emissions from soils by routing roads to avoid disturbing soils with a high organic content (e.g. peat).
- Reduce road wear and maintenance by using tyre pressure control systems on large commercial vehicles.

Reuse

- Reuse road material if possible. For example, stone may be reused from stacking/loading areas if it is in a concentrated bulk and not contaminated with organic material.

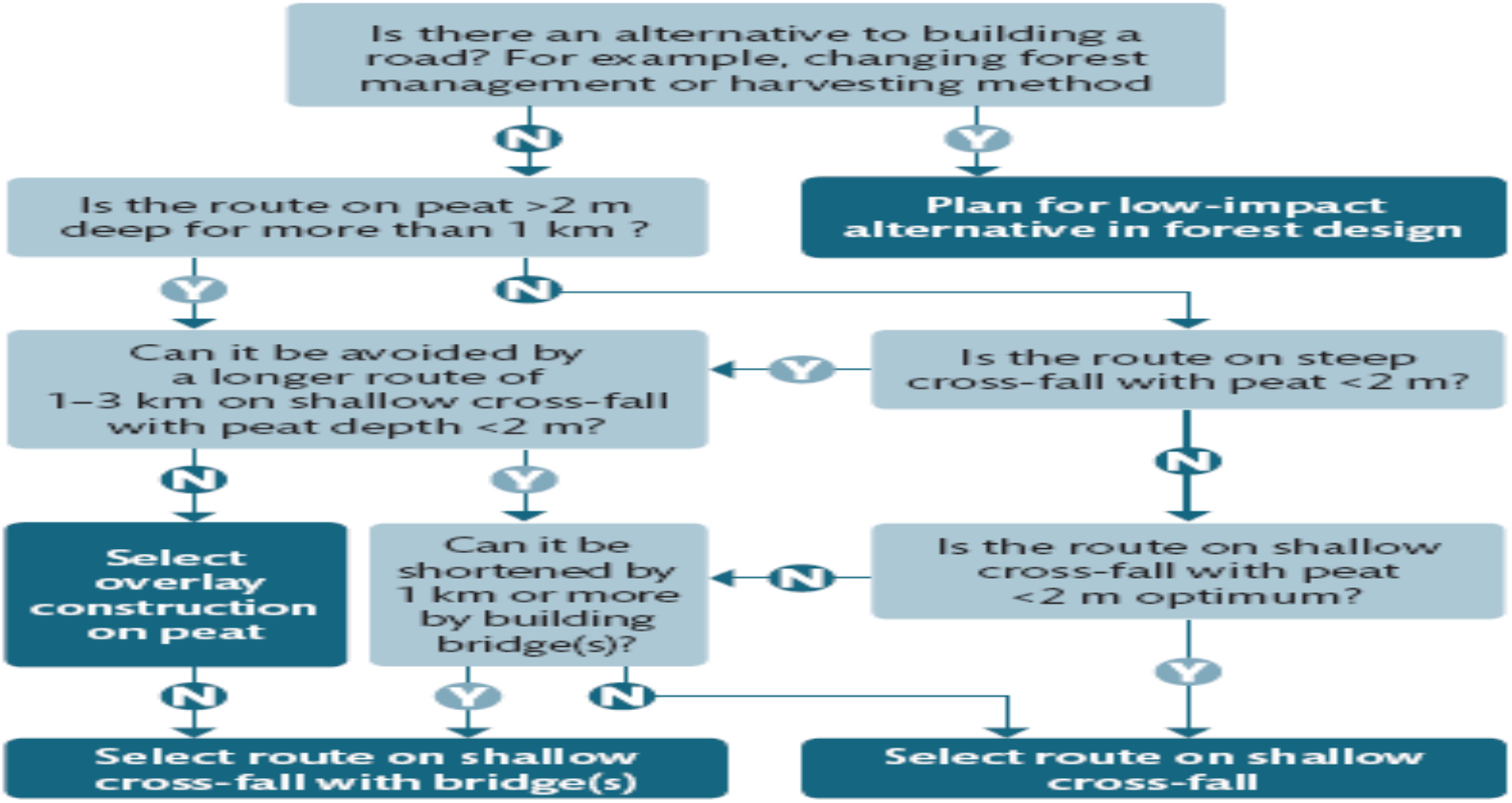
Recycle

- Recycle other materials from outside the forest if appropriate. For example, recycled bitumen-macadam ('bitmac') road planings have been used in forest road building. However, avoid using materials that have to be transported over long distances to help minimise carbon emissions.

Planning and Design

Plan for the minimum road density, Plan ahead – phased approach, Plan the route, Plan for efficient construction

Planning Decision 'Tree'

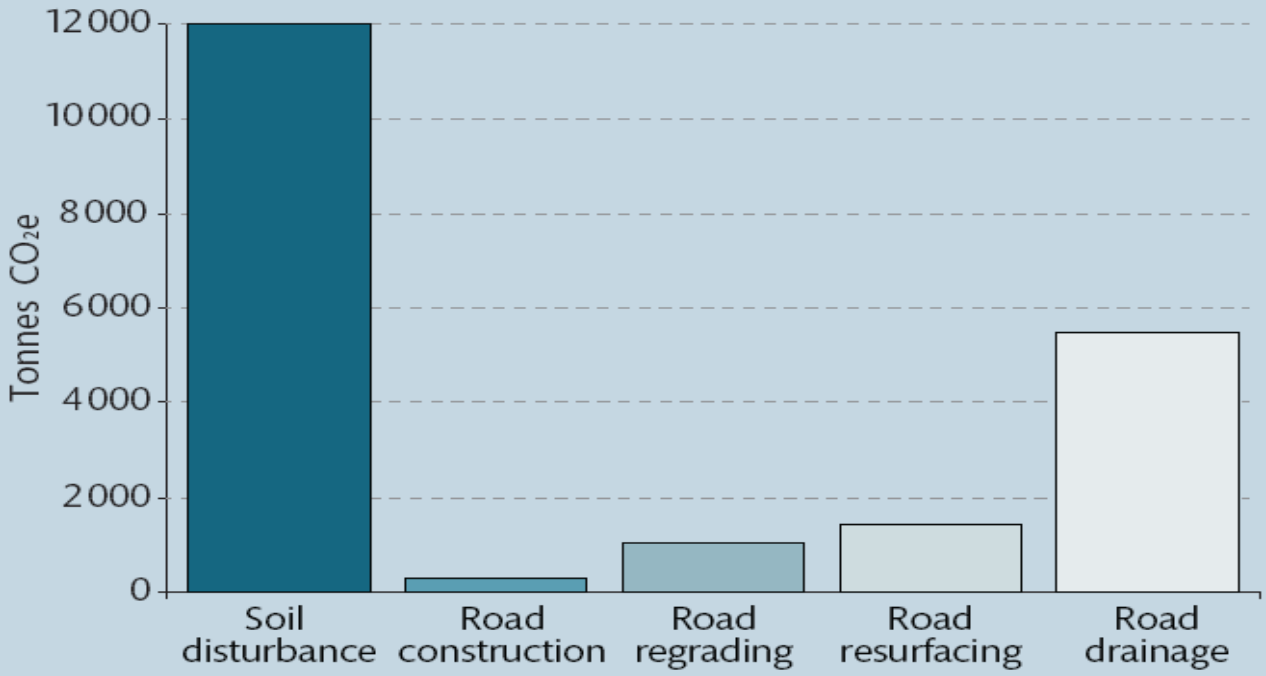


Minimise soil disturbance

Especially high carbon soils ie peat

Case Study – Eskdalemuir Village Bypass

Comparison of five road engineering activities on the lifetime (125 years) CO_2e losses, for the Eskdalemuir village bypass. Estimates were generated from a 'bill of quantities', with one construction phase, 250 regrading activities (minimum of twice per year) and a complete resurfacing once every 7.5 years.



Case Study – Eskdalemuir Village Bypass
FR Carbon Calculator input page (MS Excel spreadsheet)

SITE VALUES <> USER INPUT FROM CIV ENG SPECIFICATION	
Road length (m)	4500
Top Road Surface Structural Width (m)	4.5
Road Base Width (m)	5.5
Av. Road depth (m)	1
Peat depth (m) (site average)	0.5
Road lifetime (yr)	125
Rotation period (yr)	50
Average extent of drainage around drainage/road features at site (m)	30
Average distance for moving of soil outwith roadline (km)	0.05
Distance to local borrow pit (km)	2
Distance to local quarry 1 [Black Esk] (km)	10
Distance to local quarry 2 [Coatsgate] (km)	10
Distance to local quarry 3 [Grange] (km)	10
Frequency (No.) of resurfacing over 125 year lifetime of road	17
Frequency (No.) of regrading over lifetime of road	250
Road construction BASE depth (m)	0.35
Road construction SURFACE depth (m)	0.15

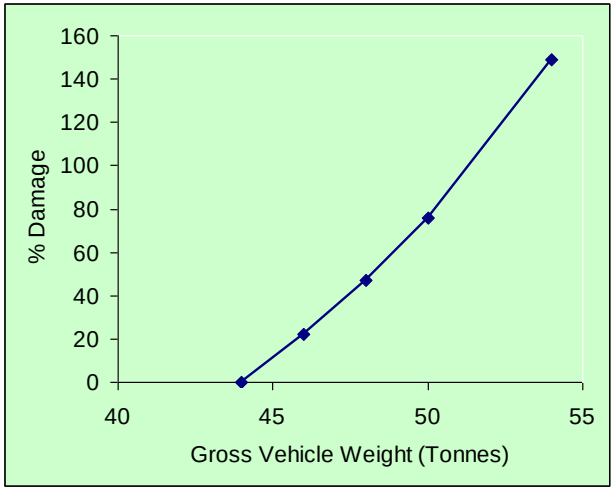
Road maintenance

-resilient sacrificial surface materials reduce attrition loss, wash-away and blow-away

Road Use

1. Timing

2. Efficient vehicle use



Timber Transport Forum 'Road Haulage of Round Timber '

3. Forwarders on forest roads

Good Practice 'Dos and Don'ts'

Summary of good practice in reducing greenhouse gas emissions from forest road and bridge building

- ✓ Minimise road build by good route planning and design.
- ✓ Optimise the route to avoid excessive loops, unless avoiding peat or dictated by harvesting needs or terrain constraints.
- ✓ Consider using a bridge to save 1–2 km of road for a similar cost but less greenhouse gas emission.
- ✓ Consider increasing road length by 1–3 km for every 1 km to avoid digging deep peat (>2 m)/steep side slopes (>20°).
- ✓ If building on peat (>2 m) is unavoidable and feasible – build 'on top' of tree stumps if present.
- ✓ Construct roads when dry, but design for use when wet.
- ✓ Use roads when dry but expect use when wet. Do not use during thaw and avoid using road salt.
- ✓ Use nearest, hardest rock and minimise rock processing, but avoid over-construction.
- ✓ Design quarry blasts for safety and effectiveness.
- ✓ Limit transport of weaker, softer rock for the road base to 10 km.
- ✓ Limit transport of stronger, harder rock for the road surface to 50 km.
- ✓ Minimise cut on side slopes.
- ✓ Spread and bury removed peat under mineral soils.
- ✓ Minimise depth of construction.
- ✓ Use site tippers, for given design load and sub-grade bearing capacity.
- ✓ Assess the need to upgrade existing roads using ground-penetrating radar and falling weight deflectometer.
- ✓ Reduce road wear by using heavy vehicles fitted with tyre pressure control systems.
- ✓ Avoid overloading lorries.
- ✓ Maintain good, hard-wearing surfacing by replenishing every 5–10 years on Class A arterial routes.
- ✓ Allow road recovery time when intensively used.
- ✓ Maintain good drainage of the formation, road structure and surface.

Technical Note link for free download
http://www.forestry.gov.uk/website/publications

Carbon Calculator
Contact Alan Dickerson or FR Mike Perks

Any further comments or recommendations - Please send or email to Alan Dickerson at alan.dickerson@forestry.gsi.gov.uk

Thank you for listening

Any Questions?